

final1

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##short term CAR test

#clean the data

```
rm(list=ls())
```

#input the data and data preparation

```
library(readr)
```

```
final_deal <- read_csv("data/final_deal.csv")
```

```
## New names:
```

```
## Rows: 2887 Columns: 39
```

```
## -- Column specification
```

```
## ----- Delimiter:
```

```
"," chr
```

```
## (4): Target 6-digit CUSIP, event_date, Acquiror 6-digit CUSIP, Date  
Eff... dbl
```

```
## (35): ...1, Acquiror PERMNO, preMTR, CAR11, CAR22, CAR55, Acquiror G  
VKEY...
```

```
## i Use `spec()` to retrieve the full column specification for this da  
ta. i
```

```
## Specify the column types or set `show_col_types = FALSE` to quiet th  
is message.
```

```
## * `` -> `...1`
```

```
data1<-final_deal
```

```
data1<-data1[,-1]
```

```
final_deal_withportfolio <- read_csv("data/final_deal_withportfolio.csv  
")
```

```
## New names:
```

```
## Rows: 290 Columns: 48
```

```
## -- Column specification
```

```
## ----- Delimiter:
```

```
"," chr
```

```
## (5): Target 6-digit CUSIP, Acquiror 6-digit CUSIP, Target GVKEY, Acq  
ui... dbl
```

```
## (42): ...1, Target PERMNO, preMKT_target, BKV_assets_target, MKTV_eq  
uit... date
```

```
## (1): event_date
```

```
## i Use `spec()` to retrieve the full column specification for this da  
ta. i
```

```
## Specify the column types or set `show_col_types = FALSE` to quiet th
```

```
is message.
## * `` -> `...1`

data2<-final_deal_withportfolio
data2<-data2[,-1]

##add package for following use
library(readr)
library(car)

## Warning: 程辑包'car'是用 R 版本 4.1.3 来建造的

## 载入需要的程辑包: carData

library(lmtest)

## 载入需要的程辑包: zoo
##
## 载入程辑包: 'zoo'
##
## The following objects are masked from 'package:base':
##
##   as.Date, as.Date.numeric

library(sandwich)

## Warning: 程辑包'sandwich'是用 R 版本 4.1.3 来建造的

library(lubridate)

##
## 载入程辑包: 'lubridate'
##
## The following objects are masked from 'package:base':
##
##   date, intersect, setdiff, union

library(robustbase)

## Warning: 程辑包'robustbase'是用 R 版本 4.1.3 来建造的

library(dplyr)

## Warning: 程辑包'dplyr'是用 R 版本 4.1.3 来建造的

##
## 载入程辑包: 'dplyr'
##
## The following object is masked from 'package:car':
##
##   recode
##
```

```

## The following objects are masked from 'package:stats':
##
##   filter, lag
##
## The following objects are masked from 'package:base':
##
##   intersect, setdiff, setequal, union

library(AER)

## Warning:  程辑包 'AER' 是用 R 版本 4.1.3 来建造的

## 载入需要的程辑包: survival
##
## 载入程辑包: 'survival'
##
## The following object is masked from 'package:robustbase':
##
##   heart

##transfer CAR and portfolio CAR into % format
data1$CAR11<-data1$CAR11*100
data1$CAR22<-data1$CAR22*100
data1$CAR55<-data1$CAR55*100

data2$portfolio_CAR11<-data2$portfolio_CAR11*100
data2$portfolio_CAR22<-data2$portfolio_CAR22*100
data2$portfolio_CAR55<-data2$portfolio_CAR55*100

##change the value of firm size
data1$`firm size`<-log(data1$MKTV_equity)
data2$`firm size acquiror`<-log(data2$MKTV_equity_acquiror)
data2$`firm size target`<-log(data2$MKTV_equity_target)

## extract year
data1$year<-year(data1$event_date)
data2$year<-year(data2$event_date)

##assign company into different type according industry number

data1$indu_type<-ifelse(data1$a_industry<10&data1$a_industry>=0,"agriculture",ifelse(data1$a_industry>=10&data1$a_industry<=14,"mining",ifelse
(data1$a_industry>=15&data1$a_industry<=17,"Construction",ifelse(data1$a_indust
ry>=20&data1$a_industry<=39,"manufacture",ifelse(data1$a_industry>=40&data1$a_industry<=49,"transportation",ifelse(data1$a_industry>=50&data1$a_industry<=51,"wholesale",ifelse(data1$a_industry>=52&data1$a_industry<=59,"retail",ifelse(data1$a_industry>=60&data1$a_industry<=67,"finance","services"))))))))

```



```

M <- length(year_cat)
print(M)

## [1] 17

##correlation between different different variables
data1$cross_border_s<-data1$cross_border*data1$ `Prev S Score`
data1$target_ESG[is.na(data1$target_ESG)] <- 0
cor_matrix <- cor(data1[c(4:7,10:16,18:24,27:31,33:36,39,42)])
cor_matrix<-as.data.frame(cor_matrix)
print(cor_matrix)

##
##          preMTR          CAR11          CAR22
CAR55
## preMTR          1.000000000 -0.018066705 -0.071544681 -0.169
167368
## CAR11          -0.018066705  1.000000000  0.891019570  0.703
281055
## CAR22          -0.071544681  0.891019570  1.000000000  0.794
613611
## CAR55          -0.169167368  0.703281055  0.794613611  1.000
000000
## BKV_assets     -0.051788016 -0.029072886 -0.027106157 -0.029
993695
## MKTV_equity    -0.082035858 -0.044168081 -0.038553854 -0.029
988058
## free cash flow -0.128466653  0.016574552  0.045862003  0.068
458824
## firm size      -0.137883906 -0.077548908 -0.057609622 -0.033
709653
## leverage       0.040391530  0.027989455  0.023120868  0.015
703662
## market-to-book 0.016730766 -0.002179742 -0.001736496 -0.001
957134
## Tobin's q      0.098291614 -0.044560320 -0.056245695 -0.052
456666
## Prev ESG Score.x -0.117409072 -0.045687214 -0.050443023 -0.056
107727
## Prev E Score   -0.119312434 -0.035420535 -0.028946016 -0.031
677491
## Prev S Score   -0.113746350 -0.026692293 -0.038294767 -0.044
667801
## Prev G Score   -0.067898814 -0.050542005 -0.057096446 -0.059
262455
## deal_size      0.103174788  0.069025836  0.074570521  0.041
800476
## hostile        0.015823584 -0.020209850 -0.012642752 -0.018
725360
## high_tech      0.040462392 -0.001880074  0.006566828 -0.001
531996

```

## diversifying 142405	-0.036156396	-0.036831002	-0.027988975	-0.018
## public_target 586122	-0.016817950	-0.106590113	-0.099140063	-0.075
## private_target 648699	0.009762607	0.022882482	0.021064607	0.021
## all_cash_deal 799173	-0.041120781	0.017031572	-0.001437073	-0.001
## stock_deal 331431	0.081325330	-0.041682389	-0.031534084	-0.031
## cross_border 743397	0.017160435	0.038553133	0.034495773	0.021
## blue state (dummy) new 470665	-0.017487367	0.026538496	0.025521460	0.007
## blue state (dummy) old 228172	-0.002790504	0.034273326	0.040470626	0.022
## religion rank (1) 243482	0.013544897	0.022916715	0.031221040	0.042
## year 412151	-0.013375432	0.009770365	-0.009324680	-0.016
## acquiror_dummy_ESG 715796	-0.103645950	-0.039964748	-0.047367418	-0.046
##	BKV_assets	MKTV_equity	free cash flow	f
irm size				
## preMTR 37883906	-0.051788016	-0.082035858	-0.128466653	-0.1
## CAR11 77548908	-0.029072886	-0.044168081	0.016574552	-0.0
## CAR22 57609622	-0.027106157	-0.038553854	0.045862003	-0.0
## CAR55 33709653	-0.029993695	-0.029988058	0.068458824	-0.0
## BKV_assets 12769954	1.000000000	0.730227555	0.048863085	0.5
## MKTV_equity 38427044	0.730227555	1.000000000	0.188988423	0.7
## free cash flow 15988932	0.048863085	0.188988423	1.000000000	0.3
## firm size 00000000	0.512769954	0.738427044	0.315988932	1.0
## leverage 58866365	0.068493938	-0.161003808	-0.265819036	-0.2
## market-to-book 53245595	-0.004446010	0.035402163	0.040706976	0.0
## Tobin's q 03818588	-0.086133804	0.126185915	0.168110715	0.2
## Prev ESG Score.x 55815654	0.346710737	0.472770291	0.223983111	0.5
## Prev E Score 50085132	0.357672443	0.464405546	0.182961821	0.5

## Prev S Score 11082793	0.324170751	0.453414379	0.165487703	0.5
## Prev G Score 10521192	0.194482581	0.251569795	0.151979234	0.3
## deal_size 05555362	-0.056596128	-0.095166294	-0.116545572	-0.2
## hostile 21518305	-0.004788315	0.008708264	0.027115932	0.0
## high_tech 79666162	0.082235202	0.230749067	0.080659578	0.1
## diversifying 09843318	0.046716380	0.014931040	-0.009854825	-0.0
## public_target 56982842	0.107510440	0.124988290	0.029579680	0.1
## private_target 09826183	-0.069549303	-0.040278016	-0.011048356	-0.1
## all_cash_deal 44835769	0.014072930	0.018021513	0.113763819	0.0
## stock_deal 00548940	-0.028582101	-0.040935173	-0.209056644	-0.1
## cross_border 68259855	-0.040660754	-0.059711321	-0.090901570	-0.0
## blue state (dummy) new 20069258	0.065879024	0.034443769	-0.070386971	0.0
## blue state (dummy) old 29710641	0.063553891	-0.013270654	-0.117298243	-0.0
## religion rank (1) 77983161	0.056290606	-0.016768467	-0.137850360	-0.0
## year 19973643	-0.076833949	-0.157214265	-0.122208318	-0.3
## acquiror_dummy_ESG 39279256	0.215532426	0.315719874	0.216532582	0.4
##				
	leverage	market-to-book	Tobin's q	Prev E
SG Score.x				
## preMTR 0.11740907	0.04039153	0.016730766	0.09829161	-
## CAR11 0.04568721	0.02798945	-0.002179742	-0.04456032	-
## CAR22 0.05044302	0.02312087	-0.001736496	-0.05624569	-
## CAR55 0.05610773	0.01570366	-0.001957134	-0.05245667	-
## BKV_assets 0.34671074	0.06849394	-0.004446010	-0.08613380	
## MKTV_equity 0.47277029	-0.16100381	0.035402163	0.12618591	
## free cash flow 0.22398311	-0.26581904	0.040706976	0.16811071	
## firm size 0.55581565	-0.25886636	0.053245595	0.20381859	

## leverage	1.00000000	-0.080063429	-0.50178052	-
0.11801958				
## market-to-book	-0.08006343	1.000000000	0.11779987	
0.03450999				
## Tobin's q	-0.50178052	0.117799871	1.00000000	
0.03310141				
## Prev ESG Score.x	-0.11801958	0.034509992	0.03310141	
1.00000000				
## Prev E Score	-0.05419374	0.022430999	-0.05486867	
0.84963017				
## Prev S Score	-0.09252895	0.047342057	0.05020254	
0.88261242				
## Prev G Score	-0.02653181	0.004570300	-0.03004809	
0.73546877				
## deal_size	0.20077905	-0.003929436	-0.09478788	-
0.07066706				
## hostile	-0.02907627	0.006148709	0.04218709	-
0.02525515				
## high_tech	-0.31955399	0.029750095	0.25003699	
0.11666335				
## diversifying	0.12395092	-0.006790360	-0.12833008	
0.02929161				
## public_target	-0.06011162	0.018203454	0.03649322	
0.10494159				
## private_target	-0.04887782	0.004795049	0.08731490	-
0.07867062				
## all_cash_deal	0.02353786	-0.054320879	-0.06264626	
0.02667139				
## stock_deal	-0.02477430	0.023129641	0.08028919	-
0.08241424				
## cross_border	0.14916295	-0.030101675	-0.10222394	-
0.01542644				
## blue state (dummy) new	0.09329581	0.008238813	-0.04770173	
0.01344230				
## blue state (dummy) old	0.15732702	0.004711802	-0.07594818	-
0.06174179				
## religion rank (1)	0.13493435	0.025751741	-0.01357694	-
0.08773284				
## year	0.21555750	0.007993606	-0.06363672	
0.10573164				
## acquiror_dummy_ESG	-0.10348027	0.032021225	0.02661956	
0.79861739				
##	Prev E Score	Prev S Score	Prev G Score	dea
l_size				
## preMTR	-0.119312434	-0.113746350	-0.067898814	0.103
174788				
## CAR11	-0.035420535	-0.026692293	-0.050542005	0.069
025836				
## CAR22	-0.028946016	-0.038294767	-0.057096446	0.074
570521				

## CAR55 800476	-0.031677491	-0.044667801	-0.059262455	0.041
## BKV_assets 596128	0.357672443	0.324170751	0.194482581	-0.056
## MKTV_equity 166294	0.464405546	0.453414379	0.251569795	-0.095
## free cash flow 545572	0.182961821	0.165487703	0.151979234	-0.116
## firm size 555362	0.550085132	0.511082793	0.310521192	-0.205
## leverage 779054	-0.054193737	-0.092528948	-0.026531809	0.200
## market-to-book 929436	0.022430999	0.047342057	0.004570300	-0.003
## Tobin's q 787878	-0.054868665	0.050202544	-0.030048088	-0.094
## Prev ESG Score.x 667064	0.849630167	0.882612419	0.735468775	-0.070
## Prev E Score 716308	1.000000000	0.713331954	0.460494314	-0.066
## Prev S Score 674712	0.713331954	1.000000000	0.455275858	-0.080
## Prev G Score 068516	0.460494314	0.455275858	1.000000000	-0.010
## deal_size 000000	-0.066716308	-0.080674712	-0.010068516	1.000
## hostile 703241	-0.022130855	-0.021586916	-0.025210713	0.023
## high_tech 136817	0.087935082	0.119565528	0.002175844	-0.053
## diversifying 841994	0.007095813	0.082388871	0.039009602	-0.113
## public_target 250707	0.110095945	0.086410817	0.058431619	0.194
## private_target 713023	-0.118104157	-0.023081657	-0.099035606	-0.131
## all_cash_deal 816729	0.022313069	0.036759676	0.031284809	-0.249
## stock_deal 876307	-0.073413652	-0.081795471	-0.066567553	0.265
## cross_border 078032	-0.033294119	-0.004367307	0.009815780	0.067
## blue state (dummy) new 598253	0.009496076	0.050130509	-0.015789240	0.007
## blue state (dummy) old 630393	-0.014996646	-0.019474379	-0.084497952	0.003
## religion rank (1) 663608	-0.046992024	-0.029566912	-0.123389290	0.029
## year 547470	0.100243823	0.144747749	0.045051296	0.088

## acquiror_dummy_ESG 346977	0.668087171	0.681230445	0.593117724	-0.062
## _target	hostile	high_tech	diversifying	public
## preMTR 6817950	0.015823584	0.040462392	-0.036156396	-0.01
## CAR11 6590113	-0.020209850	-0.001880074	-0.036831002	-0.10
## CAR22 9140063	-0.012642752	0.006566828	-0.027988975	-0.09
## CAR55 5586122	-0.018725360	-0.001531996	-0.018142405	-0.07
## BKV_assets 7510440	-0.004788315	0.082235202	0.046716380	0.10
## MKTV_equity 4988290	0.008708264	0.230749067	0.014931040	0.12
## free cash flow 9579680	0.027115932	0.080659578	-0.009854825	0.02
## firm size 6982842	0.021518305	0.179666162	-0.009843318	0.15
## leverage 0111622	-0.029076266	-0.319553991	0.123950923	-0.06
## market-to-book 8203454	0.006148709	0.029750095	-0.006790360	0.01
## Tobin's q 6493216	0.042187089	0.250036987	-0.128330081	0.03
## Prev ESG Score.x 4941587	-0.025255153	0.116663355	0.029291607	0.10
## Prev E Score 0095945	-0.022130855	0.087935082	0.007095813	0.11
## Prev S Score 6410817	-0.021586916	0.119565528	0.082388871	0.08
## Prev G Score 8431619	-0.025210713	0.002175844	0.039009602	0.05
## deal_size 4250707	0.023703241	-0.053136817	-0.113841994	0.19
## hostile 9182243	1.000000000	0.019303636	-0.026835939	0.05
## high_tech 5962097	0.019303636	1.000000000	-0.131657190	0.06
## diversifying 6277306	-0.026835939	-0.131657190	1.000000000	-0.13
## public_target 0000000	0.059182243	0.065962097	-0.136277306	1.00
## private_target 0035047	-0.024266794	0.113787702	0.121477032	-0.41
## all_cash_deal 2080945	-0.015082325	-0.030948805	0.157971013	-0.17
## stock_deal 9036041	0.028338181	0.070963200	-0.143891575	0.23

## cross_border 5311899	0.014277239	0.016528653	0.000411230	0.00
## blue state (dummy) new 6570250	-0.012609602	0.023960859	0.058096290	-0.04
## blue state (dummy) old 3921025	-0.001947871	-0.109847400	0.030897612	-0.00
## religion rank (1) 6574915	0.023351022	-0.079263316	-0.023843372	0.04
## year 1805677	-0.043473395	-0.132070533	0.050190993	-0.04
## acquiror_dummy_ESG 6950113	-0.026356843	0.042423408	0.002405304	0.07
##				
ss_border	private_target	all_cash_deal	stock_deal	cro
## preMTR 017160435	0.009762607	-4.112078e-02	0.081325330	0.
## CAR11 038553133	0.022882482	1.703157e-02	-0.041682389	0.
## CAR22 034495773	0.021064607	-1.437073e-03	-0.031534084	0.
## CAR55 021743397	0.021648699	-1.799173e-03	-0.031331431	0.
## BKV_assets 040660754	-0.069549303	1.407293e-02	-0.028582101	-0.
## MKTV_equity 059711321	-0.040278016	1.802151e-02	-0.040935173	-0.
## free cash flow 090901570	-0.011048356	1.137638e-01	-0.209056644	-0.
## firm size 068259855	-0.109826183	4.483577e-02	-0.100548940	-0.
## leverage 149162951	-0.048877823	2.353786e-02	-0.024774305	0.
## market-to-book 030101675	0.004795049	-5.432088e-02	0.023129641	-0.
## Tobin's q 102223944	0.087314898	-6.264626e-02	0.080289191	-0.
## Prev ESG Score.x 015426441	-0.078670619	2.667139e-02	-0.082414240	-0.
## Prev E Score 033294119	-0.118104157	2.231307e-02	-0.073413652	-0.
## Prev S Score 004367307	-0.023081657	3.675968e-02	-0.081795471	-0.
## Prev G Score 009815780	-0.099035606	3.128481e-02	-0.066567553	0.
## deal_size 067078032	-0.131713023	-2.498167e-01	0.265876307	0.
## hostile 014277239	-0.024266794	-1.508233e-02	0.028338181	0.
## high_tech 016528653	0.113787702	-3.094881e-02	0.070963200	0.

## diversifying 000411230	0.121477032	1.579710e-01	-0.143891575	0.
## public_target 005311899	-0.410035047	-1.720809e-01	0.239036041	0.
## private_target 050260741	1.000000000	7.132399e-03	-0.039396125	0.
## all_cash_deal 055186587	0.007132399	1.000000e+00	-0.677791128	-0.
## stock_deal 072157787	-0.039396125	-6.777911e-01	1.000000000	0.
## cross_border 000000000	0.050260741	-5.518659e-02	0.072157787	1.
## blue state (dummy) new 063560247	0.021002594	8.485337e-03	0.005949960	0.
## blue state (dummy) old 061666714	-0.045881991	2.206606e-02	-0.008652944	0.
## religion rank (1) 029928784	-0.053166063	8.266234e-03	0.009537644	0.
## year 046378428	0.044260122	-5.179621e-06	0.061035783	0.
## acquiror_dummy_ESG 025887913	-0.085755977	2.295668e-02	-0.063509989	-0.
##			blue state (dummy) new	blue state (dummy) old
## preMTR	-0.017487367		-0.002790504	
## CAR11	0.026538496		0.034273326	
## CAR22	0.025521460		0.040470626	
## CAR55	0.007470665		0.022228172	
## BKV_assets	0.065879024		0.063553891	
## MKTV_equity	0.034443769		-0.013270654	
## free cash flow	-0.070386971		-0.117298243	
## firm size	0.020069258		-0.029710641	
## leverage	0.093295806		0.157327019	
## market-to-book	0.008238813		0.004711802	
## Tobin's q	-0.047701728		-0.075948178	
## Prev ESG Score.x	0.013442303		-0.061741787	
## Prev E Score	0.009496076		-0.014996646	
## Prev S Score	0.050130509		-0.019474379	
## Prev G Score	-0.015789240		-0.084497952	
## deal_size	0.007598253		0.003630393	
## hostile	-0.012609602		-0.001947871	
## high_tech	0.023960859		-0.109847400	
## diversifying	0.058096290		0.030897612	
## public_target	-0.046570250		-0.003921025	
## private_target	0.021002594		-0.045881991	
## all_cash_deal	0.008485337		0.022066063	
## stock_deal	0.005949960		-0.008652944	
## cross_border	0.063560247		0.061666714	
## blue state (dummy) new	1.000000000		0.678167282	
## blue state (dummy) old	0.678167282		1.000000000	
## religion rank (1)	0.223383631		0.549756198	

## year	0.053420860	0.107572832
## acquiror_dummy_ESG	-0.010099029	-0.044187420
## religion rank (1)		year acquiror_dumm
y_ESG		
## preMTR	0.013544897	-1.337543e-02
45950		-0.1036
## CAR11	0.022916715	9.770365e-03
64748		-0.0399
## CAR22	0.031221040	-9.324680e-03
67418		-0.0473
## CAR55	0.042243482	-1.641215e-02
15796		-0.0467
## BKV_assets	0.056290606	-7.683395e-02
32426		0.2155
## MKTV_equity	-0.016768467	-1.572143e-01
19874		0.3157
## free cash flow	-0.137850360	-1.222083e-01
32582		0.2165
## firm size	-0.077983161	-3.199736e-01
79256		0.4392
## leverage	0.134934350	2.155575e-01
80275		-0.1034
## market-to-book	0.025751741	7.993606e-03
21225		0.0320
## Tobin's q	-0.013576935	-6.363672e-02
19559		0.0266
## Prev ESG Score.x	-0.087732842	1.057316e-01
17391		0.7986
## Prev E Score	-0.046992024	1.002438e-01
87171		0.6680
## Prev S Score	-0.029566912	1.447477e-01
30445		0.6812
## Prev G Score	-0.123389290	4.505130e-02
17724		0.5931
## deal_size	0.029663608	8.854747e-02
46977		-0.0623
## hostile	0.023351022	-4.347339e-02
56843		-0.0263
## high_tech	-0.079263316	-1.320705e-01
23408		0.0424
## diversifying	-0.023843372	5.019099e-02
05304		0.0024
## public_target	0.046574915	-4.180568e-02
50113		0.0769
## private_target	-0.053166063	4.426012e-02
55977		-0.0857
## all_cash_deal	0.008266234	-5.179621e-06
56681		0.0229
## stock_deal	0.009537644	6.103578e-02
09989		-0.0635

```

## cross_border      0.029928784  4.637843e-02    -0.0258
87913
## blue state (dummy) new  0.223383631  5.342086e-02    -0.0100
99029
## blue state (dummy) old  0.549756198  1.075728e-01    -0.0441
87420
## religion rank (1)      1.000000000  1.601742e-01    -0.0591
00441
## year                0.160174157  1.000000e+00     0.0589
71709
## acquiror_dummy_ESG    -0.059100441  5.897171e-02     1.0000
00000

```

###hypothesis1

##CAR11 regression model

```

reg1A.2<-lm(CAR11~`Prev ESG Score.x`+ `firm size`+leverage+`free cash f
low`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+i_cat*y_cat , data=data1)

```

```
summary(reg1A.2)
```

```

##
## Call:
## lm(formula = CAR11 ~ `Prev ESG Score.x` + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat * y_cat,
##   data = data1)
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -48.737  -1.870  -0.041   1.867   85.670
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.386986    5.124310   0.466   0.6414
## `Prev ESG Score.x` -0.005308    0.006627  -0.801   0.4232
## `firm size`      -0.182889    0.095395  -1.917   0.0553
## .
## leverage         0.762947    0.926528   0.823   0.4103
## `free cash flow`  0.413193    1.138925   0.363   0.7168
## `Tobin's q`     -0.118144    0.095356  -1.239   0.2155

```

## preMTR	-0.689393	0.418717	-1.646	0.0998
.				
## deal_size	1.427390	0.304888	4.682	2.98e-06

## hostile	-3.256813	3.666041	-0.888	0.3744
## high_tech	0.115083	0.274282	0.420	0.6748
## diversifying	-0.422358	0.217183	-1.945	0.0519
.				
## public_target	-1.716997	0.304995	-5.630	1.99e-08

## private_target	-0.236008	0.222709	-1.060	0.2894
## all_cash_deal	-0.069218	0.308721	-0.224	0.8226
## stock_deal	-0.652240	0.412909	-1.580	0.1143
## cross_border	0.524063	0.237298	2.208	0.0273
*				
## i_catConstruction	-3.351733	6.193915	-0.541	0.5885
## i_catfinance	-0.900458	5.407395	-0.167	0.8678
## i_catmanufacture	-0.415780	5.095199	-0.082	0.9350
## i_catmining	-0.200581	5.304683	-0.038	0.9698
## i_catretail	-0.583617	5.539040	-0.105	0.9161
## i_catservices	0.854602	5.150459	0.166	0.8682
## i_cattransportation	-0.440343	5.404888	-0.081	0.9351
## i_catwholesale	0.970729	7.164247	0.135	0.8922
## y_cat2004	-1.759557	5.661004	-0.311	0.7560
## y_cat2005	-1.439297	6.191954	-0.232	0.8162
## y_cat2006	-1.437533	5.548207	-0.259	0.7956
## y_cat2007	-0.637898	5.662358	-0.113	0.9103
## y_cat2008	-2.095700	6.199167	-0.338	0.7353
## y_cat2009	-1.359480	7.159599	-0.190	0.8494

## y_cat2010	-0.429664	7.155669	-0.060	0.9521
## y_cat2011	-0.106576	5.848349	-0.018	0.9855
## y_cat2012	-5.962858	5.418497	-1.100	0.2712
## y_cat2013	0.573461	5.418653	0.106	0.9157
## y_cat2014	-0.347728	7.158816	-0.049	0.9613
## y_cat2015	-3.054812	5.851649	-0.522	0.6017
## y_cat2016	-2.084714	7.156838	-0.291	0.7709
## y_cat2017	-5.229770	5.339939	-0.979	0.3275
## y_cat2018	-1.348503	7.158299	-0.188	0.8506
## y_cat2019	-2.043955	5.667316	-0.361	0.7184
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.233680	6.239472	0.358	0.7204
## i_catmanufacture:y_cat2004	2.794924	5.719731	0.489	0.6251
## i_catmining:y_cat2004	-0.605727	6.028732	-0.100	0.9200
## i_catretail:y_cat2004	1.176529	6.760293	0.174	0.8619
## i_catservices:y_cat2004	0.088230	5.827052	0.015	0.9879
## i_cattransportation:y_cat2004	1.260597	6.322745	0.199	0.8420
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	2.580677	6.566151	0.393	0.6943
## i_catmanufacture:y_cat2005	1.933030	6.240570	0.310	0.7568
## i_catmining:y_cat2005	0.183487	6.539066	0.028	0.9776
## i_catretail:y_cat2005	5.267453	6.970553	0.756	0.4499
## i_catservices:y_cat2005	1.336383	6.331856	0.211	0.8329

## i_cattransportation:y_cat2005	1.194542	6.800283	0.176	0.8606
## i_catwholesale:y_cat2005	-0.138073	9.474114	-0.015	0.9884
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.987234	6.871015	0.144	0.8858
## i_catmanufacture:y_cat2006	3.011187	5.679498	0.530	0.5960
## i_catmining:y_cat2006	0.426732	6.801901	0.063	0.9500
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	0.476808	5.792281	0.082	0.9344
## i_cattransportation:y_cat2006	-0.611830	6.875323	-0.089	0.9291
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.821234	6.097964	0.135	0.8929
## i_catmanufacture:y_cat2007	1.719406	5.719403	0.301	0.7637
## i_catmining:y_cat2007	1.717017	6.039827	0.284	0.7762
## i_catretail:y_cat2007	6.076809	7.074279	0.859	0.3904
## i_catservices:y_cat2007	-1.004036	5.823793	-0.172	0.8631
## i_cattransportation:y_cat2007	1.766735	6.396290	0.276	0.7824
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	14.888865	8.005407	1.860	0.0630
## i_catfinance:y_cat2008	7.308993	6.963238	1.050	0.2940
## i_catmanufacture:y_cat2008	1.930520	6.261410	0.308	0.7579
## i_catmining:y_cat2008	0.705993	6.538516	0.108	0.9140
## i_catretail:y_cat2008	3.614295	6.975486	0.518	0.6044
## i_catservices:y_cat2008	1.201654	6.343179	0.189	0.8498

## i_cattransportation:y_cat2008	2.771296	6.650432	0.417	0.6769
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.953506	7.284365	0.405	0.6852
## i_catmining:y_cat2009	7.670321	8.912945	0.861	0.3895
## i_catretail:y_cat2009	-8.420427	9.121536	-0.923	0.3560
## i_catservices:y_cat2009	1.471668	7.349684	0.200	0.8413
## i_cattransportation:y_cat2009	0.910948	7.970120	0.114	0.9090
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	1.387893	8.524409	0.163	0.8707
## i_catfinance:y_cat2010	0.131648	7.475864	0.018	0.9860
## i_catmanufacture:y_cat2010	1.273443	7.198224	0.177	0.8596
## i_catmining:y_cat2010	0.469857	7.479466	0.063	0.9499
## i_catretail:y_cat2010	2.239166	8.051110	0.278	0.7809
## i_catservices:y_cat2010	-0.032115	7.281603	-0.004	0.9965
## i_cattransportation:y_cat2010	0.759907	7.520928	0.101	0.9195
## i_catwholesale:y_cat2010	-0.239897	9.060527	-0.026	0.9789
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-2.907381	6.554561	-0.444	0.6574
## i_catmanufacture:y_cat2011	0.957513	5.943176	0.161	0.8720
## i_catmining:y_cat2011	0.579066	7.042459	0.082	0.9345
## i_catretail:y_cat2011	1.926479	8.053016	0.239	0.8109
## i_catservices:y_cat2011	-2.168203	6.190565	-0.350	0.7262

## i_cattransportation:y_cat2011	-1.344847	6.812195	-0.197	0.8435
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-2.834471	8.249650	-0.344	0.7312
## i_catfinance:y_cat2012	6.007770	5.800558	1.036	0.3004
## i_catmanufacture:y_cat2012	7.107208	5.467707	1.300	0.1938
## i_catmining:y_cat2012	-0.097824	5.862809	-0.017	0.9867
## i_catretail:y_cat2012	6.409223	6.137408	1.044	0.2964
## i_catservices:y_cat2012	5.799456	5.579815	1.039	0.2987
## i_cattransportation:y_cat2012	7.707540	5.887592	1.309	0.1906
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	3.790300	7.422596	0.511	0.6096
## i_catfinance:y_cat2013	0.132318	5.827387	0.023	0.9819
## i_catmanufacture:y_cat2013	1.217765	5.481777	0.222	0.8242
## i_catmining:y_cat2013	0.298831	6.024679	0.050	0.9604
## i_catretail:y_cat2013	0.830916	6.393424	0.130	0.8966
## i_catservices:y_cat2013	-1.775769	5.575675	-0.318	0.7501
## i_cattransportation:y_cat2013	-2.635542	5.946391	-0.443	0.6576
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	2.005276	9.461995	0.212	0.8322
## i_catfinance:y_cat2014	2.319084	8.226616	0.282	0.7780
## i_catmanufacture:y_cat2014	2.298697	7.275057	0.316	0.7520
## i_catmining:y_cat2014	7.707031	8.171740	0.943	0.3457
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-1.047377	7.400033	-0.142	0.8875

## i_cattransportation:y_cat2014	4.176306	8.227145	0.508	0.6118
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	6.295924	8.516931	0.739	0.4598
## i_catfinance:y_cat2015	6.010796	7.126481	0.843	0.3991
## i_catmanufacture:y_cat2015	4.054232	5.967522	0.679	0.4970
## i_catmining:y_cat2015	0.503655	7.053778	0.071	0.9431
## i_catretail:y_cat2015	7.109739	6.671288	1.066	0.2866
## i_catservices:y_cat2015	1.427985	6.165541	0.232	0.8169
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.753636	8.221839	0.457	0.6480
## i_catfinance:y_cat2016	2.285465	7.439322	0.307	0.7587
## i_catmanufacture:y_cat2016	3.226775	7.191683	0.449	0.6537
## i_catmining:y_cat2016	2.394519	7.409686	0.323	0.7466
## i_catretail:y_cat2016	4.286439	7.743555	0.554	0.5799
## i_catservices:y_cat2016	2.184979	7.257560	0.301	0.7634
## i_cattransportation:y_cat2016	1.021992	7.490553	0.136	0.8915
## i_catwholesale:y_cat2016	2.682130	8.886562	0.302	0.7628
## i_catConstruction:y_cat2017	8.163568	6.710368	1.217	0.2239
## i_catfinance:y_cat2017	4.943452	5.691889	0.869	0.3852
## i_catmanufacture:y_cat2017	5.810773	5.385995	1.079	0.2807
## i_catmining:y_cat2017	5.106429	5.783514	0.883	0.3774
## i_catretail:y_cat2017	3.914704	5.926905	0.660	0.5090
## i_catservices:y_cat2017	5.501122	5.459375	1.008	0.3137

```

## i_cattransportation:y_cat2017  4.375268  5.758099  0.760  0.4474
## i_catwholesale:y_cat2017          NA          NA          NA          NA
## i_catConstruction:y_cat2018  1.586994  8.230350  0.193  0.8471
## i_catfinance:y_cat2018        1.571914  7.424476  0.212  0.8323
## i_catmanufacture:y_cat2018    1.229427  7.192761  0.171  0.8643
## i_catmining:y_cat2018         -2.358076  7.430348 -0.317  0.7510
## i_catretail:y_cat2018          4.256698  7.845296  0.543  0.5875
## i_catservices:y_cat2018        0.880208  7.240324  0.122  0.9032
## i_cattransportation:y_cat2018  2.181120  7.457792  0.292  0.7700
## i_catwholesale:y_cat2018        4.074304  8.858308  0.460  0.6456
## i_catConstruction:y_cat2019          NA          NA          NA          NA
## i_catfinance:y_cat2019          2.146781  6.102849  0.352  0.7250
## i_catmanufacture:y_cat2019      2.687796  5.777278  0.465  0.6418
## i_catmining:y_cat2019          -2.818430  6.597274 -0.427  0.6693
## i_catretail:y_cat2019           2.206464  6.762257  0.326  0.7442
## i_catservices:y_cat2019         0.232723  5.794650  0.040  0.9680
## i_cattransportation:y_cat2019 -0.596894  6.275965 -0.095  0.9242
## i_catwholesale:y_cat2019          NA          NA          NA          NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.054 on 2742 degrees of freedom
## Multiple R-squared:  0.0837, Adjusted R-squared:  0.03558
## F-statistic: 1.739 on 144 and 2742 DF,  p-value: 2.607e-07

##test heteroskedasticity problem
hetero_test <- bptest(reg1A.2)
print(hetero_test)

```

```

##
## studentized Breusch-Pagan test
##
## data: reg1A.2
## BP = 593.08, df = 144, p-value < 2.2e-16

##solve heteroskedasticity problem
coefptest(reg1A.2, vcov = vcovHC(reg1A.2, type='HC0', cluster='a_industry
'))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|
)
## (Intercept)      2.3869858  0.8886252  2.6862 0.007271
5 **
## `Prev ESG Score.x`
4      -0.0053078  0.0061968 -0.8565 0.391781
## `firm size`
3      -0.1828888  0.0986889 -1.8532 0.063963
.
## leverage
4      0.7629467  0.9966134  0.7655 0.444016
## `free cash flow`
1      0.4131927  1.5168899  0.2724 0.785339
## `Tobin's q`
4     -0.1181442  0.1055828 -1.1190 0.263250
## preMTR
7     -0.6893928  0.5801549 -1.1883 0.234821
## deal_size
5      1.4273903  1.6050603  0.8893 0.373916
## hostile
5     -3.2568128  0.7861604 -4.1427 3.537e-0
5 ***
## high_tech
6      0.1150827  0.2971787  0.3873 0.698600
## diversifying
3     -0.4223581  0.2117391 -1.9947 0.046173
*
## public_target
5     -1.7169971  0.3888281 -4.4158 1.045e-0
5 ***
## private_target
2     -0.2360081  0.2305699 -1.0236 0.306121
## all_cash_deal
9     -0.0692178  0.3250191 -0.2130 0.831369
## stock_deal
4     -0.6522402  0.7105750 -0.9179 0.358749
## cross_border
9      0.5240633  0.2226647  2.3536 0.018662
*
## i_catConstruction
6     -3.3517327  0.3635326 -9.2199 < 2.2e-1
6 ***
## i_catfinance
4     -0.9004575  0.4880314 -1.8451 0.065133

```

5 .				
## i_catmanufacture	-0.4157801	0.5346573	-0.7777	0.436838
3				
## i_catmining	-0.2005811	1.2779909	-0.1570	0.875295
5				
## i_catretail	-0.5836168	0.7792267	-0.7490	0.453940
1				
## i_catservices	0.8546015	1.0271388	0.8320	0.405469
3				
## i_cattransportation	-0.4403428	1.5625104	-0.2818	0.778104
7				
## i_catwholesale	0.9707287	0.6464764	1.5016	0.133323
7				
## y_cat2004	-1.7595567	0.8982694	-1.9588	0.050234
0 .				
## y_cat2005	-1.4392973	0.3906509	-3.6844	0.000233
7 ***				
## y_cat2006	-1.4375329	0.8877661	-1.6193	0.105504
2				
## y_cat2007	-0.6378975	0.6220779	-1.0254	0.305250
7				
## y_cat2008	-2.0956998	0.9511587	-2.2033	0.027655
6 *				
## y_cat2009	-1.3594800	0.6397608	-2.1250	0.033677
3 *				
## y_cat2010	-0.4296638	0.4410457	-0.9742	0.330046
4				
## y_cat2011	-0.1065760	0.6222142	-0.1713	0.864012
3				
## y_cat2012	-5.9628582	5.4720685	-1.0897	0.275945
5				
## y_cat2013	0.5734614	1.2546187	0.4571	0.647649
6				
## y_cat2014	-0.3477281	0.4089561	-0.8503	0.395242
5				
## y_cat2015	-3.0548125	1.5386939	-1.9853	0.047207
4 *				
## y_cat2016	-2.0847141	0.3414219	-6.1060	1.166e-0
9 ***				
## y_cat2017	-5.2297698	3.2906125	-1.5893	0.112108
0				
## y_cat2018	-1.3485028	0.3822213	-3.5281	0.000425
5 ***				
## y_cat2019	-2.0439554	0.9885481	-2.0676	0.038768
1 *				
## i_catfinance:y_cat2004	2.2336804	2.3199251	0.9628	0.335720
6				
## i_catmanufacture:y_cat2004	2.7949240	1.1531996	2.4236	0.015430
7 *				
## i_catmining:y_cat2004	-0.6057274	1.7304822	-0.3500	0.726340

1					
## i_catretail:y_cat2004	1.1765290	1.8025110	0.6527	0.513993	
7					
## i_catservices:y_cat2004	0.0882305	1.4574585	0.0605	0.951732	
2					
## i_cattransportation:y_cat2004	1.2605971	1.8282219	0.6895	0.490553	
9					
## i_catfinance:y_cat2005	2.5806771	0.9222230	2.7983	0.005172	
8 **					
## i_catmanufacture:y_cat2005	1.9330301	0.6793252	2.8455	0.004466	
9 **					
## i_catmining:y_cat2005	0.1834866	2.0254252	0.0906	0.927823	
7					
## i_catretail:y_cat2005	5.2674527	1.7719216	2.9727	0.002977	
3 **					
## i_catservices:y_cat2005	1.3363825	1.3405455	0.9969	0.318903	
7					
## i_cattransportation:y_cat2005	1.1945420	1.9574521	0.6103	0.541744	
5					
## i_catwholesale:y_cat2005	-0.1380726	0.9786993	-0.1411	0.887819	
0					
## i_catfinance:y_cat2006	0.9872344	1.0310203	0.9575	0.338383	
5					
## i_catmanufacture:y_cat2006	3.0111867	1.2188863	2.4704	0.013555	
1 *					
## i_catmining:y_cat2006	0.4267321	2.2815906	0.1870	0.851648	
8					
## i_catservices:y_cat2006	0.4768078	1.5042994	0.3170	0.751295	
5					
## i_cattransportation:y_cat2006	-0.6118303	2.1362847	-0.2864	0.774594	
0					
## i_catfinance:y_cat2007	0.8212343	1.0273154	0.7994	0.424128	
7					
## i_catmanufacture:y_cat2007	1.7194063	0.8178055	2.1025	0.035603	
6 *					
## i_catmining:y_cat2007	1.7170170	1.7443755	0.9843	0.325046	
9					
## i_catretail:y_cat2007	6.0768087	6.1254056	0.9921	0.321252	
7					
## i_catservices:y_cat2007	-1.0040358	1.4497573	-0.6926	0.488647	
9					
## i_cattransportation:y_cat2007	1.7667347	1.9720488	0.8959	0.370391	
3					
## i_catConstruction:y_cat2008	14.8888647	4.4723050	3.3291	0.000882	
7 ***					
## i_catfinance:y_cat2008	7.3089933	2.3280403	3.1395	0.001710	
1 **					
## i_catmanufacture:y_cat2008	1.9305203	1.2035099	1.6041	0.108812	
6					
## i_catmining:y_cat2008	0.7059931	2.6687558	0.2645	0.791383	

6					
## i_catretail:y_cat2008	3.6142947	2.1698657	1.6657	0.095892	
0 .					
## i_catservices:y_cat2008	1.2016541	1.5595910	0.7705	0.441073	
8					
## i_cattransportation:y_cat2008	2.7712961	1.9507983	1.4206	0.155548	
0					
## i_catmanufacture:y_cat2009	2.9535059	1.3046653	2.2638	0.023664	
0 *					
## i_catmining:y_cat2009	7.6703210	1.5170238	5.0562	4.560e-0	
7 ***					
## i_catretail:y_cat2009	-8.4204272	6.0138501	-1.4002	0.161574	
8					
## i_catservices:y_cat2009	1.4716682	1.3189282	1.1158	0.264602	
9					
## i_cattransportation:y_cat2009	0.9109476	1.7829203	0.5109	0.609441	
1					
## i_catConstruction:y_cat2010	1.3878928	0.9766016	1.4211	0.155388	
2					
## i_catfinance:y_cat2010	0.1316483	1.3492246	0.0976	0.922278	
3					
## i_catmanufacture:y_cat2010	1.2734432	0.7458142	1.7075	0.087851	
0 .					
## i_catmining:y_cat2010	0.4698568	2.1722121	0.2163	0.828767	
4					
## i_catretail:y_cat2010	2.2391662	0.9129318	2.4527	0.014239	
9 *					
## i_catservices:y_cat2010	-0.0321154	1.3725383	-0.0234	0.981334	
1					
## i_cattransportation:y_cat2010	0.7599072	1.8651407	0.4074	0.683726	
8					
## i_catwholesale:y_cat2010	-0.2398974	1.1281619	-0.2126	0.831620	
1					
## i_catfinance:y_cat2011	-2.9073811	0.7723180	-3.7645	0.000170	
4 ***					
## i_catmanufacture:y_cat2011	0.9575125	1.0412608	0.9196	0.357878	
2					
## i_catmining:y_cat2011	0.5790662	2.1255739	0.2724	0.785313	
3					
## i_catretail:y_cat2011	1.9264793	0.9925133	1.9410	0.052359	
3 .					
## i_catservices:y_cat2011	-2.1682026	1.2127804	-1.7878	0.073919	
5 .					
## i_cattransportation:y_cat2011	-1.3448465	1.9597254	-0.6862	0.492618	
3					
## i_catConstruction:y_cat2012	-2.8344708	5.5550264	-0.5103	0.609915	
1					
## i_catfinance:y_cat2012	6.0077696	5.4802690	1.0963	0.273063	
7					
## i_catmanufacture:y_cat2012	7.1072080	5.4870414	1.2953	0.195335	

7					
## i_catmining:y_cat2012	-0.0978242	6.8111324	-0.0144	0.988541	
9					
## i_catretail:y_cat2012	6.4092229	5.6295627	1.1385	0.255013	
8					
## i_catservices:y_cat2012	5.7994558	5.6364075	1.0289	0.303604	
4					
## i_cattransportation:y_cat2012	7.7075403	5.7389176	1.3430	0.179373	
3					
## i_catConstruction:y_cat2013	3.7902997	1.4454458	2.6222	0.008783	
8 **					
## i_catfinance:y_cat2013	0.1323184	1.3760468	0.0962	0.923401	
8					
## i_catmanufacture:y_cat2013	1.2177653	1.3613817	0.8945	0.371129	
3					
## i_catmining:y_cat2013	0.2988309	2.7718350	0.1078	0.914154	
5					
## i_catretail:y_cat2013	0.8309164	1.6232765	0.5119	0.608779	
0					
## i_catservices:y_cat2013	-1.7757687	1.6986719	-1.0454	0.295936	
5					
## i_cattransportation:y_cat2013	-2.6355420	2.2953117	-1.1482	0.250974	
5					
## i_catConstruction:y_cat2014	2.0052758	0.5103143	3.9295	8.723e-0	
5 ***					
## i_catfinance:y_cat2014	2.3190842	1.2958120	1.7897	0.073616	
3 .					
## i_catmanufacture:y_cat2014	2.2986969	1.1114312	2.0682	0.038711	
8 *					
## i_catmining:y_cat2014	7.7070309	1.7996962	4.2824	1.912e-0	
5 ***					
## i_catservices:y_cat2014	-1.0473773	1.3348970	-0.7846	0.432748	
4					
## i_cattransportation:y_cat2014	4.1763063	6.7699625	0.6169	0.537360	
0					
## i_catConstruction:y_cat2015	6.2959239	1.6086866	3.9137	9.310e-0	
5 ***					
## i_catfinance:y_cat2015	6.0107961	2.4503533	2.4530	0.014227	
6 *					
## i_catmanufacture:y_cat2015	4.0542316	1.9585558	2.0700	0.038544	
8 *					
## i_catmining:y_cat2015	0.5036549	5.3780349	0.0937	0.925393	
7					
## i_catretail:y_cat2015	7.1097386	2.1297984	3.3382	0.000854	
4 ***					
## i_catservices:y_cat2015	1.4279854	2.0026229	0.7131	0.475870	
8					
## i_catConstruction:y_cat2016	3.7536360	0.8050498	4.6626	3.272e-0	
6 ***					
## i_catfinance:y_cat2016	2.2854655	0.6540807	3.4942	0.000483	

```

1 ***
## i_catmanufacture:y_cat2016      3.2267754  0.6693313  4.8209 1.507e-0
6 ***
## i_catmining:y_cat2016           2.3945193  1.8493187  1.2948 0.195494
2
## i_catretail:y_cat2016          4.2864392  1.4441321  2.9682 0.003021
7 **
## i_catservices:y_cat2016        2.1849787  1.4036801  1.5566 0.119679
2
## i_cattransportation:y_cat2016  1.0219922  1.7876698  0.5717 0.567579
1
## i_catwholesale:y_cat2016       2.6821305  2.8489560  0.9414 0.346560
7
## i_catConstruction:y_cat2017    8.1635677  3.4509953  2.3656 0.018071
6 *
## i_catfinance:y_cat2017         4.9434521  3.3287088  1.4851 0.137633
3
## i_catmanufacture:y_cat2017     5.8107734  3.3394815  1.7400 0.081967
2 .
## i_catmining:y_cat2017          5.1064288  3.8051044  1.3420 0.179708
9
## i_catretail:y_cat2017          3.9147036  3.8422949  1.0188 0.308366
4
## i_catservices:y_cat2017        5.5011219  3.4707087  1.5850 0.113078
5
## i_cattransportation:y_cat2017  4.3752682  3.7400762  1.1698 0.242169
5
## i_catConstruction:y_cat2018    1.5869940  1.3711865  1.1574 0.247214
9
## i_catfinance:y_cat2018         1.5719145  0.6486766  2.4233 0.015446
1 *
## i_catmanufacture:y_cat2018     1.2294271  0.7637055  1.6098 0.107552
6
## i_catmining:y_cat2018          -2.3580758  2.2246747 -1.0600 0.289254
2
## i_catretail:y_cat2018          4.2566977  3.1014862  1.3725 0.170029
3
## i_catservices:y_cat2018        0.8802079  1.2087460  0.7282 0.466553
8
## i_cattransportation:y_cat2018  2.1811199  1.7886456  1.2194 0.222787
7
## i_catwholesale:y_cat2018       4.0743038  5.1124363  0.7969 0.425555
0
## i_catfinance:y_cat2019         2.1467808  1.0534713  2.0378 0.041664
1 *
## i_catmanufacture:y_cat2019     2.6877957  1.5030304  1.7883 0.073845
9 .
## i_catmining:y_cat2019          -2.8184304  5.8777743 -0.4795 0.631616
7
## i_catretail:y_cat2019          2.2064642  2.0275483  1.0882 0.276583

```

```

7
## i_catservices:y_cat2019      0.2327232  1.9492735  0.1194 0.904975
4
## i_cattransportation:y_cat2019 -0.5968943  1.9051987 -0.3133 0.754078
4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##test multicollenarity problem
vif_values1A.2 <- vif(lm(CAR11 ~ `Prev ESG Score.x` + `firm size` + leverage
+ `free cash flow` + `Tobin's q`
+ preMTR + deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea
l + cross_border, data = data1))
print(vif_values1A.2)

## `Prev ESG Score.x`      `firm size`      leverage      `free cas
h flow`
##          1.486018          1.725136          1.565334          1
.228513
##      `Tobin's q`      preMTR      deal_size
hostile
##          1.432378          1.064238          1.229957          1
.008833
##          high_tech      diversifying      public_target      private
_target
##          1.190358          1.091410          1.352913          1
.283231
##      all_cash_deal      stock_deal      cross_border
##          1.896648          2.042504          1.041970

##CAR22 regression model
reg2A.2 <- lm(CAR22 ~ `Prev ESG Score.x` + `firm size` + leverage + `free cash f
low` + `Tobin's q`
+ preMTR + deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal + cross_borde
r + (i_cat * y_cat), data = data1)

summary(reg2A.2)

##
## Call:
## lm(formula = CAR22 ~ `Prev ESG Score.x` + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + (i_cat * y_cat),
## data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -42.323  -2.281   0.020   2.389  82.059

```

```

##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.900443   5.540393   0.343  0.73161
## `Prev ESG Score.x` -0.013121   0.007165  -1.831  0.06716
## .
## `firm size`      -0.114222   0.103141  -1.107  0.26820
## leverage         1.245074   1.001760   1.243  0.21402
## `free cash flow` 2.237254   1.231404   1.817  0.06935
## .
## `Tobin's q`      -0.202063   0.103098  -1.960  0.05011
## .
## preMTR           -2.058278   0.452715  -4.547 5.69e-06
## ***
## deal_size        1.436071   0.329644   4.356 1.37e-05
## ***
## hostile          -1.438869   3.963715  -0.363  0.71663
## high_tech        0.280189   0.296553   0.945  0.34483
## diversifying     -0.261676   0.234818  -1.114  0.26521
## public_target    -1.922190   0.329760  -5.829 6.23e-09
## ***
## private_target   -0.302407   0.240793  -1.256  0.20927
## all_cash_deal    -0.304274   0.333788  -0.912  0.36207
## stock_deal       -0.563120   0.446436  -1.261  0.20728
## cross_border     0.584676   0.256566   2.279  0.02275
## *
## i_catConstruction -3.641078   6.696848  -0.544  0.58669
## i_catfinance     -0.839522   5.846464  -0.144  0.88583
## i_catmanufacture 0.489766   5.508918   0.089  0.92916
## i_catmining      0.709634   5.735411   0.124  0.90154
## i_catretail      -0.953681   5.988798  -0.159  0.87349
## i_catservices    0.880809   5.568665   0.158  0.87433

```

## i_cattransportation	0.314881	5.843752	0.054	0.95703
## i_catwholesale	-0.973697	7.745968	-0.126	0.89998
## y_cat2004	-1.083838	6.120665	-0.177	0.85946
## y_cat2005	0.042114	6.694727	0.006	0.99498
## y_cat2006	-0.676171	5.998710	-0.113	0.91026
## y_cat2007	1.258606	6.122129	0.206	0.83713
## y_cat2008	-1.927458	6.702526	-0.288	0.77370
## y_cat2009	-2.111677	7.740942	-0.273	0.78503
## y_cat2010	1.626915	7.736693	0.210	0.83346
## y_cat2011	1.264659	6.323222	0.200	0.84149
## y_cat2012	-5.130339	5.858467	-0.876	0.38126
## y_cat2013	3.386561	5.858636	0.578	0.56328
## y_cat2014	1.001662	7.740096	0.129	0.89704
## y_cat2015	-0.892814	6.326790	-0.141	0.88779
## y_cat2016	-1.461380	7.737958	-0.189	0.85022
## y_cat2017	-3.228915	5.773531	-0.559	0.57603
## y_cat2018	-0.446781	7.739537	-0.058	0.95397
## y_cat2019	-1.461088	6.127490	-0.238	0.81155
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	1.598476	6.746103	0.237	0.81271
## i_catmanufacture:y_cat2004	1.960188	6.184160	0.317	0.75129
## i_catmining:y_cat2004	-1.977759	6.518252	-0.303	0.76159
## i_catretail:y_cat2004	2.402426	7.309214	0.329	0.74242
## i_catservices:y_cat2004	-0.237220	6.300196	-0.038	0.96997

## i_cattransportation:y_cat2004	-1.193653	6.836138	-0.175	0.86140
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	0.712437	7.099308	0.100	0.92007
## i_catmanufacture:y_cat2005	-0.049229	6.747290	-0.007	0.99418
## i_catmining:y_cat2005	-0.441879	7.070023	-0.063	0.95017
## i_catretail:y_cat2005	5.647618	7.536547	0.749	0.45370
## i_catservices:y_cat2005	-0.267554	6.845988	-0.039	0.96883
## i_cattransportation:y_cat2005	-1.254860	7.352451	-0.171	0.86449
## i_catwholesale:y_cat2005	0.650011	10.243392	0.063	0.94941
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.512264	7.428927	0.069	0.94503
## i_catmanufacture:y_cat2006	1.466426	6.140661	0.239	0.81127
## i_catmining:y_cat2006	-2.163428	7.354200	-0.294	0.76865
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	1.040915	6.262601	0.166	0.86800
## i_cattransportation:y_cat2006	-3.553857	7.433584	-0.478	0.63263
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-1.322305	6.593105	-0.201	0.84106
## i_catmanufacture:y_cat2007	-0.504014	6.183805	-0.082	0.93505
## i_catmining:y_cat2007	-0.440358	6.530248	-0.067	0.94624
## i_catretail:y_cat2007	4.721986	7.648695	0.617	0.53705
## i_catservices:y_cat2007	-2.612431	6.296672	-0.415	0.67825

## i_cattransportation:y_cat2007	-0.898423	6.915654	-0.130	0.89665
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008 **	23.586817	8.655428	2.725	0.00647
## i_catfinance:y_cat2008	5.829482	7.528637	0.774	0.43882
## i_catmanufacture:y_cat2008	1.311514	6.769822	0.194	0.84640
## i_catmining:y_cat2008	0.172696	7.069429	0.024	0.98051
## i_catretail:y_cat2008	4.735515	7.541880	0.628	0.53012
## i_catservices:y_cat2008	1.320324	6.858231	0.193	0.84735
## i_cattransportation:y_cat2008	2.283030	7.190432	0.318	0.75088
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.930485	7.875839	0.372	0.70986
## i_catmining:y_cat2009	4.867816	9.636656	0.505	0.61350
## i_catretail:y_cat2009	5.963005	9.862184	0.605	0.54547
## i_catservices:y_cat2009	1.479898	7.946462	0.186	0.85228
## i_cattransportation:y_cat2009	1.038030	8.617277	0.120	0.90413
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	-0.093254	9.216572	-0.010	0.99193
## i_catfinance:y_cat2010	-1.629398	8.082888	-0.202	0.84026
## i_catmanufacture:y_cat2010	-1.435789	7.782704	-0.184	0.85365
## i_catmining:y_cat2010	-2.950746	8.086782	-0.365	0.71523
## i_catretail:y_cat2010	1.201287	8.704842	0.138	0.89025
## i_catservices:y_cat2010	-1.116475	7.872853	-0.142	0.88724

## i_cattransportation:y_cat2010	-2.117278	8.131611	-0.260	0.79459
## i_catwholesale:y_cat2010	-0.044661	9.796222	-0.005	0.99636
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-10.565643	7.086777	-1.491	0.13610
## i_catmanufacture:y_cat2011	-0.646374	6.425748	-0.101	0.91988
## i_catmining:y_cat2011	0.630559	7.614291	0.083	0.93401
## i_catretail:y_cat2011	0.159067	8.706903	0.018	0.98543
## i_catservices:y_cat2011	-2.640680	6.693225	-0.395	0.69322
## i_cattransportation:y_cat2011	-5.028013	7.365331	-0.683	0.49488
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-4.528337	8.919504	-0.508	0.61171
## i_catfinance:y_cat2012	6.056640	6.271551	0.966	0.33426
## i_catmanufacture:y_cat2012	5.911030	5.911672	1.000	0.31745
## i_catmining:y_cat2012	-1.775953	6.338856	-0.280	0.77937
## i_catretail:y_cat2012	6.361778	6.635752	0.959	0.33779
## i_catservices:y_cat2012	4.650789	6.032884	0.771	0.44083
## i_cattransportation:y_cat2012	5.801979	6.365652	0.911	0.36214
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	-1.376664	8.025295	-0.172	0.86381
## i_catfinance:y_cat2013	-3.313424	6.300558	-0.526	0.59900
## i_catmanufacture:y_cat2013	-2.490155	5.926885	-0.420	0.67441
## i_catmining:y_cat2013	-3.572934	6.513870	-0.549	0.58339
## i_catretail:y_cat2013	-1.310992	6.912556	-0.190	0.84959
## i_catservices:y_cat2013	-3.945666	6.028408	-0.655	0.51284

## i_cattransportation:y_cat2013	-6.554156	6.429224	-1.019	0.30809
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	2.765570	10.230288	0.270	0.78693
## i_catfinance:y_cat2014	-2.241145	8.894599	-0.252	0.80109
## i_catmanufacture:y_cat2014	0.776435	7.865775	0.099	0.92138
## i_catmining:y_cat2014	3.144521	8.835268	0.356	0.72194
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-3.297061	8.000899	-0.412	0.68031
## i_cattransportation:y_cat2014	2.226244	8.895171	0.250	0.80239
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-0.253781	9.208487	-0.028	0.97802
## i_catfinance:y_cat2015	2.282979	7.705135	0.296	0.76703
## i_catmanufacture:y_cat2015	0.955233	6.452072	0.148	0.88231
## i_catmining:y_cat2015	-6.785136	7.626529	-0.890	0.37372
## i_catretail:y_cat2015	6.631441	7.212982	0.919	0.35798
## i_catservices:y_cat2015	0.118495	6.666169	0.018	0.98582
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.946719	8.889434	0.444	0.65709
## i_catfinance:y_cat2016	1.696615	8.043379	0.211	0.83296
## i_catmanufacture:y_cat2016	1.915242	7.775632	0.246	0.80546
## i_catmining:y_cat2016	2.143838	8.011336	0.268	0.78903
## i_catretail:y_cat2016	6.891597	8.372315	0.823	0.41050
## i_catservices:y_cat2016	1.741394	7.846857	0.222	0.82439

## i_cattransportation:y_cat2016	-0.176575	8.098770	-0.022	0.98261
## i_catwholesale:y_cat2016	5.898924	9.608132	0.614	0.53930
## i_catConstruction:y_cat2017	7.596564	7.255235	1.047	0.29517
## i_catfinance:y_cat2017	3.250828	6.154058	0.528	0.59737
## i_catmanufacture:y_cat2017	3.324173	5.823326	0.571	0.56816
## i_catmining:y_cat2017	1.802833	6.253122	0.288	0.77313
## i_catretail:y_cat2017	2.596646	6.408156	0.405	0.68536
## i_catservices:y_cat2017	4.755482	5.902664	0.806	0.42051
## i_cattransportation:y_cat2017	1.519240	6.225644	0.244	0.80723
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.647445	8.898636	0.185	0.85314
## i_catfinance:y_cat2018	0.492275	8.027328	0.061	0.95110
## i_catmanufacture:y_cat2018	-0.462808	7.776797	-0.060	0.95255
## i_catmining:y_cat2018	-3.425382	8.033676	-0.426	0.66987
## i_catretail:y_cat2018	-0.194815	8.482317	-0.023	0.98168
## i_catservices:y_cat2018	0.021242	7.828223	0.003	0.99784
## i_cattransportation:y_cat2018	1.087386	8.063348	0.135	0.89274
## i_catwholesale:y_cat2018	6.064861	9.577583	0.633	0.52663
## i_catConstruction:y_cat2019	NA	NA	NA	NA
## i_catfinance:y_cat2019	1.451691	6.598387	0.220	0.82588
## i_catmanufacture:y_cat2019	0.845552	6.246380	0.135	0.89233
## i_catmining:y_cat2019	1.698836	7.132958	0.238	0.81177
## i_catretail:y_cat2019	2.552207	7.311337	0.349	0.72706
## i_catservices:y_cat2019	0.475346	6.265163	0.076	0.93953

```

## i_cattransportation:y_cat2019  -1.902767  6.785560  -0.280  0.77918
## i_catwholesale:y_cat2019          NA          NA          NA          NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.464 on 2742 degrees of freedom
## Multiple R-squared:  0.1025, Adjusted R-squared:  0.05538
## F-statistic: 2.175 on 144 and 2742 DF,  p-value: 1.667e-13

##test heteroskedasticity problem
hetero_test <- bptest(reg2A.2)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg2A.2
## BP = 577.79, df = 144, p-value < 2.2e-16

##solve heteroskedasticity problem
coeftest(reg2A.2, vcov = vcovHC(reg2A.2,type='HC0',cluster='a_industry'
))

##
## t test of coefficients:
##
##              Estimate  Std. Error t value  Pr(>|
t|)
## (Intercept)      1.9004432    0.9364762   2.0294 0.0425
185 *
## `Prev ESG Score.x` -0.0131208    0.0068038  -1.9284 0.0539
031 .
## `firm size`      -0.1142225    0.1055727  -1.0819 0.2793
778
## leverage         1.2450737    1.0383479   1.1991 0.2305
962
## `free cash flow` 2.2372538    1.8096078   1.2363 0.2164
456
## `Tobin's q`     -0.2020631    0.1118580  -1.8064 0.0709
616 .
## preMTR           -2.0582776    0.6570064  -3.1328 0.0017
497 **
## deal_size        1.4360706    1.4927281   0.9620 0.3361
122
## hostile          -1.4388686    0.8329300  -1.7275 0.0841
944 .
## high_tech        0.2801891    0.3149413   0.8897 0.3737
292
## diversifying     -0.2616764    0.2277143  -1.1491 0.2505

```

969					
## public_target	-1.9221903	0.4082783	-4.7080	2.625e	
-06 ***					
## private_target	-0.3024069	0.2465892	-1.2264	0.2201	
689					
## all_cash_deal	-0.3042740	0.3456967	-0.8802	0.3788	
409					
## stock_deal	-0.5631199	0.7093464	-0.7939	0.4273	
471					
## cross_border	0.5846762	0.2506284	2.3328	0.0197	
285 *					
## i_catConstruction	-3.6410780	1.5235228	-2.3899	0.0169	
198 *					
## i_catfinance	-0.8395217	1.1697159	-0.7177	0.4729	
947					
## i_catmanufacture	0.4897663	0.6902335	0.7096	0.4780	
336					
## i_catmining	0.7096337	1.2332787	0.5754	0.5650	
652					
## i_catretail	-0.9536810	1.0571824	-0.9021	0.3670	
846					
## i_catservices	0.8808092	1.0343563	0.8516	0.3945	
366					
## i_cattransportation	0.3148812	1.3920371	0.2262	0.8210	
614					
## i_catwholesale	-0.9736970	0.6754600	-1.4415	0.1495	
487					
## y_cat2004	-1.0838379	1.8978761	-0.5711	0.5679	
927					
## y_cat2005	0.0421135	0.6713343	0.0627	0.9499	
852					
## y_cat2006	-0.6761709	1.0516535	-0.6430	0.5203	
040					
## y_cat2007	1.2586062	0.9326575	1.3495	0.1772	
930					
## y_cat2008	-1.9274582	2.3894086	-0.8067	0.4199	
280					
## y_cat2009	-2.1116769	0.6550506	-3.2237	0.0012	
804 **					
## y_cat2010	1.6269146	0.4567522	3.5619	0.0003	
744 ***					
## y_cat2011	1.2646589	1.5054672	0.8400	0.4009	
569					
## y_cat2012	-5.1303394	6.2824081	-0.8166	0.4142	
166					
## y_cat2013	3.3865608	1.3283672	2.5494	0.0108	
443 *					
## y_cat2014	1.0016616	0.4491570	2.2301	0.0258	
220 *					
## y_cat2015	-0.8928136	1.6926239	-0.5275	0.5979	

078				
## y_cat2016	-1.4613802	0.3709375	-3.9397	8.362e
-05 ***				
## y_cat2017	-3.2289153	3.4511929	-0.9356	0.3495
647				
## y_cat2018	-0.4467810	0.4174126	-1.0704	0.2845
523				
## y_cat2019	-1.4610884	1.6298245	-0.8965	0.3700
806				
## i_catfinance:y_cat2004	1.5984758	3.3787718	0.4731	0.6361
840				
## i_catmanufacture:y_cat2004	1.9601879	2.0518590	0.9553	0.3394
986				
## i_catmining:y_cat2004	-1.9777586	2.4198622	-0.8173	0.4138
268				
## i_catretail:y_cat2004	2.4024262	2.4343815	0.9869	0.3237
918				
## i_catservices:y_cat2004	-0.2372202	2.2733438	-0.1043	0.9169
003				
## i_cattransportation:y_cat2004	-1.1936533	2.4420956	-0.4888	0.6250
349				
## i_catfinance:y_cat2005	0.7124366	1.5653456	0.4551	0.6490
514				
## i_catmanufacture:y_cat2005	-0.0492290	0.9751919	-0.0505	0.9597
425				
## i_catmining:y_cat2005	-0.4418792	2.1096196	-0.2095	0.8341
054				
## i_catretail:y_cat2005	5.6476183	1.6649115	3.3921	0.0007
033 ***				
## i_catservices:y_cat2005	-0.2675540	1.4652097	-0.1826	0.8551
218				
## i_cattransportation:y_cat2005	-1.2548604	1.9044081	-0.6589	0.5099
998				
## i_catwholesale:y_cat2005	0.6500112	1.1342016	0.5731	0.5666
238				
## i_catfinance:y_cat2006	0.5122643	1.5887687	0.3224	0.7471
527				
## i_catmanufacture:y_cat2006	1.4664264	1.4679958	0.9989	0.3179
163				
## i_catmining:y_cat2006	-2.1634285	3.4578984	-0.6256	0.5315
977				
## i_catservices:y_cat2006	1.0409152	1.6289664	0.6390	0.5228
741				
## i_cattransportation:y_cat2006	-3.5538568	1.9842848	-1.7910	0.0734
033 .				
## i_catfinance:y_cat2007	-1.3223045	1.7430438	-0.7586	0.4481
463				
## i_catmanufacture:y_cat2007	-0.5040139	1.1573818	-0.4355	0.6632
500				
## i_catmining:y_cat2007	-0.4403578	1.9923930	-0.2210	0.8250

937					
## i_catretail:y_cat2007	4.7219859	5.1080845	0.9244	0.3553	
520					
## i_catservices:y_cat2007	-2.6124307	1.6532583	-1.5802	0.1141	
831					
## i_cattransportation:y_cat2007	-0.8984227	2.0665347	-0.4347	0.6637	
793					
## i_catConstruction:y_cat2008	23.5868171	8.0208436	2.9407	0.0033	
022 **					
## i_catfinance:y_cat2008	5.8294819	3.8639832	1.5087	0.1314	
979					
## i_catmanufacture:y_cat2008	1.3115144	2.5808814	0.5082	0.6113	
783					
## i_catmining:y_cat2008	0.1726961	3.5519769	0.0486	0.9612	
259					
## i_catretail:y_cat2008	4.7355153	3.7449505	1.2645	0.2061	
557					
## i_catservices:y_cat2008	1.3203240	2.7219747	0.4851	0.6276	
718					
## i_cattransportation:y_cat2008	2.2830296	3.0246188	0.7548	0.4504	
244					
## i_catmanufacture:y_cat2009	2.9304847	1.6007832	1.8307	0.0672	
603 .					
## i_catmining:y_cat2009	4.8678155	1.4959777	3.2539	0.0011	
520 **					
## i_catretail:y_cat2009	5.9630054	5.6761436	1.0505	0.2935	
633					
## i_catservices:y_cat2009	1.4798977	1.3155370	1.1249	0.2607	
137					
## i_cattransportation:y_cat2009	1.0380304	1.7658600	0.5878	0.5566	
929					
## i_catConstruction:y_cat2010	-0.0932542	1.7442452	-0.0535	0.9573	
662					
## i_catfinance:y_cat2010	-1.6293980	1.7191217	-0.9478	0.3433	
105					
## i_catmanufacture:y_cat2010	-1.4357895	0.8470637	-1.6950	0.0901	
852 .					
## i_catmining:y_cat2010	-2.9507462	2.1515325	-1.3715	0.1703	
430					
## i_catretail:y_cat2010	1.2012867	1.1039101	1.0882	0.2765	
978					
## i_catservices:y_cat2010	-1.1164755	1.4300241	-0.7807	0.4350	
235					
## i_cattransportation:y_cat2010	-2.1172785	1.8122094	-1.1683	0.2427	
708					
## i_catwholesale:y_cat2010	-0.0446613	1.0795749	-0.0414	0.9670	
045					
## i_catfinance:y_cat2011	-10.5656429	2.6300374	-4.0173	6.045e	
-05 ***					
## i_catmanufacture:y_cat2011	-0.6463741	1.7665279	-0.3659	0.7144	

673				
## i_catmining:y_cat2011	0.6305586	2.5187704	0.2503	0.8023
402				
## i_catretail:y_cat2011	0.1590666	1.8332357	0.0868	0.9308
621				
## i_catservices:y_cat2011	-2.6406805	1.8747302	-1.4086	0.1590
770				
## i_cattransportation:y_cat2011	-5.0280126	2.6677050	-1.8848	0.0595
665 .				
## i_catConstruction:y_cat2012	-4.5283372	6.5190364	-0.6946	0.4873
442				
## i_catfinance:y_cat2012	6.0566397	6.3789547	0.9495	0.3424
642				
## i_catmanufacture:y_cat2012	5.9110301	6.3051257	0.9375	0.3485
860				
## i_catmining:y_cat2012	-1.7759525	7.3278931	-0.2424	0.8085
231				
## i_catretail:y_cat2012	6.3617776	6.4927329	0.9798	0.3272
562				
## i_catservices:y_cat2012	4.6507888	6.4261267	0.7237	0.4692
925				
## i_cattransportation:y_cat2012	5.8019789	6.4863982	0.8945	0.3711
415				
## i_catConstruction:y_cat2013	-1.3766644	2.3601946	-0.5833	0.5597
499				
## i_catfinance:y_cat2013	-3.3134235	1.8025857	-1.8382	0.0661
484 .				
## i_catmanufacture:y_cat2013	-2.4901551	1.4804763	-1.6820	0.0926
835 .				
## i_catmining:y_cat2013	-3.5729339	3.2035167	-1.1153	0.2648
127				
## i_catretail:y_cat2013	-1.3109920	1.8218523	-0.7196	0.4718
370				
## i_catservices:y_cat2013	-3.9456657	1.7820910	-2.2141	0.0269
063 *				
## i_cattransportation:y_cat2013	-6.5541559	2.3016174	-2.8476	0.0044
374 **				
## i_catConstruction:y_cat2014	2.7655703	1.5672800	1.7646	0.0777
479 .				
## i_catfinance:y_cat2014	-2.2411447	2.1837020	-1.0263	0.3048
383				
## i_catmanufacture:y_cat2014	0.7764355	1.2390838	0.6266	0.5309
601				
## i_catmining:y_cat2014	3.1445214	2.2668828	1.3872	0.1655
068				
## i_catservices:y_cat2014	-3.2970612	1.5667148	-2.1044	0.0354
307 *				
## i_cattransportation:y_cat2014	2.2262439	4.5209744	0.4924	0.6224
579				
## i_catConstruction:y_cat2015	-0.2537807	2.2875587	-0.1109	0.9116

724					
## i_catfinance:y_cat2015	2.2829786	3.4272292	0.6661	0.5053	
843					
## i_catmanufacture:y_cat2015	0.9552333	2.1886140	0.4365	0.6625	
404					
## i_catmining:y_cat2015	-6.7851364	3.4421545	-1.9712	0.0488	
027 *					
## i_catretail:y_cat2015	6.6314407	2.7045468	2.4520	0.0142	
700 *					
## i_catservices:y_cat2015	0.1184953	2.2480354	0.0527	0.9579	
663					
## i_catConstruction:y_cat2016	3.9467187	2.0168950	1.9568	0.0504	
689 .					
## i_catfinance:y_cat2016	1.6966151	1.2554074	1.3514	0.1766	
642					
## i_catmanufacture:y_cat2016	1.9152416	0.8060344	2.3761	0.0175	
637 *					
## i_catmining:y_cat2016	2.1438384	1.7987526	1.1918	0.2334	
243					
## i_catretail:y_cat2016	6.8915972	3.2080163	2.1482	0.0317	
818 *					
## i_catservices:y_cat2016	1.7413940	1.5165093	1.1483	0.2509	
486					
## i_cattransportation:y_cat2016	-0.1765752	1.6433299	-0.1074	0.9144	
401					
## i_catwholesale:y_cat2016	5.8989240	2.3369097	2.5242	0.0116	
508 *					
## i_catConstruction:y_cat2017	7.5965640	3.9673310	1.9148	0.0556	
246 .					
## i_catfinance:y_cat2017	3.2508277	3.6463934	0.8915	0.3727	
292					
## i_catmanufacture:y_cat2017	3.3241728	3.5169545	0.9452	0.3446	
477					
## i_catmining:y_cat2017	1.8028329	4.0061613	0.4500	0.6527	
352					
## i_catretail:y_cat2017	2.5966460	3.9850470	0.6516	0.5147	
156					
## i_catservices:y_cat2017	4.7554818	3.6435578	1.3052	0.1919	
427					
## i_cattransportation:y_cat2017	1.5192404	3.8224587	0.3975	0.6910	
658					
## i_catConstruction:y_cat2018	1.6474450	2.1861716	0.7536	0.4511	
690					
## i_catfinance:y_cat2018	0.4922747	1.2471796	0.3947	0.6930	
874					
## i_catmanufacture:y_cat2018	-0.4628081	0.9414626	-0.4916	0.6230	
527					
## i_catmining:y_cat2018	-3.4253820	2.0213702	-1.6946	0.0902	
679 .					
## i_catretail:y_cat2018	-0.1948149	2.5453748	-0.0765	0.9389	

```

976
## i_catservices:y_cat2018      0.0212424    1.2515979    0.0170 0.9864
600
## i_cattransportation:y_cat2018 1.0873862    1.6441424    0.6614 0.5084
307
## i_catwholesale:y_cat2018      6.0648609    5.0275096    1.2063 0.2277
924
## i_catfinance:y_cat2019        1.4516910    1.9926461    0.7285 0.4663
549
## i_catmanufacture:y_cat2019    0.8455523    2.1185003    0.3991 0.6898
301
## i_catmining:y_cat2019         1.6988362    8.6589861    0.1962 0.8444
733
## i_catretail:y_cat2019         2.5522067    3.1723392    0.8045 0.4211
671
## i_catservices:y_cat2019       0.4753458    2.3025352    0.2064 0.8364
590
## i_cattransportation:y_cat2019 -1.9027667    2.1604977   -0.8807 0.3785
533
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values2A.2 <- vif(lm(CAR22 ~`Prev ESG Score.x`+ `firm size`+leverage
+`free cash flow`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea
l+cross_border, data = data1))
print(vif_values2A.2)

```

```

## `Prev ESG Score.x`      `firm size`      leverage      `free cas
h flow`
##          1.486018          1.725136          1.565334          1
.228513
##      `Tobin's q`      preMTR      deal_size
hostile
##          1.432378          1.064238          1.229957          1
.008833
##          high_tech      diversifying      public_target      private
_target
##          1.190358          1.091410          1.352913          1
.283231
##      all_cash_deal      stock_deal      cross_border
##          1.896648          2.042504          1.041970

```

##CAR55 regression model

```

reg3A.2<-lm(CAR55~`Prev ESG Score.x`+ `firm size`+leverage+`free cash f
low`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde

```

```

r+(i_cat*y_cat) , data=data1)

summary(reg3A.2)

##
## Call:
## lm(formula = CAR55 ~ `Prev ESG Score.x` + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + (i_cat * y_cat),
##   data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -56.444  -3.095  -0.092   3.247  89.771
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)          -1.450538    6.877598  -0.211  0.832975
## `Prev ESG Score.x`    -0.029416    0.008894  -3.307  0.000954
## ***
## `firm size`          -0.051734    0.128035  -0.404  0.686201
## leverage              2.396932    1.243540   1.928  0.054020
## .
## `free cash flow`     3.857042    1.528610   2.523  0.011684
## *
## `Tobin's q`         -0.191143    0.127982  -1.494  0.135416
## preMTR                -5.367391    0.561981  -9.551 < 2e-16
## ***
## deal_size            1.106527    0.409206   2.704  0.006892
## **
## hostile              -3.413168    4.920380  -0.694  0.487942
## high_tech             0.310832    0.368128   0.844  0.398542
## diversifying         -0.176961    0.291492  -0.607  0.543844
## public_target        -1.798085    0.409350  -4.393  1.16e-05
## ***
## private_target       -0.237219    0.298910  -0.794  0.427488
## all_cash_deal        -0.379356    0.414350  -0.916  0.359986
## stock_deal           -0.438127    0.554186  -0.791  0.429259

```

## cross_border	0.514233	0.318489	1.615	0.106512
## i_catConstruction	-4.628834	8.313169	-0.557	0.577704
## i_catfinance	1.060607	7.257540	0.146	0.883823
## i_catmanufacture	4.194884	6.838526	0.613	0.539650
## i_catmining	4.135753	7.119685	0.581	0.561362
## i_catretail	1.776067	7.434227	0.239	0.811198
## i_catservices	4.349313	6.912694	0.629	0.529285
## i_cattransportation	3.647575	7.254175	0.503	0.615128
## i_catwholesale	3.586707	9.615500	0.373	0.709168
## y_cat2004	-2.396823	7.597922	-0.315	0.752438
## y_cat2005	1.311017	8.310537	0.158	0.874663
## y_cat2006	-2.228457	7.446532	-0.299	0.764763
## y_cat2007	-0.351019	7.599739	-0.046	0.963164
## y_cat2008	-3.969000	8.320218	-0.477	0.633378
## y_cat2009	-5.633271	9.609262	-0.586	0.557767
## y_cat2010	5.774403	9.603987	0.601	0.547723
## y_cat2011	-0.437218	7.849367	-0.056	0.955584
## y_cat2012	-5.546346	7.272440	-0.763	0.445736
## y_cat2013	2.693808	7.272650	0.370	0.711111
## y_cat2014	0.781132	9.608211	0.081	0.935211
## y_cat2015	-2.288646	7.853796	-0.291	0.770763
## y_cat2016	4.351729	9.605557	0.453	0.650554
## y_cat2017	-5.077061	7.167004	-0.708	0.478761
## y_cat2018	1.887029	9.607518	0.196	0.844302

## y_cat2019	1.283079	7.606394	0.169	0.866057
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.776638	8.374312	0.332	0.740242
## i_catmanufacture:y_cat2004	2.563863	7.676741	0.334	0.738422
## i_catmining:y_cat2004	-4.157902	8.091468	-0.514	0.607390
## i_catretail:y_cat2004	6.696667	9.073334	0.738	0.460541
## i_catservices:y_cat2004	0.353635	7.820783	0.045	0.963937
## i_cattransportation:y_cat2004	0.143808	8.486078	0.017	0.986481
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	0.014344	8.812766	0.002	0.998701
## i_catmanufacture:y_cat2005	-1.333344	8.375786	-0.159	0.873531
## i_catmining:y_cat2005	-0.931809	8.776413	-0.106	0.915454
## i_catretail:y_cat2005	6.972137	9.355534	0.745	0.456189
## i_catservices:y_cat2005	-1.847008	8.498306	-0.217	0.827961
## i_cattransportation:y_cat2005	-3.753703	9.127006	-0.411	0.680904
## i_catwholesale:y_cat2005	-3.118530	12.715691	-0.245	0.806281
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	6.088329	9.221939	0.660	0.509181
## i_catmanufacture:y_cat2006	2.870252	7.622744	0.377	0.706546
## i_catmining:y_cat2006	-7.162728	9.129177	-0.785	0.432757
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	3.049650	7.774115	0.392	0.694880
## i_cattransportation:y_cat2006	-2.493377	9.227721	-0.270	0.787023

## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.125179	8.184387	0.015	0.987798
## i_catmanufacture:y_cat2007	0.365008	7.676301	0.048	0.962078
## i_catmining:y_cat2007	1.646745	8.106359	0.203	0.839039
## i_catretail:y_cat2007	7.049037	9.494750	0.742	0.457900
## i_catservices:y_cat2007	-0.416206	7.816409	-0.053	0.957538
## i_cattransportation:y_cat2007	-0.058979	8.584786	-0.007	0.994519
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	35.495314	10.744464	3.304	0.000967

## i_catfinance:y_cat2008	11.387373	9.345716	1.218	0.223154
## i_catmanufacture:y_cat2008	2.407209	8.403756	0.286	0.774559
## i_catmining:y_cat2008	3.150741	8.775675	0.359	0.719599
## i_catretail:y_cat2008	12.225772	9.362155	1.306	0.191706
## i_catservices:y_cat2008	4.076815	8.513503	0.479	0.632073
## i_cattransportation:y_cat2008	3.254476	8.925883	0.365	0.715430
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	4.746944	9.776717	0.486	0.627335
## i_catmining:y_cat2009	7.616730	11.962517	0.637	0.524363
## i_catretail:y_cat2009	26.075892	12.242477	2.130	0.033264
*				
## i_catservices:y_cat2009	6.069121	9.864384	0.615	0.538437
## i_cattransportation:y_cat2009	4.663868	10.697104	0.436	0.662876

## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	2.636803	11.441043	0.230	0.817745
## i_catfinance:y_cat2010	-3.553289	10.033738	-0.354	0.723266
## i_catmanufacture:y_cat2010	-6.217217	9.661103	-0.644	0.519934
## i_catmining:y_cat2010	-5.075319	10.038572	-0.506	0.613191
## i_catretail:y_cat2010	-1.736476	10.805805	-0.161	0.872343
## i_catservices:y_cat2010	-6.354205	9.773010	-0.650	0.515631
## i_cattransportation:y_cat2010	-7.564277	10.094221	-0.749	0.453700
## i_catwholesale:y_cat2010	-4.602108	12.160594	-0.378	0.705130
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-7.221524	8.797210	-0.821	0.411781
## i_catmanufacture:y_cat2011	-0.493067	7.976639	-0.062	0.950716
## i_catmining:y_cat2011	-1.003673	9.452042	-0.106	0.915443
## i_catretail:y_cat2011	6.440075	10.808362	0.596	0.551330
## i_catservices:y_cat2011	0.120659	8.308672	0.015	0.988415
## i_cattransportation:y_cat2011	-7.262662	9.142994	-0.794	0.427065
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	10.218468	11.072276	0.923	0.356147
## i_catfinance:y_cat2012	7.669384	7.785224	0.985	0.324652
## i_catmanufacture:y_cat2012	5.622439	7.338487	0.766	0.443648
## i_catmining:y_cat2012	-3.046556	7.868774	-0.387	0.698660
## i_catretail:y_cat2012	7.765784	8.237328	0.943	0.345889
## i_catservices:y_cat2012	5.223468	7.488954	0.697	0.485556
## i_cattransportation:y_cat2012	6.709191	7.902037	0.849	0.395930

## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	3.666715	9.962244	0.368	0.712856
## i_catfinance:y_cat2013	-1.757802	7.821233	-0.225	0.822192
## i_catmanufacture:y_cat2013	-2.391475	7.357372	-0.325	0.745172
## i_catmining:y_cat2013	-4.788980	8.086029	-0.592	0.553730
## i_catretail:y_cat2013	1.260272	8.580939	0.147	0.883246
## i_catservices:y_cat2013	-4.383121	7.483397	-0.586	0.558117
## i_cattransportation:y_cat2013	-4.729813	7.980953	-0.593	0.553473
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	4.300986	12.699425	0.339	0.734880
## i_catfinance:y_cat2014	-0.573381	11.041360	-0.052	0.958588
## i_catmanufacture:y_cat2014	-0.941124	9.764224	-0.096	0.923222
## i_catmining:y_cat2014	7.645216	10.967709	0.697	0.485821
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-1.999940	9.931961	-0.201	0.840429
## i_cattransportation:y_cat2014	2.390444	11.042070	0.216	0.828626
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-1.926479	11.431007	-0.169	0.866178
## i_catfinance:y_cat2015	5.672298	9.564812	0.593	0.553205
## i_catmanufacture:y_cat2015	1.359712	8.009315	0.170	0.865206
## i_catmining:y_cat2015	7.195452	9.467234	0.760	0.447298
## i_catretail:y_cat2015	9.155315	8.953876	1.022	0.306636
## i_catservices:y_cat2015	0.283578	8.275086	0.034	0.972665
## i_cattransportation:y_cat2015	NA	NA	NA	NA

## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.750572	11.034948	0.340	0.733972
## i_catfinance:y_cat2016	-2.254200	9.984693	-0.226	0.821401
## i_catmanufacture:y_cat2016	-3.963182	9.652324	-0.411	0.681403
## i_catmining:y_cat2016	-3.621435	9.944916	-0.364	0.715775
## i_catretail:y_cat2016	0.529445	10.393020	0.051	0.959375
## i_catservices:y_cat2016	-4.292637	9.740740	-0.441	0.659473
## i_cattransportation:y_cat2016	-7.554880	10.053453	-0.751	0.452434
## i_catwholesale:y_cat2016	-0.724249	11.927107	-0.061	0.951584
## i_catConstruction:y_cat2017	15.635189	9.006326	1.736	0.082672
## i_catfinance:y_cat2017	6.200992	7.639374	0.812	0.417026
## i_catmanufacture:y_cat2017	4.778072	7.228819	0.661	0.508684
## i_catmining:y_cat2017	3.727376	7.762348	0.480	0.631133
## i_catretail:y_cat2017	6.677799	7.954800	0.839	0.401280
## i_catservices:y_cat2017	6.671624	7.327305	0.911	0.362631
## i_cattransportation:y_cat2017	3.870146	7.728238	0.501	0.616566
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	5.938505	11.046371	0.538	0.590898
## i_catfinance:y_cat2018	-1.493416	9.964768	-0.150	0.880878
## i_catmanufacture:y_cat2018	-3.841022	9.653770	-0.398	0.690751
## i_catmining:y_cat2018	-8.757188	9.972648	-0.878	0.379955
## i_catretail:y_cat2018	0.086952	10.529571	0.008	0.993412
## i_catservices:y_cat2018	-2.071302	9.717608	-0.213	0.831226
## i_cattransportation:y_cat2018	-1.767042	10.009482	-0.177	0.859885

```

## i_catwholesale:y_cat2018      4.564982  11.889186   0.384 0.701037
## i_catConstruction:y_cat2019           NA           NA           NA           NA
## i_catfinance:y_cat2019        -0.587741   8.190944  -0.072 0.942802
## i_catmanufacture:y_cat2019     -3.131632   7.753978  -0.404 0.686337
## i_catmining:y_cat2019         -5.951733   8.854537  -0.672 0.501534
## i_catretail:y_cat2019          2.984139   9.075969   0.329 0.742335
## i_catservices:y_cat2019       -1.997475   7.777295  -0.257 0.797326
## i_cattransportation:y_cat2019 -6.228427   8.423292  -0.739 0.459710
## i_catwholesale:y_cat2019           NA           NA           NA           NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.783 on 2742 degrees of freedom
## Multiple R-squared:  0.1232, Adjusted R-squared:  0.0771
## F-statistic: 2.674 on 144 and 2742 DF,  p-value: < 2.2e-16

##test heteroskedasticity problem
hetero_test <- bptest(reg3A.2)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg3A.2
## BP = 576.96, df = 144, p-value < 2.2e-16

##solve heteroskedasticity problem
coefptest(reg3A.2, vcov = vcovHC(reg3A.2, type='HC0', cluster='a_industr
y'))

##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>|t|)

## (Intercept) -1.450538 1.188398 -1.2206 0.2223491

## `Prev ESG Score.x` -0.029416 0.008580 -3.4284 0.0006161
## ***
## `firm size` -0.051734 0.133794 -0.3867 0.6990339

```

## leverage	2.396932	1.299342	1.8447	0.0651850
.				
## `free cash flow`	3.857042	2.271809	1.6978	0.0896620
.				
## `Tobin's q`	-0.191143	0.139540	-1.3698	0.1708571
## preMTR	-5.367391	0.740182	-7.2514	5.339e-13

## deal_size	1.106527	1.772329	0.6243	0.5324598
## hostile	-3.413168	1.882254	-1.8133	0.0698886
.				
## high_tech	0.310833	0.359416	0.8648	0.3872092
## diversifying	-0.176961	0.286511	-0.6176	0.5368639
## public_target	-1.798085	0.484705	-3.7096	0.0002117

## private_target	-0.237219	0.303478	-0.7817	0.4344768
## all_cash_deal	-0.379356	0.437463	-0.8672	0.3859232
## stock_deal	-0.438127	0.806574	-0.5432	0.5870399
## cross_border	0.514233	0.312907	1.6434	0.1004139
## i_catConstruction	-4.628834	1.799190	-2.5727	0.0101421
*				
## i_catfinance	1.060607	1.540431	0.6885	0.4911880
## i_catmanufacture	4.194884	0.847654	4.9488	7.918e-07

## i_catmining	4.135753	1.775151	2.3298	0.0198887
*				
## i_catretail	1.776067	1.919871	0.9251	0.3549969
## i_catservices	4.349313	1.244072	3.4960	0.0004797

## i_cattransportation	3.647575	2.611025	1.3970	0.1625298
## i_catwholesale	3.586707	0.812124	4.4165	1.042e-05

## y_cat2004	-2.396823	2.393340	-1.0015	0.3166951
## y_cat2005	1.311017	0.280729	4.6700	3.156e-06

## y_cat2006	-2.228457	1.420323	-1.5690	0.1167681
## y_cat2007	-0.351019	0.849222	-0.4133	0.6793881

## y_cat2008	-3.969000	1.961057	-2.0239	0.0430763
*				
## y_cat2009	-5.633271	0.755021	-7.4611	1.145e-13

## y_cat2010	5.774403	0.559633	10.3182	< 2.2e-16

## y_cat2011	-0.437219	1.386916	-0.3152	0.7525996
## y_cat2012	-5.546346	5.331067	-1.0404	0.2982541
## y_cat2013	2.693808	1.283649	2.0986	0.0359474
*				
## y_cat2014	0.781132	0.555697	1.4057	0.1599329
## y_cat2015	-2.288646	2.913867	-0.7854	0.4322679
## y_cat2016	4.351729	0.461630	9.4269	< 2.2e-16

## y_cat2017	-5.077061	5.040992	-1.0072	0.3139491
## y_cat2018	1.887029	0.526359	3.5851	0.0003429

## y_cat2019	1.283079	0.941722	1.3625	0.1731576
## i_catfinance:y_cat2004	2.776638	4.225295	0.6571	0.5111418
## i_catmanufacture:y_cat2004	2.563863	2.622203	0.9778	0.3282835
## i_catmining:y_cat2004	-4.157902	3.108365	-1.3376	0.1811218
## i_catretail:y_cat2004	6.696667	3.561253	1.8804	0.0601562
.				
## i_catservices:y_cat2004	0.353635	2.861097	0.1236	0.9016400
## i_cattransportation:y_cat2004	0.143808	3.654144	0.0394	0.9686104
## i_catfinance:y_cat2005	0.014344	1.807468	0.0079	0.9936687
## i_catmanufacture:y_cat2005	-1.333344	0.923960	-1.4431	0.1491134
## i_catmining:y_cat2005	-0.931809	2.527185	-0.3687	0.7123693
## i_catretail:y_cat2005	6.972137	2.198279	3.1716	0.0015326
**				
## i_catservices:y_cat2005	-1.847008	1.858361	-0.9939	0.3203639
## i_cattransportation:y_cat2005	-3.753703	3.612868	-1.0390	0.2989049

## i_catwholesale:y_cat2005	-3.118530	1.082950	-2.8797	0.0040119
**				
## i_catfinance:y_cat2006	6.088329	2.196596	2.7717	0.0056139
**				
## i_catmanufacture:y_cat2006	2.870252	2.007044	1.4301	0.1528053
## i_catmining:y_cat2006	-7.162728	5.868356	-1.2206	0.2223545
## i_catservices:y_cat2006	3.049650	2.100421	1.4519	0.1466373
## i_cattransportation:y_cat2006	-2.493377	3.988716	-0.6251	0.5319524
## i_catfinance:y_cat2007	0.125179	2.143068	0.0584	0.9534253
## i_catmanufacture:y_cat2007	0.365008	1.220984	0.2989	0.7650040
## i_catmining:y_cat2007	1.646745	2.418779	0.6808	0.4960452
## i_catretail:y_cat2007	7.049037	4.704985	1.4982	0.1341949
## i_catservices:y_cat2007	-0.416206	1.971113	-0.2112	0.8327838
## i_cattransportation:y_cat2007	-0.058979	2.884594	-0.0204	0.9836888
## i_catConstruction:y_cat2008	35.495314	13.516922	2.6260	0.0086878
**				
## i_catfinance:y_cat2008	11.387373	4.785780	2.3794	0.0174080
*				
## i_catmanufacture:y_cat2008	2.407209	2.433553	0.9892	0.3226650
## i_catmining:y_cat2008	3.150741	4.005674	0.7866	0.4316019
## i_catretail:y_cat2008	12.225772	2.999488	4.0760	4.713e-05

## i_catservices:y_cat2008	4.076815	2.609131	1.5625	0.1182814
## i_cattransportation:y_cat2008	3.254476	3.840184	0.8475	0.3968021
## i_catmanufacture:y_cat2009	4.746944	1.645058	2.8856	0.0039375
**				
## i_catmining:y_cat2009	7.616730	2.018145	3.7741	0.0001640

## i_catretail:y_cat2009	26.075892	6.824263	3.8211	0.0001358

## i_catservices:y_cat2009	6.069121	2.104562	2.8838	0.0039598
**				
## i_cattransportation:y_cat2009	4.663868	2.957965	1.5767	0.1149764

## i_catConstruction:y_cat2010	2.636803	2.244473	1.1748	0.2401776
## i_catfinance:y_cat2010	-3.553289	2.293405	-1.5494	0.1214127
## i_catmanufacture:y_cat2010	-6.217217	1.054818	-5.8941	4.228e-09

## i_catmining:y_cat2010	-5.075319	2.408303	-2.1074	0.0351713
*				
## i_catretail:y_cat2010	-1.736476	2.012259	-0.8629	0.3882413
## i_catservices:y_cat2010	-6.354205	1.790894	-3.5481	0.0003946

## i_cattransportation:y_cat2010	-7.564277	2.967504	-2.5490	0.0108561
*				
## i_catwholesale:y_cat2010	-4.602108	1.403027	-3.2801	0.0010506
**				
## i_catfinance:y_cat2011	-7.221524	2.530636	-2.8536	0.0043546
**				
## i_catmanufacture:y_cat2011	-0.493067	1.797328	-0.2743	0.7838490
## i_catmining:y_cat2011	-1.003673	2.764122	-0.3631	0.7165528
## i_catretail:y_cat2011	6.440075	2.359891	2.7290	0.0063938
**				
## i_catservices:y_cat2011	0.120659	1.951557	0.0618	0.9507052
## i_cattransportation:y_cat2011	-7.262662	3.757543	-1.9328	0.0533610
.				
## i_catConstruction:y_cat2012	10.218468	5.730248	1.7833	0.0746561
.				
## i_catfinance:y_cat2012	7.669384	5.539672	1.3844	0.1663342
## i_catmanufacture:y_cat2012	5.622439	5.385073	1.0441	0.2965412
## i_catmining:y_cat2012	-3.046556	6.428600	-0.4739	0.6356043
## i_catretail:y_cat2012	7.765784	5.835713	1.3307	0.1833871
## i_catservices:y_cat2012	5.223468	5.562502	0.9391	0.3477877
## i_cattransportation:y_cat2012	6.709191	6.002672	1.1177	0.2637928
## i_catConstruction:y_cat2013	3.666715	3.693443	0.9928	0.3209129
## i_catfinance:y_cat2013	-1.757802	2.043234	-0.8603	0.3896967
## i_catmanufacture:y_cat2013	-2.391475	1.543716	-1.5492	0.1214570

## i_catmining:y_cat2013	-4.788980	3.733961	-1.2825	0.1997593
## i_catretail:y_cat2013	1.260272	2.675050	0.4711	0.6375918
## i_catservices:y_cat2013	-4.383121	1.963506	-2.2323	0.0256761
* ## i_cattransportation:y_cat2013	-4.729813	3.361632	-1.4070	0.1595410
## i_catConstruction:y_cat2014	4.300986	1.851594	2.3229	0.0202597
* ## i_catfinance:y_cat2014	-0.573381	1.722778	-0.3328	0.7392931
## i_catmanufacture:y_cat2014	-0.941124	1.538467	-0.6117	0.5407680
## i_catmining:y_cat2014	7.645216	3.666197	2.0853	0.0371320
* ## i_catservices:y_cat2014	-1.999940	1.929453	-1.0365	0.3000455
## i_cattransportation:y_cat2014	2.390444	6.257674	0.3820	0.7024895
## i_catConstruction:y_cat2015	-1.926479	3.427514	-0.5621	0.5741190
## i_catfinance:y_cat2015	5.672298	5.925349	0.9573	0.3385036
## i_catmanufacture:y_cat2015	1.359713	3.389393	0.4012	0.6883285
## i_catmining:y_cat2015	7.195452	12.890745	0.5582	0.5767620
## i_catretail:y_cat2015	9.155316	3.921160	2.3348	0.0196231
* ## i_catservices:y_cat2015	0.283578	3.276094	0.0866	0.9310277
## i_catConstruction:y_cat2016	3.750572	3.484228	1.0764	0.2818240
## i_catfinance:y_cat2016	-2.254200	1.717904	-1.3122	0.1895692
## i_catmanufacture:y_cat2016	-3.963182	1.051717	-3.7683	0.0001678
*** ## i_catmining:y_cat2016	-3.621435	2.656954	-1.3630	0.1729937
## i_catretail:y_cat2016	0.529445	4.001901	0.1323	0.8947580
## i_catservices:y_cat2016	-4.292637	1.801165	-2.3833	0.0172280
* ## i_cattransportation:y_cat2016	-7.554880	2.906973	-2.5989	0.0094029
** ## i_catwholesale:y_cat2016	-0.724249	2.375526	-0.3049	0.7604810

```

## i_catConstruction:y_cat2017 15.635189 5.607497 2.7883 0.0053357
**
## i_catfinance:y_cat2017 6.200992 5.292045 1.1718 0.2413963
## i_catmanufacture:y_cat2017 4.778072 5.119066 0.9334 0.3507021
## i_catmining:y_cat2017 3.727376 5.564285 0.6699 0.5029938
## i_catretail:y_cat2017 6.677799 5.536646 1.2061 0.2278795
## i_catservices:y_cat2017 6.671624 5.231986 1.2752 0.2023603
## i_cattransportation:y_cat2017 3.870146 5.766047 0.6712 0.5021524
## i_catConstruction:y_cat2018 5.938505 2.322734 2.5567 0.0106208
*
## i_catfinance:y_cat2018 -1.493416 1.637053 -0.9123 0.3617127
## i_catmanufacture:y_cat2018 -3.841022 1.148583 -3.3441 0.0008365
***
## i_catmining:y_cat2018 -8.757188 3.024069 -2.8958 0.0038115
**
## i_catretail:y_cat2018 0.086952 4.044786 0.0215 0.9828506
## i_catservices:y_cat2018 -2.071302 1.507452 -1.3740 0.1695411
## i_cattransportation:y_cat2018 -1.767042 2.794596 -0.6323 0.5272393
## i_catwholesale:y_cat2018 4.564982 5.474846 0.8338 0.4044606
## i_catfinance:y_cat2019 -0.587741 1.949001 -0.3016 0.7630102
## i_catmanufacture:y_cat2019 -3.131632 2.190143 -1.4299 0.1528668
## i_catmining:y_cat2019 -5.951733 10.668907 -0.5579 0.5769870
## i_catretail:y_cat2019 2.984139 3.087096 0.9666 0.3338047
## i_catservices:y_cat2019 -1.997475 2.205667 -0.9056 0.3652216
## i_cattransportation:y_cat2019 -6.228427 3.390834 -1.8368 0.0663413
.
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##test multicollenarity problem
vif_values3A.2 <- vif(lm(CAR55 ~`Prev ESG Score.x`+ `firm size`+leverag

```



```

e+`free cash flow`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea
l+cross_border, data = data1))
print(vif_values3A.2)

## `Prev ESG Score.x`      `firm size`      leverage      `free cas
h flow`
##          1.486018          1.725136          1.565334          1
.228513
##      `Tobin's q`      preMTR      deal_size
hostile
##          1.432378          1.064238          1.229957          1
.008833
##          high_tech      diversifying      public_target      private
_target
##          1.190358          1.091410          1.352913          1
.283231
##      all_cash_deal      stock_deal      cross_border
##          1.896648          2.042504          1.041970

###hypothesis1----with acquirer high ESG dummy variables

##CAR11 regression model
reg1A.3<-lm(CAR11~ `firm size`+leverage+`free cash flow`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+acquiror_dummy_ESG+i_cat*y_cat , data=data1)

summary(reg1A.3)

##
## Call:
## lm(formula = CAR11 ~ `firm size` + leverage + `free cash flow` +
##      `Tobin's q` + preMTR + deal_size + hostile + high_tech +
##      diversifying + public_target + private_target + all_cash_deal +
##      stock_deal + cross_border + acquiror_dummy_ESG + i_cat *
##      y_cat, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -48.780  -1.851  -0.057   1.887  85.687
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)          2.31558     5.12691    0.452  0.6516
## `firm size`         -0.19448     0.08540   -2.277  0.0228 *

```

## leverage	0.75206	0.92689	0.811	0.4172
## `free cash flow`	0.45949	1.14181	0.402	0.6874
## `Tobin's q`	-0.11688	0.09507	-1.229	0.2191
## preMTR	-0.69238	0.41871	-1.654	0.0983 .
## deal_size	1.42255	0.30456	4.671	3.14e-06 *
**				
## hostile	-3.25501	3.66544	-0.888	0.3746
## high_tech	0.09167	0.27380	0.335	0.7378
## diversifying	-0.42603	0.21710	-1.962	0.0498 *
## public_target	-1.72080	0.30498	-5.642	1.85e-08 *
**				
## private_target	-0.24031	0.22275	-1.079	0.2808
## all_cash_deal	-0.06594	0.30857	-0.214	0.8308
## stock_deal	-0.64133	0.41254	-1.555	0.1202
## cross_border	0.52074	0.23719	2.195	0.0282 *
## acquiror_dummy_ESG	-0.20480	0.22815	-0.898	0.3694
## i_catConstruction	-3.25130	6.19290	-0.525	0.5996
## i_catfinance	-0.82262	5.40663	-0.152	0.8791
## i_catmanufacture	-0.32187	5.09536	-0.063	0.9496
## i_catmining	-0.11513	5.30428	-0.022	0.9827
## i_catretail	-0.53424	5.53878	-0.096	0.9232
## i_catservices	0.96489	5.15044	0.187	0.8514
## i_cattransportation	-0.36566	5.40399	-0.068	0.9461
## i_catwholesale	1.06313	7.16249	0.148	0.8820
## y_cat2004	-1.79286	5.66084	-0.317	0.7515
## y_cat2005	-1.31103	6.19476	-0.212	0.8324

## y_cat2006	-1.46263	5.54798	-0.264	0.7921
## y_cat2007	-0.64727	5.66208	-0.114	0.9090
## y_cat2008	-2.08141	6.19908	-0.336	0.7371
## y_cat2009	-1.39575	7.15915	-0.195	0.8454
## y_cat2010	-0.35763	7.15516	-0.050	0.9601
## y_cat2011	-0.08480	5.84839	-0.014	0.9884
## y_cat2012	-5.94110	5.41852	-1.096	0.2730
## y_cat2013	0.56674	5.41803	0.105	0.9167
## y_cat2014	-0.37058	7.15610	-0.052	0.9587
## y_cat2015	-3.04173	5.85147	-0.520	0.6032
## y_cat2016	-2.15340	7.15317	-0.301	0.7634
## y_cat2017	-5.25741	5.33876	-0.985	0.3248
## y_cat2018	-1.33896	7.15809	-0.187	0.8516
## y_cat2019	-2.10104	5.66455	-0.371	0.7107
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.29875	6.23962	0.368	0.7126
## i_catmanufacture:y_cat2004	2.82237	5.71934	0.493	0.6217
## i_catmining:y_cat2004	-0.55540	6.02892	-0.092	0.9266
## i_catretail:y_cat2004	1.24846	6.75882	0.185	0.8535
## i_catservices:y_cat2004	0.11973	5.82680	0.021	0.9836
## i_cattransportation:y_cat2004	1.30057	6.32239	0.206	0.8370
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	2.43499	6.56884	0.371	0.7109

## i_catmanufacture:y_cat2005	1.81212	6.24354	0.290	0.7717
## i_catmining:y_cat2005	0.08063	6.54132	0.012	0.9902
## i_catretail:y_cat2005	5.18753	6.97242	0.744	0.4569
## i_catservices:y_cat2005	1.19434	6.33477	0.189	0.8505
## i_cattransportation:y_cat2005	1.06256	6.80274	0.156	0.8759
## i_catwholesale:y_cat2005	-0.32605	9.47583	-0.034	0.9726
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	1.00393	6.87076	0.146	0.8838
## i_catmanufacture:y_cat2006	3.00029	5.67933	0.528	0.5973
## i_catmining:y_cat2006	0.48636	6.80030	0.072	0.9430
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	0.48822	5.79206	0.084	0.9328
## i_cattransportation:y_cat2006	-0.56224	6.87465	-0.082	0.9348
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.85896	6.09783	0.141	0.8880
## i_catmanufacture:y_cat2007	1.72076	5.71915	0.301	0.7635
## i_catmining:y_cat2007	1.73077	6.03956	0.287	0.7745
## i_catretail:y_cat2007	6.07139	7.07404	0.858	0.3908
## i_catservices:y_cat2007	-0.99102	5.82351	-0.170	0.8649
## i_cattransportation:y_cat2007	1.88880	6.39529	0.295	0.7678
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	14.84663	8.00566	1.855	0.0638
## i_catfinance:y_cat2008	7.31840	6.96305	1.051	0.2933

## i_catmanufacture:y_cat2008	1.93782	6.26107	0.310	0.7570
## i_catmining:y_cat2008	0.69808	6.53827	0.107	0.9150
## i_catretail:y_cat2008	3.61393	6.97527	0.518	0.6044
## i_catservices:y_cat2008	1.17819	6.34313	0.186	0.8527
## i_cattransportation:y_cat2008	2.79859	6.65016	0.421	0.6739
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.94423	7.28413	0.404	0.6861
## i_catmining:y_cat2009	7.65880	8.91272	0.859	0.3902
## i_catretail:y_cat2009	-8.44132	9.12099	-0.925	0.3548
## i_catservices:y_cat2009	1.49474	7.34950	0.203	0.8389
## i_cattransportation:y_cat2009	0.95652	7.97065	0.120	0.9045
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	1.24514	8.52349	0.146	0.8839
## i_catfinance:y_cat2010	0.07284	7.47410	0.010	0.9922
## i_catmanufacture:y_cat2010	1.18194	7.19665	0.164	0.8696
## i_catmining:y_cat2010	0.39788	7.47859	0.053	0.9576
## i_catretail:y_cat2010	2.08562	8.04797	0.259	0.7955
## i_catservices:y_cat2010	-0.09793	7.28031	-0.013	0.9893
## i_cattransportation:y_cat2010	0.70315	7.51942	0.094	0.9255
## i_catwholesale:y_cat2010	-0.28534	9.05871	-0.031	0.9749
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-2.85660	6.55445	-0.436	0.6630

## i_catmanufacture:y_cat2011	0.91495	5.94376	0.154	0.8777
## i_catmining:y_cat2011	0.46683	7.04329	0.066	0.9472
## i_catretail:y_cat2011	1.91088	8.05267	0.237	0.8124
## i_catservices:y_cat2011	-2.19726	6.19066	-0.355	0.7227
## i_cattransportation:y_cat2011	-1.32889	6.81152	-0.195	0.8453
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-2.94502	8.25162	-0.357	0.7212
## i_catfinance:y_cat2012	6.04017	5.80017	1.041	0.2978
## i_catmanufacture:y_cat2012	7.04829	5.46856	1.289	0.1976
## i_catmining:y_cat2012	-0.18702	5.86437	-0.032	0.9746
## i_catretail:y_cat2012	6.37029	6.13768	1.038	0.2994
## i_catservices:y_cat2012	5.75260	5.58057	1.031	0.3027
## i_cattransportation:y_cat2012	7.67929	5.88773	1.304	0.1922
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	3.73283	7.42328	0.503	0.6151
## i_catfinance:y_cat2013	0.13757	5.82723	0.024	0.9812
## i_catmanufacture:y_cat2013	1.20582	5.48168	0.220	0.8259
## i_catmining:y_cat2013	0.35692	6.02380	0.059	0.9528
## i_catretail:y_cat2013	0.80258	6.39331	0.126	0.9001
## i_catservices:y_cat2013	-1.78854	5.57560	-0.321	0.7484
## i_cattransportation:y_cat2013	-2.61784	5.94626	-0.440	0.6598
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	1.94127	9.46300	0.205	0.8375
## i_catfinance:y_cat2014	2.28626	8.22658	0.278	0.7811

## i_catmanufacture:y_cat2014	2.28677	7.27415	0.314	0.7533
## i_catmining:y_cat2014	7.69823	8.17129	0.942	0.3462
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-1.05336	7.39895	-0.142	0.8868
## i_cattransportation:y_cat2014	4.29863	8.22536	0.523	0.6013
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	6.20120	8.51817	0.728	0.4667
## i_catfinance:y_cat2015	6.02459	7.12612	0.845	0.3979
## i_catmanufacture:y_cat2015	4.03967	5.96738	0.677	0.4985
## i_catmining:y_cat2015	0.42344	7.05097	0.060	0.9521
## i_catretail:y_cat2015	7.08419	6.67126	1.062	0.2884
## i_catservices:y_cat2015	1.37900	6.16599	0.224	0.8230
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.74622	8.22161	0.456	0.6487
## i_catfinance:y_cat2016	2.34266	7.43746	0.315	0.7528
## i_catmanufacture:y_cat2016	3.27029	7.18980	0.455	0.6493
## i_catmining:y_cat2016	2.45129	7.40774	0.331	0.7407
## i_catretail:y_cat2016	4.37458	7.74091	0.565	0.5720
## i_catservices:y_cat2016	2.24720	7.25508	0.310	0.7568
## i_cattransportation:y_cat2016	1.10230	7.48804	0.147	0.8830
## i_catwholesale:y_cat2016	2.74896	8.88597	0.309	0.7571
## i_catConstruction:y_cat2017	8.16288	6.71016	1.216	0.2239
## i_catfinance:y_cat2017	4.95145	5.69166	0.870	0.3844

```

## i_catmanufacture:y_cat2017    5.80775    5.38583    1.078    0.2810
## i_catmining:y_cat2017         5.13669    5.78329    0.888    0.3745
## i_catretail:y_cat2017         3.96431    5.92652    0.669    0.5036
## i_catservices:y_cat2017       5.50474    5.45918    1.008    0.3134
## i_cattransportation:y_cat2017 4.41515    5.75772    0.767    0.4433
## i_catwholesale:y_cat2017      NA         NA         NA         NA
## i_catConstruction:y_cat2018   1.56940    8.23015    0.191    0.8488
## i_catfinance:y_cat2018        1.55477    7.42416    0.209    0.8341
## i_catmanufacture:y_cat2018    1.18220    7.19261    0.164    0.8695
## i_catmining:y_cat2018        -2.39508    7.42999   -0.322    0.7472
## i_catretail:y_cat2018         4.21483    7.84485    0.537    0.5911
## i_catservices:y_cat2018       0.83286    7.24018    0.115    0.9084
## i_cattransportation:y_cat2018 2.14591    7.45731    0.288    0.7736
## i_catwholesale:y_cat2018      4.02772    8.85778    0.455    0.6494
## i_catConstruction:y_cat2019   NA         NA         NA         NA
## i_catfinance:y_cat2019        2.22094    6.10202    0.364    0.7159
## i_catmanufacture:y_cat2019    2.70324    5.77670    0.468    0.6399
## i_catmining:y_cat2019        -2.78702    6.59678   -0.422    0.6727
## i_catretail:y_cat2019         2.26018    6.76166    0.334    0.7382
## i_catservices:y_cat2019       0.25636    5.79400    0.044    0.9647
## i_cattransportation:y_cat2019 -0.53347    6.27565   -0.085    0.9323
## i_catwholesale:y_cat2019      NA         NA         NA         NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.054 on 2742 degrees of freedom

```



```

## Multiple R-squared:  0.08376,    Adjusted R-squared:  0.03564
## F-statistic: 1.741 on 144 and 2742 DF,  p-value: 2.513e-07

##test heteroskedasticity problem
hetero_test <- bptest(reg1A.3)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg1A.3
## BP = 593.34, df = 144, p-value < 2.2e-16

##solve heteroskedasticity problem
coefptest(reg1A.3, vcov = vcovHC(reg1A.3, type='HC0', cluster='a_industry
'))

##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>|t|)

## (Intercept)          2.315582    0.912842   2.5367 0.0112461
## *
## `firm size`         -0.194483    0.089319  -2.1774 0.0295349
## *
## leverage            0.752059    0.999589   0.7524 0.4518938
## `free cash flow`    0.459493    1.515074   0.3033 0.7616988
## `Tobin's q`        -0.116875    0.105677  -1.1060 0.2688384
## preMTR              -0.692376    0.580704  -1.1923 0.2332447
## deal_size           1.422546    1.605841   0.8859 0.3757721
## hostile              -3.255011    0.787692  -4.1323 3.698e-05
## ***
## high_tech           0.091667    0.297429   0.3082 0.7579542
## diversifying        -0.426035    0.211497  -2.0144 0.0440672
## *
## public_target       -1.720795    0.389385  -4.4193 1.029e-05
## ***
## private_target      -0.240313    0.230885  -1.0408 0.2980446
## all_cash_deal       -0.065936    0.325337  -0.2027 0.8394076
## stock_deal          -0.641331    0.711776  -0.9010 0.3676517

```

## cross_border	0.520745	0.222939	2.3358	0.0195726
*				
## acquiror_dummy_ESG	-0.204801	0.219644	-0.9324	0.3512001
## i_catConstruction	-3.251300	0.338254	-9.6120	< 2.2e-16

## i_catfinance	-0.822616	0.493112	-1.6682	0.0953876
.				
## i_catmanufacture	-0.321874	0.533287	-0.6036	0.5461822
## i_catmining	-0.115129	1.273625	-0.0904	0.9279799
## i_catretail	-0.534243	0.772686	-0.6914	0.4893664
## i_catservices	0.964886	1.028054	0.9386	0.3480416
## i_cattransportation	-0.365661	1.552729	-0.2355	0.8138418
## i_catwholesale	1.063132	0.623713	1.7045	0.0883968
.				
## y_cat2004	-1.792863	0.894316	-2.0047	0.0450900
*				
## y_cat2005	-1.311032	0.428735	-3.0579	0.0022504
**				
## y_cat2006	-1.462633	0.885914	-1.6510	0.0988555
.				
## y_cat2007	-0.647274	0.614669	-1.0530	0.2924135
## y_cat2008	-2.081410	0.979466	-2.1250	0.0336719
*				
## y_cat2009	-1.395755	0.637115	-2.1907	0.0285542
*				
## y_cat2010	-0.357628	0.447005	-0.8001	0.4237489
## y_cat2011	-0.084800	0.633356	-0.1339	0.8934998
## y_cat2012	-5.941105	5.456125	-1.0889	0.2762993
## y_cat2013	0.566738	1.247668	0.4542	0.6496939
## y_cat2014	-0.370582	0.385880	-0.9604	0.3369614
## y_cat2015	-3.041733	1.553607	-1.9579	0.0503487
.				
## y_cat2016	-2.153397	0.271621	-7.9279	3.213e-15

## y_cat2017	-5.257410	3.297153	-1.5945	0.1109326
## y_cat2018	-1.338958	0.382477	-3.5008	0.0004713

```

***
## y_cat2019          -2.101038    0.970850 -2.1641  0.0305411
*
## i_catfinance:y_cat2004    2.298750    2.308582  0.9957  0.3194638
## i_catmanufacture:y_cat2004  2.822374    1.148609  2.4572  0.0140636
*
## i_catmining:y_cat2004     -0.555397    1.729111 -0.3212  0.7480804
## i_catretail:y_cat2004     1.248459    1.805987  0.6913  0.4894423
## i_catservices:y_cat2004    0.119732    1.454140  0.0823  0.9343834
## i_cattransportation:y_cat2004  1.300574    1.822112  0.7138  0.4754285
## i_catfinance:y_cat2005    2.434987    0.956371  2.5461  0.0109487
*
## i_catmanufacture:y_cat2005  1.812122    0.698994  2.5925  0.0095795
**
## i_catmining:y_cat2005     0.080627    2.036341  0.0396  0.9684196
## i_catretail:y_cat2005     5.187526    1.776768  2.9196  0.0035329
**
## i_catservices:y_cat2005    1.194336    1.363521  0.8759  0.3811497
## i_cattransportation:y_cat2005  1.062560    1.966123  0.5404  0.5889415
## i_catwholesale:y_cat2005   -0.326047    0.969567 -0.3363  0.7366842
## i_catfinance:y_cat2006    1.003929    1.033702  0.9712  0.3315358
## i_catmanufacture:y_cat2006  3.000287    1.218296  2.4627  0.0138509
*
## i_catmining:y_cat2006     0.486363    2.276305  0.2137  0.8308256
## i_catservices:y_cat2006    0.488221    1.502420  0.3250  0.7452387
## i_cattransportation:y_cat2006 -0.562242    2.143083 -0.2624  0.7930700
## i_catfinance:y_cat2007    0.858962    1.027980  0.8356  0.4034630
## i_catmanufacture:y_cat2007  1.720759    0.812735  2.1172  0.0343289
*
## i_catmining:y_cat2007    1.730773    1.737238  0.9963  0.3192027
## i_catretail:y_cat2007     6.071388    6.138438  0.9891  0.3227127
## i_catservices:y_cat2007   -0.991018    1.445166 -0.6857  0.4929307

```

## i_cattransportation:y_cat2007	1.888797	1.962825	0.9623	0.3359914
## i_catConstruction:y_cat2008	14.846630	4.477075	3.3161	0.0009246

## i_catfinance:y_cat2008	7.318396	2.340481	3.1269	0.0017853
**				
## i_catmanufacture:y_cat2008	1.937823	1.222933	1.5846	0.1131795
## i_catmining:y_cat2008	0.698080	2.681386	0.2603	0.7946189
## i_catretail:y_cat2008	3.613929	2.170746	1.6648	0.0960604
.				
## i_catservices:y_cat2008	1.178187	1.576352	0.7474	0.4548782
## i_cattransportation:y_cat2008	2.798592	1.961427	1.4268	0.1537473
## i_catmanufacture:y_cat2009	2.944230	1.300425	2.2641	0.0236487
*				
## i_catmining:y_cat2009	7.658799	1.518041	5.0452	4.827e-07

## i_catretail:y_cat2009	-8.441315	6.016217	-1.4031	0.1607022
## i_catservices:y_cat2009	1.494743	1.318624	1.1336	0.2570771
## i_cattransportation:y_cat2009	0.956517	1.780087	0.5373	0.5910745
## i_catConstruction:y_cat2010	1.245138	0.988017	1.2602	0.2076901
## i_catfinance:y_cat2010	0.072838	1.352256	0.0539	0.9570471
## i_catmanufacture:y_cat2010	1.181939	0.739168	1.5990	0.1099328
## i_catmining:y_cat2010	0.397876	2.174731	0.1830	0.8548474
## i_catretail:y_cat2010	2.085619	0.897440	2.3240	0.0202001
*				
## i_catservices:y_cat2010	-0.097933	1.366384	-0.0717	0.9428675
## i_cattransportation:y_cat2010	0.703155	1.857547	0.3785	0.7050592
## i_catwholesale:y_cat2010	-0.285341	1.126119	-0.2534	0.7999905
## i_catfinance:y_cat2011	-2.856596	0.780818	-3.6585	0.0002585

## i_catmanufacture:y_cat2011	0.914950	1.051896	0.8698	0.3844798
## i_catmining:y_cat2011	0.466835	2.113468	0.2209	0.8251979

## i_catretail:y_cat2011	1.910880	0.990134	1.9299	0.0537197
.				
## i_catservices:y_cat2011	-2.197259	1.214946	-1.8085	0.0706345
.				
## i_cattransportation:y_cat2011	-1.328886	1.948776	-0.6819	0.4953545
## i_catConstruction:y_cat2012	-2.945021	5.541408	-0.5315	0.5951451
## i_catfinance:y_cat2012	6.040174	5.473713	1.1035	0.2699123
## i_catmanufacture:y_cat2012	7.048295	5.474222	1.2875	0.1980139
## i_catmining:y_cat2012	-0.187021	6.804782	-0.0275	0.9780759
## i_catretail:y_cat2012	6.370292	5.617143	1.1341	0.2568600
## i_catservices:y_cat2012	5.752602	5.622584	1.0231	0.3063393
## i_cattransportation:y_cat2012	7.679289	5.726630	1.3410	0.1800384
## i_catConstruction:y_cat2013	3.732827	1.449561	2.5751	0.0100718
*				
## i_catfinance:y_cat2013	0.137574	1.371343	0.1003	0.9200973
## i_catmanufacture:y_cat2013	1.205816	1.355540	0.8895	0.3737874
## i_catmining:y_cat2013	0.356920	2.763270	0.1292	0.8972359
## i_catretail:y_cat2013	0.802579	1.621562	0.4949	0.6206807
## i_catservices:y_cat2013	-1.788543	1.694648	-1.0554	0.2913325
## i_cattransportation:y_cat2013	-2.617836	2.280627	-1.1479	0.2511272
## i_catConstruction:y_cat2014	1.941271	0.542629	3.5775	0.0003529

## i_catfinance:y_cat2014	2.286261	1.320708	1.7311	0.0835486
.				
## i_catmanufacture:y_cat2014	2.286767	1.115374	2.0502	0.0404374
*				
## i_catmining:y_cat2014	7.698227	1.821278	4.2268	2.448e-05

## i_catservices:y_cat2014	-1.053359	1.334925	-0.7891	0.4301353
## i_cattransportation:y_cat2014	4.298633	6.767059	0.6352	0.5253320
## i_catConstruction:y_cat2015	6.201203	1.629539	3.8055	0.0001446

```

***
## i_catfinance:y_cat2015      6.024588    2.488037    2.4214 0.0155244
*
## i_catmanufacture:y_cat2015   4.039671    1.969417    2.0512 0.0403421
*
## i_catmining:y_cat2015        0.423437    5.426452    0.0780 0.9378083

## i_catretail:y_cat2015        7.084190    2.157437    3.2836 0.0010377
**
## i_catservices:y_cat2015      1.379004    2.015585    0.6842 0.4939253

## i_catConstruction:y_cat2016  3.746224    0.783036    4.7842 1.807e-06
***
## i_catfinance:y_cat2016       2.342655    0.644520    3.6347 0.0002834
***
## i_catmanufacture:y_cat2016   3.270295    0.652271    5.0137 5.679e-07
***
## i_catmining:y_cat2016        2.451287    1.835127    1.3358 0.1817388

## i_catretail:y_cat2016        4.374583    1.438125    3.0419 0.0023734
**
## i_catservices:y_cat2016      2.247196    1.391266    1.6152 0.1063789

## i_cattransportation:y_cat2016 1.102298    1.775570    0.6208 0.5347738

## i_catwholesale:y_cat2016     2.748958    2.853369    0.9634 0.3354279

## i_catConstruction:y_cat2017  8.162885    3.454630    2.3629 0.0182028
*
## i_catfinance:y_cat2017       4.951451    3.333727    1.4853 0.1375899

## i_catmanufacture:y_cat2017   5.807754    3.344087    1.7367 0.0825483
.
## i_catmining:y_cat2017        5.136691    3.802536    1.3509 0.1768519

## i_catretail:y_cat2017        3.964306    3.845884    1.0308 0.3027293

## i_catservices:y_cat2017      5.504744    3.474085    1.5845 0.1131916

## i_cattransportation:y_cat2017 4.415152    3.738404    1.1810 0.2376948

## i_catConstruction:y_cat2018  1.569396    1.372163    1.1437 0.2528319

## i_catfinance:y_cat2018       1.554767    0.654828    2.3743 0.0176500
*
## i_catmanufacture:y_cat2018   1.182204    0.763946    1.5475 0.1218590

## i_catmining:y_cat2018        -2.395081    2.221536   -1.0781 0.2810754

```

```

## i_catretail:y_cat2018      4.214826    3.120217    1.3508 0.1768672
## i_catservices:y_cat2018   0.832860    1.207151    0.6899 0.4902914
## i_cattransportation:y_cat2018 2.145908    1.778350    1.2067 0.2276576
## i_catwholesale:y_cat2018   4.027716    5.119043    0.7868 0.4314609
## i_catfinance:y_cat2019    2.220937    1.046283    2.1227 0.0338690
*
## i_catmanufacture:y_cat2019 2.703244    1.497500    1.8052 0.0711576
.
## i_catmining:y_cat2019     -2.787024    5.889517   -0.4732 0.6360955
## i_catretail:y_cat2019     2.260183    2.034677    1.1108 0.2667385
## i_catservices:y_cat2019    0.256362    1.945568    0.1318 0.8951781
## i_cattransportation:y_cat2019 -0.533471    1.892306   -0.2819 0.7780293

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values1A.3 <- vif(lm(CAR11 ~ `firm size`+leverage+`free cash flow`+
`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea
l+cross_border+acquiror_dummy_ESG, data = data1))
print(vif_values1A.3)

```

```

##      `firm size`      leverage      `free cash flow`      `Tob
in's q`
##      1.507813      1.565819      1.233903      1
.427590
##      preMTR      deal_size      hostile      hi
gh_tech
##      1.063957      1.227420      1.008483      1
.188141
##      diversifying      public_target      private_target      all_ca
sh_deal
##      1.089452      1.352664      1.284249      1
.895759
##      stock_deal      cross_border      acquiror_dummy_ESG
##      2.040279      1.041557      1.265274

```

##CAR22 regression model

```

reg2A.3<-lm(CAR22~ `firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde

```

```

r+acquiror_dummy_ESG+(i_cat*y_cat), data=data1)

summary(reg2A.3)

##
## Call:
## lm(formula = CAR22 ~ `firm size` + leverage + `free cash flow` +
##     `Tobin's q` + preMTR + deal_size + hostile + high_tech +
##     diversifying + public_target + private_target + all_cash_deal +
##     stock_deal + cross_border + acquiror_dummy_ESG + (i_cat *
##     y_cat), data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -42.417  -2.258   0.035   2.351  82.096
##
## Coefficients: (23 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.755328    5.542916   0.317  0.75151
## `firm size`     -0.147049    0.092325  -1.593  0.11133
## leverage         1.224844    1.002098   1.222  0.22171
## `free cash flow` 2.341261    1.234462   1.897  0.05799
## .
## `Tobin's q`    -0.197962    0.102787  -1.926  0.05421
## .
## preMTR         -2.065391    0.452684  -4.563 5.28e-06
## ***
## deal_size       1.423017    0.329272   4.322 1.60e-05
## ***
## hostile        -1.422403    3.962855  -0.359  0.71967
## high_tech       0.223338    0.296013   0.754  0.45062
## diversifying   -0.270877    0.234719  -1.154  0.24858
## public_target  -1.931364    0.329728  -5.857 5.26e-09
## ***
## private_target  -0.312518    0.240829  -1.298  0.19451
## all_cash_deal  -0.295449    0.333608  -0.886  0.37590
## stock_deal     -0.535780    0.446017  -1.201  0.22976
## cross_border    0.576136    0.256435   2.247  0.02474
## *

```


## acquiror_dummy_ESG	-0.481205	0.246660	-1.951	0.05117
## i_catConstruction	-3.394955	6.695395	-0.507	0.61215
## i_catfinance	-0.648617	5.845334	-0.111	0.91165
## i_catmanufacture	0.714307	5.508804	0.130	0.89684
## i_catmining	0.916680	5.734671	0.160	0.87301
## i_catretail	-0.833949	5.988207	-0.139	0.88925
## i_catservices	1.145732	5.568355	0.206	0.83700
## i_cattransportation	0.499100	5.842477	0.085	0.93193
## i_catwholesale	-0.741631	7.743657	-0.096	0.92371
## y_cat2004	-1.163898	6.120170	-0.190	0.84919
## y_cat2005	0.336732	6.697407	0.050	0.95990
## y_cat2006	-0.737793	5.998146	-0.123	0.90211
## y_cat2007	1.231894	6.121506	0.201	0.84053
## y_cat2008	-1.900729	6.702083	-0.284	0.77674
## y_cat2009	-2.202776	7.740047	-0.285	0.77598
## y_cat2010	1.802839	7.735736	0.233	0.81574
## y_cat2011	1.301160	6.322933	0.206	0.83697
## y_cat2012	-5.095877	5.858189	-0.870	0.38445
## y_cat2013	3.358130	5.857650	0.573	0.56650
## y_cat2014	0.916050	7.736759	0.118	0.90576
## y_cat2015	-0.875634	6.326261	-0.138	0.88992
## y_cat2016	-1.650608	7.733590	-0.213	0.83100
## y_cat2017	-3.307725	5.771951	-0.573	0.56665
## y_cat2018	-0.433836	7.738903	-0.056	0.95530

## y_cat2019	-1.616114	6.124178	-0.264	0.79188
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	1.752134	6.745914	0.260	0.79509
## i_catmanufacture:y_cat2004	2.029795	6.183418	0.328	0.74274
## i_catmining:y_cat2004	-1.860835	6.518116	-0.285	0.77529
## i_catretail:y_cat2004	2.584966	7.307237	0.354	0.72355
## i_catservices:y_cat2004	-0.160204	6.299595	-0.025	0.97971
## i_cattransportation:y_cat2004	-1.095274	6.835400	-0.160	0.87271
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	0.374152	7.101844	0.053	0.95799
## i_catmanufacture:y_cat2005	-0.323887	6.750145	-0.048	0.96173
## i_catmining:y_cat2005	-0.673433	7.072093	-0.095	0.92414
## i_catretail:y_cat2005	5.476299	7.538166	0.726	0.46761
## i_catservices:y_cat2005	-0.596145	6.848783	-0.087	0.93064
## i_cattransportation:y_cat2005	-1.559261	7.354723	-0.212	0.83212
## i_catwholesale:y_cat2005	0.206808	10.244714	0.020	0.98390
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.554080	7.428262	0.075	0.94055
## i_catmanufacture:y_cat2006	1.440458	6.140162	0.235	0.81454
## i_catmining:y_cat2006	-2.008075	7.352088	-0.273	0.78477
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	1.070170	6.262036	0.171	0.86432
## i_cattransportation:y_cat2006	-3.429267	7.432465	-0.461	0.64456

## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-1.232217	6.592617	-0.187	0.85175
## i_catmanufacture:y_cat2007	-0.494727	6.183206	-0.080	0.93623
## i_catmining:y_cat2007	-0.404509	6.529619	-0.062	0.95061
## i_catretail:y_cat2007	4.716686	7.648040	0.617	0.53747
## i_catservices:y_cat2007	-2.577752	6.296040	-0.409	0.68226
## i_cattransportation:y_cat2007	-0.600931	6.914206	-0.087	0.93075
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	23.495822	8.655244	2.715	0.00668
## i_catfinance:y_cat2008	5.843822	7.528042	0.776	0.43765
## i_catmanufacture:y_cat2008	1.335542	6.769096	0.197	0.84361
## i_catmining:y_cat2008	0.164801	7.068794	0.023	0.98140
## i_catretail:y_cat2008	4.732809	7.541253	0.628	0.53033
## i_catservices:y_cat2008	1.267784	6.857817	0.185	0.85335
## i_cattransportation:y_cat2008	2.350168	7.189764	0.327	0.74379
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.906977	7.875170	0.369	0.71206
## i_catmining:y_cat2009	4.844698	9.635909	0.503	0.61516
## i_catretail:y_cat2009	5.904859	9.861073	0.599	0.54935
## i_catservices:y_cat2009	1.534273	7.945851	0.193	0.84690
## i_cattransportation:y_cat2009	1.127761	8.617396	0.131	0.89589

## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	-0.440303	9.215100	-0.048	0.96189
## i_catfinance:y_cat2010	-1.785040	8.080559	-0.221	0.82518
## i_catmanufacture:y_cat2010	-1.664711	7.780595	-0.214	0.83060
## i_catmining:y_cat2010	-3.129626	8.085406	-0.387	0.69873
## i_catretail:y_cat2010	0.819212	8.700991	0.094	0.92500
## i_catservices:y_cat2010	-1.284207	7.871038	-0.163	0.87041
## i_cattransportation:y_cat2010	-2.266360	8.129550	-0.279	0.78043
## i_catwholesale:y_cat2010	-0.173456	9.793744	-0.018	0.98587
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-10.444393	7.086288	-1.474	0.14063
## i_catmanufacture:y_cat2011	-0.735634	6.426045	-0.114	0.90887
## i_catmining:y_cat2011	0.366426	7.614788	0.048	0.96162
## i_catretail:y_cat2011	0.117687	8.706074	0.014	0.98922
## i_catservices:y_cat2011	-2.704070	6.692973	-0.404	0.68623
## i_cattransportation:y_cat2011	-4.978826	7.364219	-0.676	0.49904
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-4.777451	8.921168	-0.536	0.59233
## i_catfinance:y_cat2012	6.137724	6.270804	0.979	0.32778
## i_catmanufacture:y_cat2012	5.779060	5.912286	0.977	0.32842
## i_catmining:y_cat2012	-1.979236	6.340217	-0.312	0.75493
## i_catretail:y_cat2012	6.275818	6.635698	0.946	0.34435
## i_catservices:y_cat2012	4.551044	6.033384	0.754	0.45073
## i_cattransportation:y_cat2012	5.741526	6.365462	0.902	0.36715

## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	-1.502022	8.025609	-0.187	0.85155
## i_catfinance:y_cat2013	-3.303591	6.300055	-0.524	0.60006
## i_catmanufacture:y_cat2013	-2.514553	5.926474	-0.424	0.67139
## i_catmining:y_cat2013	-3.427248	6.512576	-0.526	0.59876
## i_catretail:y_cat2013	-1.377516	6.912073	-0.199	0.84205
## i_catservices:y_cat2013	-3.968492	6.028005	-0.658	0.51037
## i_cattransportation:y_cat2013	-6.512941	6.428743	-1.013	0.31110
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	2.640264	10.230834	0.258	0.79637
## i_catfinance:y_cat2014	-2.290474	8.894093	-0.258	0.79679
## i_catmanufacture:y_cat2014	0.776768	7.864383	0.099	0.92133
## i_catmining:y_cat2014	3.141421	8.834320	0.356	0.72217
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-3.283525	7.999309	-0.410	0.68149
## i_cattransportation:y_cat2014	2.529252	8.892779	0.284	0.77611
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-0.468151	9.209343	-0.051	0.95946
## i_catfinance:y_cat2015	2.321157	7.704342	0.301	0.76322
## i_catmanufacture:y_cat2015	0.934447	6.451577	0.145	0.88485
## i_catmining:y_cat2015	-6.995061	7.623092	-0.918	0.35890
## i_catretail:y_cat2015	6.574692	7.212573	0.912	0.36208
## i_catservices:y_cat2015	0.008992	6.666310	0.001	0.99892
## i_cattransportation:y_cat2015	NA	NA	NA	NA

## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.934290	8.888721	0.443	0.65808
## i_catfinance:y_cat2016	1.849340	8.040946	0.230	0.81812
## i_catmanufacture:y_cat2016	2.037628	7.773186	0.262	0.79324
## i_catmining:y_cat2016	2.296194	8.008817	0.287	0.77436
## i_catretail:y_cat2016	7.119732	8.369019	0.851	0.39500
## i_catservices:y_cat2016	1.909392	7.843768	0.243	0.80769
## i_cattransportation:y_cat2016	0.032624	8.095626	0.004	0.99678
## i_catwholesale:y_cat2016	6.063399	9.606991	0.631	0.52800
## i_catConstruction:y_cat2017	7.596442	7.254635	1.047	0.29514
## i_catfinance:y_cat2017	3.272718	6.153491	0.532	0.59487
## i_catmanufacture:y_cat2017	3.320764	5.822842	0.570	0.56852
## i_catmining:y_cat2017	1.876449	6.252557	0.300	0.76412
## i_catretail:y_cat2017	2.718163	6.407403	0.424	0.67144
## i_catservices:y_cat2017	4.766965	5.902140	0.808	0.41935
## i_cattransportation:y_cat2017	1.617792	6.224903	0.260	0.79497
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.607361	8.897956	0.181	0.85666
## i_catfinance:y_cat2018	0.447939	8.026565	0.056	0.95550
## i_catmanufacture:y_cat2018	-0.575654	7.776223	-0.074	0.94099
## i_catmining:y_cat2018	-3.516698	8.032870	-0.438	0.66157
## i_catretail:y_cat2018	-0.298902	8.481387	-0.035	0.97189
## i_catservices:y_cat2018	-0.091689	7.827661	-0.012	0.99066
## i_cattransportation:y_cat2018	0.998350	8.062408	0.124	0.90146

```

## i_catwholesale:y_cat2018      5.948581    9.576506    0.621    0.53454
## i_catConstruction:y_cat2019           NA           NA           NA           NA
## i_catfinance:y_cat2019         1.634617    6.597149    0.248    0.80433
## i_catmanufacture:y_cat2019      0.891456    6.245428    0.143    0.88651
## i_catmining:y_cat2019          1.779299    7.132046    0.249    0.80301
## i_catretail:y_cat2019          2.685636    7.310305    0.367    0.71337
## i_catservices:y_cat2019        0.540083    6.264133    0.086    0.93130
## i_cattransportation:y_cat2019  -1.748996    6.784864   -0.258    0.79660
## i_catwholesale:y_cat2019           NA           NA           NA           NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.464 on 2742 degrees of freedom
## Multiple R-squared:  0.1027, Adjusted R-squared:  0.05553
## F-statistic: 2.178 on 144 and 2742 DF,  p-value: 1.471e-13

##test heteroskedasticity problem
hetero_test <- bptest(reg2A.3)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg2A.3
## BP = 578.63, df = 144, p-value < 2.2e-16

##solve heteroskedasticity problem
coefptest(reg2A.3, vcov = vcovHC(reg2A.3, type='HC0', cluster='a_industr
y'))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|
)
## (Intercept)    1.755328    0.954818  1.8384 0.066113
1 .
## `firm size`   -0.147049    0.093867 -1.5666 0.117330
0
## leverage     1.224844    1.041143  1.1764 0.239520
6

```

## `free cash flow` 5	2.341261	1.806205	1.2962	0.195004
## `Tobin's q` 1 .	-0.197962	0.111597	-1.7739	0.076190
## preMTR 9 **	-2.065392	0.657963	-3.1391	0.001712
## deal_size 3	1.423017	1.494664	0.9521	0.341148
## hostile 4 .	-1.422403	0.826690	-1.7206	0.085436
## high_tech 9	0.223338	0.315127	0.7087	0.478555
## diversifying 0	-0.270877	0.227450	-1.1909	0.233784
## public_target 6 ***	-1.931364	0.408967	-4.7225	2.446e-0
## private_target 2	-0.312518	0.246877	-1.2659	0.205662
## all_cash_deal 3	-0.295449	0.346066	-0.8537	0.393326
## stock_deal 6	-0.535780	0.710902	-0.7537	0.451116
## cross_border 4 *	0.576137	0.250748	2.2977	0.021655
## acquiror_dummy_ESG 7 *	-0.481205	0.243546	-1.9758	0.048274
## i_catConstruction 2 *	-3.394955	1.571279	-2.1606	0.030810
## i_catfinance 6	-0.648617	1.191208	-0.5445	0.586139
## i_catmanufacture 0	0.714307	0.690241	1.0349	0.300823
## i_catmining 3	0.916680	1.235267	0.7421	0.458096
## i_catretail 1	-0.833949	1.042797	-0.7997	0.423940
## i_catservices 6	1.145732	1.032332	1.1098	0.267161
## i_cattransportation 8	0.499100	1.375738	0.3628	0.716791
## i_catwholesale 2	-0.741630	0.647692	-1.1450	0.252294
## y_cat2004 9	-1.163898	1.886071	-0.6171	0.537218
## y_cat2005 9	0.336732	0.697945	0.4825	0.629515
## y_cat2006 3	-0.737793	1.049118	-0.7033	0.481959
## y_cat2007 6	1.231894	0.934421	1.3184	0.187496

## y_cat2008	-1.900729	2.459213	-0.7729	0.439647
5				
## y_cat2009	-2.202776	0.650652	-3.3855	0.000720
5 ***				
## y_cat2010	1.802839	0.460736	3.9130	9.339e-0
5 ***				
## y_cat2011	1.301160	1.499358	0.8678	0.385573
5				
## y_cat2012	-5.095877	6.254840	-0.8147	0.415309
4				
## y_cat2013	3.358130	1.303330	2.5766	0.010030
3 *				
## y_cat2014	0.916050	0.417267	2.1954	0.028221
6 *				
## y_cat2015	-0.875633	1.723281	-0.5081	0.611410
1				
## y_cat2016	-1.650608	0.300630	-5.4905	4.375e-0
8 ***				
## y_cat2017	-3.307725	3.465422	-0.9545	0.339917
6				
## y_cat2018	-0.433837	0.416466	-1.0417	0.297638
1				
## y_cat2019	-1.616114	1.589924	-1.0165	0.309494
1				
## i_catfinance:y_cat2004	1.752134	3.365760	0.5206	0.602704
2				
## i_catmanufacture:y_cat2004	2.029795	2.039431	0.9953	0.319690
1				
## i_catmining:y_cat2004	-1.860835	2.416962	-0.7699	0.441421
5				
## i_catretail:y_cat2004	2.584966	2.426997	1.0651	0.286929
7				
## i_catservices:y_cat2004	-0.160204	2.263551	-0.0708	0.943581
5				
## i_cattransportation:y_cat2004	-1.095274	2.428783	-0.4510	0.652057
0				
## i_catfinance:y_cat2005	0.374152	1.601764	0.2336	0.815322
8				
## i_catmanufacture:y_cat2005	-0.323887	0.997711	-0.3246	0.745485
9				
## i_catmining:y_cat2005	-0.673433	2.123591	-0.3171	0.751176
6				
## i_catretail:y_cat2005	5.476299	1.666389	3.2863	0.001027
8 **				
## i_catservices:y_cat2005	-0.596145	1.482390	-0.4022	0.687604
2				
## i_cattransportation:y_cat2005	-1.559261	1.919038	-0.8125	0.416562
7				
## i_catwholesale:y_cat2005	0.206808	1.130976	0.1829	0.854922
7				

## i_catfinance:y_cat2006 8	0.554080	1.608373	0.3445	0.730498
## i_catmanufacture:y_cat2006 3	1.440458	1.466512	0.9822	0.326071
## i_catmining:y_cat2006 0	-2.008075	3.452744	-0.5816	0.560892
## i_catservices:y_cat2006 1	1.070170	1.625005	0.6586	0.510231
## i_cattransportation:y_cat2006 1 .	-3.429267	2.001879	-1.7130	0.086821
## i_catfinance:y_cat2007 9	-1.232217	1.766999	-0.6973	0.485642
## i_catmanufacture:y_cat2007 3	-0.494727	1.159094	-0.4268	0.669542
## i_catmining:y_cat2007 8	-0.404509	1.986467	-0.2036	0.838655
## i_catretail:y_cat2007 3	4.716686	5.139774	0.9177	0.358865
## i_catservices:y_cat2007 3	-2.577752	1.651383	-1.5610	0.118647
## i_cattransportation:y_cat2007 6	-0.600931	2.051989	-0.2929	0.769656
## i_catConstruction:y_cat2008 1 **	23.495822	8.048035	2.9194	0.003535
## i_catfinance:y_cat2008 0	5.843821	3.915407	1.4925	0.135678
## i_catmanufacture:y_cat2008 0	1.335542	2.643277	0.5053	0.613417
## i_catmining:y_cat2008 1	0.164801	3.601740	0.0458	0.963508
## i_catretail:y_cat2008 4	4.732809	3.786299	1.2500	0.211412
## i_catservices:y_cat2008 0	1.267784	2.781135	0.4559	0.648533
## i_cattransportation:y_cat2008 7	2.350168	3.083302	0.7622	0.445991
## i_catmanufacture:y_cat2009 9 .	2.906977	1.591673	1.8264	0.067903
## i_catmining:y_cat2009 6 **	4.844698	1.501507	3.2266	0.001267
## i_catretail:y_cat2009 2	5.904859	5.680484	1.0395	0.298664
## i_catservices:y_cat2009 4	1.534272	1.313782	1.1678	0.242977
## i_cattransportation:y_cat2009 8	1.127761	1.787848	0.6308	0.528228
## i_catConstruction:y_cat2010 9	-0.440303	1.792479	-0.2456	0.805979
## i_catfinance:y_cat2010 2	-1.785039	1.738273	-1.0269	0.304556

## i_catmanufacture:y_cat2010	-1.664711	0.838503	-1.9853	0.047206
4 *				
## i_catmining:y_cat2010	-3.129626	2.157739	-1.4504	0.147056
0				
## i_catretail:y_cat2010	0.819212	1.072097	0.7641	0.444860
5				
## i_catservices:y_cat2010	-1.284207	1.418014	-0.9056	0.365207
2				
## i_cattransportation:y_cat2010	-2.266360	1.798860	-1.2599	0.207817
5				
## i_catwholesale:y_cat2010	-0.173456	1.079591	-0.1607	0.872366
3				
## i_catfinance:y_cat2011	-10.444393	2.590635	-4.0316	5.691e-0
5 ***				
## i_catmanufacture:y_cat2011	-0.735634	1.762507	-0.4174	0.676433
4				
## i_catmining:y_cat2011	0.366426	2.480119	0.1477	0.882554
6				
## i_catretail:y_cat2011	0.117687	1.818891	0.0647	0.948415
4				
## i_catservices:y_cat2011	-2.704070	1.874137	-1.4428	0.149181
3				
## i_cattransportation:y_cat2011	-4.978826	2.639187	-1.8865	0.059333
3 .				
## i_catConstruction:y_cat2012	-4.777451	6.506306	-0.7343	0.462840
9				
## i_catfinance:y_cat2012	6.137724	6.367311	0.9639	0.335159
6				
## i_catmanufacture:y_cat2012	5.779060	6.281478	0.9200	0.357645
4				
## i_catmining:y_cat2012	-1.979236	7.318698	-0.2704	0.786845
6				
## i_catretail:y_cat2012	6.275818	6.469423	0.9701	0.332095
2				
## i_catservices:y_cat2012	4.551044	6.400387	0.7111	0.477109
1				
## i_cattransportation:y_cat2012	5.741526	6.463477	0.8883	0.374455
7				
## i_catConstruction:y_cat2013	-1.502022	2.385125	-0.6297	0.528913
5				
## i_catfinance:y_cat2013	-3.303591	1.801446	-1.8339	0.066783
7 .				
## i_catmanufacture:y_cat2013	-2.514553	1.460226	-1.7220	0.085176
9 .				
## i_catmining:y_cat2013	-3.427248	3.187235	-1.0753	0.282333
2				
## i_catretail:y_cat2013	-1.377516	1.807311	-0.7622	0.446011
7				
## i_catservices:y_cat2013	-3.968492	1.764776	-2.2487	0.024609
3 *				

## i_cattransportation:y_cat2013 3 **	-6.512941	2.266404	-2.8737	0.004088
## i_catConstruction:y_cat2014 6	2.640264	1.633313	1.6165	0.106099
## i_catfinance:y_cat2014 9	-2.290474	2.226878	-1.0286	0.303777
## i_catmanufacture:y_cat2014 1	0.776768	1.246705	0.6231	0.533299
## i_catmining:y_cat2014 7	3.141421	2.312553	1.3584	0.174441
## i_catservices:y_cat2014 4 *	-3.283526	1.558195	-2.1073	0.035185
## i_cattransportation:y_cat2014 4	2.529251	4.514655	0.5602	0.575367
## i_catConstruction:y_cat2015 6	-0.468151	2.353080	-0.1990	0.842314
## i_catfinance:y_cat2015 8	2.321157	3.518729	0.6597	0.509528
## i_catmanufacture:y_cat2015 6	0.934447	2.209955	0.4228	0.672448
## i_catmining:y_cat2015 1 *	-6.995061	3.546248	-1.9725	0.048650
## i_catretail:y_cat2015 5 *	6.574692	2.766506	2.3765	0.017544
## i_catservices:y_cat2015 6	0.008992	2.270687	0.0040	0.996840
## i_catConstruction:y_cat2016 0 .	3.934290	2.041964	1.9267	0.054118
## i_catfinance:y_cat2016 2	1.849340	1.272445	1.4534	0.146234
## i_catmanufacture:y_cat2016 0 *	2.037628	0.794508	2.5646	0.010381
## i_catmining:y_cat2016 0	2.296194	1.784813	1.2865	0.198371
## i_catretail:y_cat2016 6 *	7.119732	3.203582	2.2224	0.026335
## i_catservices:y_cat2016 3	1.909392	1.504239	1.2693	0.204427
## i_cattransportation:y_cat2016 7	0.032624	1.623754	0.0201	0.983971
## i_catwholesale:y_cat2016 9 *	6.063399	2.358979	2.5703	0.010211
## i_catConstruction:y_cat2017 0 .	7.596442	4.008013	1.8953	0.058156
## i_catfinance:y_cat2017 6	3.272718	3.666246	0.8927	0.372116
## i_catmanufacture:y_cat2017 6	3.320764	3.529374	0.9409	0.346842
## i_catmining:y_cat2017 2	1.876449	4.006685	0.4683	0.639586

```

## i_catretail:y_cat2017      2.718163    3.992508    0.6808    0.496045
5
## i_catservices:y_cat2017    4.766965    3.653498    1.3048    0.192081
5
## i_cattransportation:y_cat2017 1.617792    3.826210    0.4228    0.672460
9
## i_catConstruction:y_cat2018 1.607361    2.226225    0.7220    0.470348
8
## i_catfinance:y_cat2018     0.447939    1.271348    0.3523    0.724615
2
## i_catmanufacture:y_cat2018 -0.575654    0.942450   -0.6108    0.541378
7
## i_catmining:y_cat2018     -3.516698    2.021251   -1.7399    0.081995
5
## i_catretail:y_cat2018     -0.298902    2.565536   -0.1165    0.907259
7
## i_catservices:y_cat2018    -0.091689    1.249118   -0.0734    0.941491
0
## i_cattransportation:y_cat2018 0.998350    1.625641    0.6141    0.539182
5
## i_catwholesale:y_cat2018    5.948581    5.037217    1.1809    0.237734
5
## i_catfinance:y_cat2019     1.634617    1.984826    0.8236    0.410263
1
## i_catmanufacture:y_cat2019 0.891456    2.092784    0.4260    0.670165
6
## i_catmining:y_cat2019     1.779298    8.686425    0.2048    0.837714
9
## i_catretail:y_cat2019     2.685636    3.182936    0.8438    0.398876
9
## i_catservices:y_cat2019    0.540083    2.279816    0.2369    0.812753
9
## i_cattransportation:y_cat2019 -1.748995    2.125062   -0.8230    0.410561
0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values2A.3 <- vif(lm(CAR22 ~ `firm size`+leverage+`free cash flow`+
`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea
l+cross_border+acquiror_dummy_ESG, data = data1))
print(vif_values2A.3)

```

```

##      `firm size`      leverage  `free cash flow`      `Tob
in's q`
##      1.507813      1.565819      1.233903      1
.427590
##      preMTR      deal_size      hostile      hi

```

```

gh_tech
##          1.063957          1.227420          1.008483          1
.188141
##      diversifying      public_target      private_target      all_ca
sh_deal
##          1.089452          1.352664          1.284249          1
.895759
##      stock_deal      cross_border      acquiror_dummy_ESG
##          2.040279          1.041557          1.265274

```

##CAR55 regression model

```

reg3A.3<-lm(CAR55~ `firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+acquiror_dummy_ESG+(i_cat*y_cat) , data=data1)

```

```
summary(reg3A.3)
```

```

##
## Call:
## lm(formula = CAR55 ~ `firm size` + leverage + `free cash flow` +
##   `Tobin's q` + preMTR + deal_size + hostile + high_tech +
##   diversifying + public_target + private_target + all_cash_deal +
##   stock_deal + cross_border + acquiror_dummy_ESG + (i_cat *
##   y_cat), data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -56.553  -3.137  -0.091   3.218  89.822
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -1.47404     6.88563  -0.214  0.830505
## `firm size`       -0.16537     0.11469  -1.442  0.149446
## leverage          2.41583     1.24485   1.941  0.052401 .
## `free cash flow`  3.98978     1.53350   2.602  0.009325 *
## `Tobin's q`      -0.17268     0.12769  -1.352  0.176371
## preMTR           -5.38084     0.56234  -9.569 < 2e-16 **
## deal_size         1.06689     0.40903   2.608  0.009149 *
## hostile           -3.26077     4.92281  -0.662  0.507784
## high_tech         0.19330     0.36772   0.526  0.599157

```

## diversifying	-0.19866	0.29158	-0.681	0.495716
## public_target	-1.81658	0.40960	-4.435	9.57e-06 *
**				
## private_target	-0.25479	0.29917	-0.852	0.394467
## all_cash_deal	-0.35271	0.41442	-0.851	0.394789
## stock_deal	-0.37325	0.55406	-0.674	0.500579
## cross_border	0.49186	0.31855	1.544	0.122697
## acquiror_dummy_ESG	-0.83784	0.30641	-2.734	0.006290 *
*				
## i_catConstruction	-4.09768	8.31728	-0.493	0.622285
## i_catfinance	1.47399	7.26130	0.203	0.839156
## i_catmanufacture	4.62525	6.84325	0.676	0.499170
## i_catmining	4.55964	7.12383	0.640	0.522191
## i_catretail	2.02218	7.43879	0.272	0.785763
## i_catservices	4.86921	6.91723	0.704	0.481539
## i_cattransportation	4.05677	7.25775	0.559	0.576237
## i_catwholesale	4.14201	9.61947	0.431	0.666803
## y_cat2004	-2.55446	7.60271	-0.336	0.736902
## y_cat2005	1.75566	8.31978	0.211	0.832886
## y_cat2006	-2.36251	7.45113	-0.317	0.751217
## y_cat2007	-0.44488	7.60437	-0.059	0.953352
## y_cat2008	-3.99172	8.32559	-0.479	0.631656
## y_cat2009	-5.85123	9.61499	-0.609	0.542871
## y_cat2010	6.14815	9.60963	0.640	0.522363
## y_cat2011	-0.52201	7.85460	-0.066	0.947017
## y_cat2012	-5.65475	7.27727	-0.777	0.437201

## y_cat2013	2.51652	7.27660	0.346	0.729491
## y_cat2014	0.30926	9.61090	0.032	0.974333
## y_cat2015	-2.39580	7.85873	-0.305	0.760497
## y_cat2016	3.74057	9.60697	0.389	0.697040
## y_cat2017	-5.35454	7.17014	-0.747	0.455259
## y_cat2018	1.81365	9.61357	0.189	0.850377
## y_cat2019	0.80171	7.60769	0.105	0.916081
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	3.05195	8.38004	0.364	0.715742
## i_catmanufacture:y_cat2004	2.73676	7.68128	0.356	0.721651
## i_catmining:y_cat2004	-3.96781	8.09706	-0.490	0.624151
## i_catretail:y_cat2004	7.15137	9.07734	0.788	0.430866
## i_catservices:y_cat2004	0.51807	7.82560	0.066	0.947222
## i_cattransportation:y_cat2004	0.36010	8.49120	0.042	0.966176
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	-0.53387	8.82219	-0.061	0.951750
## i_catmanufacture:y_cat2005	-1.71616	8.38529	-0.205	0.837850
## i_catmining:y_cat2005	-1.23254	8.78523	-0.140	0.888435
## i_catretail:y_cat2005	6.84054	9.36420	0.730	0.465148
## i_catservices:y_cat2005	-2.36689	8.50783	-0.278	0.780878
## i_cattransportation:y_cat2005	-4.22598	9.13632	-0.463	0.643725
## i_catwholesale:y_cat2005	-3.90571	12.72638	-0.307	0.758944
## i_catConstruction:y_cat2006	NA	NA	NA	NA

## i_catfinance:y_cat2006	6.18734	9.22768	0.671	0.502583
## i_catmanufacture:y_cat2006	2.82141	7.62755	0.370	0.711487
## i_catmining:y_cat2006	-6.73804	9.13305	-0.738	0.460721
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	3.12524	7.77895	0.402	0.687895
## i_cattransportation:y_cat2006	-2.19477	9.23290	-0.238	0.812122
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.29663	8.18961	0.036	0.971109
## i_catmanufacture:y_cat2007	0.44297	7.68102	0.058	0.954015
## i_catmining:y_cat2007	1.74484	8.11135	0.215	0.829697
## i_catretail:y_cat2007	7.11503	9.50070	0.749	0.453984
## i_catservices:y_cat2007	-0.31444	7.82119	-0.040	0.967934
## i_cattransportation:y_cat2007	0.56713	8.58910	0.066	0.947359
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	35.42022	10.75188	3.294	0.000999 *
**				
## i_catfinance:y_cat2008	11.33392	9.35163	1.212	0.225627
## i_catmanufacture:y_cat2008	2.51852	8.40884	0.300	0.764575
## i_catmining:y_cat2008	3.24521	8.78113	0.370	0.711734
## i_catretail:y_cat2008	12.20237	9.36804	1.303	0.192837
## i_catservices:y_cat2008	4.01164	8.51905	0.471	0.637748
## i_cattransportation:y_cat2008	3.40175	8.93141	0.381	0.703326
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA

## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	4.68868	9.78284	0.479	0.631781
## i_catmining:y_cat2009	7.61649	11.97010	0.636	0.524639
## i_catretail:y_cat2009	25.88294	12.24981	2.113	0.034697 *
## i_catservices:y_cat2009	6.16539	9.87065	0.625	0.532273
## i_cattransportation:y_cat2009	4.64470	10.70487	0.434	0.664405
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	1.91490	11.44736	0.167	0.867163
## i_catfinance:y_cat2010	-4.00090	10.03799	-0.399	0.690237
## i_catmanufacture:y_cat2010	-6.75662	9.66536	-0.699	0.484577
## i_catmining:y_cat2010	-5.48543	10.04401	-0.546	0.585014
## i_catretail:y_cat2010	-2.61714	10.80871	-0.242	0.808696
## i_catservices:y_cat2010	-6.77861	9.77771	-0.693	0.488198
## i_cattransportation:y_cat2010	-7.98301	10.09884	-0.790	0.429312
## i_catwholesale:y_cat2010	-5.04910	12.16617	-0.415	0.678166
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-6.99094	8.80286	-0.794	0.427167
## i_catmanufacture:y_cat2011	-0.53980	7.98268	-0.068	0.946092
## i_catmining:y_cat2011	-1.46792	9.45939	-0.155	0.876690
## i_catretail:y_cat2011	6.32020	10.81503	0.584	0.559005
## i_catservices:y_cat2011	0.05966	8.31427	0.007	0.994275
## i_cattransportation:y_cat2011	-7.05881	9.14812	-0.772	0.440410
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	9.89232	11.08222	0.893	0.372134

## i_catfinance:y_cat2012	7.86059	7.78984	1.009	0.313024
## i_catmanufacture:y_cat2012	5.45794	7.34447	0.743	0.457463
## i_catmining:y_cat2012	-3.33682	7.87607	-0.424	0.671843
## i_catretail:y_cat2012	7.67189	8.24312	0.931	0.352090
## i_catservices:y_cat2012	5.15442	7.49491	0.688	0.491686
## i_cattransportation:y_cat2012	6.66390	7.90743	0.843	0.399448
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	3.54639	9.96973	0.356	0.722081
## i_catfinance:y_cat2013	-1.76613	7.82617	-0.226	0.821476
## i_catmanufacture:y_cat2013	-2.39675	7.36210	-0.326	0.744788
## i_catmining:y_cat2013	-4.44227	8.09018	-0.549	0.582985
## i_catretail:y_cat2013	1.14503	8.58645	0.133	0.893924
## i_catservices:y_cat2013	-4.35016	7.48822	-0.581	0.561333
## i_cattransportation:y_cat2013	-4.66196	7.98604	-0.584	0.559427
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	4.33651	12.70914	0.341	0.732971
## i_catfinance:y_cat2014	-0.37813	11.04859	-0.034	0.972701
## i_catmanufacture:y_cat2014	-0.65364	9.76944	-0.067	0.946661
## i_catmining:y_cat2014	7.81770	10.97434	0.712	0.476302
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-1.69730	9.93705	-0.171	0.864390
## i_cattransportation:y_cat2014	3.07568	11.04696	0.278	0.780712
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-2.21691	11.44021	-0.194	0.846361

## i_catfinance:y_cat2015	5.79716	9.57064	0.606	0.544749
## i_catmanufacture:y_cat2015	1.45933	8.01440	0.182	0.855527
## i_catmining:y_cat2015	6.61305	9.46970	0.698	0.485026
## i_catretail:y_cat2015	9.08969	8.95974	1.015	0.310432
## i_catservices:y_cat2015	0.14941	8.28115	0.018	0.985607
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.77938	11.04192	0.342	0.732170
## i_catfinance:y_cat2016	-1.80267	9.98878	-0.180	0.856797
## i_catmanufacture:y_cat2016	-3.54644	9.65616	-0.367	0.713444
## i_catmining:y_cat2016	-3.16426	9.94887	-0.318	0.750470
## i_catretail:y_cat2016	1.13939	10.39632	0.110	0.912738
## i_catservices:y_cat2016	-3.77952	9.74384	-0.388	0.698129
## i_cattransportation:y_cat2016	-6.98317	10.05670	-0.694	0.487503
## i_catwholesale:y_cat2016	-0.36245	11.93418	-0.030	0.975774
## i_catConstruction:y_cat2017	15.64997	9.01199	1.737	0.082575 .
## i_catfinance:y_cat2017	6.27042	7.64411	0.820	0.412120
## i_catmanufacture:y_cat2017	4.80942	7.23336	0.665	0.506175
## i_catmining:y_cat2017	3.88094	7.76717	0.500	0.617355
## i_catretail:y_cat2017	6.93965	7.95953	0.872	0.383358
## i_catservices:y_cat2017	6.72169	7.33187	0.917	0.359340
## i_cattransportation:y_cat2017	4.09069	7.73282	0.529	0.596846
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	5.88151	11.05339	0.532	0.594700

```

## i_catfinance:y_cat2018      -1.61154      9.97091     -0.162  0.871614
## i_catmanufacture:y_cat2018  -4.05662      9.65993     -0.420  0.674560
## i_catmining:y_cat2018       -8.96036      9.97875     -0.898  0.369294
## i_catretail:y_cat2018       -0.15198     10.53591     -0.014  0.988492
## i_catservices:y_cat2018     -2.28493      9.72383     -0.235  0.814240
## i_cattransportation:y_cat2018 -1.98582     10.01544     -0.198  0.842844
## i_catwholesale:y_cat2018      4.29356     11.89631      0.361  0.718191
## i_catConstruction:y_cat2019      NA           NA           NA      NA
## i_catfinance:y_cat2019       -0.18139      8.19524     -0.022  0.982343
## i_catmanufacture:y_cat2019   -2.95454      7.75832     -0.381  0.703364
## i_catmining:y_cat2019       -5.74417      8.85971     -0.648  0.516814
## i_catretail:y_cat2019        3.28939      9.08115      0.362  0.717214
## i_catservices:y_cat2019     -1.79175      7.78155     -0.230  0.817910
## i_cattransportation:y_cat2019 -5.91264      8.42842     -0.702  0.483043
## i_catwholesale:y_cat2019      NA           NA           NA      NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.787 on 2742 degrees of freedom
## Multiple R-squared:  0.122, Adjusted R-squared:  0.07594
## F-statistic: 2.647 on 144 and 2742 DF,  p-value: < 2.2e-16

##test heteroskedasticity problem
hetero_test <- bptest(reg3A.3)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg3A.3
## BP = 578.47, df = 144, p-value < 2.2e-16

```

##solve heteroskedasticity problem

```
coefstest(reg3A.3, vcov = vcovHC(reg3A.3, type='HC0', cluster='a_industry'))
```

```
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -1.474038   1.202358 -1.2260 0.2203205
## `firm size` -0.165370   0.118097 -1.4003 0.1615396
## leverage    2.415834   1.306290  1.8494 0.0645097
## `free cash flow`
.
## `Tobin's q` -0.172677   0.138792 -1.2441 0.2135536
.
## preMTR      -5.380837   0.740653 -7.2650 4.840e-13
***
## deal_size    1.066887   1.773794  0.6015 0.5475755
## hostile     -3.260772   1.768532 -1.8438 0.0653240
.
## high_tech    0.193300   0.360529  0.5362 0.5918942
## diversifying -0.198662   0.286173 -0.6942 0.4876137
## public_target
***
## private_target -0.254795   0.303537 -0.8394 0.4013068
## all_cash_deal -0.352714   0.438408 -0.8045 0.4211592
## stock_deal  -0.373252   0.807861 -0.4620 0.6440994
## cross_border  0.491856   0.312596  1.5735 0.1157283
## acquiror_dummy_ESG
**
## i_catConstruction
*
## i_catfinance  1.473994   1.559082  0.9454 0.3445256
## i_catmanufacture
***
## i_catmining  4.559637   1.785059  2.5543 0.0106927
*
```

## i_catretail	2.022185	1.918919	1.0538	0.2920607
## i_catservices ***	4.869212	1.232785	3.9498	8.020e-05
## i_cattransportation	4.056768	2.584209	1.5698	0.1165702
## i_catwholesale ***	4.142013	0.776666	5.3331	1.044e-07
## y_cat2004	-2.554458	2.357236	-1.0837	0.2786079
## y_cat2005 ***	1.755656	0.362878	4.8381	1.383e-06
## y_cat2006 .	-2.362508	1.418739	-1.6652	0.0959837
## y_cat2007	-0.444883	0.838845	-0.5304	0.5959111
## y_cat2008 *	-3.991717	2.025921	-1.9703	0.0489019
## y_cat2009 ***	-5.851232	0.750794	-7.7934	9.186e-15
## y_cat2010 ***	6.148149	0.558543	11.0075	< 2.2e-16
## y_cat2011	-0.522006	1.364600	-0.3825	0.7020948
## y_cat2012	-5.654749	5.291138	-1.0687	0.2852896
## y_cat2013 *	2.516525	1.278256	1.9687	0.0490861
## y_cat2014	0.309255	0.503164	0.6146	0.5388561
## y_cat2015	-2.395803	2.976870	-0.8048	0.4210014
## y_cat2016 ***	3.740565	0.369906	10.1122	< 2.2e-16
## y_cat2017	-5.354538	5.084782	-1.0531	0.2924101
## y_cat2018 ***	1.813654	0.521703	3.4764	0.0005161
## y_cat2019	0.801708	0.882193	0.9088	0.3635528
## i_catfinance:y_cat2004	3.051954	4.197308	0.7271	0.4672134
## i_catmanufacture:y_cat2004	2.736760	2.587358	1.0577	0.2902657
## i_catmining:y_cat2004	-3.967812	3.101129	-1.2795	0.2008386
## i_catretail:y_cat2004 *	7.151369	3.526354	2.0280	0.0426590
## i_catservices:y_cat2004	0.518069	2.834946	0.1827	0.8550125

## i_cattransportation:y_cat2004	0.360102	3.618821	0.0995	0.9207421
## i_catfinance:y_cat2005	-0.533871	1.844298	-0.2895	0.7722429
## i_catmanufacture:y_cat2005	-1.716164	0.955781	-1.7956	0.0726742
·				
## i_catmining:y_cat2005	-1.232543	2.547998	-0.4837	0.6286160
## i_catretail:y_cat2005	6.840539	2.189424	3.1244	0.0018006
**				
## i_catservices:y_cat2005	-2.366895	1.871724	-1.2646	0.2061391
## i_cattransportation:y_cat2005	-4.225985	3.631836	-1.1636	0.2446895
## i_catwholesale:y_cat2005	-3.905711	1.087421	-3.5917	0.0003343

## i_catfinance:y_cat2006	6.187338	2.216902	2.7910	0.0052912
**				
## i_catmanufacture:y_cat2006	2.821412	1.996522	1.4132	0.1577211
## i_catmining:y_cat2006	-6.738036	5.863470	-1.1492	0.2505923
## i_catservices:y_cat2006	3.125239	2.093712	1.4927	0.1356364
## i_cattransportation:y_cat2006	-2.194771	4.056884	-0.5410	0.5885521
## i_catfinance:y_cat2007	0.296631	2.164884	0.1370	0.8910254
## i_catmanufacture:y_cat2007	0.442969	1.213858	0.3649	0.7151947
## i_catmining:y_cat2007	1.744839	2.414830	0.7226	0.4700171
## i_catretail:y_cat2007	7.115034	4.772753	1.4908	0.1361393
## i_catservices:y_cat2007	-0.314438	1.960651	-0.1604	0.8725980
## i_cattransportation:y_cat2007	0.567132	2.850066	0.1990	0.8422862
## i_catConstruction:y_cat2008	35.420224	13.529007	2.6181	0.0088909
**				
## i_catfinance:y_cat2008	11.333918	4.820760	2.3511	0.0187902
*				
## i_catmanufacture:y_cat2008	2.518520	2.480054	1.0155	0.3099522
## i_catmining:y_cat2008	3.245214	4.053103	0.8007	0.4233898
## i_catretail:y_cat2008	12.202368	3.095367	3.9421	8.278e-05


```

***
## i_catservices:y_cat2008      4.011637    2.652940    1.5121    0.1306116
## i_cattransportation:y_cat2008 3.401746    3.885585    0.8755    0.3813904
## i_catmanufacture:y_cat2009    4.688678    1.639797    2.8593    0.0042778
**
## i_catmining:y_cat2009         7.616493    2.033179    3.7461    0.0001833
***
## i_catretail:y_cat2009         25.882938    6.828934    3.7902    0.0001538
***
## i_catservices:y_cat2009       6.165395    2.099702    2.9363    0.0033490
**
## i_cattransportation:y_cat2009 4.644704    2.933321    1.5834    0.1134392
## i_catConstruction:y_cat2010   1.914904    2.314457    0.8274    0.4081015
## i_catfinance:y_cat2010        -4.000898    2.311342   -1.7310    0.0835669
.
## i_catmanufacture:y_cat2010    -6.756617    1.043283   -6.4763    1.110e-10
***
## i_catmining:y_cat2010         -5.485430    2.413787   -2.2725    0.0231309
*
## i_catretail:y_cat2010         -2.617137    2.011873   -1.3008    0.1934205
## i_catservices:y_cat2010       -6.778609    1.769963   -3.8298    0.0001311
***
## i_cattransportation:y_cat2010 -7.983005    2.936038   -2.7190    0.0065898
**
## i_catwholesale:y_cat2010      -5.049099    1.366859   -3.6939    0.0002251
***
## i_catfinance:y_cat2011        -6.990940    2.469485   -2.8309    0.0046751
**
## i_catmanufacture:y_cat2011    -0.539796    1.774844   -0.3041    0.7610463
## i_catmining:y_cat2011         -1.467922    2.662373   -0.5514    0.5814329
## i_catretail:y_cat2011         6.320202    2.344962    2.6952    0.0070770
**
## i_catservices:y_cat2011       0.059663    1.949913    0.0306    0.9755927
## i_cattransportation:y_cat2011 -7.058807    3.749835   -1.8824    0.0598833
.
## i_catConstruction:y_cat2012   9.892324    5.734282    1.7251    0.0846186
.
## i_catfinance:y_cat2012        7.860594    5.518052    1.4245    0.1544088
## i_catmanufacture:y_cat2012    5.457944    5.348819    1.0204    0.3076280

```

## i_catmining:y_cat2012	-3.336821	6.443794	-0.5178	0.6046153
## i_catretail:y_cat2012	7.671890	5.799058	1.3230	0.1859608
## i_catservices:y_cat2012	5.154415	5.526093	0.9327	0.3510357
## i_cattransportation:y_cat2012	6.663902	5.962744	1.1176	0.2638401
## i_catConstruction:y_cat2013	3.546386	3.738992	0.9485	0.3429651
## i_catfinance:y_cat2013	-1.766127	2.064890	-0.8553	0.3924528
## i_catmanufacture:y_cat2013	-2.396746	1.541533	-1.5548	0.1201136
## i_catmining:y_cat2013	-4.442273	3.740588	-1.1876	0.2350992
## i_catretail:y_cat2013	1.145028	2.676327	0.4278	0.6688043
## i_catservices:y_cat2013	-4.350162	1.966786	-2.2118	0.0270618
*				
## i_cattransportation:y_cat2013	-4.661957	3.311851	-1.4077	0.1593455
## i_catConstruction:y_cat2014	4.336505	1.965235	2.2066	0.0274240
*				
## i_catfinance:y_cat2014	-0.378131	1.734148	-0.2181	0.8274062
## i_catmanufacture:y_cat2014	-0.653643	1.542288	-0.4238	0.6717349
## i_catmining:y_cat2014	7.817697	3.676213	2.1266	0.0335455
*				
## i_catservices:y_cat2014	-1.697297	1.883121	-0.9013	0.3674967
## i_cattransportation:y_cat2014	3.075685	6.247017	0.4923	0.6225152
## i_catConstruction:y_cat2015	-2.216909	3.541861	-0.6259	0.5314218
## i_catfinance:y_cat2015	5.797159	6.070532	0.9550	0.3396785
## i_catmanufacture:y_cat2015	1.459325	3.441718	0.4240	0.6715913
## i_catmining:y_cat2015	6.613045	13.105182	0.5046	0.6138712
## i_catretail:y_cat2015	9.089695	3.991922	2.2770	0.0228616
*				
## i_catservices:y_cat2015	0.149410	3.333071	0.0448	0.9642488
## i_catConstruction:y_cat2016	3.779382	3.583269	1.0547	0.2916416

## i_catfinance:y_cat2016	-1.802675	1.734183	-1.0395	0.2986661
## i_catmanufacture:y_cat2016	-3.546441	1.026738	-3.4541	0.0005605

## i_catmining:y_cat2016	-3.164255	2.657617	-1.1906	0.2338995
## i_catretail:y_cat2016	1.139389	4.011061	0.2841	0.7763844
## i_catservices:y_cat2016	-3.779519	1.786218	-2.1159	0.0344404
*				
## i_cattransportation:y_cat2016	-6.983170	2.878507	-2.4260	0.0153317
*				
## i_catwholesale:y_cat2016	-0.362446	2.420604	-0.1497	0.8809856
## i_catConstruction:y_cat2017	15.649973	5.662201	2.7639	0.0057490
**				
## i_catfinance:y_cat2017	6.270417	5.334628	1.1754	0.2399297
## i_catmanufacture:y_cat2017	4.809415	5.155366	0.9329	0.3509563
## i_catmining:y_cat2017	3.880945	5.588400	0.6945	0.4874498
## i_catretail:y_cat2017	6.939645	5.569841	1.2459	0.2128956
## i_catservices:y_cat2017	6.721687	5.264768	1.2767	0.2018057
## i_cattransportation:y_cat2017	4.090686	5.784981	0.7071	0.4795509
## i_catConstruction:y_cat2018	5.881509	2.386941	2.4640	0.0137992
*				
## i_catfinance:y_cat2018	-1.611535	1.662248	-0.9695	0.3323855
## i_catmanufacture:y_cat2018	-4.056622	1.151955	-3.5215	0.0004361

## i_catmining:y_cat2018	-8.960360	3.055480	-2.9326	0.0033897
**				
## i_catretail:y_cat2018	-0.151979	4.102152	-0.0370	0.9704489
## i_catservices:y_cat2018	-2.284926	1.503270	-1.5200	0.1286336
## i_cattransportation:y_cat2018	-1.985820	2.765884	-0.7180	0.4728373
## i_catwholesale:y_cat2018	4.293560	5.486345	0.7826	0.4339354
## i_catfinance:y_cat2019	-0.181388	1.966199	-0.0923	0.9265038
## i_catmanufacture:y_cat2019	-2.954544	2.172208	-1.3602	0.1738921

```
## i_catmining:y_cat2019      -5.744172  10.685477 -0.5376 0.5909189
## i_catretail:y_cat2019      3.289394   3.080601  1.0678 0.2857153
## i_catservices:y_cat2019   -1.791753   2.189630 -0.8183 0.4132625
## i_cattransportation:y_cat2019 -5.912643   3.369019 -1.7550 0.0793702
.
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

##test multicollenarity problem

```
vif_values3A.3 <- vif(lm(CAR55 ~ `firm size`+leverage+`free cash flow`+
`Tobin's q`
                        + preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea
l+cross_border+acquiror_dummy_ESG, data = data1))
print(vif_values3A.3)
```

```
##      `firm size`      leverage      `free cash flow`      `Tob
in's q`
##      1.507813      1.565819      1.233903      1
.427590
##      preMTR      deal_size      hostile      hi
gh_tech
##      1.063957      1.227420      1.008483      1
.188141
##      diversifying      public_target      private_target      all_ca
sh_deal
##      1.089452      1.352664      1.284249      1
.895759
##      stock_deal      cross_border      acquiror_dummy_ESG
##      2.040279      1.041557      1.265274
```

##hypothesis 2

#####run model with rolling window to show E, S, G effect on firm value over time

##CAR11 regression model

Create an empty list to store the model summaries

```
model_summaries <- list()
```

```
reg_model<-list()
```

```
start_year <- 2003
```

```
end_year <- 2015
```

Iterate over the range of years

```
for (year in start_year:end_year) {
```

```

# Fit the regression model for the current year
reg_model <- lm(CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` + `firm size` + leverage + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat,
               data = data1[data1$year%in% c(year,year+4),])

# Store the summary of the regression model in the list
model_summaries[[year]] <- summary(reg_model)

# Print the summary for the current year
print(model_summaries[[year]])
##test heteroscedasticity problem
hetero_test <- bptest( reg_model)
print(hetero_test)
##use white's robustness standard error
coeftestttt<-coeftest(reg_model, vcov = vcovHC(reg_model, type='HC0', cluster='a_industry'))
print(coeftestttt)
}

##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` + `firm size` + leverage + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat, data = data1[data1$year %in% c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.1385  -2.0646  -0.2595   1.4812  21.5902
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      7.290580   4.387041   1.662  0.09774 .
## `Prev E Score`    0.018111   0.015687   1.155  0.24935
## `Prev G Score`    0.003432   0.011320   0.303  0.76202
## `Prev S Score`   -0.015457   0.015864  -0.974  0.33077
## `firm size`      -0.404341   0.239672  -1.687  0.09279 .
## leverage         -3.733545   2.300420  -1.623  0.10580
## `free cash flow` -4.526710   3.754903  -1.206  0.22908
## `Tobin's q`      -0.412015   0.200988  -2.050  0.04137 *
## preMTR            0.584709   0.960538   0.609  0.54323
## deal_size         0.155332   1.501400   0.103  0.91768

```

```

## hostile -1.601644 3.933618 -0.407 0.68422
## high_tech 0.630099 0.629049 1.002 0.31743
## diversifying 0.012684 0.501160 0.025 0.97983
## public_target -1.135985 0.665109 -1.708 0.08883 .
## private_target -0.663221 0.553390 -1.198 0.23182
## all_cash_deal -0.765820 0.718965 -1.065 0.28778
## stock_deal -2.899870 1.005137 -2.885 0.00424 **
## cross_border -0.342106 0.554738 -0.617 0.53797
## i_catConstruction -2.822400 4.646644 -0.607 0.54411
## i_catfinance -0.451746 3.907349 -0.116 0.90805
## i_catmanufacture -0.128786 3.825733 -0.034 0.97317
## i_catmining 0.140890 3.873155 0.036 0.97101
## i_catretail 0.396201 4.054146 0.098 0.92222
## i_catservices 0.356263 3.855467 0.092 0.92645
## i_cattransportation -0.206133 3.956581 -0.052 0.95849
## i_catwholesale -0.099994 4.229211 -0.024 0.98115
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.76 on 261 degrees of freedom
## Multiple R-squared: 0.1541, Adjusted R-squared: 0.07303
## F-statistic: 1.901 on 25 and 261 DF, p-value: 0.007238
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 54.025, df = 25, p-value = 0.0006595
##
##
## t test of coefficients:
##
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) 7.2905800 2.4872502 2.9312 0.003676 **
## `Prev E Score` 0.0181109 0.0118768 1.5249 0.128496
## `Prev G Score` 0.0034316 0.0116646 0.2942 0.768850
## `Prev S Score` -0.0154574 0.0115783 -1.3350 0.183030
## `firm size` -0.4043409 0.2379874 -1.6990 0.090510 .
## leverage -3.7335451 2.2219742 -1.6803 0.094099 .
## `free cash flow` -4.5267105 4.5942146 -0.9853 0.325386
## `Tobin's q` -0.4120154 0.2322558 -1.7740 0.077234 .
## preMTR 0.5847092 1.6093678 0.3633 0.716663
## deal_size 0.1553322 3.2914703 0.0472 0.962396
## hostile -1.6016443 1.2073917 -1.3265 0.185823
## high_tech 0.6300987 0.6694198 0.9413 0.347442
## diversifying 0.0126838 0.5057957 0.0251 0.980013
## public_target -1.1359845 0.6742379 -1.6848 0.093214 .
## private_target -0.6632212 0.5159974 -1.2853 0.199820
## all_cash_deal -0.7658203 0.6839843 -1.1196 0.263894
## stock_deal -2.8998701 1.1886367 -2.4397 0.015367 *

```

```

## cross_border      -0.3421058  0.5744592 -0.5955  0.552008
## i_catConstruction -2.8224004  0.6372763 -4.4288  1.394e-05 ***
## i_catfinance      -0.4517463  0.9169146 -0.4927  0.622652
## i_catmanufacture  -0.1287855  0.6763258 -0.1904  0.849129
## i_catmining        0.1408900  0.9150793  0.1540  0.877756
## i_catretail        0.3962014  1.8325994  0.2162  0.829004
## i_catservices      0.3562628  0.8416910  0.4233  0.672447
## i_cattransportation -0.2061329  1.1654442 -0.1769  0.859747
## i_catwholesale     -0.0999940  1.1542300 -0.0866  0.931030
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -16.4360  -1.9671  -0.0827   1.9044  18.2647
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    13.298376   4.441333   2.994  0.00302 **
## `Prev E Score` -0.013664   0.019973  -0.684  0.49450
## `Prev G Score`  0.002097   0.014774   0.142  0.88723
## `Prev S Score`  0.017657   0.020778   0.850  0.39623
## `firm size`    -0.462902   0.331395  -1.397  0.16368
## leverage        4.767330   3.751338   1.271  0.20495
## `free cash flow`  0.305925   4.968638   0.062  0.95095
## `Tobin's q`     0.191268   0.315746   0.606  0.54521
## preMTR          -0.197932   1.272661  -0.156  0.87653
## deal_size       -4.329745   2.211990  -1.957  0.05139 .
## hostile          NA           NA         NA      NA
## high_tech        0.647210   0.792353   0.817  0.41479
## diversifying     -0.134504   0.624496  -0.215  0.82964
## public_target    0.662578   0.976109   0.679  0.49788
## private_target   -0.417088   0.700904  -0.595  0.55232
## all_cash_deal    0.044286   0.975852   0.045  0.96384
## stock_deal      -1.902970   1.348664  -1.411  0.15946
## cross_border     0.254464   0.675602   0.377  0.70675
## i_catfinance     -8.696029   3.704705  -2.347  0.01968 *
## i_catmanufacture -10.063010   3.476986  -2.894  0.00413 **
## i_catmining      -11.506975   3.649461  -3.153  0.00181 **
## i_catretail      -10.429779   3.809743  -2.738  0.00662 **

```

```

## i_catservices      -10.751145    3.490658   -3.080   0.00230 **
## i_cattransportation -10.154008    3.691864   -2.750   0.00638 **
## i_catwholesale     -10.833518    3.891932   -2.784   0.00578 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.676 on 255 degrees of freedom
## Multiple R-squared:  0.09855,    Adjusted R-squared:  0.01724
## F-statistic: 1.212 on 23 and 255 DF,  p-value: 0.2342
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 43.675, df = 23, p-value = 0.005754
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   13.2983758   5.0709716   2.6225 0.009255 **
## `Prev E Score` -0.0136643   0.0169787  -0.8048 0.421691
## `Prev G Score`  0.0020972   0.0141900   0.1478 0.882624
## `Prev S Score`  0.0176571   0.0176617   0.9997 0.318385
## `firm size`    -0.4629025   0.3320014  -1.3943 0.164447
## leverage      4.7673300   3.9946227   1.1934 0.233807
## `free cash flow` 0.3059252   5.7391702   0.0533 0.957531
## `Tobin's q`    0.1912676   0.2691432   0.7107 0.477948
## preMTR        -0.1979316   1.4682547  -0.1348 0.892871
## deal_size     -4.3297453   1.5407160  -2.8102 0.005335 **
## high_tech     0.6472098   0.7607142   0.8508 0.395683
## diversifying  -0.1345042   0.5850053  -0.2299 0.818338
## public_target  0.6625781   0.8750818   0.7572 0.449652
## private_target -0.4170883   0.7173272  -0.5814 0.561452
## all_cash_deal  0.0442857   0.6675566   0.0663 0.947159
## stock_deal    -1.9029703   1.1703957  -1.6259 0.105202
## cross_border  0.2544637   0.5604364   0.4540 0.650182
## i_catfinance  -8.6960294   4.6336084  -1.8767 0.061697 .
## i_catmanufacture -10.0630102   4.3118909  -2.3338 0.020385 *
## i_catmining    -11.5069750   4.5952417  -2.5041 0.012901 *
## i_catretail    -10.4297791   4.4725267  -2.3320 0.020482 *
## i_catservices  -10.7511452   4.3114718  -2.4936 0.013279 *
## i_cattransportation -10.1540078   4.3602955  -2.3287 0.020655 *
## i_catwholesale -10.8335182   4.3265516  -2.5040 0.012907 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score

```



```

` +
## `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -13.3634  -1.5633  -0.0425   1.4074  13.7131
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      5.50842    3.62934   1.518 0.130642
## `Prev E Score`    0.01013    0.01310   0.773 0.440154
## `Prev G Score`   -0.01600    0.01328  -1.204 0.229881
## `Prev S Score`    0.01881    0.01712   1.099 0.273215
## `firm size`      -0.69030    0.27905  -2.474 0.014195 *
## leverage         -0.90187    2.85793  -0.316 0.752657
## `free cash flow` -6.83313    3.95961  -1.726 0.085929 .
## `Tobin's q`      0.43409    0.18062   2.403 0.017149 *
## preMTR           -1.42694    0.99031  -1.441 0.151161
## deal_size        -3.49583    0.95332  -3.667 0.000314 ***
## hostile          -2.24564    3.70974  -0.605 0.545635
## high_tech         0.19896    0.58849   0.338 0.735654
## diversifying     -1.08824    0.52593  -2.069 0.039805 *
## public_target    -0.83129    0.73596  -1.130 0.260012
## private_target   -0.75885    0.56870  -1.334 0.183583
## all_cash_deal    0.22216    0.64824   0.343 0.732165
## stock_deal       -0.25207    0.88687  -0.284 0.776525
## cross_border     -0.16428    0.60589  -0.271 0.786565
## i_catfinance     3.36876    2.64021   1.276 0.203441
## i_catmanufacture 1.92886    2.54338   0.758 0.449106
## i_catmining      1.00406    2.76476   0.363 0.716862
## i_catretail      5.87741    3.00589   1.955 0.051927 .
## i_catservices    1.64173    2.58760   0.634 0.526498
## i_cattransportation 0.88683    2.77878   0.319 0.749946
## i_catwholesale   1.69661    3.64155   0.466 0.641787
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.416 on 202 degrees of freedom
## Multiple R-squared:  0.1796, Adjusted R-squared:  0.0821
## F-statistic: 1.842 on 24 and 202 DF,  p-value: 0.01257
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 42.665, df = 24, p-value = 0.01086

```

```

##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)      5.508417   2.355387   2.3386 0.0203313 *
## `Prev E Score`    0.010134   0.011363   0.8918 0.3735350
## `Prev G Score`   -0.015998   0.012614  -1.2683 0.2061586
## `Prev S Score`    0.018814   0.018214   1.0329 0.3028636
## `firm size`      -0.690304   0.317791  -2.1722 0.0310055 *
## leverage         -0.901867   3.433694  -0.2627 0.7930863
## `free cash flow` -6.833125   5.395568  -1.2664 0.2068165
## `Tobin's q`       0.434089   0.266286   1.6302 0.1046258
## preMTR           -1.426944   1.027007  -1.3894 0.1662347
## deal_size        -3.495832   0.921739  -3.7926 0.0001968 ***
## hostile          -2.245637   1.507136  -1.4900 0.1377832
## high_tech         0.198956   0.499087   0.3986 0.6905802
## diversifying     -1.088235   0.459021  -2.3708 0.0186917 *
## public_target    -0.831288   0.517387  -1.6067 0.1096812
## private_target   -0.758853   0.486874  -1.5586 0.1206512
## all_cash_deal    0.222164   0.551617   0.4028 0.6875576
## stock_deal       -0.252075   1.005959  -0.2506 0.8023925
## cross_border     -0.164278   0.420658  -0.3905 0.6965588
## i_catfinance     3.368756   1.446944   2.3282 0.0208917 *
## i_catmanufacture 1.928856   0.928820   2.0767 0.0390970 *
## i_catmining       1.004063   1.846562   0.5437 0.5872152
## i_catretail       5.877407   1.658038   3.5448 0.0004882 ***
## i_catservices     1.641732   0.997490   1.6459 0.1013471
## i_cattransportation 0.886835   1.185660   0.7480 0.4553498
## i_catwholesale    1.696609   1.413723   1.2001 0.2315060
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.318  -1.579  -0.205   1.349  13.638
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    1.784421   4.200603   0.425  0.67138

```

```

## `Prev E Score`      -0.017278    0.015742   -1.098    0.27355
## `Prev G Score`     -0.009199    0.011772   -0.781    0.43535
## `Prev S Score`     0.042911    0.018533    2.315    0.02147 *
## `firm size`        -0.557783    0.271029   -2.058    0.04072 *
## leverage           0.526964    2.520161    0.209    0.83456
## `free cash flow`   4.932165    5.194374    0.950    0.34335
## `Tobin's q`        -0.049933    0.354162   -0.141    0.88800
## preMTR             -2.259184    1.102045   -2.050    0.04150 *
## deal_size          0.872229    0.334316    2.609    0.00968 **
## hostile              NA              NA          NA        NA
## high_tech          -0.301188    0.613794   -0.491    0.62411
## diversifying       -0.030622    0.524892   -0.058    0.95353
## public_target      -0.310729    0.715523   -0.434    0.66450
## private_target     0.347713    0.534855    0.650    0.51627
## all_cash_deal     -0.001590    0.655612   -0.002    0.99807
## stock_deal         -0.464356    1.035341   -0.449    0.65421
## cross_border       0.642262    0.558067    1.151    0.25098
## i_catConstruction  -1.285558    4.396610   -0.292    0.77025
## i_catfinance       1.068181    3.837944    0.278    0.78102
## i_catmanufacture   2.344191    3.688207    0.636    0.52567
## i_catmining        2.876347    3.909860    0.736    0.46268
## i_catretail        2.405044    4.255169    0.565    0.57249
## i_catservices      2.081218    3.706767    0.561    0.57503
## i_cattransportation 2.059056    3.787418    0.544    0.58720
## i_catwholesale     2.325073    3.930234    0.592    0.55471
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.59 on 230 degrees of freedom
## Multiple R-squared:  0.1144, Adjusted R-squared:  0.02193
## F-statistic: 1.237 on 24 and 230 DF,  p-value: 0.2112
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 37.722, df = 24, p-value = 0.03701
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   1.7844210  1.8063162  0.9879  0.32425
## `Prev E Score` -0.0172778  0.0112350 -1.5379  0.12546
## `Prev G Score` -0.0091992  0.0109710 -0.8385  0.40262
## `Prev S Score`  0.0429109  0.0170201  2.5212  0.01237 *
## `firm size`    -0.5577829  0.2232782 -2.4982  0.01318 *
## leverage       0.5269637  2.3582439  0.2235  0.82338
## `free cash flow` 4.9321655  5.3587868  0.9204  0.35833
## `Tobin's q`    -0.0499329  0.3800856 -0.1314  0.89560

```

```

## preMTR          -2.2591841  1.2327860 -1.8326   0.06816  .
## deal_size       0.8722286  0.1646921  5.2961  2.762e-07 ***
## high_tech      -0.3011882  0.5751779 -0.5236   0.60103
## diversifying   -0.0306223  0.4822490 -0.0635   0.94942
## public_target  -0.3107295  0.7740857 -0.4014   0.68849
## private_target  0.3477127  0.4630291  0.7510   0.45345
## all_cash_deal  -0.0015897  0.5231741 -0.0030   0.99758
## stock_deal     -0.4643563  1.3013455 -0.3568   0.72155
## cross_border    0.6422622  0.5348659  1.2008   0.23107
## i_catConstruction -1.2855576  1.7660934 -0.7279   0.46741
## i_catfinance    1.0681809  1.3469126  0.7931   0.42856
## i_catmanufacture 2.3441910  0.9701138  2.4164   0.01645 *
## i_catmining     2.8763465  1.9068997  1.5084   0.13283
## i_catretail     2.4050439  1.0101323  2.3809   0.01808 *
## i_catservices   2.0812178  1.1526098  1.8057   0.07228 .
## i_cattransportation 2.0590561  1.2713008  1.6196   0.10668
## i_catwholesale  2.3250733  1.2771155  1.8206   0.06997 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -9.0971 -1.5338 -0.1003  1.3975 14.5951
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.31188    2.61451  -0.502   0.6164
## `Prev E Score`  0.01021    0.01490   0.685   0.4941
## `Prev G Score`  0.03230    0.01157   2.791   0.0058 **
## `Prev S Score` -0.02101    0.01648  -1.275   0.2039
## `firm size`    0.03979    0.25214   0.158   0.8748
## leverage      -5.35417    2.65410  -2.017   0.0451 *
## `free cash flow` -8.81619    5.34004  -1.651   0.1004
## `Tobin's q`    0.30375    0.27724   1.096   0.2747
## preMTR        -2.04446    1.11788  -1.829   0.0690 .
## deal_size      1.94675    1.53603   1.267   0.2066
## hostile        NA          NA        NA        NA
## high_tech     -0.10836    0.60445  -0.179   0.8579
## diversifying   0.32118    0.53213   0.604   0.5469
## public_target -1.34255    0.66120  -2.030   0.0437 *

```

```

## private_target      -0.60775      0.54872     -1.108      0.2695
## all_cash_deal       0.23150      0.72676      0.319      0.7504
## stock_deal          2.71459      1.12294      2.417      0.0166 *
## cross_border        0.12913      0.56344      0.229      0.8190
## i_catmanufacture    1.15987      0.95246      1.218      0.2249
## i_catmining         0.70616      1.25545      0.562      0.5745
## i_catretail         3.38541      2.16391      1.564      0.1194
## i_catservices      -0.58088      1.07874     -0.538      0.5909
## i_cattransportation 1.36236      1.49636      0.910      0.3638
## i_catwholesale      0.94816      1.51394      0.626      0.5319
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.235 on 187 degrees of freedom
## Multiple R-squared:  0.1842, Adjusted R-squared:  0.08826
## F-statistic: 1.92 on 22 and 187 DF,  p-value: 0.01064
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 98.502, df = 22, p-value = 1.177e-11
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.311881  2.455505  -0.5343  0.59380
## `Prev E Score`  0.010206  0.010426  0.9789  0.32887
## `Prev G Score`  0.032298  0.013772  2.3452  0.02006 *
## `Prev S Score` -0.021011  0.013904 -1.5112  0.13242
## `firm size`    0.039793  0.242378  0.1642  0.86977
## leverage      -5.354170  2.569469 -2.0838  0.03854 *
## `free cash flow` -8.816195  6.070639 -1.4523  0.14810
## `Tobin's q`    0.303747  0.289614  1.0488  0.29562
## preMTR        -2.044455  1.297860 -1.5753  0.11689
## deal_size     1.946754  3.912350  0.4976  0.61936
## high_tech     -0.108364  0.612632 -0.1769  0.85979
## diversifying  0.321175  0.544760  0.5896  0.55619
## public_target -1.342551  0.737416 -1.8206  0.07026 .
## private_target -0.607746  0.463757 -1.3105  0.19164
## all_cash_deal  0.231503  0.692023  0.3345  0.73835
## stock_deal     2.714586  1.810373  1.4995  0.13544
## cross_border   0.129125  0.420576  0.3070  0.75917
## i_catmanufacture 1.159868  0.849273  1.3657  0.17367
## i_catmining    0.706158  1.163618  0.6069  0.54468
## i_catretail    3.385415  3.606969  0.9386  0.34916
## i_catservices  -0.580877  1.212498 -0.4791  0.63245
## i_cattransportation 1.362362  1.337836  1.0183  0.30984
## i_catwholesale  0.948157  0.853401  1.1110  0.26798

```

```

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -33.212  -1.775   0.051   2.523  21.727
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      4.17648    4.27778   0.976 0.329600
## `Prev E Score`  -0.01857    0.01804  -1.030 0.303843
## `Prev G Score`  -0.01149    0.01628  -0.705 0.481050
## `Prev S Score`   0.03999    0.02194   1.823 0.069210 .
## `firm size`     -0.12741    0.28969  -0.440 0.660346
## leverage        -1.46426    3.18780  -0.459 0.646289
## `free cash flow` -18.64116    5.57123  -3.346 0.000912 ***
## `Tobin's q`     0.11354    0.38777   0.293 0.769846
## preMTR          -2.71726    1.38322  -1.964 0.050292 .
## deal_size       1.21457    2.57175   0.472 0.637034
## hostile          NA           NA         NA         NA
## high_tech       0.80613    0.81202   0.993 0.321536
## diversifying    -1.58858    0.63663  -2.495 0.013058 *
## public_target   -0.34231    0.90650  -0.378 0.705951
## private_target  -0.67639    0.67938  -0.996 0.320149
## all_cash_deal   0.14299    0.87411   0.164 0.870152
## stock_deal      0.42612    1.52361   0.280 0.779893
## cross_border    0.28136    0.67457   0.417 0.676878
## i_catfinance    -2.08556    3.46929  -0.601 0.548141
## i_catmanufacture -1.06988    3.32014  -0.322 0.747468
## i_catmining     -7.90224    3.50448  -2.255 0.024776 *
## i_catretail     -1.14588    3.63695  -0.315 0.752904
## i_catservices   -1.77083    3.40083  -0.521 0.602912
## i_cattransportation -1.28605    3.47085  -0.371 0.711218
## i_catwholesale  -4.91553    3.71477  -1.323 0.186645
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.427 on 340 degrees of freedom
## Multiple R-squared:  0.1284, Adjusted R-squared:  0.06947
## F-statistic: 2.178 on 23 and 340 DF,  p-value: 0.001598

```

```

##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 88.164, df = 23, p-value = 1.442e-09
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)    4.176484   6.795801   0.6146  0.53925
## `Prev E Score` -0.018575   0.016021  -1.1594  0.24713
## `Prev G Score` -0.011487   0.016103  -0.7133  0.47612
## `Prev S Score`  0.039988   0.020959   1.9080  0.05724 .
## `firm size`    -0.127413   0.246159  -0.5176  0.60507
## leverage      -1.464258   2.963910  -0.4940  0.62160
## `free cash flow` -18.641165   8.080641  -2.3069  0.02166 *
## `Tobin's q`     0.113544   0.568561   0.1997  0.84183
## preMTR         -2.717261   1.866042  -1.4562  0.14627
## deal_size      1.214568   3.894889   0.3118  0.75536
## high_tech      0.806133   0.730525   1.1035  0.27059
## diversifying   -1.588578   0.681427  -2.3313  0.02032 *
## public_target  -0.342308   0.829239  -0.4128  0.68001
## private_target -0.676394   0.619744  -1.0914  0.27587
## all_cash_deal  0.142994   0.673306   0.2124  0.83194
## stock_deal     0.426124   2.006536   0.2124  0.83195
## cross_border   0.281355   0.665155   0.4230  0.67257
## i_catfinance  -2.085558   6.472690  -0.3222  0.74749
## i_catmanufacture -1.069885   6.507882  -0.1644  0.86952
## i_catmining    -7.902239   6.944340  -1.1379  0.25595
## i_catretail    -1.145883   6.542080  -0.1752  0.86106
## i_catservices  -1.770828   6.551064  -0.2703  0.78708
## i_cattransportation -1.286052   6.508155  -0.1976  0.84347
## i_catwholesale -4.915534   7.301792  -0.6732  0.50128
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max

```

```

## -9.6512 -2.0459 0.0087 1.7677 14.4711
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.24397    3.61635   0.621  0.5357
## `Prev E Score` 0.03200    0.01687   1.897  0.0595 .
## `Prev G Score` -0.01811    0.01494  -1.212  0.2271
## `Prev S Score` -0.01953    0.02313  -0.844  0.3996
## `firm size`    -0.07827    0.25647  -0.305  0.7606
## leverage       1.02617    2.85678   0.359  0.7199
## `free cash flow` 2.97170    3.01941   0.984  0.3264
## `Tobin's q`     0.03091    0.31210   0.099  0.9212
## preMTR         -0.40090    1.23805  -0.324  0.7465
## deal_size      -0.55000    0.90461  -0.608  0.5440
## hostile                NA            NA            NA            NA
## high_tech           -1.18035    0.75420  -1.565  0.1194
## diversifying         0.30327    0.61387   0.494  0.6219
## public_target      -0.48686    0.89518  -0.544  0.5872
## private_target     -0.05942    0.58611  -0.101  0.9194
## all_cash_deal     -1.42954    0.86079  -1.661  0.0985 .
## stock_deal         0.57523    1.29060   0.446  0.6564
## cross_border       0.87033    0.59689   1.458  0.1466
## i_catfinance      -0.27261    2.79024  -0.098  0.9223
## i_catmanufacture   0.98782    2.65115   0.373  0.7099
## i_catmining        1.78876    3.04248   0.588  0.5573
## i_catretail       -1.29954    3.17586  -0.409  0.6829
## i_catservices      0.28453    2.69980   0.105  0.9162
## i_cattransportation -2.44184    2.81969  -0.866  0.3877
## i_catwholesale     1.20374    2.90967   0.414  0.6796
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.546 on 176 degrees of freedom
## Multiple R-squared:  0.1299, Adjusted R-squared:  0.01618
## F-statistic: 1.142 on 23 and 176 DF,  p-value: 0.3049
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 35.806, df = 23, p-value = 0.04318
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.243967    2.928191   0.7663  0.44451
## `Prev E Score` 0.031997    0.016245   1.9696  0.05045 .
## `Prev G Score` -0.018111    0.016458  -1.1004  0.27264
## `Prev S Score` -0.019532    0.022712  -0.8600  0.39098

```



```

## `firm size`      -0.078274    0.261105 -0.2998    0.76470
## leverage        1.026174    2.561839  0.4006    0.68923
## `free cash flow` 2.971704    4.024863  0.7383    0.46129
## `Tobin's q`      0.030906    0.408956  0.0756    0.93984
## preMTR          -0.400896    1.063428 -0.3770    0.70664
## deal_size       -0.549999    0.789178 -0.6969    0.48677
## high_tech       -1.180355    0.719743 -1.6400    0.10280
## diversifying     0.303272    0.570421  0.5317    0.59563
## public_target   -0.486863    1.016870 -0.4788    0.63269
## private_target  -0.059419    0.483466 -0.1229    0.90232
## all_cash_deal   -1.429542    1.175386 -1.2162    0.22553
## stock_deal      0.575229    1.795909  0.3203    0.74912
## cross_border    0.870327    0.547797  1.5888    0.11391
## i_catfinance    -0.272612    1.625674 -0.1677    0.86702
## i_catmanufacture 0.987815    1.491124  0.6625    0.50854
## i_catmining     1.788760    2.817600  0.6349    0.52635
## i_catretail     -1.299538    2.011310 -0.6461    0.51905
## i_catservices   0.284530    1.439940  0.1976    0.84359
## i_cattransportation -2.441836    1.732853 -1.4091    0.16056
## icatwholesale   1.203742    1.731619  0.6952    0.48788
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.6428  -1.7165  -0.2209   1.5532  15.1253
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    3.366863   4.594373   0.733   0.4644
## `Prev E Score` -0.005134   0.016176  -0.317   0.7512
## `Prev G Score` -0.012108   0.012502  -0.968   0.3339
## `Prev S Score`  0.028363   0.019377   1.464   0.1447
## `firm size`    -0.710833   0.298969  -2.378   0.0183 *
## leverage       -0.141464   2.575310  -0.055   0.9562
## `free cash flow` 0.378712   5.130555   0.074   0.9412
## `Tobin's q`    0.152774   0.322514   0.474   0.6362
## preMTR         -2.828556   1.166830  -2.424   0.0162 *
## deal_size      0.869011   0.358889   2.421   0.0163 *
## hostile                NA                NA        NA        NA

```

```

## high_tech          -0.301399    0.680062   -0.443    0.6581
## diversifying       -0.127012    0.550204   -0.231    0.8177
## public_target      -0.108213    0.757416   -0.143    0.8865
## private_target     0.176004    0.580366    0.303    0.7620
## all_cash_deal      -0.155695    0.727505   -0.214    0.8307
## stock_deal         -0.580379    1.112254   -0.522    0.6023
## cross_border        0.614005    0.590961    1.039    0.3000
## i_catConstruction  0.167480    4.457877    0.038    0.9701
## i_catfinance        1.821667    4.079214    0.447    0.6556
## i_catmanufacture    2.866693    3.939524    0.728    0.4676
## i_catmining         3.204634    4.152686    0.772    0.4411
## i_catretail         3.136282    4.546262    0.690    0.4910
## i_catservices       2.363867    3.975410    0.595    0.5527
## i_cattransportation 2.940876    4.037961    0.728    0.4672
## i_catwholesale      2.672427    4.284956    0.624    0.5335
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.835 on 219 degrees of freedom
## Multiple R-squared:  0.1103, Adjusted R-squared:  0.01275
## F-statistic: 1.131 on 24 and 219 DF,  p-value: 0.3118
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 44.102, df = 24, p-value = 0.007424
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    3.3668631  2.1234122  1.5856 0.114275
## `Prev E Score` -0.0051343  0.0122773 -0.4182 0.676216
## `Prev G Score` -0.0121077  0.0103452 -1.1704 0.243125
## `Prev S Score`  0.0283633  0.0210033  1.3504 0.178275
## `firm size`    -0.7108327  0.2543671 -2.7945 0.005659 **
## leverage       -0.1414636  2.4335665 -0.0581 0.953698
## `free cash flow` 0.3787120  5.6308195  0.0673 0.946438
## `Tobin's q`    0.1527737  0.3366987  0.4537 0.650465
## preMTR         -2.8285558  1.2338117 -2.2925 0.022824 *
## deal_size       0.8690113  0.1814751  4.7886 3.092e-06 ***
## high_tech       -0.3013993  0.5675542 -0.5310 0.595923
## diversifying    -0.1270116  0.4928943 -0.2577 0.796892
## public_target   -0.1082125  0.8227921 -0.1315 0.895486
## private_target  0.1760038  0.4862850  0.3619 0.717749
## all_cash_deal  -0.1556952  0.5784775 -0.2691 0.788070
## stock_deal      -0.5803786  1.3892792 -0.4178 0.676535
## cross_border    0.6140048  0.5434525  1.1298 0.259787
## i_catConstruction 0.1674797  1.5376205  0.1089 0.913365

```

```

## i_catfinance      1.8216671  1.4014624  1.2998  0.195025
## i_catmanufacture  2.8666928  1.0617199  2.7000  0.007475 **
## i_catmining       3.2046341  1.7984505  1.7819  0.076153 .
## i_catretail       3.1362817  1.1308503  2.7734  0.006026 **
## i_catservices     2.3638674  1.3319313  1.7748  0.077326 .
## i_cattransportation 2.9408763  1.4382037  2.0448  0.042068 *
## i_catwholesale    2.6724265  1.3460173  1.9854  0.048344 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -18.4457  -1.4959  -0.1331   1.8271  14.8062
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.787986   6.831504   0.847  0.3994
## `Prev E Score` -0.027862   0.028023  -0.994  0.3231
## `Prev G Score` -0.002793   0.027388  -0.102  0.9190
## `Prev S Score`  0.067199   0.038942   1.726  0.0883 .
## `firm size`    -0.539618   0.547020  -0.986  0.3269
## leverage       3.677152   4.521952   0.813  0.4186
## `free cash flow` -6.792345   5.909363  -1.149  0.2539
## `Tobin's q`    0.415645   0.428833   0.969  0.3354
## preMTR         0.485275   2.771149   0.175  0.8614
## deal_size      4.043352   1.659048   2.437  0.0171 *
## hostile        NA          NA          NA      NA
## high_tech      0.457302   1.245197   0.367  0.7144
## diversifying   -1.335477   0.961636  -1.389  0.1688
## public_target  -1.409904   1.379618  -1.022  0.3099
## private_target -0.073396   1.022251  -0.072  0.9429
## all_cash_deal  0.161560   1.611180   0.100  0.9204
## stock_deal     4.519145   2.172862   2.080  0.0408 *
## cross_border   -2.318801   1.133444  -2.046  0.0441 *
## i_catfinance   -6.051047   4.945266  -1.224  0.2247
## i_catmanufacture -1.349026   4.477942  -0.301  0.7640
## i_catmining    -5.470827   5.050920  -1.083  0.2820
## i_catretail    0.880530   4.757345   0.185  0.8536
## i_catservices  -3.962118   4.579580  -0.865  0.3896
## i_cattransportation -2.357686   5.165660  -0.456  0.6493

```

```

## i_catwholesale      -1.202540    4.660404  -0.258    0.7971
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.077 on 79 degrees of freedom
## Multiple R-squared:  0.3814, Adjusted R-squared:  0.2013
## F-statistic: 2.118 on 23 and 79 DF,  p-value: 0.007583
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 36.348, df = 23, p-value = 0.038
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.787986   3.842708  1.5062 0.1359975
## `Prev E Score` -0.027862   0.025341 -1.0995 0.2748975
## `Prev G Score` -0.002793   0.023684 -0.1179 0.9064243
## `Prev S Score`  0.067199   0.034188  1.9656 0.0528594 .
## `firm size`    -0.539619   0.466497 -1.1567 0.2508621
## leverage       3.677152   3.820680  0.9624 0.3387684
## `free cash flow` -6.792345   4.514927 -1.5044 0.1364610
## `Tobin's q`    0.415645   0.332510  1.2500 0.2149806
## preMTR         0.485275   3.192220  0.1520 0.8795603
## deal_size      4.043352   1.011119  3.9989 0.0001423 ***
## high_tech      0.457302   1.377510  0.3320 0.7407857
## diversifying   -1.335477   0.645323 -2.0695 0.0417710 *
## public_target  -1.409904   1.487146 -0.9481 0.3459901
## private_target -0.073396   0.790512 -0.0928 0.9262605
## all_cash_deal  0.161560   0.941632  0.1716 0.8642105
## stock_deal     4.519145   1.708332  2.6454 0.0098428 **
## cross_border   -2.318801   0.640331 -3.6213 0.0005161 ***
## i_catfinance   -6.051047   2.314423 -2.6145 0.0106980 *
## i_catmanufacture -1.349026   1.514680 -0.8906 0.3758296
## i_catmining    -5.470827   2.787311 -1.9628 0.0531941 .
## i_catretail     0.880530   1.783223  0.4938 0.6228277
## i_catservices  -3.962118   1.607539 -2.4647 0.0158823 *
## i_cattransportation -2.357686   2.260995 -1.0428 0.3002379
## i_catwholesale -1.202540   1.476270 -0.8146 0.4177617
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## `firm size` + leverage + `free cash flow` + `Tobin's q` +

```

```

##      preMTR + deal_size + hostile + high_tech + diversifying +
##      public_target + private_target + all_cash_deal + stock_deal +
##      cross_border + i_cat, data = data1[data1$year %in% c(year,
##      year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -37.861  -1.827   0.195   2.129  21.572
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.04079    5.55339  -0.007 0.994142
## `Prev E Score` -0.02040    0.01327  -1.537 0.124916
## `Prev G Score` -0.01424    0.01245  -1.145 0.252912
## `Prev S Score`  0.02932    0.01641   1.787 0.074464 .
## `firm size`    -0.14790    0.23178  -0.638 0.523695
## leverage      -1.44581    2.17298  -0.665 0.506110
## `free cash flow` -9.31223    3.40884  -2.732 0.006509 **
## `Tobin's q`    -0.04997    0.27437  -0.182 0.855565
## preMTR        -1.82802    1.04821  -1.744 0.081748 .
## deal_size      3.32725    1.56514   2.126 0.033976 *
## hostile                NA                NA                NA                NA
## high_tech         0.34515    0.66963   0.515 0.606467
## diversifying     -0.24528    0.49223  -0.498 0.618472
## public_target    -2.67073    0.69683  -3.833 0.000142 ***
## private_target   -0.68610    0.50907  -1.348 0.178320
## all_cash_deal    0.01662    0.67382   0.025 0.980335
## stock_deal       1.15089    0.99029   1.162 0.245686
## cross_border     0.67473    0.53449   1.262 0.207367
## i_catConstruction -1.24115    5.44548  -0.228 0.819793
## i_catfinance      1.18045    5.17792   0.228 0.819751
## i_catmanufacture  3.55767    5.15962   0.690 0.490797
## i_catmining      -1.96492    5.25976  -0.374 0.708869
## i_catretail       3.25249    5.30812   0.613 0.540311
## i_catservices     3.11436    5.20319   0.599 0.549730
## i_cattransportation 2.11552    5.23205   0.404 0.686126
## i_catwholesale    1.56887    5.28309   0.297 0.766612
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.097 on 531 degrees of freedom
## Multiple R-squared:  0.1134, Adjusted R-squared:  0.0733
## F-statistic: 2.829 on 24 and 531 DF,  p-value: 1.137e-05
##
##
##      studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 98.147, df = 24, p-value = 6.209e-11
##

```

```

##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -0.040791   2.076149  -0.0196  0.984332
## `Prev E Score` -0.020398   0.012509  -1.6306  0.103559
## `Prev G Score` -0.014244   0.012929  -1.1017  0.271077
## `Prev S Score`  0.029323   0.016091   1.8223  0.068979 .
## `firm size`    -0.147895   0.205072  -0.7212  0.471111
## leverage      -1.445813   2.150062  -0.6725  0.501588
## `free cash flow` -9.312231   5.462452  -1.7048  0.088822 .
## `Tobin's q`    -0.049967   0.369111  -0.1354  0.892371
## preMTR        -1.828020   1.354061  -1.3500  0.177582
## deal_size      3.327254   2.610594   1.2745  0.203037
## high_tech      0.345149   0.660997   0.5222  0.601774
## diversifying   -0.245282   0.549674  -0.4462  0.655611
## public_target  -2.670727   0.817949  -3.2652  0.001165 **
## private_target -0.686095   0.490972  -1.3974  0.162870
## all_cash_deal  0.016617   0.574789   0.0289  0.976947
## stock_deal     1.150892   1.113353   1.0337  0.301739
## cross_border   0.674728   0.515312   1.3094  0.190979
## i_catConstruction -1.241154   1.604300  -0.7736  0.439487
## i_catfinance    1.180455   0.879732   1.3418  0.180223
## i_catmanufacture 3.557665   0.764056   4.6563 4.073e-06 ***
## i_catmining     -1.964921   2.296765  -0.8555  0.392651
## i_catretail     3.252494   0.987664   3.2931  0.001057 **
## i_catservices   3.114358   0.991330   3.1416  0.001774 **
## i_cattransportation 2.115521   1.013276   2.0878  0.037292 *
## i_catwholesale  1.568874   2.752756   0.5699  0.568967
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -26.5291  -1.6696   0.0355   2.1137  19.4520
##
## Coefficients: (1 not defined because of singularities)
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.095434    2.341809   0.895 0.371282
## `Prev E Score` -0.007171    0.012194  -0.588 0.556708

```

```

## `Prev G Score`      -0.005530    0.010662   -0.519  0.604220
## `Prev S Score`      0.016345    0.014656    1.115  0.265235
## `firm size`         -0.145743    0.195141   -0.747  0.455461
## leverage            -1.118471    1.852769   -0.604  0.546303
## `free cash flow`    2.216945    1.822327    1.217  0.224289
## `Tobin's q`         -0.387395    0.221245   -1.751  0.080496 .
## preMTR              -1.451797    1.001517   -1.450  0.147729
## deal_size           0.907349    1.227286    0.739  0.460026
## hostile              NA              NA          NA      NA
## high_tech           -2.078082    0.616993   -3.368  0.000809 ***
## diversifying         0.006387    0.461854    0.014  0.988972
## public_target       -0.375431    0.703086   -0.534  0.593570
## private_target      -0.343271    0.428184   -0.802  0.423072
## all_cash_deal       -0.037889    0.672155   -0.056  0.955068
## stock_deal          -0.963750    0.922720   -1.044  0.296720
## cross_border         0.750341    0.487699    1.539  0.124482
## i_catfinance        -1.030135    1.670597   -0.617  0.537731
## i_catmanufacture     0.664852    1.628707    0.408  0.683276
## i_catmining          0.320709    1.967867    0.163  0.870598
## i_catretail         -1.667346    1.875443   -0.889  0.374362
## i_catservices       2.005584    1.696986    1.182  0.237766
## i_cattransportation -0.947749    1.762116   -0.538  0.590896
## i_catwholesale      -1.866926    1.988499   -0.939  0.348206
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.608 on 561 degrees of freedom
## Multiple R-squared:  0.07518,    Adjusted R-squared:  0.03727
## F-statistic: 1.983 on 23 and 561 DF,  p-value: 0.004373
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 91.743, df = 23, p-value = 3.617e-10
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.0954337  1.8793691  1.1150 0.265342
## `Prev E Score` -0.0071710  0.0103903 -0.6902 0.490378
## `Prev G Score` -0.0055299  0.0106362 -0.5199 0.603327
## `Prev S Score`  0.0163448  0.0133753  1.2220 0.222216
## `firm size`    -0.1457427  0.1849367 -0.7881 0.430990
## leverage       -1.1184714  1.7792612 -0.6286 0.529857
## `free cash flow` 2.2169447  2.2353109  0.9918 0.321731
## `Tobin's q`    -0.3873947  0.2458909 -1.5755 0.115711
## preMTR         -1.4517972  1.5718611 -0.9236 0.356083
## deal_size       0.9073488  1.5836914  0.5729 0.566920

```

```

## high_tech          -2.0780822  0.7715969 -2.6932 0.007288 **
## diversifying       0.0063866  0.5023395  0.0127 0.989861
## public_target     -0.3754309  0.7497089 -0.5008 0.616730
## private_target    -0.3432706  0.4158495 -0.8255 0.409457
## all_cash_deal     -0.0378887  0.7464656 -0.0508 0.959537
## stock_deal        -0.9637496  1.2656380 -0.7615 0.446694
## cross_border       0.7503407  0.5129024  1.4629 0.144046
## i_catfinance      -1.0301350  0.9660766 -1.0663 0.286743
## i_catmanufacture   0.6648517  0.9047544  0.7348 0.462743
## i_catmining        0.3207094  1.3961158  0.2297 0.818397
## i_catretail        -1.6673457  1.8968260 -0.8790 0.379767
## i_catservices      2.0055841  0.9935375  2.0186 0.044001 *
## i_cattransportation -0.9477493  1.1087952 -0.8548 0.393051
## i_catwholesale     -1.8669260  2.1977019 -0.8495 0.395971
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## + `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -31.300  -2.342   0.292   2.349  50.993
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.790499   6.492520  -0.276  0.7828
## `Prev E Score` -0.003937   0.017594  -0.224  0.8230
## `Prev G Score` -0.020119   0.015636  -1.287  0.1989
## `Prev S Score`  0.008541   0.021253   0.402  0.6880
## `firm size`    0.173040   0.275314   0.629  0.5300
## leverage       4.160845   2.353234   1.768  0.0777 .
## `free cash flow` -2.168151   3.556365  -0.610  0.5424
## `Tobin's q`    0.475326   0.322363   1.475  0.1410
## preMTR         -0.418010   1.060094  -0.394  0.6935
## deal_size      9.271298   0.972579   9.533 < 2e-16 ***
## hostile                NA                NA                NA                NA
## high_tech         -0.119763   0.962629  -0.124  0.9010
## diversifying     -0.951515   0.666904  -1.427  0.1543
## public_target    -5.652350   0.919279  -6.149 1.69e-09 ***
## private_target    0.460632   0.682190   0.675  0.4999
## all_cash_deal    0.055457   1.046113   0.053  0.9577
## stock_deal      -2.936263   1.254949  -2.340  0.0197 *

```



```

## cross_border      0.920886    0.764390    1.205    0.2289
## i_catConstruction -1.404277    6.675985   -0.210    0.8335
## i_catfinance      -1.381655    6.322049   -0.219    0.8271
## i_catmanufacture  -0.982139    6.283490   -0.156    0.8759
## i_catmining       -3.274000    6.423758   -0.510    0.6105
## i_catretail        1.000266    6.907434    0.145    0.8849
## i_catservices     -0.652834    6.311073   -0.103    0.9177
## i_cattransportation 0.681154    6.359630    0.107    0.9148
## i_catwholesale     1.693105    6.470481    0.262    0.7937
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.18 on 464 degrees of freedom
## Multiple R-squared:  0.2644, Adjusted R-squared:  0.2263
## F-statistic: 6.948 on 24 and 464 DF,  p-value: < 2.2e-16
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 233.16, df = 24, p-value < 2.2e-16
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.7904987  1.9830736  -0.9029  0.36705
## `Prev E Score` -0.0039369  0.0145219  -0.2711  0.78644
## `Prev G Score` -0.0201185  0.0144502  -1.3923  0.16451
## `Prev S Score`  0.0085407  0.0187907   0.4545  0.64967
## `firm size`    0.1730397  0.2751047   0.6290  0.52966
## leverage      4.1608445  2.4893228   1.6715  0.09530 .
## `free cash flow` -2.1681507  4.0642438  -0.5335  0.59396
## `Tobin's q`    0.4753260  0.3917907   1.2132  0.22567
## preMTR        -0.4180098  1.6798965  -0.2488  0.80360
## deal_size     9.2712984  4.9324787   1.8796  0.06078 .
## high_tech     -0.1197629  1.0531026  -0.1137  0.90951
## diversifying  -0.9515150  0.6918202  -1.3754  0.16968
## public_target -5.6523501  1.2570175  -4.4966 8.733e-06 ***
## private_target  0.4606318  0.7465465   0.6170  0.53753
## all_cash_deal  0.0554567  1.2102443   0.0458  0.96347
## stock_deal    -2.9362635  2.4835418  -1.1823  0.23770
## cross_border   0.9208865  0.6860221   1.3424  0.18014
## i_catConstruction -1.4042772  1.8303981  -0.7672  0.44335
## i_catfinance    -1.3816554  1.2471868  -1.1078  0.26851
## i_catmanufacture -0.9821390  1.2799264  -0.7673  0.44327
## i_catmining     -3.2739999  2.4091408  -1.3590  0.17481
## i_catretail      1.0002661  3.6188062   0.2764  0.78236
## i_catservices   -0.6528338  1.2143433  -0.5376  0.59111
## i_cattransportation 0.6811542  1.4799579   0.4603  0.64555

```

```

## i_catwholesale      1.6931048  2.8260200  0.5991  0.54939
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -22.8374  -2.5389  -0.3425   2.5878  21.9598
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      6.99070     8.01171   0.873  0.38451
## `Prev E Score`  -0.01126     0.03763  -0.299  0.76520
## `Prev G Score`  -0.07797     0.03067  -2.542  0.01219 *
## `Prev S Score`   0.07751     0.04526   1.713  0.08916 .
## `firm size`     -0.35716     0.50552  -0.707  0.48113
## leverage         6.39624     5.08935   1.257  0.21108
## `free cash flow` 1.23928     4.23853   0.292  0.77046
## `Tobin's q`     -0.41740     0.38830  -1.075  0.28439
## preMTR           -0.85516     2.39484  -0.357  0.72161
## deal_size       -3.28900     0.87322  -3.767  0.00025 ***
## hostile          NA           NA         NA         NA
## high_tech        0.84844     1.47430   0.575  0.56596
## diversifying    -1.72776     1.28192  -1.348  0.18007
## public_target   -2.03440     1.99857  -1.018  0.31060
## private_target  -0.27214     1.26822  -0.215  0.83043
## all_cash_deal   0.83838     1.85734   0.451  0.65246
## stock_deal      3.49646     2.16868   1.612  0.10933
## cross_border    0.15000     1.34429   0.112  0.91133
## i_catfinance    -3.93859     6.76770  -0.582  0.56160
## i_catmanufacture -1.92274     6.61781  -0.291  0.77187
## i_catmining     -3.14986     7.10274  -0.443  0.65816
## i_catretail     -0.02523     6.91421  -0.004  0.99709
## i_catservices   -4.16428     6.68574  -0.623  0.53447
## i_cattransportation -6.49596     6.86547  -0.946  0.34581
## i_catwholesale  -2.30472     6.91459  -0.333  0.73943
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.22 on 130 degrees of freedom
## Multiple R-squared:  0.1996, Adjusted R-squared:  0.05796

```

```

## F-statistic: 1.409 on 23 and 130 DF, p-value: 0.118
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 82.02, df = 23, p-value = 1.49e-08
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)      6.990703   3.980987  1.7560 0.081440 .
## `Prev E Score`  -0.011261   0.030528 -0.3689 0.712827
## `Prev G Score`  -0.077972   0.027656 -2.8194 0.005565 **
## `Prev S Score`   0.077506   0.040491  1.9142 0.057797 .
## `firm size`     -0.357164   0.435876 -0.8194 0.414049
## leverage        6.396239   5.118880  1.2495 0.213713
## `free cash flow` 1.239284   4.058276  0.3054 0.760571
## `Tobin's q`     -0.417401   0.295367 -1.4132 0.159998
## preMTR          -0.855164   2.317176 -0.3691 0.712688
## deal_size       -3.288998   2.491037 -1.3203 0.189044
## high_tech        0.848442   1.273047  0.6665 0.506295
## diversifying    -1.727758   1.051555 -1.6431 0.102789
## public_target   -2.034404   2.089348 -0.9737 0.332012
## private_target  -0.272142   1.203903 -0.2260 0.821518
## all_cash_deal    0.838376   1.473453  0.5690 0.570346
## stock_deal       3.496457   1.759655  1.9870 0.049023 *
## cross_border     0.149996   1.104506  0.1358 0.892187
## i_catfinance    -3.938588   2.347326 -1.6779 0.095768 .
## i_catmanufacture -1.922744   2.135108 -0.9005 0.369500
## i_catmining     -3.149858   4.617540 -0.6822 0.496357
## i_catretail     -0.025232   2.121751 -0.0119 0.990530
## i_catservices   -4.164282   2.571331 -1.6195 0.107762
## i_cattransportation -6.495959  1.976680 -3.2863 0.001305 **
## i_catwholesale  -2.304725   1.904813 -1.2099 0.228494
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##CAR22 regression model

Create an empty list to store the model summaries

```
model_summaries <- list()
```

```
reg_model<-list()
```

```
start_year <- 2003
```

```
end_year <- 2015
```

Iterate over the range of years

```
for (year in start_year:end_year) {
```

```

# Fit the regression model for the current year
reg_model <- lm(CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` + `firm size` + leverage + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat,
               data = data1[data1$year%in% c(year,year+4),])

# Store the summary of the regression model in the list
model_summaries[[year]] <- summary(reg_model)

# Print the summary for the current year
print(model_summaries[[year]])
##test heteroscedasticity problem
hetero_test <- bptest( reg_model)
print(hetero_test)
##use white's robustness standard error
coeftestttt<-coeftest(reg_model, vcov = vcovHC(reg_model, type='HC0', cluster='a_industry'))

print(coeftestttt)
}

##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` + `firm size` + leverage + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat, data = data1[data1$year %in% c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.4772  -2.7066  -0.2431   2.1626  19.5193
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    9.111759   5.120707   1.779  0.07634 .
## `Prev E Score`  0.023675   0.018311   1.293  0.19717
## `Prev G Score`  0.009494   0.013213   0.719  0.47305
## `Prev S Score` -0.015829   0.018517  -0.855  0.39343
## `firm size`    -0.760164   0.279754  -2.717  0.00702 **
## leverage       -3.019625   2.685130  -1.125  0.26180
## `free cash flow` -0.968223   4.382854  -0.221  0.82533
## `Tobin's q`    -0.260226   0.234600  -1.109  0.26835
## preMTR         -2.148396   1.121174  -1.916  0.05643 .

```

```

## deal_size          -0.014374    1.752487   -0.008    0.99346
## hostile            0.435241    4.591456    0.095    0.92455
## high_tech         0.646075    0.734248    0.880    0.37971
## diversifying      -0.036053    0.584971   -0.062    0.95090
## public_target     -1.466098    0.776339   -1.888    0.06007 .
## private_target    -1.277503    0.645936   -1.978    0.04901 *
## all_cash_deal     -1.164588    0.839200   -1.388    0.16640
## stock_deal        -2.576126    1.173231   -2.196    0.02899 *
## cross_border      -0.010715    0.647509   -0.017    0.98681
## i_catConstruction -2.398170    5.423725   -0.442    0.65874
## i_catfinance       0.187919    4.560794    0.041    0.96717
## i_catmanufacture   1.306906    4.465529    0.293    0.77001
## i_catmining        1.809169    4.520881    0.400    0.68935
## i_catretail        0.559316    4.732140    0.118    0.90600
## i_catservices      1.053514    4.500235    0.234    0.81509
## i_cattransportation 1.583697    4.618259    0.343    0.73193
## i_catwholesale     0.689941    4.936483    0.140    0.88895
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.389 on 261 degrees of freedom
## Multiple R-squared:  0.1425, Adjusted R-squared:  0.0604
## F-statistic: 1.735 on 25 and 261 DF,  p-value: 0.01858
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 51.211, df = 25, p-value = 0.001507
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    9.1117591  2.7790515   3.2787 0.001184 **
## `Prev E Score`  0.0236746  0.0157973   1.4986 0.135174
## `Prev G Score`  0.0094943  0.0131741   0.7207 0.471755
## `Prev S Score` -0.0158286  0.0148247  -1.0677 0.286634
## `firm size`    -0.7601641  0.2898212  -2.6229 0.009232 **
## leverage       -3.0196249  2.6059650  -1.1587 0.247623
## `free cash flow` -0.9682231  5.2085948  -0.1859 0.852676
## `Tobin's q`    -0.2602265  0.2443471  -1.0650 0.287866
## preMTR         -2.1483958  2.0775479  -1.0341 0.302046
## deal_size      -0.0143743  3.2342637  -0.0044 0.996457
## hostile         0.4352414  1.4274173   0.3049 0.760674
## high_tech       0.6460754  0.7255621   0.8904 0.374045
## diversifying    -0.0360526  0.5733075  -0.0629 0.949906
## public_target   -1.4660982  0.7455147  -1.9666 0.050294 .
## private_target  -1.2775027  0.6090006  -2.0977 0.036893 *
## all_cash_deal  -1.1645878  0.7846615  -1.4842 0.138965

```

```

## stock_deal      -2.5761263  1.3079298 -1.9696 0.049939 *
## cross_border    -0.0107146  0.6120996 -0.0175 0.986047
## i_catConstruction -2.3981698  2.1168355 -1.1329 0.258295
## i_catfinance     0.1879189  1.1634513  0.1615 0.871810
## i_catmanufacture 1.3069059  0.9158384  1.4270 0.154774
## i_catmining      1.8091685  1.0317570  1.7535 0.080693 .
## i_catretail      0.5593164  1.7839454  0.3135 0.754130
## i_catservices    1.0535137  1.0389686  1.0140 0.311522
## i_cattransportation 1.5836968  1.2544797  1.2624 0.207920
## i_catwholesale   0.6899414  1.1578128  0.5959 0.551758
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -20.2698  -2.3195  -0.2335   2.3717  17.2314
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    22.036724   5.075444   4.342 2.04e-05 ***
## `Prev E Score` -0.016203   0.022824  -0.710  0.4784
## `Prev G Score`  0.007105   0.016883   0.421  0.6742
## `Prev S Score`  0.011021   0.023744   0.464  0.6429
## `firm size`    -0.489679   0.378710  -1.293  0.1972
## leverage       8.903685   4.286935   2.077  0.0388 *
## `free cash flow` -2.635686   5.678035  -0.464  0.6429
## `Tobin's q`    0.390445   0.360827   1.082  0.2802
## preMTR        -1.734655   1.454366  -1.193  0.2341
## deal_size     -3.371390   2.527807  -1.334  0.1835
## hostile              NA             NA       NA       NA
## high_tech       1.041850   0.905481   1.151  0.2510
## diversifying    0.163775   0.713658   0.229  0.8187
## public_target   1.530723   1.115473   1.372  0.1712
## private_target  0.592642   0.800976   0.740  0.4600
## all_cash_deal  -1.474638   1.115179  -1.322  0.1872
## stock_deal     -2.860371   1.541220  -1.856  0.0646 .
## cross_border   -0.345059   0.772061  -0.447  0.6553
## i_catfinance   -17.344979   4.233644  -4.097 5.63e-05 ***
## i_catmanufacture -18.078264   3.973413  -4.550 8.31e-06 ***
## i_catmining    -20.060328   4.170513  -4.810 2.58e-06 ***

```

```

## i_catretail      -17.828972    4.353679   -4.095 5.67e-05 ***
## i_catservices   -19.079936    3.989037   -4.783 2.92e-06 ***
## i_cattransportation -18.498969    4.218970   -4.385 1.70e-05 ***
## i_catwholesale  -20.992551    4.447603   -4.720 3.89e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.344 on 255 degrees of freedom
## Multiple R-squared:  0.1534, Adjusted R-squared:  0.07705
## F-statistic: 2.009 on 23 and 255 DF,  p-value: 0.005005
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 33.527, df = 23, p-value = 0.07231
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  22.0367239   7.7654822   2.8378 0.004908 **
## `Prev E Score` -0.0162034   0.0190648  -0.8499 0.396171
## `Prev G Score`  0.0071055   0.0152142   0.4670 0.640879
## `Prev S Score`  0.0110210   0.0224828   0.4902 0.624415
## `firm size`    -0.4896792   0.3500184  -1.3990 0.163025
## leverage      8.9036847   3.9481031   2.2552 0.024970 *
## `free cash flow` -2.6356859   6.4580892  -0.4081 0.683527
## `Tobin's q`    0.3904449   0.3050308   1.2800 0.201702
## preMTR        -1.7346546   1.6972178  -1.0221 0.307722
## deal_size     -3.3713902   2.2107516  -1.5250 0.128499
## high_tech     1.0418500   0.8067782   1.2914 0.197744
## diversifying  0.1637748   0.6476903   0.2529 0.800580
## public_target  1.5307232   1.0933698   1.4000 0.162727
## private_target  0.5926422   0.8125876   0.7293 0.466471
## all_cash_deal -1.4746378   0.7948865  -1.8552 0.064728 .
## stock_deal    -2.8603709   1.2810624  -2.2328 0.026430 *
## cross_border  -0.3450589   0.7203094  -0.4790 0.632319
## i_catfinance  -17.3449792   7.4957163  -2.3140 0.021464 *
## i_catmanufacture -18.0782640   7.2066501  -2.5086 0.012744 *
## i_catmining    -20.0603280   7.3862043  -2.7159 0.007061 **
## i_catretail    -17.8289721   7.3587341  -2.4228 0.016097 *
## i_catservices  -19.0799363   7.1967875  -2.6512 0.008523 **
## i_cattransportation -18.4989688   7.2797812  -2.5411 0.011642 *
## i_catwholesale -20.9925512   7.3150176  -2.8698 0.004452 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:

```

```

## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.641  -1.708   0.000   1.824  15.052
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    9.120846   4.013231   2.273  0.02410 *
## `Prev E Score`  0.001121   0.014488   0.077  0.93839
## `Prev G Score` -0.014540   0.014689  -0.990  0.32344
## `Prev S Score`  0.020792   0.018936   1.098  0.27350
## `firm size`    -0.769992   0.308568  -2.495  0.01338 *
## leverage       -4.197696   3.160218  -1.328  0.18558
## `free cash flow` -3.829178   4.378428  -0.875  0.38285
## `Tobin's q`    0.294690   0.199722   1.476  0.14163
## preMTR         -2.849587   1.095061  -2.602  0.00995 **
## deal_size      -1.454989   1.054154  -1.380  0.16904
## hostile        -2.286972   4.102126  -0.558  0.57780
## high_tech      0.495667   0.650734   0.762  0.44712
## diversifying   -1.139368   0.581563  -1.959  0.05147 .
## public_target  -1.043522   0.813801  -1.282  0.20121
## private_target -1.096160   0.628848  -1.743  0.08283 .
## all_cash_deal -0.340004   0.716801  -0.474  0.63577
## stock_deal     -1.351123   0.980673  -1.378  0.16980
## cross_border   -0.654906   0.669981  -0.977  0.32949
## i_catfinance   2.149093   2.919472   0.736  0.46251
## i_catmanufacture 0.664027   2.812403   0.236  0.81359
## i_catmining    1.099082   3.057195   0.360  0.71959
## i_catretail    6.772231   3.323830   2.037  0.04291 *
## i_catservices  -0.370604   2.861304  -0.130  0.89707
## i_cattransportation 0.019601   3.072701   0.006  0.99492
## i_catwholesale -1.679008   4.026727  -0.417  0.67715
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.777 on 202 degrees of freedom
## Multiple R-squared:  0.1772, Adjusted R-squared:  0.07945
## F-statistic: 1.813 on 24 and 202 DF,  p-value: 0.01471
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model

```



```

## BP = 46.192, df = 24, p-value = 0.004198
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)      9.1208459  2.9149453  3.1290 0.0020135 **
## `Prev E Score`    0.0011212  0.0135141  0.0830 0.9339604
## `Prev G Score`   -0.0145401  0.0138755 -1.0479 0.2959365
## `Prev S Score`    0.0207916  0.0198443  1.0477 0.2960118
## `firm size`      -0.7699915  0.3701426 -2.0803 0.0387636 *
## leverage         -4.1976960  4.2306802 -0.9922 0.3222853
## `free cash flow` -3.8291784  5.5945068 -0.6845 0.4944735
## `Tobin's q`       0.2946902  0.2737552  1.0765 0.2829996
## preMTR           -2.8495871  1.1223213 -2.5390 0.0118699 *
## deal_size        -1.4549885  1.6320040 -0.8915 0.3737030
## hostile          -2.2869723  1.8438650 -1.2403 0.2162979
## high_tech         0.4956672  0.5870814  0.8443 0.3995059
## diversifying     -1.1393676  0.4971353 -2.2919 0.0229442 *
## public_target    -1.0435218  0.6666308 -1.5654 0.1190621
## private_target   -1.0961598  0.5317869 -2.0613 0.0405573 *
## all_cash_deal    -0.3400043  0.6194794 -0.5489 0.5837112
## stock_deal       -1.3511227  1.0741085 -1.2579 0.2098795
## cross_border     -0.6549060  0.5157793 -1.2697 0.2056378
## i_catfinance      2.1490929  1.5574137  1.3799 0.1691393
## i_catmanufacture  0.6640273  0.8474350  0.7836 0.4342084
## i_catmining       1.0990818  1.6897310  0.6504 0.5161421
## i_catretail       6.7722310  1.8281262  3.7045 0.0002734 ***
## i_catservices    -0.3706039  0.9231383 -0.4015 0.6885053
## i_cattransportation 0.0196015  1.2191171  0.0161 0.9871877
## i_catwholesale   -1.6790076  1.6351707 -1.0268 0.3057385
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.7716  -1.9687  -0.0684   1.7570  15.8718
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)

```

```

## (Intercept)          3.42152    4.60704    0.743    0.45844
## `Prev E Score`      -0.01099    0.01727   -0.637    0.52507
## `Prev G Score`      -0.01598    0.01291   -1.238    0.21715
## `Prev S Score`       0.03548    0.02033    1.745    0.08226 .
## `firm size`         -0.41807    0.29725   -1.406    0.16094
## leverage            1.10898    2.76400    0.401    0.68863
## `free cash flow`    -2.96266    5.69696   -0.520    0.60353
## `Tobin's q`         0.25729    0.38843    0.662    0.50839
## preMTR              -3.76245    1.20868   -3.113    0.00209 **
## deal_size           0.99659    0.36666    2.718    0.00707 **
## hostile              NA            NA            NA            NA
## high_tech           -0.24854    0.67318   -0.369    0.71232
## diversifying         0.27627    0.57568    0.480    0.63176
## public_target       -0.76202    0.78475   -0.971    0.33255
## private_target       0.26203    0.58661    0.447    0.65552
## all_cash_deal       -0.49587    0.71905   -0.690    0.49112
## stock_deal          -1.14569    1.13552   -1.009    0.31406
## cross_border         0.80422    0.61206    1.314    0.19017
## i_catConstruction   -3.11848    4.82201   -0.647    0.51846
## i_catfinance         -1.77655    4.20929   -0.422    0.67338
## i_catmanufacture     0.14338    4.04506    0.035    0.97175
## i_catmining          -1.32897    4.28816   -0.310    0.75690
## i_catretail          0.65811    4.66688    0.141    0.88798
## i_catservices        0.61698    4.06542    0.152    0.87951
## i_cattransportation -0.85443    4.15388   -0.206    0.83721
## i_catwholesale       -0.75078    4.31051   -0.174    0.86188
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.938 on 230 degrees of freedom
## Multiple R-squared:  0.1353, Adjusted R-squared:  0.04512
## F-statistic:  1.5 on 24 and 230 DF,  p-value: 0.0682
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 34.658, df = 24, p-value = 0.07364
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    3.421517   2.077303  1.6471  0.100904
## `Prev E Score` -0.010990    0.012776 -0.8602  0.390578
## `Prev G Score` -0.015978    0.011544 -1.3841  0.167676
## `Prev S Score`  0.035476    0.018128  1.9570  0.051563 .
## `firm size`    -0.418071    0.265348 -1.5756  0.116502
## leverage       1.108983    2.399621  0.4621  0.644411
## `free cash flow` -2.962661    6.542749 -0.4528  0.651108

```

```

## `Tobin's q`      0.257285    0.413392    0.6224    0.534311
## preMTR          -3.762450    1.260013   -2.9860    0.003132 **
## deal_size       0.996588    0.151290    6.5873  3.015e-10 ***
## high_tech      -0.248535    0.628456   -0.3955    0.692863
## diversifying    0.276265    0.523857    0.5274    0.598447
## public_target  -0.762020    0.808448   -0.9426    0.346889
## private_target  0.262032    0.512851    0.5109    0.609889
## all_cash_deal  -0.495874    0.593801   -0.8351    0.404537
## stock_deal     -1.145688    1.319656   -0.8682    0.386205
## cross_border    0.804221    0.633339    1.2698    0.205435
## i_catConstruction -3.118483    1.701353   -1.8329    0.068104 .
## i_catfinance   -1.776554    1.386698   -1.2811    0.201435
## i_catmanufacture 0.143381    0.970851    0.1477    0.882720
## i_catmining    -1.328974    2.254072   -0.5896    0.556046
## i_catretail     0.658113    1.123894    0.5856    0.558742
## i_catservices   0.616978    1.236607    0.4989    0.618307
## i_cattransportation -0.854435    1.393264   -0.6133    0.540309
## i_catwholesale  -0.750776    1.359952   -0.5521    0.581443
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.1784  -2.1541  -0.0109   2.4061  12.2601
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.45432    3.25954  -0.446  0.65599
## `Prev E Score`  0.01942    0.01857   1.046  0.29699
## `Prev G Score`  0.03394    0.01443   2.352  0.01971 *
## `Prev S Score` -0.04057    0.02055  -1.974  0.04982 *
## `firm size`    0.03992    0.31434   0.127  0.89907
## leverage      -6.64360    3.30890  -2.008  0.04610 *
## `free cash flow` -4.57140    6.65751  -0.687  0.49315
## `Tobin's q`    0.31163    0.34563   0.902  0.36842
## preMTR        -4.26464    1.39368  -3.060  0.00254 **
## deal_size      1.40519    1.91499   0.734  0.46400
## hostile        NA          NA        NA      NA
## high_tech     -0.34668    0.75357  -0.460  0.64601
## diversifying   0.57335    0.66341   0.864  0.38856

```

```

## public_target      -1.57857    0.82433   -1.915   0.05702 .
## private_target    -0.83027    0.68410   -1.214   0.22641
## all_cash_deal     -0.39803    0.90606   -0.439   0.66096
## stock_deal        1.65147    1.39998    1.180   0.23964
## cross_border       0.06429    0.70245    0.092   0.92717
## i_catmanufacture   2.74143    1.18745    2.309   0.02206 *
## i_catmining        2.72076    1.56519    1.738   0.08381 .
## i_catretail        3.66730    2.69777    1.359   0.17566
## i_catservices      1.08334    1.34488    0.806   0.42154
## i_cattransportation 2.10090    1.86554    1.126   0.26154
## i_catwholesale     1.71088    1.88745    0.906   0.36586
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.033 on 187 degrees of freedom
## Multiple R-squared:  0.199, Adjusted R-squared:  0.1047
## F-statistic: 2.111 on 22 and 187 DF,  p-value: 0.003931
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 66.136, df = 22, p-value = 2.643e-06
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.454317   2.980692  -0.4879 0.626183
## `Prev E Score`  0.019424   0.015125   1.2842 0.200648
## `Prev G Score`  0.033937   0.015095   2.2483 0.025726 *
## `Prev S Score` -0.040567   0.020227  -2.0056 0.046345 *
## `firm size`     0.039923   0.316548   0.1261 0.899773
## leverage       -6.643601   3.581675  -1.8549 0.065187 .
## `free cash flow` -4.571396   6.866362  -0.6658 0.506381
## `Tobin's q`     0.311632   0.340849   0.9143 0.361747
## preMTR         -4.264638   1.427209  -2.9881 0.003184 **
## deal_size       1.405189   3.587336   0.3917 0.695720
## high_tech       -0.346683   0.717387  -0.4833 0.629478
## diversifying     0.573349   0.648441   0.8842 0.377726
## public_target   -1.578575   0.823214  -1.9176 0.056689 .
## private_target  -0.830270   0.597532  -1.3895 0.166334
## all_cash_deal   -0.398026   0.801553  -0.4966 0.620076
## stock_deal      1.651472   1.925964   0.8575 0.392278
## cross_border     0.064291   0.596973   0.1077 0.914353
## i_catmanufacture 2.741433   1.230708   2.2275 0.027105 *
## i_catmining      2.720758   1.652552   1.6464 0.101361
## i_catretail      3.667299   2.883926   1.2716 0.205082
## i_catservices    1.083338   1.519407   0.7130 0.476734
## i_cattransportation 2.100897   1.967750   1.0677 0.287048

```

```

## i_catwholesale      1.710882    1.424585    1.2010 0.231282
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -36.961  -2.441   0.305   2.928  18.937
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    10.70798     4.75074   2.254 0.024835 *
## `Prev E Score` -0.02049     0.02003  -1.023 0.307108
## `Prev G Score` -0.01029     0.01808  -0.569 0.569572
## `Prev S Score`  0.04136     0.02436   1.698 0.090452 .
## `firm size`    -0.18708     0.32172  -0.581 0.561301
## leverage       -0.96385     3.54024  -0.272 0.785590
## `free cash flow` -23.14372     6.18719  -3.741 0.000215 ***
## `Tobin's q`     0.08077     0.43065   0.188 0.851332
## preMTR         -4.52720     1.53615  -2.947 0.003429 **
## deal_size      -0.18769     2.85608  -0.066 0.947643
## hostile                NA             NA      NA      NA
## high_tech         1.44409     0.90179   1.601 0.110228
## diversifying     -1.39581     0.70701  -1.974 0.049164 *
## public_target    -0.16833     1.00672  -0.167 0.867304
## private_target   -0.31627     0.75449  -0.419 0.675347
## all_cash_deal   -0.26689     0.97075  -0.275 0.783534
## stock_deal      -0.52309     1.69206  -0.309 0.757403
## cross_border    -0.03396     0.74915  -0.045 0.963871
## i_catfinance    -7.41923     3.85285  -1.926 0.054982 .
## i_catmanufacture -6.22107     3.68722  -1.687 0.092482 .
## i_catmining     -13.40890     3.89194  -3.445 0.000642 ***
## i_catretail     -6.16511     4.03905  -1.526 0.127846
## i_catservices   -7.62405     3.77683  -2.019 0.044310 *
## i_cattransportation -6.94166     3.85458  -1.801 0.072607 .
## i_catwholesale  -11.81461     4.12548  -2.864 0.004446 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.027 on 340 degrees of freedom
## Multiple R-squared:  0.1525, Adjusted R-squared:  0.09521

```

```

## F-statistic: 2.661 on 23 and 340 DF, p-value: 7.449e-05
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 85.854, df = 23, p-value = 3.491e-09
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)    10.707984   9.312865   1.1498 0.251032
## `Prev E Score`  -0.020489   0.017384  -1.1786 0.239383
## `Prev G Score`  -0.010295   0.018844  -0.5463 0.585217
## `Prev S Score`   0.041365   0.023620   1.7512 0.080807 .
## `firm size`     -0.187075   0.273120  -0.6850 0.493839
## leverage        -0.963853   3.364564  -0.2865 0.774691
## `free cash flow` -23.143717   8.574436  -2.6992 0.007299 **
## `Tobin's q`     0.080773   0.603751   0.1338 0.893651
## preMTR          -4.527202   1.971708  -2.2961 0.022279 *
## deal_size       -0.187688   4.257302  -0.0441 0.964862
## high_tech        1.444089   0.712275   2.0274 0.043398 *
## diversifying    -1.395808   0.689634  -2.0240 0.043753 *
## public_target   -0.168335   0.909724  -0.1850 0.853309
## private_target  -0.316270   0.749522  -0.4220 0.673320
## all_cash_deal   -0.266892   0.745650  -0.3579 0.720617
## stock_deal      -0.523086   2.014712  -0.2596 0.795304
## cross_border    -0.033959   0.725544  -0.0468 0.962696
## i_catfinance    -7.419234   8.994745  -0.8248 0.410040
## i_catmanufacture -6.221073   9.044963  -0.6878 0.492051
## i_catmining     -13.408903   9.284538  -1.4442 0.149598
## i_catretail     -6.165115   9.061269  -0.6804 0.496726
## i_catservices   -7.624047   9.068087  -0.8408 0.401076
## i_cattransportation -6.941657   9.050042  -0.7670 0.443596
## i_catwholesale  -11.814610   9.795876  -1.2061 0.228625
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## + `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:

```

```

##      Min      1Q   Median      3Q      Max
## -11.7013 -2.0155  0.2312  2.0800 12.7763
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -2.052477   3.949963  -0.520  0.6040
## `Prev E Score`  0.017432   0.018423   0.946  0.3453
## `Prev G Score` -0.021449   0.016321  -1.314  0.1905
## `Prev S Score` -0.009944   0.025267  -0.394  0.6944
## `firm size`    0.178316   0.280132   0.637  0.5253
## leverage      -0.138347   3.120325  -0.044  0.9647
## `free cash flow` 5.031216   3.297952   1.526  0.1289
## `Tobin's q`    -0.000206   0.340893  -0.001  0.9995
## preMTR        -1.741879   1.352262  -1.288  0.1994
## deal_size      1.833269   0.988062   1.855  0.0652 .
## hostile                NA                NA                NA                NA
## high_tech        -1.127840   0.823779  -1.369  0.1727
## diversifying     0.061626   0.670498   0.092  0.9269
## public_target   -0.182763   0.977759  -0.187  0.8519
## private_target  -0.172084   0.640180  -0.269  0.7884
## all_cash_deal   -1.814886   0.940200  -1.930  0.0552 .
## stock_deal      -0.278596   1.409665  -0.198  0.8436
## cross_border    0.817516   0.651955   1.254  0.2115
## i_catfinance    2.036031   3.047644   0.668  0.5050
## i_catmanufacture 3.444338   2.895720   1.189  0.2359
## i_catmining     3.732782   3.323151   1.123  0.2629
## i_catretail     2.045552   3.468840   0.590  0.5562
## i_catservices   2.720928   2.948866   0.923  0.3574
## i_cattransportation 0.208830   3.079814   0.068  0.9460
## i_catwholesale  3.880710   3.178096   1.221  0.2237
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.873 on 176 degrees of freedom
## Multiple R-squared:  0.1583, Adjusted R-squared:  0.04826
## F-statistic: 1.439 on 23 and 176 DF,  p-value: 0.0984
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 36.804, df = 23, p-value = 0.03408
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -2.05247689  3.06801240  -0.6690 0.504377
## `Prev E Score`  0.01743182  0.01751127  0.9955 0.320878
## `Prev G Score` -0.02144872  0.01775708 -1.2079 0.228708

```

```

## `Prev S Score`      -0.00994393  0.02458825 -0.4044 0.686396
## `firm size`        0.17831591  0.30366660  0.5872 0.557816
## leverage          -0.13834663  2.74888434 -0.0503 0.959918
## `free cash flow`   5.03121613  4.59858787  1.0941 0.275416
## `Tobin's q`       -0.00020605  0.39637587 -0.0005 0.999586
## preMTR            -1.74187882  1.19472617 -1.4580 0.146630
## deal_size         1.83326943  0.57468471  3.1900 0.001684 **
## high_tech        -1.12783971  0.81874265 -1.3775 0.170099
## diversifying      0.06162593  0.61014728  0.1010 0.919664
## public_target    -0.18276343  1.21020331 -0.1510 0.880134
## private_target   -0.17208346  0.54502639 -0.3157 0.752578
## all_cash_deal    -1.81488574  1.12656733 -1.6110 0.108974
## stock_deal       -0.27859599  1.70750752 -0.1632 0.870580
## cross_border     0.81751603  0.62375599  1.3106 0.191689
## i_catfinance     2.03603102  1.38500955  1.4700 0.143334
## i_catmanufacture 3.44433788  1.11426668  3.0911 0.002319 **
## i_catmining      3.73278179  3.04223774  1.2270 0.221467
## i_catretail      2.04555243  1.54228846  1.3263 0.186456
## i_catservices    2.72092781  1.15027413  2.3655 0.019096 *
## icattransportation 0.20883039  1.57455128  0.1326 0.894639
## i_catwholesale   3.88070987  1.50628486  2.5763 0.010806 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.0363  -2.1183  -0.0169   1.6930  14.6709
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.554586   4.927444   1.127  0.26086
## `Prev E Score`  0.008041   0.017349   0.463  0.64348
## `Prev G Score` -0.015221   0.013409  -1.135  0.25756
## `Prev S Score`  0.010838   0.020781   0.522  0.60254
## `firm size`    -0.627901   0.320643  -1.958  0.05147 .
## leverage       0.478412   2.762008   0.173  0.86265
## `free cash flow` -4.729027   5.502496  -0.859  0.39104
## `Tobin's q`    0.156844   0.345895   0.453  0.65068
## preMTR        -3.901314   1.251420  -3.118  0.00207 **
## deal_size      1.011721   0.384907   2.628  0.00918 **

```



```

## hostile                NA          NA          NA          NA
## high_tech             -0.024060   0.729363  -0.033   0.97371
## diversifying          0.206158   0.590091   0.349   0.72715
## public_target        -0.657831   0.812326  -0.810   0.41893
## private_target        0.148471   0.622440   0.239   0.81169
## all_cash_deal        -0.600018   0.780245  -0.769   0.44271
## stock_deal           -1.252666   1.192888  -1.050   0.29482
## cross_border          1.208611   0.633803   1.907   0.05784 .
## i_catConstruction    -1.298667   4.781052  -0.272   0.78616
## i_catfinance         -1.276670   4.374938  -0.292   0.77070
## i_catmanufacture      0.677369   4.225121   0.160   0.87278
## i_catmining          -0.695585   4.453736  -0.156   0.87603
## i_catretail           1.608073   4.875845   0.330   0.74186
## i_catservices         0.369066   4.263609   0.087   0.93110
## i_cattransportation  0.093434   4.330695   0.022   0.98281
## i_catwholesale        0.395654   4.595595   0.086   0.93147
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.113 on 219 degrees of freedom
## Multiple R-squared:  0.1246, Adjusted R-squared:  0.0287
## F-statistic: 1.299 on 24 and 219 DF,  p-value: 0.1661
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 32.827, df = 24, p-value = 0.1078
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.5545863  2.2052331  2.5188 0.012489 *
## `Prev E Score`  0.0080408  0.0132616  0.6063 0.544926
## `Prev G Score` -0.0152206  0.0114244 -1.3323 0.184148
## `Prev S Score`  0.0108378  0.0213243  0.5082 0.611798
## `firm size`    -0.6279009  0.2669413 -2.3522 0.019549 *
## leverage        0.4784121  2.5279406  0.1892 0.850072
## `free cash flow` -4.7290267  6.4726241 -0.7306 0.465792
## `Tobin's q`     0.1568444  0.3830609  0.4095 0.682609
## preMTR          -3.9013141  1.3282856 -2.9371 0.003667 **
## deal_size       1.0117213  0.1790351  5.6510 4.935e-08 ***
## high_tech       -0.0240601  0.6514115 -0.0369 0.970570
## diversifying     0.2061583  0.5109424  0.4035 0.686984
## public_target   -0.6578310  0.8494292 -0.7744 0.439507
## private_target   0.1484710  0.5368955  0.2765 0.782397
## all_cash_deal  -0.6000178  0.6529167 -0.9190 0.359117
## stock_deal      -1.2526657  1.3559295 -0.9238 0.356585
## cross_border     1.2086107  0.6271925  1.9270 0.055271 .

```

```

## i_catConstruction    -1.2986669  1.6527426 -0.7858  0.432855
## i_catfinance         -1.2766704  1.4972186 -0.8527  0.394760
## i_catmanufacture     0.6773689  1.1075959  0.6116  0.541459
## i_catmining          -0.6955847  2.0969870 -0.3317  0.740428
## i_catretail          1.6080730  1.3358377  1.2038  0.229969
## i_catservices        0.3690655  1.4771410  0.2499  0.802937
## i_cattransportation  0.0934343  1.4213743  0.0657  0.947649
## i_catwholesale       0.3956537  1.3738498  0.2880  0.773627
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -19.819  -2.042   0.000   2.256  13.729
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.19428    7.68996   0.285  0.77613
## `Prev E Score` -0.01731    0.03154  -0.549  0.58474
## `Prev G Score` -0.02099    0.03083  -0.681  0.49805
## `Prev S Score`  0.03823    0.04384   0.872  0.38575
## `firm size`    -0.40501    0.61576  -0.658  0.51262
## leverage       1.29099    5.09019   0.254  0.80045
## `free cash flow` 1.05567    6.65194   0.159  0.87431
## `Tobin's q`     0.02109    0.48272   0.044  0.96526
## preMTR         3.63726    3.11938   1.166  0.24711
## deal_size      2.76204    1.86753   1.479  0.14312
## hostile        NA          NA        NA     NA
## high_tech      0.49339    1.40167   0.352  0.72577
## diversifying   -0.11894    1.08248  -0.110  0.91278
## public_target  -0.90061    1.55298  -0.580  0.56362
## private_target  0.26627    1.15071   0.231  0.81761
## all_cash_deal  0.33341    1.81364   0.184  0.85462
## stock_deal     6.68753    2.44591   2.734  0.00772 **
## cross_border   -2.82557    1.27587  -2.215  0.02967 *
## i_catfinance   -6.06781    5.56669  -1.090  0.27902
## i_catmanufacture 2.28184    5.04065   0.453  0.65201
## i_catmining     0.53396    5.68563   0.094  0.92542
## i_catretail    5.39363    5.35516   1.007  0.31692
## i_catservices  0.63354    5.15506   0.123  0.90250

```

```

## i_cattransportation 0.45419 5.81478 0.078 0.93794
## i_catwholesale 1.78952 5.24604 0.341 0.73392
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.59 on 79 degrees of freedom
## Multiple R-squared: 0.4315, Adjusted R-squared: 0.2661
## F-statistic: 2.608 on 23 and 79 DF, p-value: 0.0008841
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 35.065, df = 23, p-value = 0.05125
##
##
## t test of coefficients:
##
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2.194280 4.579782 0.4791 0.6331746
## `Prev E Score` -0.017309 0.030296 -0.5713 0.5694047
## `Prev G Score` -0.020986 0.025094 -0.8363 0.4055086
## `Prev S Score` 0.038232 0.038642 0.9894 0.3254948
## `firm size` -0.405009 0.532709 -0.7603 0.4493488
## leverage 1.290993 4.154991 0.3107 0.7568402
## `free cash flow` 1.055667 5.049731 0.2091 0.8349441
## `Tobin's q` 0.021091 0.367020 0.0575 0.9543184
## preMTR 3.637264 3.550357 1.0245 0.3087362
## deal_size 2.762042 1.137258 2.4287 0.0174254 *
## high_tech 0.493393 1.500327 0.3289 0.7431340
## diversifying -0.118945 0.719417 -0.1653 0.8691027
## public_target -0.900614 1.532046 -0.5879 0.5583094
## private_target 0.266267 0.910742 0.2924 0.7707758
## all_cash_deal 0.333406 1.168543 0.2853 0.7761473
## stock_deal 6.687529 1.798094 3.7192 0.0003721 ***
## cross_border -2.825573 0.782450 -3.6112 0.0005335 ***
## i_catfinance -6.067814 3.047258 -1.9912 0.0499117 *
## i_catmanufacture 2.281835 1.663358 1.3718 0.1740014
## i_catmining 0.533961 3.097139 0.1724 0.8635604
## i_catretail 5.393630 1.950628 2.7651 0.0070813 **
## i_catservices 0.633541 1.832151 0.3458 0.7304191
## i_cattransportation 0.454190 2.671205 0.1700 0.8654196
## i_catwholesale 1.789518 1.683896 1.0627 0.2911447
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +

```

```

## `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -45.089  -2.106   0.254   2.412  26.292
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.03148    6.08381   0.170 0.865433
## `Prev E Score`  -0.01282    0.01454  -0.882 0.378323
## `Prev G Score`  -0.01613    0.01363  -1.183 0.237317
## `Prev S Score`   0.01248    0.01797   0.694 0.487673
## `firm size`     -0.14031    0.25392  -0.553 0.580773
## leverage        -0.20297    2.38053  -0.085 0.932084
## `free cash flow` -4.58619    3.73443  -1.228 0.219960
## `Tobin's q`     -0.25841    0.30058  -0.860 0.390345
## preMTR          -4.42134    1.14833  -3.850 0.000132 ***
## deal_size       3.15407    1.71463   1.840 0.066399 .
## hostile          NA          NA        NA      NA
## high_tech       0.77504    0.73359   1.057 0.291217
## diversifying    -0.22063    0.53924  -0.409 0.682600
## public_target   -3.10236    0.76339  -4.064 5.56e-05 ***
## private_target  -0.85239    0.55770  -1.528 0.127006
## all_cash_deal   0.15001    0.73818   0.203 0.839041
## stock_deal      0.99645    1.08488   0.918 0.358779
## cross_border    0.44426    0.58554   0.759 0.448361
## i_catConstruction -1.56920    5.96560  -0.263 0.792621
## i_catfinance     1.30175    5.67249   0.229 0.818581
## i_catmanufacture 3.14941    5.65243   0.557 0.577640
## i_catmining     -0.88746    5.76213  -0.154 0.877656
## i_catretail      4.32342    5.81512   0.743 0.457520
## i_catservices    2.53059    5.70017   0.444 0.657259
## i_cattransportation 1.34894    5.73178   0.235 0.814032
## i_catwholesale   1.59185    5.78770   0.275 0.783392
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.584 on 531 degrees of freedom
## Multiple R-squared:  0.1062, Adjusted R-squared:  0.06581
## F-statistic: 2.629 on 24 and 531 DF,  p-value: 4.853e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 82.174, df = 24, p-value = 2.73e-08

```

```

##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.031478   2.360377   0.4370 0.6622911
## `Prev E Score`  -0.012820   0.012487  -1.0267 0.3050329
## `Prev G Score`  -0.016130   0.014507  -1.1119 0.2667041
## `Prev S Score`   0.012483   0.017023   0.7333 0.4637040
## `firm size`     -0.140315   0.222197  -0.6315 0.5279933
## leverage        -0.202972   2.545827  -0.0797 0.9364843
## `free cash flow` -4.586189   5.979983  -0.7669 0.4434679
## `Tobin's q`     -0.258408   0.408393  -0.6327 0.5271733
## preMTR          -4.421344   1.445988  -3.0577 0.0023431 **
## deal_size       3.154069   3.029809   1.0410 0.2983434
## high_tech       0.775044   0.691519   1.1208 0.2628861
## diversifying    -0.220628   0.571248  -0.3862 0.6994881
## public_target   -3.102356   0.868726  -3.5712 0.0003877 ***
## private_target  -0.852392   0.548521  -1.5540 0.1207845
## all_cash_deal   0.150013   0.607933   0.2468 0.8051901
## stock_deal      0.996450   1.217745   0.8183 0.4135676
## cross_border    0.444258   0.583048   0.7620 0.4464235
## i_catConstruction -1.569199   1.937891  -0.8097 0.4184491
## i_catfinance     1.301746   0.929788   1.4000 0.1620837
## i_catmanufacture 3.149413   0.794163   3.9657 8.321e-05 ***
## i_catmining     -0.887457   2.249496  -0.3945 0.6933603
## i_catretail     4.323418   1.656504   2.6100 0.0093107 **
## i_catservices   2.530594   1.064516   2.3772 0.0177967 *
## i_cattransportation 1.348944   1.075800   1.2539 0.2104306
## i_catwholesale  1.591852   2.940225   0.5414 0.5884556
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -26.8617  -2.1145   0.1327   2.3298  22.4758
##
## Coefficients: (1 not defined because of singularities)
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.212936   2.493798   0.887 0.375257

```

```

## `Prev E Score`      -0.017479   0.012985  -1.346  0.178820
## `Prev G Score`     -0.007407   0.011354  -0.652  0.514443
## `Prev S Score`      0.029938   0.015607   1.918  0.055593 .
## `firm size`        -0.129571   0.207806  -0.624  0.533195
## leverage           -1.388528   1.973018  -0.704  0.481875
## `free cash flow`    0.377846   1.940600   0.195  0.845694
## `Tobin's q`        -0.504247   0.235604  -2.140  0.032767 *
## preMTR             -2.036638   1.066518  -1.910  0.056693 .
## deal_size          0.841656   1.306939   0.644  0.519845
## hostile              NA              NA         NA      NA
## high_tech          -2.258349   0.657037  -3.437  0.000631 ***
## diversifying       -0.112668   0.491829  -0.229  0.818890
## public_target      0.143496   0.748718   0.192  0.848082
## private_target     -0.308091   0.455974  -0.676  0.499525
## all_cash_deal      0.036054   0.715779   0.050  0.959845
## stock_deal         -0.330293   0.982607  -0.336  0.736891
## cross_border       0.572295   0.519352   1.102  0.270960
## i_catfinance       -1.303766   1.779022  -0.733  0.463953
## i_catmanufacture    0.550588   1.734413   0.317  0.751021
## i_catmining        -0.767681   2.095586  -0.366  0.714255
## i_catretail        -1.662846   1.997164  -0.833  0.405423
## i_catservices      2.446149   1.807124   1.354  0.176405
## i_cattransportation -1.400955   1.876481  -0.747  0.455626
## i_catwholesale     -1.590492   2.117557  -0.751  0.452909
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.907 on 561 degrees of freedom
## Multiple R-squared:  0.08256, Adjusted R-squared:  0.04495
## F-statistic: 2.195 on 23 and 561 DF, p-value: 0.001159
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 83.232, df = 23, p-value = 9.441e-09
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   2.2129364  2.0714498   1.0683 0.285843
## `Prev E Score` -0.0174790  0.0113134  -1.5450 0.122914
## `Prev G Score` -0.0074071  0.0118142  -0.6270 0.530938
## `Prev S Score`  0.0299380  0.0156152   1.9172 0.055716 .
## `firm size`    -0.1295714  0.1986321  -0.6523 0.514463
## leverage      -1.3885284  1.9205253  -0.7230 0.469985
## `free cash flow` 0.3778460  2.8045210   0.1347 0.892876
## `Tobin's q`    -0.5042468  0.2760814  -1.8264 0.068315 .
## preMTR        -2.0366379  1.6137919  -1.2620 0.207466

```

```

## deal_size          0.8416557  1.6614383  0.5066 0.612647
## high_tech         -2.2583486  0.7650206 -2.9520 0.003289 **
## diversifying      -0.1126680  0.5313986 -0.2120 0.832167
## public_target     0.1434956  0.8212858  0.1747 0.861362
## private_target    -0.3080906  0.4311596 -0.7146 0.475176
## all_cash_deal     0.0360543  0.8249954  0.0437 0.965157
## stock_deal        -0.3302929  1.2910996 -0.2558 0.798181
## cross_border      0.5722945  0.5409146  1.0580 0.290505
## i_catfinance      -1.3037658  1.2435938 -1.0484 0.294912
## i_catmanufacture  0.5505879  1.1926176  0.4617 0.644502
## i_catmining        -0.7676808  1.8169972 -0.4225 0.672822
## i_catretail        -1.6628460  1.9407118 -0.8568 0.391909
## i_catservices      2.4461485  1.3049666  1.8745 0.061382 .
## i_cattransportation -1.4009546  1.3773324 -1.0172 0.309520
## i_catwholesale     -1.5904922  2.3996005 -0.6628 0.507721
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -28.894  -2.831   0.138   2.685  50.628
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -1.172798   6.976310  -0.168  0.8666
## `Prev E Score`  0.005816   0.018905   0.308  0.7585
## `Prev G Score` -0.025078   0.016801  -1.493  0.1362
## `Prev S Score` -0.013655   0.022837  -0.598  0.5502
## `firm size`    0.330826   0.295829   1.118  0.2640
## leverage       3.953699   2.528585   1.564  0.1186
## `free cash flow` 3.362792   3.821368   0.880  0.3793
## `Tobin's q`    0.099616   0.346384   0.288  0.7738
## preMTR         -1.278918   1.139086  -1.123  0.2621
## deal_size      8.512415   1.045051   8.145 3.53e-15 ***
## hostile                NA                NA                NA                NA
## high_tech            0.874455   1.034359   0.845  0.3983
## diversifying        -0.884522   0.716598  -1.234  0.2177
## public_target       -5.909986   0.987779  -5.983 4.38e-09 ***
## private_target      0.457532   0.733024   0.624  0.5328
## all_cash_deal      0.086749   1.124064   0.077  0.9385

```

```

## stock_deal      -2.325159    1.348462   -1.724    0.0853 .
## cross_border    1.799672    0.821349    2.191    0.0289 *
## i_catConstruction -2.724583    7.173446   -0.380    0.7043
## i_catfinance    -2.788158    6.793137   -0.410    0.6817
## i_catmanufacture -2.021348    6.751704   -0.299    0.7648
## i_catmining     -3.903211    6.902425   -0.565    0.5720
## i_catretail     -4.716647    7.422142   -0.635    0.5254
## i_catservices   -2.243170    6.781343   -0.331    0.7410
## i_cattransportation -0.391445    6.833519   -0.057    0.9543
## i_catwholesale    0.831955    6.952630    0.120    0.9048
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.64 on 464 degrees of freedom
## Multiple R-squared:  0.2512, Adjusted R-squared:  0.2125
## F-statistic: 6.486 on 24 and 464 DF,  p-value: < 2.2e-16
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 222.01, df = 24, p-value < 2.2e-16
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -1.1727977  2.2124474  -0.5301  0.59630
## `Prev E Score`  0.0058158  0.0163134  0.3565  0.72162
## `Prev G Score` -0.0250782  0.0148506 -1.6887  0.09195 .
## `Prev S Score` -0.0136554  0.0197220 -0.6924  0.48904
## `firm size`    0.3308262  0.2992331  1.1056  0.26948
## leverage      3.9536995  2.5491643  1.5510  0.12159
## `free cash flow` 3.3627920  4.3019757  0.7817  0.43480
## `Tobin's q`    0.0996164  0.4000667  0.2490  0.80347
## preMTR        -1.2789176  1.8553317  -0.6893  0.49097
## deal_size     8.5124147  4.9168802  1.7313  0.08407 .
## high_tech     0.8744548  1.1516162  0.7593  0.44804
## diversifying  -0.8845221  0.7161898  -1.2350  0.21744
## public_target -5.9099857  1.3641315  -4.3324 1.809e-05 ***
## private_target  0.4575323  0.7900611  0.5791  0.56280
## all_cash_deal  0.0867493  1.2908403  0.0672  0.94645
## stock_deal    -2.3251591  2.5281265  -0.9197  0.35820
## cross_border   1.7996720  0.7344285  2.4504  0.01464 *
## i_catConstruction -2.7245834  2.1567589  -1.2633  0.20712
## i_catfinance    -2.7881580  1.3022276  -2.1411  0.03279 *
## i_catmanufacture -2.0213477  1.3503624  -1.4969  0.13510
## i_catmining     -3.9032115  2.3497483  -1.6611  0.09737 .
## i_catretail     -4.7166474  2.8278866  -1.6679  0.09601 .
## i_catservices   -2.2431697  1.3289443  -1.6879  0.09210 .

```



```

## i_cattransportation -0.3914455  1.4421014 -0.2714    0.78617
## i_catwholesale      0.8319551  3.0183152  0.2756    0.78295
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -22.0019  -3.0336   0.0402   2.9653  23.6820
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    2.28282    8.78167   0.260  0.79531
## `Prev E Score` -0.01854    0.04124  -0.450  0.65373
## `Prev G Score` -0.09135    0.03362  -2.717  0.00748 **
## `Prev S Score`  0.06487    0.04960   1.308  0.19324
## `firm size`    -0.05799    0.55411  -0.105  0.91681
## leverage       2.83778    5.57846   0.509  0.61182
## `free cash flow` 6.65636    4.64587   1.433  0.15433
## `Tobin's q`    -0.41894    0.42562  -0.984  0.32680
## preMTR         -0.60912    2.62499  -0.232  0.81687
## deal_size      -2.11438    0.95714  -2.209  0.02892 *
## hostile                NA                NA                NA                NA
## high_tech         0.85751    1.61598   0.531  0.59657
## diversifying     -1.06564    1.40512  -0.758  0.44958
## public_target    -2.28780    2.19064  -1.044  0.29826
## private_target   -1.14411    1.39011  -0.823  0.41199
## all_cash_deal    0.54446    2.03583   0.267  0.78956
## stock_deal       3.40156    2.37710   1.431  0.15484
## cross_border     -0.41494    1.47348  -0.282  0.77869
## i_catfinance     0.83003    7.41810   0.112  0.91108
## i_catmanufacture 1.73872    7.25381   0.240  0.81094
## i_catmining      4.16362    7.78534   0.535  0.59370
## i_catretail      4.73183    7.57869   0.624  0.53349
## i_catservices    0.60737    7.32827   0.083  0.93407
## i_cattransportation -2.25379    7.52527  -0.299  0.76504
## i_catwholesale   0.57169    7.57910   0.075  0.93999
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.817 on 130 degrees of freedom

```

```

## Multiple R-squared: 0.1421, Adjusted R-squared: -0.009697
## F-statistic: 0.9361 on 23 and 130 DF, p-value: 0.5513
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 84.53, df = 23, p-value = 5.777e-09
##
##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2.282823 4.677808 0.4880 0.626364
## `Prev E Score` -0.018543 0.034761 -0.5335 0.594632
## `Prev G Score` -0.091353 0.031536 -2.8968 0.004425 **
## `Prev S Score` 0.064875 0.044762 1.4493 0.149652
## `firm size` -0.057992 0.491771 -0.1179 0.906309
## leverage 2.837782 5.666269 0.5008 0.617345
## `free cash flow` 6.656360 4.707848 1.4139 0.159786
## `Tobin's q` -0.418937 0.319025 -1.3132 0.191436
## preMTR -0.609118 2.493399 -0.2443 0.807390
## deal_size -2.114380 2.481965 -0.8519 0.395838
## high_tech 0.857512 1.397637 0.6135 0.540589
## diversifying -1.065642 1.151523 -0.9254 0.356462
## public_target -2.287801 2.302213 -0.9937 0.322196
## private_target -1.144115 1.302882 -0.8781 0.381487
## all_cash_deal 0.544457 1.627596 0.3345 0.738529
## stock_deal 3.401559 1.987652 1.7113 0.089402 .
## cross_border -0.414939 1.164278 -0.3564 0.722125
## i_catfinance 0.830026 2.582163 0.3214 0.748389
## i_catmanufacture 1.738725 2.429595 0.7156 0.475495
## i_catmining 4.163621 5.979005 0.6964 0.487438
## i_catretail 4.731827 2.503210 1.8903 0.060944 .
## i_catservices 0.607368 2.924772 0.2077 0.835817
## i_cattransportation -2.253787 2.053901 -1.0973 0.274530
## i_catwholesale 0.571693 2.494590 0.2292 0.819094
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##CAR55 regression model

Create an empty list to store the model summaries

```
model_summaries <- list()
```

```
reg_model<-list()
```

```
start_year <- 2003
```

```
end_year <- 2015
```

Iterate over the range of years

```
for (year in start_year:end_year) {
```

```

# Fit the regression model for the current year
reg_model <- lm(CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` + `firm size` + leverage + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat,
               data = data1[data1$year%in% c(year,year+4),])

# Store the summary of the regression model in the list
model_summaries[[year]] <- summary(reg_model)

# Print the summary for the current year
print(model_summaries[[year]])
##test heteroscedasticity problem
hetero_test <- bptest( reg_model)
print(hetero_test)
##use white's robustness standard error
coefstttt<-coefstest(reg_model, vcov = vcovHC(reg_model, type='HC0', cluster='a_industry'))
print(coefstttt)
}

##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` + `firm size` + leverage + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat, data = data1[data1$year %in% c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -18.1616  -2.7161  -0.2176   2.6031  22.0836
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    8.5267117   6.4897239   1.314  0.19004
## `Prev E Score` -0.0006966   0.0232059  -0.030  0.97608
## `Prev G Score`  0.0038097   0.0167451   0.228  0.82020
## `Prev S Score` -0.0094643   0.0234671  -0.403  0.68706
## `firm size`    -0.9339595   0.3545455  -2.634  0.00894 **
## leverage       0.1834826   3.4029968   0.054  0.95704
## `free cash flow` -7.1343410   5.5546060  -1.284  0.20014
## `Tobin's q`    -0.2388706   0.2973196  -0.803  0.42247
## preMTR         -6.5013908   1.4209184  -4.575  7.35e-06 ***

```

```

## deal_size          -0.5411995  2.2210124  -0.244  0.80768
## hostile            1.4147984  5.8189771   0.243  0.80809
## high_tech          0.0016934  0.9305483   0.002  0.99855
## diversifying      -0.0567996  0.7413623  -0.077  0.93899
## public_target      0.2457341  0.9838924   0.250  0.80297
## private_target    -0.8430292  0.8186270  -1.030  0.30405
## all_cash_deal     -1.7242933  1.0635599  -1.621  0.10617
## stock_deal        -3.7114726  1.4868929  -2.496  0.01317 *
## cross_border      -0.6087615  0.8206199  -0.742  0.45886
## i_catConstruction -3.4429000  6.8737532  -0.501  0.61688
## i_catfinance       1.2579482  5.7801184   0.218  0.82788
## i_catmanufacture   4.8597946  5.6593846   0.859  0.39129
## i_catmining        5.0922361  5.7295345   0.889  0.37495
## i_catretail        3.1162501  5.9972733   0.520  0.60378
## i_catservices      4.9800780  5.7033686   0.873  0.38337
## i_cattransportation 4.5604036  5.8529470   0.779  0.43659
## i_catwholesale     3.8650589  6.2562470   0.618  0.53725
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.562 on 261 degrees of freedom
## Multiple R-squared:  0.2219, Adjusted R-squared:  0.1474
## F-statistic: 2.978 on 25 and 261 DF,  p-value: 6.856e-06
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 39.915, df = 25, p-value = 0.02975
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   8.52671168  3.41328010  2.4981 0.0131020 *
## `Prev E Score` -0.00069657  0.02023135 -0.0344 0.9725603
## `Prev G Score`  0.00380975  0.01687910  0.2257 0.8216053
## `Prev S Score` -0.00946427  0.01933478 -0.4895 0.6249027
## `firm size`    -0.93395950  0.33977148 -2.7488 0.0063992 **
## leverage       0.18348262  3.44634829  0.0532 0.9575816
## `free cash flow` -7.13434098  5.98219510 -1.1926 0.2341108
## `Tobin's q`    -0.23887060  0.26063600 -0.9165 0.3602553
## preMTR         -6.50139085  2.38699309 -2.7237 0.0068918 **
## deal_size     -0.54119953  3.67186586 -0.1474 0.8829373
## hostile        1.41479843  1.56192549  0.9058 0.3658750
## high_tech      0.00169339  0.93315656  0.0018 0.9985535
## diversifying   -0.05679959  0.73039614 -0.0778 0.9380742
## public_target  0.24573412  1.01582324  0.2419 0.8090427
## private_target -0.84302921  0.84381195 -0.9991 0.3186850
## all_cash_deal -1.72429334  1.01074082 -1.7060 0.0892033 .

```

```

## stock_deal          -3.71147264  1.57436643 -2.3574 0.0191401 *
## cross_border        -0.60876146  0.80838142 -0.7531 0.4520913
## i_catConstruction   -3.44290004  2.05454312 -1.6757 0.0949847 .
## i_catfinance         1.25794817  1.50848261  0.8339 0.4050907
## i_catmanufacture     4.85979458  1.08594303  4.4752 1.141e-05 ***
## i_catmining          5.09223610  1.24494206  4.0903 5.743e-05 ***
## i_catretail          3.11625005  1.80619567  1.7253 0.0856550 .
## i_catservices        4.98007796  1.35481902  3.6758 0.0002878 ***
## i_cattransportation  4.56040365  1.83101766  2.4906 0.0133736 *
## i_catwholesale       3.86505890  1.43328353  2.6966 0.0074599 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -34.373  -4.235   0.178   2.936  26.168
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    31.09631    7.37377   4.217 3.44e-05 ***
## `Prev E Score` -0.02586    0.03316  -0.780 0.436271
## `Prev G Score`  0.01690    0.02453   0.689 0.491452
## `Prev S Score`  0.01188    0.03450   0.344 0.730813
## `firm size`    -0.94355    0.55020  -1.715 0.087574 .
## leverage       8.27777    6.22820   1.329 0.185010
## `free cash flow` -1.91533    8.24924  -0.232 0.816583
## `Tobin's q`    0.83000    0.52422   1.583 0.114590
## preMTR         -3.34111    2.11295  -1.581 0.115060
## deal_size      -2.57826    3.67248  -0.702 0.483288
## hostile         NA          NA        NA      NA
## high_tech       1.23349    1.31551   0.938 0.349313
## diversifying    1.08934    1.03683   1.051 0.294415
## public_target   1.00109    1.62060   0.618 0.537307
## private_target  0.52833    1.16368   0.454 0.650207
## all_cash_deal  -2.08656    1.62017  -1.288 0.198960
## stock_deal     -4.40386    2.23913  -1.967 0.050294 .
## cross_border   -1.18256    1.12168  -1.054 0.292755
## i_catfinance   -22.47481    6.15078  -3.654 0.000313 ***
## i_catmanufacture -23.78612    5.77270  -4.120 5.12e-05 ***
## i_catmining    -26.11899    6.05906  -4.311 2.33e-05 ***

```

```

## i_catretail      -19.30289      6.32517   -3.052 0.002515 **
## i_catservices   -24.41802      5.79540   -4.213 3.49e-05 ***
## i_cattransportation -23.48129      6.12946   -3.831 0.000161 ***
## i_catwholesale  -26.15024      6.46162   -4.047 6.88e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.763 on 255 degrees of freedom
## Multiple R-squared:  0.1554, Adjusted R-squared:  0.07917
## F-statistic: 2.039 on 23 and 255 DF,  p-value: 0.004221
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 42.191, df = 23, p-value = 0.008624
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    31.096312  14.065715  2.2108  0.02794 *
## `Prev E Score` -0.025856   0.027879 -0.9274  0.35458
## `Prev G Score`  0.016900   0.022890  0.7383  0.46100
## `Prev S Score`  0.011881   0.032183  0.3692  0.71230
## `firm size`    -0.943555   0.586613 -1.6085  0.10897
## leverage       8.277766   6.087493  1.3598  0.17509
## `free cash flow` -1.915327   8.862556 -0.2161  0.82907
## `Tobin's q`    0.830005   0.454993  1.8242  0.06929 .
## preMTR        -3.341110   2.417611 -1.3820  0.16818
## deal_size     -2.578264   2.966270 -0.8692  0.38556
## high_tech     1.233486   1.041303  1.1846  0.23729
## diversifying  1.089338   0.937736  1.1617  0.24646
## public_target 1.001086   1.408439  0.7108  0.47787
## private_target 0.528325   1.180202  0.4477  0.65478
## all_cash_deal -2.086561   1.297299 -1.6084  0.10899
## stock_deal    -4.403864   1.736601 -2.5359  0.01181 *
## cross_border  -1.182555   1.089572 -1.0853  0.27880
## i_catfinance  -22.474811  13.515333 -1.6629  0.09756 .
## i_catmanufacture -23.786117  13.219534 -1.7993  0.07315 .
## i_catmining    -26.118985  13.381569 -1.9519  0.05205 .
## i_catretail    -19.302892  13.227580 -1.4593  0.14572
## i_catservices  -24.418022  13.206818 -1.8489  0.06563 .
## i_cattransportation -23.481286  13.306512 -1.7646  0.07882 .
## i_catwholesale -26.150240  13.249171 -1.9737  0.04949 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:

```

```

## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -24.4392  -3.0356  -0.3522   2.7458  16.9716
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      8.3697905   5.6751649   1.475 0.141820
## `Prev E Score`  -0.0024545   0.0204878  -0.120 0.904760
## `Prev G Score`   0.0001082   0.0207725   0.005 0.995848
## `Prev S Score`  -0.0188702   0.0267771  -0.705 0.481800
## `firm size`     -0.8542517   0.4363495  -1.958 0.051640 .
## leverage        -0.4849153   4.4689067  -0.109 0.913700
## `free cash flow` 11.6001571   6.1915942   1.874 0.062439 .
## `Tobin's q`     0.0675797   0.2824295   0.239 0.811131
## preMTR          -6.0346296   1.5485408  -3.897 0.000132 ***
## deal_size        2.3237617   1.4906932   1.559 0.120598
## hostile         -6.4417516   5.8008724  -1.110 0.268112
## high_tech        1.6772663   0.9202112   1.823 0.069828 .
## diversifying     -0.0397593   0.8223960  -0.048 0.961489
## public_target    -1.2045219   1.1508074  -1.047 0.296500
## private_target   -0.1184091   0.8892628  -0.133 0.894204
## all_cash_deal    -0.3222679   1.0136384  -0.318 0.750865
## stock_deal       -2.5520669   1.3867827  -1.840 0.067194 .
## cross_border     -1.6753928   0.9474292  -1.768 0.078511 .
## i_catfinance     2.2000175   4.1284655   0.533 0.594696
## i_catmanufacture 1.6556480   3.9770577   0.416 0.677633
## i_catmining      4.8759112   4.3232208   1.128 0.260724
## i_catretail      9.7852192   4.7002732   2.082 0.038617 *
## i_catservices    1.1901614   4.0462085   0.294 0.768951
## i_cattransportation 1.0326815   4.3451486   0.238 0.812383
## i_catwholesale   -3.7837706   5.6942485  -0.664 0.507135
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.341 on 202 degrees of freedom
## Multiple R-squared:  0.2231, Adjusted R-squared:  0.1308
## F-statistic: 2.417 on 24 and 202 DF,  p-value: 0.0004693
##
## studentized Breusch-Pagan test
##
## data:  reg_model

```

```

## BP = 40.25, df = 24, p-value = 0.0201
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)      8.36979054  3.97694156  2.1046  0.036565 *
## `Prev E Score`  -0.00245445  0.01880559 -0.1305  0.896287
## `Prev G Score`   0.00010824  0.01891788  0.0057  0.995441
## `Prev S Score`  -0.01887016  0.02418555 -0.7802  0.436172
## `firm size`     -0.85425172  0.48687806 -1.7545  0.080853 .
## leverage        -0.48491532  6.21132969 -0.0781  0.937850
## `free cash flow` 11.60015715  6.70683007  1.7296  0.085229 .
## `Tobin's q`      0.06757965  0.37290308  0.1812  0.856372
## preMTR          -6.03462955  2.23880876 -2.6955  0.007621 **
## deal_size        2.32376173  1.74424246  1.3322  0.184280
## hostile          -6.44175157  2.72608232 -2.3630  0.019077 *
## high_tech        1.67726632  0.86943338  1.9291  0.055114 .
## diversifying     -0.03975927  0.68189743 -0.0583  0.953562
## public_target    -1.20452192  0.88125556 -1.3668  0.173200
## private_target   -0.11840911  0.78941404 -0.1500  0.880917
## all_cash_deal    -0.32226793  0.79063216 -0.4076  0.683993
## stock_deal       -2.55206687  1.49422553 -1.7080  0.089181 .
## cross_border     -1.67539280  0.70656357 -2.3712  0.018672 *
## i_catfinance     2.20001747  1.84694624  1.1912  0.234987
## i_catmanufacture 1.65564800  1.24862585  1.3260  0.186345
## i_catmining       4.87591120  2.24113361  2.1756  0.030743 *
## i_catretail       9.78521921  2.03402666  4.8108 2.937e-06 ***
## i_catservices     1.19016139  1.41406222  0.8417  0.400973
## i_cattransportation 1.03268150  1.92998737  0.5351  0.593189
## i_catwholesale   -3.78377059  2.39173351 -1.5820  0.115209
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -15.3422  -3.0054  -0.0027   2.7140  17.5026
##
## Coefficients: (1 not defined because of singularities)
##           Estimate Std. Error t value Pr(>|t|)

```



```

## (Intercept)          2.395380    5.834677    0.411 0.681791
## `Prev E Score`      -0.026529    0.021866   -1.213 0.226287
## `Prev G Score`      0.002777    0.016352    0.170 0.865283
## `Prev S Score`      0.046537    0.025743    1.808 0.071949 .
## `firm size`         -0.314615    0.376462   -0.836 0.404183
## leverage            2.653775    3.500527    0.758 0.449163
## `free cash flow`    -1.812814    7.215033   -0.251 0.801841
## `Tobin's q`         0.019618    0.491934    0.040 0.968224
## preMTR              -6.623815    1.530751   -4.327 2.25e-05 ***
## deal_size           1.643615    0.464368    3.539 0.000485 ***
## hostile              NA              NA          NA     NA
## high_tech           0.261026    0.852566    0.306 0.759755
## diversifying        1.219282    0.729080    1.672 0.095814 .
## public_target       -0.577468    0.993868   -0.581 0.561788
## private_target      -0.033564    0.742919   -0.045 0.964004
## all_cash_deal       -0.217758    0.910651   -0.239 0.811223
## stock_deal          -1.349391    1.438098   -0.938 0.349066
## cross_border        1.393371    0.775160    1.798 0.073564 .
## i_catConstruction   -2.138724    6.106932   -0.350 0.726500
## i_catfinance        -4.019673    5.330940   -0.754 0.451604
## i_catmanufacture    -1.840310    5.122953   -0.359 0.719754
## i_catmining         -1.508753    5.430832   -0.278 0.781406
## i_catretail         -1.338586    5.910470   -0.226 0.821031
## i_catservices       -1.235829    5.148733   -0.240 0.810524
## i_cattransportation -3.749337    5.260759   -0.713 0.476755
## i_catwholesale      -2.340687    5.459131   -0.429 0.668495
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.987 on 230 degrees of freedom
## Multiple R-squared:  0.1781, Adjusted R-squared:  0.09236
## F-statistic: 2.077 on 24 and 230 DF,  p-value: 0.003149
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 32.374, df = 24, p-value = 0.118
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  2.3953797  2.5992579   0.9216 0.3577222
## `Prev E Score` -0.0265286  0.0161706  -1.6405 0.1022580
## `Prev G Score`  0.0027772  0.0144692   0.1919 0.8479602
## `Prev S Score`  0.0465370  0.0216359   2.1509 0.0325257 *
## `firm size`    -0.3146147  0.3547076  -0.8870 0.3760221
## leverage      2.6537747  2.8371153   0.9354 0.3505747
## `free cash flow` -1.8128138  6.4980300  -0.2790 0.7805116

```

```

## `Tobin's q`      0.0196178  0.4988110  0.0393  0.9686620
## preMTR          -6.6238148  1.7836326 -3.7137  0.0002564 ***
## deal_size       1.6436145  0.1948237  8.4364  3.655e-15 ***
## high_tech       0.2610264  0.7988128  0.3268  0.7441406
## diversifying    1.2192818  0.6247466  1.9516  0.0521946 .
## public_target   -0.5774681  1.0144556 -0.5692  0.5697492
## private_target  -0.0335638  0.6461110 -0.0519  0.9586157
## all_cash_deal  -0.2177583  0.7526756 -0.2893  0.7726031
## stock_deal     -1.3493915  1.5264454 -0.8840  0.3776145
## cross_border    1.3933708  0.7257799  1.9198  0.0561170 .
## i_catConstruction -2.1387243  2.1654614 -0.9877  0.3243605
## i_catfinance    -4.0196732  1.8456847 -2.1779  0.0304320 *
## i_catmanufacture -1.8403104  1.2479048 -1.4747  0.1416553
## i_catmining     -1.5087532  2.6823712 -0.5625  0.5743437
## i_catretail     -1.3385862  1.7762341 -0.7536  0.4518547
## i_catservices   -1.2358289  1.5297583 -0.8079  0.4200065
## i_cattransportation -3.7493371  1.7828350 -2.1030  0.0365510 *
## i_catwholesale  -2.3406874  1.8296183 -1.2793  0.2020696
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -15.6133  -2.4927  -0.0664   2.5975  21.9776
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -4.21074    4.22483  -0.997  0.320215
## `Prev E Score` -0.01289    0.02407  -0.536  0.592829
## `Prev G Score`  0.01215    0.01870   0.650  0.516674
## `Prev S Score` -0.03361    0.02663  -1.262  0.208463
## `firm size`    0.29871    0.40743   0.733  0.464387
## leverage      -0.51823    4.28880  -0.121  0.903953
## `free cash flow` -8.81827    8.62906  -1.022  0.308136
## `Tobin's q`   -0.19367    0.44799  -0.432  0.666018
## preMTR        -7.90317    1.80640  -4.375  2.01e-05 ***
## deal_size     -0.64488    2.48209  -0.260  0.795295
## hostile              NA              NA      NA      NA
## high_tech      -0.59653    0.97674  -0.611  0.542114
## diversifying    0.57677    0.85987   0.671  0.503201

```

```

## public_target      -0.84547      1.06845     -0.791  0.429769
## private_target    -0.88740      0.88669     -1.001  0.318216
## all_cash_deal     -0.15002      1.17438     -0.128  0.898492
## stock_deal        2.33765      1.81457      1.288  0.199245
## cross_border      -0.39972      0.91047     -0.439  0.661151
## i_catmanufacture   5.18182      1.53910      3.367  0.000923 ***
## i_catmining        5.01108      2.02871      2.470  0.014404 *
## i_catretail        8.43748      3.49669      2.413  0.016788 *
## i_catservices      5.03489      1.74315      2.888  0.004329 **
## i_cattransportation 1.75658      2.41800      0.726  0.468465
## i_catwholesale     3.46099      2.44640      1.415  0.158811
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.227 on 187 degrees of freedom
## Multiple R-squared:  0.1951, Adjusted R-squared:  0.1004
## F-statistic:  2.06 on 22 and 187 DF,  p-value: 0.00516
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 45.647, df = 22, p-value = 0.002195
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -4.210739   4.332196  -0.9720  0.332324
## `Prev E Score` -0.012895   0.021091  -0.6114  0.541678
## `Prev G Score`  0.012151   0.019580   0.6206  0.535649
## `Prev S Score` -0.033614   0.025113  -1.3385  0.182345
## `firm size`    0.298708   0.381886   0.7822  0.435090
## leverage      -0.518229   4.325330  -0.1198  0.904760
## `free cash flow` -8.818267  10.069810  -0.8757  0.382309
## `Tobin's q`    -0.193668   0.344569  -0.5621  0.574749
## preMTR        -7.903167   2.957461  -2.6723  0.008199 **
## deal_size     -0.644876   2.968434  -0.2172  0.828255
## high_tech     -0.596532   0.895328  -0.6663  0.506058
## diversifying   0.576766   0.815901   0.7069  0.480504
## public_target  -0.845468   0.974068  -0.8680  0.386520
## private_target -0.887404   0.818949  -1.0836  0.279942
## all_cash_deal -0.150016   0.989132  -0.1517  0.879616
## stock_deal     2.337653   1.954069   1.1963  0.233094
## cross_border  -0.399719   0.821599  -0.4865  0.627173
## i_catmanufacture 5.181823   1.801018   2.8772  0.004479 **
## i_catmining     5.011085   2.089638   2.3981  0.017466 *
## i_catretail     8.437479   3.058935   2.7583  0.006387 **
## i_catservices   5.034893   2.286558   2.2020  0.028892 *
## i_cattransportation 1.756578   2.382855   0.7372  0.461940

```

```

## i_catwholesale      3.460990    1.756452    1.9704 0.050263 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -34.759  -3.149   0.338   3.737  26.353
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    17.324464   5.819019   2.977 0.003117 **
## `Prev E Score` -0.031951   0.024536  -1.302 0.193729
## `Prev G Score` -0.005619   0.022152  -0.254 0.799910
## `Prev S Score`  0.038267   0.029842   1.282 0.200601
## `firm size`    -0.147015   0.394065  -0.373 0.709327
## leverage       -3.429763   4.336320  -0.791 0.429531
## `free cash flow` -23.191565   7.578479  -3.060 0.002388 **
## `Tobin's q`     0.283637   0.527485   0.538 0.591125
## preMTR         -5.944232   1.881576  -3.159 0.001724 **
## deal_size      -1.929601   3.498315  -0.552 0.581598
## hostile                NA             NA      NA      NA
## high_tech        1.569624   1.104577   1.421 0.156228
## diversifying     -0.271998   0.865995  -0.314 0.753648
## public_target    -0.777838   1.233098  -0.631 0.528595
## private_target   -0.668268   0.924151  -0.723 0.470106
## all_cash_deal    -0.917919   1.189038  -0.772 0.440660
## stock_deal       1.079365   2.072550   0.521 0.602852
## cross_border     -0.348002   0.917611  -0.379 0.704741
## i_catfinance     -13.542267   4.719231  -2.870 0.004367 **
## i_catmanufacture -12.837337   4.516350  -2.842 0.004748 **
## i_catmining      -20.463171   4.767109  -4.293 2.31e-05 ***
## i_catretail      -10.908493   4.947301  -2.205 0.028128 *
## i_catservices    -13.290231   4.626109  -2.873 0.004323 **
## i_cattransportation -13.276650   4.721349  -2.812 0.005209 **
## i_catwholesale   -18.081921   5.053162  -3.578 0.000396 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.382 on 340 degrees of freedom
## Multiple R-squared:  0.1384, Adjusted R-squared:  0.08011

```

```

## F-statistic: 2.374 on 23 and 340 DF,  p-value: 0.0004727
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 60.791, df = 23, p-value = 2.934e-05
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    17.324464  11.584958  1.4954  0.13573
## `Prev E Score` -0.031951  0.021573 -1.4810  0.13952
## `Prev G Score` -0.005619  0.023385 -0.2403  0.81025
## `Prev S Score`  0.038267  0.031262  1.2241  0.22177
## `firm size`    -0.147015  0.374834 -0.3922  0.69515
## leverage       -3.429763  3.907328 -0.8778  0.38068
## `free cash flow` -23.191565  9.354291 -2.4792  0.01365 *
## `Tobin's q`    0.283637  0.686443  0.4132  0.67972
## preMTR         -5.944233  2.298452 -2.5862  0.01012 *
## deal_size      -1.929601  4.407390 -0.4378  0.66180
## high_tech       1.569624  0.897883  1.7481  0.08134 .
## diversifying   -0.271998  0.840018 -0.3238  0.74629
## public_target  -0.777838  1.039778 -0.7481  0.45493
## private_target -0.668269  0.907283 -0.7366  0.46190
## all_cash_deal  -0.917919  0.906064 -1.0131  0.31174
## stock_deal     1.079365  2.223908  0.4853  0.62774
## cross_border   -0.348002  0.863151 -0.4032  0.68707
## i_catfinance   -13.542267  11.105641 -1.2194  0.22354
## i_catmanufacture -12.837337  11.099847 -1.1565  0.24828
## i_catmining    -20.463171  11.255682 -1.8180  0.06994 .
## i_catretail    -10.908493  11.060090 -0.9863  0.32469
## i_catservices  -13.290231  11.158921 -1.1910  0.23449
## i_cattransportation -13.276650  11.111729 -1.1948  0.23299
## i_catwholesale -18.081921  11.529300 -1.5683  0.11773
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:

```

```

##      Min      1Q   Median      3Q      Max
## -12.4392 -2.7679  0.1243  2.7576 13.3935
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -5.187882  4.974137  -1.043  0.2984
## `Prev E Score`  0.005515  0.023200  0.238  0.8124
## `Prev G Score` -0.028765  0.020553 -1.400  0.1634
## `Prev S Score` -0.031641  0.031819 -0.994  0.3214
## `firm size`    0.624590  0.352767  1.771  0.0784 .
## leverage      4.492932  3.929384  1.143  0.2544
## `free cash flow` 9.935902  4.153068  2.392  0.0178 *
## `Tobin's q`    0.288626  0.429282  0.672  0.5022
## preMTR        -2.912617  1.702885 -1.710  0.0890 .
## deal_size      3.019420  1.244253  2.427  0.0162 *
## hostile                NA                NA                NA                NA
## high_tech        -2.072061  1.037374 -1.997  0.0473 *
## diversifying     0.851927  0.844349  1.009  0.3144
## public_target   -0.460004  1.231279 -0.374  0.7092
## private_target  -0.280333  0.806170 -0.348  0.7285
## all_cash_deal   -1.642512  1.183982 -1.387  0.1671
## stock_deal      -0.759728  1.775173 -0.428  0.6692
## cross_border    0.253565  0.820998  0.309  0.7578
## i_catfinance    0.403199  3.837858  0.105  0.9164
## i_catmanufacture 2.384395  3.646543  0.654  0.5140
## i_catmining     2.218532  4.184801  0.530  0.5967
## i_catretail     4.117055  4.368265  0.942  0.3472
## i_catservices   1.811551  3.713468  0.488  0.6263
## i_cattransportation 0.606343  3.878370  0.156  0.8759
## i_catwholesale  3.151835  4.002135  0.788  0.4320
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.877 on 176 degrees of freedom
## Multiple R-squared:  0.1978, Adjusted R-squared:  0.09296
## F-statistic: 1.887 on 23 and 176 DF,  p-value: 0.01173
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 29.73, df = 23, p-value = 0.1573
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -5.1878824  4.6235255 -1.1221 0.263365
## `Prev E Score`  0.0055152  0.0225641  0.2444 0.807188
## `Prev G Score` -0.0287653  0.0217512 -1.3225 0.187729

```

```

## `Prev S Score`      -0.0316414  0.0320346 -0.9877 0.324644
## `firm size`        0.6245902  0.3657905  1.7075 0.089491 .
## leverage           4.4929319  3.9184187  1.1466 0.253096
## `free cash flow`   9.9359021  3.2071433  3.0981 0.002268 **
## `Tobin's q`        0.2886262  0.4195184  0.6880 0.492362
## preMTR             -2.9126167  2.1788538 -1.3368 0.183025
## deal_size          3.0194198  1.5159688  1.9917 0.047946 *
## high_tech          -2.0720605  1.0644054 -1.9467 0.053165 .
## diversifying        0.8519269  0.8080451  1.0543 0.293188
## public_target      -0.4600041  1.3871394 -0.3316 0.740570
## private_target     -0.2803329  0.7015117 -0.3996 0.689926
## all_cash_deal      -1.6425117  1.3169215 -1.2472 0.213968
## stock_deal         -0.7597281  1.8258940 -0.4161 0.677854
## cross_border        0.2535651  0.7640931  0.3319 0.740397
## i_catfinance        0.4031988  3.2453862  0.1242 0.901269
## i_catmanufacture    2.3843951  3.0685321  0.7770 0.438174
## i_catmining         2.2185320  4.3538868  0.5096 0.611004
## i_catretail         4.1170550  3.5149755  1.1713 0.243066
## i_catservices       1.8115509  3.1333231  0.5782 0.563898
## icattransportation  0.6063433  3.4185295  0.1774 0.859422
## i_catwholesale      3.1518348  3.2602113  0.9668 0.334992
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -13.579  -2.613  -0.152   2.270  17.383
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.203436   5.958530   0.873  0.38347
## `Prev E Score` -0.008110   0.020979  -0.387  0.69944
## `Prev G Score` -0.008813   0.016215  -0.544  0.58733
## `Prev S Score`  0.031940   0.025130   1.271  0.20508
## `firm size`    -0.606718   0.387738  -1.565  0.11908
## leverage        2.569569   3.339969   0.769  0.44252
## `free cash flow` -8.297557   6.653915  -1.247  0.21372
## `Tobin's q`     0.437652   0.418275   1.046  0.29656
## preMTR         -6.135853   1.513284  -4.055 6.98e-05 ***
## deal_size       1.511940   0.465451   3.248  0.00134 **

```

```

## hostile                NA                NA                NA                NA
## high_tech              -0.021525         0.881985        -0.024         0.98055
## diversifying           0.932367         0.713570         1.307         0.19271
## public_target          0.093345         0.982308         0.095         0.92438
## private_target         -0.209005         0.752688        -0.278         0.78152
## all_cash_deal          -0.335241         0.943515        -0.355         0.72270
## stock_deal             -1.224672         1.442504        -0.849         0.39681
## cross_border           0.675605         0.766429         0.881         0.37902
## i_catConstruction      -1.665585         5.781506        -0.288         0.77355
## i_catfinance           -3.320222         5.290411        -0.628         0.53092
## i_catmanufacture       -1.064157         5.109244        -0.208         0.83520
## i_catmining            0.077682         5.385698         0.014         0.98850
## i_catretail            -0.414648         5.896133        -0.070         0.94400
## i_catservices          -1.377164         5.155786        -0.267         0.78964
## i_cattransportation    -2.387684         5.236909        -0.456         0.64889
## i_catwholesale         0.056938         5.557241         0.010         0.99183
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.973 on 219 degrees of freedom
## Multiple R-squared:  0.1542, Adjusted R-squared:  0.06152
## F-statistic: 1.664 on 24 and 219 DF,  p-value: 0.03096
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 33.772, df = 24, p-value = 0.08881
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    5.2034359  2.7983672   1.8595  0.06430 .
## `Prev E Score` -0.0081103  0.0161939  -0.5008  0.61700
## `Prev G Score` -0.0088128  0.0142768  -0.6173  0.53769
## `Prev S Score`  0.0319403  0.0237178   1.3467  0.17948
## `firm size`    -0.6067182  0.3461898  -1.7526  0.08108 .
## leverage       2.5695687  2.8614024   0.8980  0.37017
## `free cash flow` -8.2975574  7.4917886  -1.1076  0.26927
## `Tobin's q`    0.4376518  0.4273557   1.0241  0.30692
## preMTR         -6.1358534  1.8910616  -3.2447  0.00136 **
## deal_size      1.5119395  0.1990835   7.5945 8.856e-13 ***
## high_tech      -0.0215248  0.8238167  -0.0261  0.97918
## diversifying    0.9323668  0.5999420   1.5541  0.12161
## public_target   0.0933454  1.0164266   0.0918  0.92691
## private_target  -0.2090049  0.6666295  -0.3135  0.75418
## all_cash_deal  -0.3352408  0.8142050  -0.4117  0.68093
## stock_deal     -1.2246719  1.5245035  -0.8033  0.42266
## cross_border    0.6756048  0.6974842   0.9686  0.33380

```



```

## i_catConstruction    -1.6655853  1.7112994 -0.9733   0.33148
## i_catfinance         -3.3202222  1.7912340 -1.8536   0.06514 .
## i_catmanufacture     -1.0641573  1.3536114 -0.7862   0.43262
## i_catmining          0.0776824  2.3035732  0.0337   0.97313
## i_catretail          -0.4146480  1.7665436 -0.2347   0.81464
## i_catservices        -1.3771639  1.6832073 -0.8182   0.41414
## i_cattransportation  -2.3876838  1.7280763 -1.3817   0.16847
## i_catwholesale        0.0569375  1.6197936  0.0352   0.97199
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -27.5297  -2.6906   0.1255   3.1704  12.4047
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -5.04443    10.01535  -0.504  0.61590
## `Prev E Score` -0.02437     0.04108  -0.593  0.55472
## `Prev G Score` -0.01833     0.04015  -0.456  0.64933
## `Prev S Score`  0.03857     0.05709   0.676  0.50123
## `firm size`    -0.38642     0.80196  -0.482  0.63125
## leverage        6.33447     6.62943   0.956  0.34224
## `free cash flow` -27.92028     8.66345  -3.223  0.00185 **
## `Tobin's q`     0.85996     0.62869   1.368  0.17524
## preMTR          -1.01055     4.06265  -0.249  0.80421
## deal_size       1.33561     2.43225   0.549  0.58447
## hostile          NA           NA         NA      NA
## high_tech       -0.16483     1.82553  -0.090  0.92828
## diversifying    -0.22827     1.40981  -0.162  0.87178
## public_target   -0.80536     2.02259  -0.398  0.69157
## private_target  -0.83984     1.49867  -0.560  0.57680
## all_cash_deal  -1.59666     2.36208  -0.676  0.50104
## stock_deal      5.07960     3.18553   1.595  0.11480
## cross_border    -2.60145     1.66169  -1.566  0.12145
## i_catfinance    -0.59183     7.25003  -0.082  0.93515
## i_catmanufacture 11.00792     6.56490   1.677  0.09754 .
## i_catmining      7.69780     7.40492   1.040  0.30172
## i_catretail     15.85982     6.97453   2.274  0.02568 *
## i_catservices   10.31455     6.71391   1.536  0.12846

```

```

## i_cattransportation 6.09473 7.57314 0.805 0.42336
## i_catwholesale 10.53533 6.83240 1.542 0.12708
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.978 on 79 degrees of freedom
## Multiple R-squared: 0.3831, Adjusted R-squared: 0.2035
## F-statistic: 2.133 on 23 and 79 DF, p-value: 0.007089
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 26.724, df = 23, p-value = 0.2679
##
##
## t test of coefficients:
##
## Estimate Std. Error t value Pr(>|t|)
## (Intercept) -5.044426 6.130569 -0.8228 0.41308
## `Prev E Score` -0.024372 0.043605 -0.5589 0.57779
## `Prev G Score` -0.018327 0.030594 -0.5990 0.55086
## `Prev S Score` 0.038573 0.047234 0.8166 0.41659
## `firm size` -0.386416 0.744865 -0.5188 0.60537
## leverage 6.334468 5.335579 1.1872 0.23870
## `free cash flow` -27.920284 8.419377 -3.3162 0.00138 **
## `Tobin's q` 0.859960 0.528374 1.6276 0.10760
## preMTR -1.010548 4.756039 -0.2125 0.83228
## deal_size 1.335607 1.827594 0.7308 0.46706
## high_tech -0.164830 1.902270 -0.0866 0.93117
## diversifying -0.228274 0.931076 -0.2452 0.80696
## public_target -0.805356 2.000621 -0.4026 0.68836
## private_target -0.839838 1.041781 -0.8062 0.42257
## all_cash_deal -1.596656 1.433943 -1.1135 0.26888
## stock_deal 5.079604 2.066354 2.4582 0.01615 *
## cross_border -2.601454 1.083526 -2.4009 0.01870 *
## i_catfinance -0.591833 3.348801 -0.1767 0.86017
## i_catmanufacture 11.007918 1.898785 5.7973 1.323e-07 ***
## i_catmining 7.697805 3.748220 2.0537 0.04331 *
## i_catretail 15.859823 2.443813 6.4898 6.937e-09 ***
## i_catservices 10.314547 2.284881 4.5143 2.189e-05 ***
## i_cattransportation 6.094730 3.305075 1.8441 0.06892 .
## i_catwholesale 10.535334 2.243670 4.6956 1.102e-05 ***
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +

```

```

## `firm size` + leverage + `free cash flow` + `Tobin's q` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal +
## cross_border + i_cat, data = data1[data1$year %in% c(year,
## year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -43.228  -3.061   0.270   3.261  24.022
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.508739   7.290836   0.070  0.94440
## `Prev E Score` -0.008558   0.017424  -0.491  0.62354
## `Prev G Score` -0.015830   0.016339  -0.969  0.33307
## `Prev S Score` -0.008265   0.021539  -0.384  0.70133
## `firm size`    0.067259   0.304296   0.221  0.82515
## leverage       0.959860   2.852825   0.336  0.73666
## `free cash flow` -6.348221   4.475339  -1.418  0.15663
## `Tobin's q`    -0.003581   0.360216  -0.010  0.99207
## preMTR         -6.946379   1.376156  -5.048 6.15e-07 ***
## deal_size      2.937208   2.054813   1.429  0.15347
## hostile                NA                NA                NA                NA
## high_tech        0.383123   0.879135   0.436  0.66316
## diversifying     -0.047780   0.646229  -0.074  0.94109
## public_target   -2.888900   0.914846  -3.158  0.00168 **
## private_target  -1.258566   0.668345  -1.883  0.06023 .
## all_cash_deal   1.618348   0.884636   1.829  0.06790 .
## stock_deal      3.387987   1.300114   2.606  0.00942 **
## cross_border    0.238039   0.701712   0.339  0.73457
## i_catConstruction -1.433864   7.149163  -0.201  0.84112
## i_catfinance     -0.724292   6.797900  -0.107  0.91519
## i_catmanufacture 1.158227   6.773867   0.171  0.86430
## i_catmining     -4.596841   6.905335  -0.666  0.50590
## i_catretail      1.673307   6.968830   0.240  0.81034
## i_catservices    0.386562   6.831075   0.057  0.95489
## i_cattransportation -1.519552   6.868962  -0.221  0.82501
## i_catwholesale   0.112093   6.935972   0.016  0.98711
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.692 on 531 degrees of freedom
## Multiple R-squared:  0.1133, Adjusted R-squared:  0.07323
## F-statistic: 2.827 on 24 and 531 DF,  p-value: 1.152e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 67.823, df = 24, p-value = 4.648e-06

```

```

##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.5087394  2.7777985  0.1831  0.85475
## `Prev E Score` -0.0085575  0.0147882 -0.5787  0.56306
## `Prev G Score` -0.0158298  0.0162665 -0.9732  0.33092
## `Prev S Score` -0.0082654  0.0197628 -0.4182  0.67595
## `firm size`    0.0672588  0.2557203  0.2630  0.79264
## leverage       0.9598602  3.2953803  0.2913  0.77096
## `free cash flow` -6.3482207  5.8763837 -1.0803  0.28050
## `Tobin's q`    -0.0035806  0.4052554 -0.0088  0.99295
## preMTR         -6.9463794  1.7537503 -3.9609 8.487e-05 ***
## deal_size      2.9372081  3.2483079  0.9042  0.36629
## high_tech      0.3831226  0.8778124  0.4365  0.66269
## diversifying   -0.0477799  0.6827217 -0.0700  0.94423
## public_target  -2.8889002  0.9274855 -3.1148  0.00194 **
## private_target -1.2585660  0.6198358 -2.0305  0.04281 *
## all_cash_deal  1.6183483  0.9218928  1.7555  0.07976 .
## stock_deal     3.3879873  1.6263592  2.0832  0.03771 *
## cross_border   0.2380394  0.6504611  0.3660  0.71454
## i_catConstruction -1.4338637  2.7321731 -0.5248  0.59994
## i_catfinance    -0.7242917  1.0601431 -0.6832  0.49478
## i_catmanufacture 1.1582273  0.9249604  1.2522  0.21105
## i_catmining     -4.5968407  2.3007283 -1.9980  0.04623 *
## i_catretail     1.6733072  1.9753137  0.8471  0.39732
## i_catservices   0.3865623  1.2402852  0.3117  0.75541
## i_cattransportation -1.5195516  1.3284603 -1.1438  0.25320
## i_catwholesale  0.1120933  2.6932426  0.0416  0.96682
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -40.937  -2.654   0.038   2.887  23.361
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    3.457638   2.895349   1.194 0.232903

```

```

## `Prev E Score`      -0.027974    0.015076   -1.856 0.064047 .
## `Prev G Score`      -0.015770    0.013183   -1.196 0.232106
## `Prev S Score`      0.031685    0.018121    1.749 0.080916 .
## `firm size`         0.003838    0.241266    0.016 0.987313
## leverage            -0.636850    2.290713   -0.278 0.781104
## `free cash flow`    1.643568    2.253075    0.729 0.466014
## `Tobin's q`         -0.430857    0.273541   -1.575 0.115795
## preMTR              -5.613807    1.238249   -4.534 7.09e-06 ***
## deal_size          -0.271019    1.517383   -0.179 0.858309
## hostile              NA              NA          NA      NA
## high_tech          -2.553217    0.762833   -3.347 0.000872 ***
## diversifying       -0.616076    0.571023   -1.079 0.281097
## public_target      -0.386732    0.869277   -0.445 0.656572
## private_target     -0.377212    0.529396   -0.713 0.476431
## all_cash_deal      -0.756552    0.831034   -0.910 0.363016
## stock_deal         1.244271    1.140826    1.091 0.275884
## cross_border       0.641235    0.602978    1.063 0.288037
## i_catfinance       -2.366197    2.065480   -1.146 0.252453
## i_catmanufacture   -0.503561    2.013689   -0.250 0.802625
## i_catmining        -2.874692    2.433017   -1.182 0.237891
## i_catretail        -1.420347    2.318747   -0.613 0.540423
## i_catservices      0.950958    2.098108    0.453 0.650547
## i_cattransportation -2.017487    2.178632   -0.926 0.354827
## i_catwholesale     -2.826536    2.458526   -1.150 0.250763
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.697 on 561 degrees of freedom
## Multiple R-squared:  0.1023, Adjusted R-squared:  0.06552
## F-statistic:  2.78 on 23 and 561 DF,  p-value: 2.178e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 49.152, df = 23, p-value = 0.001189
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.4576382  2.6726777   1.2937 0.1963021
## `Prev E Score` -0.0279736  0.0128546  -2.1762 0.0299604 *
## `Prev G Score` -0.0157699  0.0137552  -1.1465 0.2520914
## `Prev S Score`  0.0316845  0.0184221   1.7199 0.0859982 .
## `firm size`    0.0038383  0.2340466   0.0164 0.9869215
## leverage      -0.6368502  2.1567395  -0.2953 0.7678864
## `free cash flow` 1.6435682  2.8003897   0.5869 0.5575023
## `Tobin's q`    -0.4308567  0.3492339  -1.2337 0.2178241
## preMTR        -5.6138073  1.5367329  -3.6531 0.0002834 ***

```

```

## deal_size          -0.2710192  1.6973372 -0.1597  0.8731960
## high_tech          -2.5532170  0.7337012 -3.4799  0.0005406 ***
## diversifying       -0.6160758  0.6327579 -0.9736  0.3306569
## public_target      -0.3867317  0.8929314 -0.4331  0.6651060
## private_target     -0.3772119  0.5008058 -0.7532  0.4516398
## all_cash_deal     -0.7565518  0.9489800 -0.7972  0.4256569
## stock_deal         1.2442712  1.3180102  0.9441  0.3455491
## cross_border       0.6412347  0.6524642  0.9828  0.3261349
## i_catfinance       -2.3661973  1.7937529 -1.3191  0.1876631
## i_catmanufacture   -0.5035613  1.7875359 -0.2817  0.7782721
## i_catmining        -2.8746918  2.2605020 -1.2717  0.2040049
## i_catretail        -1.4203471  2.0236642 -0.7019  0.4830520
## i_catservices      0.9509583  1.9188951  0.4956  0.6203877
## i_cattransportation -2.0174870  1.9612391 -1.0287  0.3040735
## i_catwholesale     -2.8265361  3.4354031 -0.8228  0.4109901
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -29.599  -3.268  -0.066   3.595  54.880
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.320649   8.276485   0.039  0.9691
## `Prev E Score`  0.008339   0.022428   0.372  0.7102
## `Prev G Score` -0.038855   0.019933  -1.949  0.0519 .
## `Prev S Score` -0.021681   0.027093  -0.800  0.4240
## `firm size`    0.358278   0.350962   1.021  0.3079
## leverage       3.529327   2.999837   1.177  0.2400
## `free cash flow` 9.388182   4.533557   2.071  0.0389 *
## `Tobin's q`    0.124001   0.410939   0.302  0.7630
## preMTR         -6.099395   1.351378  -4.513 8.09e-06 ***
## deal_size      8.830262   1.239817   7.122 4.07e-12 ***
## hostile                NA                NA                NA                NA
## high_tech          1.377007   1.227132   1.122  0.2624
## diversifying      -1.551958   0.850151  -1.826  0.0686 .
## public_target     -5.423487   1.171871  -4.628 4.80e-06 ***
## private_target    1.410110   0.869637   1.621  0.1056
## all_cash_deal    -0.688627   1.333556  -0.516  0.6058

```

```

## stock_deal      -3.560005    1.599775   -2.225    0.0265 *
## cross_border    2.453752    0.974423    2.518    0.0121 *
## i_catConstruction -2.155232    8.510361   -0.253    0.8002
## i_catfinance    -4.082516    8.059174   -0.507    0.6127
## i_catmanufacture -3.655398    8.010019   -0.456    0.6483
## i_catmining     -5.843514    8.188830   -0.714    0.4758
## i_catretail     -4.392826    8.805406   -0.499    0.6181
## i_catservices   -2.642991    8.045182   -0.329    0.7427
## i_cattransportation -1.519320    8.107082   -0.187    0.8514
## i_catwholesale   1.717826    8.248391    0.208    0.8351
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.878 on 464 degrees of freedom
## Multiple R-squared:  0.2596, Adjusted R-squared:  0.2213
## F-statistic:  6.78 on 24 and 464 DF,  p-value: < 2.2e-16
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 206.81, df = 24, p-value < 2.2e-16
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.3206491  2.4729928  0.1297 0.8968913
## `Prev E Score`  0.0083392  0.0198095  0.4210 0.6739713
## `Prev G Score` -0.0388552  0.0194410 -1.9986 0.0462328 *
## `Prev S Score` -0.0216811  0.0239292 -0.9061 0.3653784
## `firm size`    0.3582777  0.3135988  1.1425 0.2538472
## leverage       3.5293272  3.1152688  1.1329 0.2578360
## `free cash flow` 9.3881817  4.3989079  2.1342 0.0333494 *
## `Tobin's q`    0.1240013  0.4474440  0.2771 0.7818017
## preMTR         -6.0993949  1.9046012 -3.2025 0.0014563 **
## deal_size      8.8302621  5.3233670  1.6588 0.0978371 .
## high_tech      1.3770072  1.2258264  1.1233 0.2618784
## diversifying   -1.5519580  0.8620694 -1.8003 0.0724673 .
## public_target  -5.4234872  1.4987840 -3.6186 0.0003288 ***
## private_target  1.4101095  0.9431727  1.4951 0.1355758
## all_cash_deal  -0.6886270  1.4972819 -0.4599 0.6457905
## stock_deal     -3.5600047  2.7729582 -1.2838 0.1998425
## cross_border    2.4537515  0.9019705  2.7204 0.0067645 **
## i_catConstruction -2.1552324  2.4785922 -0.8695 0.3850020
## i_catfinance    -4.0825160  1.5510498 -2.6321 0.0087687 **
## i_catmanufacture -3.6553976  1.5816857 -2.3111 0.0212660 *
## i_catmining     -5.8435136  3.0842704 -1.8946 0.0587645 .
## i_catretail     -4.3928256  4.0875872 -1.0747 0.2830790
## i_catservices   -2.6429906  1.6336200 -1.6179 0.1063694

```

```

## i_cattransportation -1.5193203  1.6273269 -0.9336 0.3509807
## i_catwholesale      1.7178260  3.2669540  0.5258 0.5992653
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat, data = data1[data1$year %in% c(year,
##   year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -26.9569  -3.9094  -0.0079   3.9367  24.3565
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -8.7336397  10.9482108  -0.798  0.4265
## `Prev E Score`  0.0002231  0.0514165   0.004  0.9965
## `Prev G Score` -0.0982164  0.0419139  -2.343  0.0206 *
## `Prev S Score`  0.0229052  0.0618426   0.370  0.7117
## `firm size`    0.3519971  0.6908108   0.510  0.6112
## leverage       4.9032177  6.9547291   0.705  0.4821
## `free cash flow` 4.2580580  5.7920656   0.735  0.4636
## `Tobin's q`    -0.2818133  0.5306259  -0.531  0.5963
## preMTR         -6.9704975  3.2726134  -2.130  0.0351 *
## deal_size      -5.8322420  1.1932821  -4.888 2.95e-06 ***
## hostile                NA                NA                NA                NA
## high_tech            0.8802767  2.0146658   0.437  0.6629
## diversifying       -2.5440037  1.7517774  -1.452  0.1488
## public_target      -2.9404584  2.7310959  -1.077  0.2836
## private_target     -1.5942947  1.7330612  -0.920  0.3593
## all_cash_deal       1.3908590  2.5380984   0.548  0.5846
## stock_deal         4.7291272  2.9635545   1.596  0.1130
## cross_border       -0.1606206  1.8370018  -0.087  0.9305
## i_catfinance       10.6679066  9.2482349   1.154  0.2508
## i_catmanufacture   10.7179683  9.0434084   1.185  0.2381
## i_catmining        17.1318523  9.7060806   1.765  0.0799 .
## i_catretail        14.9998690  9.4484468   1.588  0.1148
## i_catservices      10.6079134  9.1362381   1.161  0.2477
## i_cattransportation 6.0472403  9.3818453   0.645  0.5203
## i_catwholesale     12.7532003  9.4489630   1.350  0.1795
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.499 on 130 degrees of freedom

```



```

## Multiple R-squared:  0.2598, Adjusted R-squared:  0.1288
## F-statistic: 1.984 on 23 and 130 DF,  p-value: 0.008742
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 67.263, df = 23, p-value = 3.194e-06
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)   -8.73363967  6.67506550  -1.3084 0.1930470
## `Prev E Score`  0.00022314  0.04398067  0.0051 0.9959596
## `Prev G Score` -0.09821635  0.04184137 -2.3474 0.0204176 *
## `Prev S Score`  0.02290522  0.05215040  0.4392 0.6612352
## `firm size`    0.35199714  0.64019152  0.5498 0.5833787
## leverage      4.90321771  7.33812611  0.6682 0.5052008
## `free cash flow` 4.25805803  7.14119229  0.5963 0.5520336
## `Tobin's q`    -0.28181327  0.42910510 -0.6567 0.5125049
## preMTR        -6.97049745  3.04822146 -2.2867 0.0238275 *
## deal_size     -5.83224198  2.17729300 -2.6787 0.0083466 **
## high_tech      0.88027671  1.93057143  0.4560 0.6491745
## diversifying  -2.54400369  1.48986880 -1.7075 0.0901097 .
## public_target -2.94045836  2.89789739 -1.0147 0.3121399
## private_target -1.59429467  1.56646478 -1.0178 0.3106795
## all_cash_deal  1.39085899  1.79996961  0.7727 0.4410952
## stock_deal    4.72912720  2.40304429  1.9680 0.0511995 .
## cross_border  -0.16062065  1.61473655 -0.0995 0.9209170
## i_catfinance  10.66790661  3.14115975  3.3962 0.0009069 ***
## i_catmanufacture 10.71796830  3.04610909  3.5186 0.0005985 ***
## i_catmining     17.13185227  8.25149584  2.0762 0.0398445 *
## i_catretail    14.99986904  3.00782709  4.9869 1.923e-06 ***
## i_catservices  10.60791338  3.35596955  3.1609 0.0019572 **
## i_cattransportation 6.04724026  3.04004492  1.9892 0.0487789 *
## i_catwholesale 12.75320028  3.12250860  4.0843 7.682e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

####run model with rolling window to show E, S, G effect on firm value
over time with intersection factor
####with cross border and S score intersection factor
##CAR11 regression model
# Create an empty list to store the model summaries
model_summaries <- list()
reg_model<-list()

start_year <- 2003
end_year <- 2015

```

```

# Iterate over the range of years
for (year in start_year:end_year) {

  # Fit the regression model for the current year
  reg_model <- lm(CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+I(`Prev S Score`*cross_border)+ `firm size` + leverage + `free cash flow` + `Tobin's q`
+ preMTR + deal_size + hostile + high_tech + diversifying + public_target + private_target + all_cash_deal + stock_deal + cross_border + i_cat,
data = data1[data1$year%in% c(year,year+4),])

  # Store the summary of the regression model in the list
  model_summaries[[year]] <- summary(reg_model)

  # Print the summary for the current year
  print(model_summaries[[year]])
  ##test heteroscedasticity problem
  hetero_test <- bptest( reg_model)
  print(hetero_test)
  ##use white's robustness standard error
  coeftestttt<-coeftest(reg_model, vcov = vcovHC(reg_model, type='HC0',
cluster='a_industry'))
  print(coeftestttt)
}

##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` +
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
## data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.1378  -2.1041  -0.2602   1.4372  21.6800
##
## Coefficients:
##
##              Estimate Std. Error t value Pr(>|t
## (Intercept)          7.121286   4.450414   1.600  0.110
78

```

## `Prev E Score` 10	0.018342	0.015745	1.165	0.245
## `Prev G Score` 74	0.003923	0.011521	0.341	0.733
## `Prev S Score` 70	-0.011577	0.022587	-0.513	0.608
## I(`Prev S Score` * cross_border) 16	-0.006044	0.025000	-0.242	0.809
## `firm size` 30 .	-0.405819	0.240183	-1.690	0.092
## leverage 64	-3.813331	2.328091	-1.638	0.102
## `free cash flow` 09	-4.467251	3.769726	-1.185	0.237
## `Tobin's q` 05 *	-0.411412	0.201366	-2.043	0.042
## preMTR 63	0.585196	0.962278	0.608	0.543
## deal_size 38	0.173487	1.505989	0.115	0.908
## hostile 29	-1.598816	3.940750	-0.406	0.685
## high_tech 22	0.631554	0.630215	1.002	0.317
## diversifying 92	0.020253	0.503041	0.040	0.967
## public_target 68 .	-1.150485	0.669006	-1.720	0.086
## private_target 29	-0.659723	0.554580	-1.190	0.235
## all_cash_deal 22	-0.759149	0.720793	-1.053	0.293
## stock_deal 46 **	-2.890592	1.007686	-2.869	0.004
## cross_border 64	-0.124272	1.058643	-0.117	0.906
## i_catConstruction 26	-2.848339	4.656285	-0.612	0.541
## i_catfinance 39	-0.421450	3.916422	-0.108	0.914
## i_catmanufacture 25	-0.119020	3.832866	-0.031	0.975
## i_catmining 67	0.133044	3.880296	0.034	0.972
## i_catretail 77	0.414679	4.062197	0.102	0.918
## i_catservices 29	0.372349	3.863013	0.096	0.923
## i_cattransportation 07	-0.178787	3.965351	-0.045	0.964

```

## i_catwholesale          -0.109864   4.237057  -0.026  0.979
33
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.767 on 260 degrees of freedom
## Multiple R-squared:  0.1542, Adjusted R-squared:  0.06967
## F-statistic: 1.824 on 26 and 260 DF,  p-value: 0.01031
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 54.662, df = 26, p-value = 0.0008371
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept)          7.1212864   2.8330649   2.5136  0.0
1255 *
## `Prev E Score`       0.0183418   0.0117198   1.5650  0.1
1879
## `Prev G Score`       0.0039232   0.0122349   0.3207  0.7
4873
## `Prev S Score`      -0.0115771   0.0197930  -0.5849  0.5
5912
## I(`Prev S Score` * cross_border) -0.0060440   0.0246118  -0.2456  0.8
0621
## `firm size`         -0.4058187   0.2362706  -1.7176  0.0
8706 .
## leverage            -3.8133311   2.2116304  -1.7242  0.0
8586 .
## `free cash flow`    -4.4672506   4.5646920  -0.9787  0.3
2866
## `Tobin's q`        -0.4114122   0.2329999  -1.7657  0.0
7862 .
## preMTR              0.5851962   1.6072529   0.3641  0.7
1608
## deal_size           0.1734867   3.2965182   0.0526  0.9
5807
## hostile             -1.5988162   1.2096495  -1.3217  0.1
8742
## high_tech           0.6315538   0.6676750   0.9459  0.3
4508
## diversifying         0.0202529   0.5174628   0.0391  0.9
6881
## public_target       -1.1504846   0.6661260  -1.7271  0.0
8533 .

```

```

## private_target          -0.6597234  0.5212843 -1.2656  0.2
0680
## all_cash_deal          -0.7591494  0.6788120 -1.1183  0.2
6445
## stock_deal             -2.8905924  1.1911283 -2.4268  0.0
1591 *
## cross_border           -0.1242723  1.3046376 -0.0953  0.9
2419
## i_catConstruction      -2.8483395  0.6561568 -4.3409  2.034
e-05 ***
## i_catfinance           -0.4214496  0.8770971 -0.4805  0.6
3127
## i_catmanufacture       -0.1190201  0.6713746 -0.1773  0.8
5943
## i_catmining            0.1330442  0.9155970  0.1453  0.8
8458
## i_catretail            0.4146791  1.8351838  0.2260  0.8
2141
## i_catservices          0.3723493  0.8293734  0.4490  0.6
5384
## i_cattransportation    -0.1787871  1.1695853 -0.1529  0.8
7862
## i_catwholesale         -0.1098636  1.1660787 -0.0942  0.9
2501
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -16.3694  -1.9921  -0.0827   1.9261  18.2528
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          13.088327   4.538955   2.884  0.00
427 **
## `Prev E Score`       -0.013622   0.020011  -0.681  0.49
665
## `Prev G Score`        0.002475   0.014889   0.166  0.86

```

```

809
## `Prev S Score`          0.021767    0.027219    0.800    0.42
463
## I(`Prev S Score` * cross_border) -0.006718    0.028664   -0.234    0.81
489
## `firm size`            -0.460918    0.332119   -1.388    0.16
641
## leverage                4.784589    3.759030    1.273    0.20
424
## `free cash flow`       0.358193    4.982865    0.072    0.94
275
## `Tobin's q`            0.191298    0.316333    0.605    0.54
589
## preMTR                  -0.246322    1.291637   -0.191    0.84
891
## deal_size              -4.340328    2.216560   -1.958    0.05
131 .
## hostile                  NA            NA            NA
NA
## high_tech               0.657951    0.795147    0.827    0.40
875
## diversifying            -0.120009    0.628706   -0.191    0.84
877
## public_target           0.666965    0.978102    0.682    0.49
593
## private_target          -0.396996    0.707421   -0.561    0.57
516
## all_cash_deal           0.048983    0.977871    0.050    0.96
009
## stock_deal              -1.891591    1.352043   -1.399    0.16
301
## cross_border            0.497829    1.239540    0.402    0.68
830
## i_catfinance            -8.702048    3.711678   -2.345    0.01
982 *
## i_catmanufacture        -10.062065    3.483449   -2.889    0.00
420 **
## i_catmining             -11.500163    3.656358   -3.145    0.00
186 **
## i_catretail             -10.365590    3.826637   -2.709    0.00
721 **
## i_catservices           -10.742775    3.497327   -3.072    0.00
236 **
## i_cattransportation     -10.138821    3.699292   -2.741    0.00
657 **
## i_catwholesale          -10.865555    3.901560   -2.785    0.00
576 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##

```

```

## Residual standard error: 4.685 on 254 degrees of freedom
## Multiple R-squared:  0.09874,    Adjusted R-squared:  0.01358
## F-statistic: 1.16 on 24 and 254 DF,  p-value: 0.2803
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 43.985, df = 24, p-value = 0.007661
##
##
## t test of coefficients:
##
##
##           Estimate Std. Error t value Pr(
>|t|)
## (Intercept)      13.0883266    5.1018466   2.5654 0.0
10880 *
## `Prev E Score`   -0.0136221    0.0170370  -0.7996 0.4
24711
## `Prev G Score`   0.0024753    0.0143667   0.1723 0.8
63344
## `Prev S Score`   0.0217669    0.0197615   1.1015 0.2
71729
## I(`Prev S Score` * cross_border) -0.0067177    0.0246798  -0.2722 0.7
85695
## `firm size`      -0.4609185    0.3307628  -1.3935 0.1
64686
## leverage         4.7845886    3.9889693   1.1995 0.2
31469
## `free cash flow` 0.3581930    5.7543220   0.0622 0.9
50415
## `Tobin's q`      0.1912984    0.2690747   0.7109 0.4
77768
## preMTR           -0.2463218    1.4990177  -0.1643 0.8
69608
## deal_size        -4.3403278    1.5421063  -2.8145 0.0
05267 **
## high_tech         0.6579511    0.7691167   0.8555 0.3
93101
## diversifying     -0.1200088    0.5809989  -0.2066 0.8
36522
## public_target     0.6669650    0.8732813   0.7637 0.4
45728
## private_target   -0.3969959    0.7345321  -0.5405 0.5
89343
## all_cash_deal    0.0489825    0.6694249   0.0732 0.9
41728
## stock_deal       -1.8915909    1.1717491  -1.6143 0.1
07697
## cross_border      0.4978288    1.2485125   0.3987 0.6

```

```

90422
## i_catfinance          -8.7020482    4.6403938 -1.8753 0.0
61901 .
## i_catmanufacture     -10.0620648    4.3184892 -2.3300 0.0
20590 *
## i_catmining          -11.5001629    4.6013402 -2.4993 0.0
13076 *
## i_catretail          -10.3655898    4.4953913 -2.3058 0.0
21926 *
## i_catservices        -10.7427754    4.3182337 -2.4878 0.0
13497 *
## i_cattransportation  -10.1388208    4.3671728 -2.3216 0.0
21046 *
## i_catwholesale       -10.8655553    4.3391019 -2.5041 0.0
12904 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -13.2830  -1.5571  -0.0569   1.4772  13.7065
##
## Coefficients:
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          5.766658    3.666505   1.573 0.1173
39
## `Prev E Score`       0.009748    0.013144   0.742 0.4591
96
## `Prev G Score`     -0.015597    0.013328  -1.170 0.2432
87
## `Prev S Score`      0.004838    0.030880   0.157 0.8756
70
## I(`Prev S Score` * cross_border) 0.017006    0.031242   0.544 0.5868
15
## `firm size`        -0.672695    0.281404  -2.390 0.0177
49 *
## leverage           -0.974566    2.866030  -0.340 0.7341
81

```



```

## `free cash flow`          -6.930744    3.970574   -1.746 0.0824
21 .
## `Tobin's q`              0.430457    0.181056    2.377 0.0183
69 *
## preMTR                   -1.389394    0.994437   -1.397 0.1639
04
## deal_size                -3.480179    0.955416   -3.643 0.0003
43 ***
## hostile                   -2.180081    3.718165   -0.586 0.5583
10
## high_tech                 0.197686    0.589520    0.335 0.7377
23
## diversifying             -1.132622    0.533125   -2.124 0.0348
50 *
## public_target            -0.870432    0.740741   -1.175 0.2413
52
## private_target           -0.782218    0.571303   -1.369 0.1724
71
## all_cash_deal            0.244431    0.650655    0.376 0.7075
59
## stock_deal               -0.256633    0.888454   -0.289 0.7729
91
## cross_border             -0.764509    1.258696   -0.607 0.5442
83
## i_catfinance             3.488792    2.653997    1.315 0.1901
62
## i_catmanufacture         2.034461    2.555199    0.796 0.4268
53
## i_catmining              1.055798    2.771216    0.381 0.7036
15
## i_catretail              5.997568    3.019218    1.986 0.0483
40 *
## i_catservices            1.722904    2.596409    0.664 0.5077
25
## i_cattransportation      1.014167    2.793445    0.363 0.7169
47
## i_catwholesale           1.543126    3.658789    0.422 0.6736
52
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.422 on 201 degrees of freedom
## Multiple R-squared:  0.1808, Adjusted R-squared:  0.07889
## F-statistic: 1.774 on 25 and 201 DF,  p-value: 0.01663
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 43.717, df = 25, p-value = 0.01166

```

```

##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>
|t|)
## (Intercept)           5.7666584  2.4010359  2.4017 0.017
2277 *
## `Prev E Score`
1205           0.0097478  0.0115360  0.8450 0.399
## `Prev G Score`
1423          -0.0155970  0.0125980 -1.2380 0.217
## `Prev S Score`
7075           0.0048376  0.0231532  0.2089 0.834
## I(`Prev S Score` * cross_border)
2611           0.0170062  0.0246052  0.6912 0.490
## `firm size`
0223 *          -0.6726945  0.3204093 -2.0995 0.037
## leverage
2870           -0.9745664  3.4408220 -0.2832 0.777
## `free cash flow`
9164           -6.9307442  5.4133904 -1.2803 0.201
## `Tobin's q`
2467           0.4304566  0.2690941  1.5997 0.111
## preMTR
7237           -1.3893940  1.0343954 -1.3432 0.180
## deal_size
2052 ***        -3.4801789  0.9202158 -3.7819 0.000
## hostile
4446           -2.1800808  1.4879655 -1.4651 0.144
## high_tech
6957           0.1976863  0.4977919  0.3971 0.691
## diversifying
7397 *          -1.1326224  0.4694727 -2.4125 0.016
## public_target
1119 .          -0.8704322  0.5253568 -1.6568 0.099
## private_target
0226           -0.7822177  0.4928059 -1.5873 0.114
## all_cash_deal
5053           0.2444309  0.5522171  0.4426 0.658
## stock_deal
9631           -0.2566329  1.0012065 -0.2563 0.797
## cross_border
7358           -0.7645092  1.0207133 -0.7490 0.454
## i_catfinance
3056 *          3.4887922  1.5033307  2.3207 0.021
## i_catmanufacture
6085 *          2.0344613  0.9720548  2.0929 0.037
## i_catmining
0280           1.0557977  1.8605339  0.5675 0.571

```

```

## i_catretail          5.9975685  1.6785388  3.5731 0.000
4416 ***
## i_catservices       1.7229039  1.0220939  1.6857 0.093
4128 .
## i_cattransportation 1.0141669  1.2411338  0.8171 0.414
8220
## i_catwholesale      1.5431257  1.4309462  1.0784 0.282
1498
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.3092  -1.6279  -0.1391   1.2962  13.6666
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          2.158893    4.296988   0.502  0.61
59
## `Prev E Score`       -0.016849    0.015802  -1.066  0.28
74
## `Prev G Score`       -0.009772    0.011868  -0.823  0.41
11
## `Prev S Score`        0.033302    0.029028   1.147  0.25
25
## I(`Prev S Score` * cross_border) 0.011795    0.027393   0.431  0.66
72
## `firm size`         -0.557120    0.271515  -2.052  0.04
13 *
## leverage            0.585452    2.528287   0.232  0.81
71
## `free cash flow`     4.821801    5.209905   0.926  0.35
57
## `Tobin's q`         -0.037884    0.355892  -0.106  0.91
53
## preMTR              -2.255464    1.104036  -2.043  0.04
22 *
## deal_size           0.867802    0.335067   2.590  0.01

```

```

02 *
## hostile                NA                NA                NA
NA
## high_tech             -0.295186    0.615042   -0.480    0.63
17
## diversifying         -0.085479    0.541037   -0.158    0.87
46
## public_target        -0.296708    0.717532   -0.414    0.67
96
## private_target       0.340580    0.536061    0.635    0.52
58
## all_cash_deal        0.021965    0.659050    0.033    0.97
34
## stock_deal           -0.469870    1.037258   -0.453    0.65
10
## cross_border         0.166335    1.238631    0.134    0.89
33
## i_catConstruction    -1.234004    4.406043   -0.280    0.77
97
## i_catfinance         1.094048    3.845228    0.285    0.77
63
## i_catmanufacture     2.338892    3.694776    0.633    0.52
73
## i_catmining          2.862306    3.916938    0.731    0.46
57
## i_catretail          2.509017    4.269558    0.588    0.55
73
## i_catservices        2.085115    3.713359    0.562    0.57
50
## i_cattransportation  2.044246    3.794299    0.539    0.59
06
## i_catwholesale       2.329239    3.937224    0.592    0.55
47
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.597 on 229 degrees of freedom
## Multiple R-squared:  0.1151, Adjusted R-squared:  0.01846
## F-statistic: 1.191 on 25 and 229 DF,  p-value: 0.2487
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 40.326, df = 25, p-value = 0.02699
##
##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>

```

t)				
## (Intercept)	2.1588935	1.6897671	1.2776	0.2
0267				
## `Prev E Score`	-0.0168488	0.0112010	-1.5042	0.1
3390				
## `Prev G Score`	-0.0097724	0.0109344	-0.8937	0.3
7240				
## `Prev S Score`	0.0333024	0.0255081	1.3056	0.1
9301				
## I(`Prev S Score` * cross_border)	0.0117952	0.0230411	0.5119	0.6
0920				
## `firm size`	-0.5571197	0.2240329	-2.4868	0.0
1360 *				
## leverage	0.5854524	2.3428884	0.2499	0.8
0290				
## `free cash flow`	4.8218006	5.3664746	0.8985	0.3
6986				
## `Tobin's q`	-0.0378840	0.3791779	-0.0999	0.9
2050				
## preMTR	-2.2554641	1.2346660	-1.8268	0.0
6903 .				
## deal_size	0.8678022	0.1643800	5.2792	3.009
e-07 ***				
## high_tech	-0.2951860	0.5720277	-0.5160	0.6
0633				
## diversifying	-0.0854787	0.4921369	-0.1737	0.8
6226				
## public_target	-0.2967076	0.7766460	-0.3820	0.7
0279				
## private_target	0.3405805	0.4623417	0.7366	0.4
6209				
## all_cash_deal	0.0219648	0.5260289	0.0418	0.9
6673				
## stock_deal	-0.4698700	1.3052310	-0.3600	0.7
1919				
## cross_border	0.1663348	0.9180568	0.1812	0.8
5639				
## i_catConstruction	-1.2340040	1.7747998	-0.6953	0.4
8758				
## i_catfinance	1.0940485	1.3460086	0.8128	0.4
1717				
## i_catmanufacture	2.3388917	0.9715980	2.4073	0.0
1687 *				
## i_catmining	2.8623060	1.9234623	1.4881	0.1
3810				
## i_catretail	2.5090167	1.0588321	2.3696	0.0
1864 *				
## i_catservices	2.0851148	1.1526316	1.8090	0.0
7176 .				
## i_cattransportation	2.0442456	1.2717899	1.6074	0.1

```

0935
## i_catwholesale                2.3292386  1.2734277  1.8291  0.0
6868 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.8836 -1.5742  0.0311  1.3859 14.2253
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          -2.813246    2.700684  -1.042  0.298
91
## `Prev E Score`         0.008910    0.014794   0.602  0.547
71
## `Prev G Score`         0.036114    0.011640   3.103  0.002
22 **
## `Prev S Score`         0.009841    0.022498   0.437  0.662
32
## I(`Prev S Score` * cross_border) -0.047036    0.023559  -1.997  0.047
34 *
## `firm size`            0.075906    0.250801   0.303  0.762
49
## leverage               -6.153578    2.663426  -2.310  0.021
96 *
## `free cash flow`      -8.962200    5.298414  -1.691  0.092
42 .
## `Tobin's q`           0.295336    0.275081   1.074  0.284
38
## preMTR                 -2.169984    1.110842  -1.953  0.052
27 .
## deal_size              1.868595    1.524412   1.226  0.221
83
## hostile                NA            NA         NA
NA
## high_tech              -0.232010    0.602869  -0.385  0.700
79

```

```

## diversifying          0.396747    0.529282    0.750    0.454
45
## public_target        -1.564001    0.665297   -2.351    0.019
78 *
## private_target      -0.664852    0.545146   -1.220    0.224
17
## all_cash_deal        0.259059    0.721158    0.359    0.719
83
## stock_deal           2.944139    1.119995    2.629    0.009
29 **
## cross_border         2.069319    1.121091    1.846    0.066
51 .
## i_catmanufacture     1.057939    0.946328    1.118    0.265
03
## i_catmining           0.135792    1.277889    0.106    0.915
49
## i_catretail           3.275718    2.147535    1.525    0.128
87
## i_catservices        -0.631658    1.070530   -0.590    0.555
88
## i_cattransportation  1.447081    1.485162    0.974    0.331
14
## i_catwholesale       0.614402    1.511266    0.407    0.684
81
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.209 on 186 degrees of freedom
## Multiple R-squared:  0.2013, Adjusted R-squared:  0.1026
## F-statistic: 2.039 on 23 and 186 DF,  p-value: 0.005101
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 97.743, df = 23, p-value = 3.444e-11
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept) -2.8132458  2.5024693 -1.1242  0.26
238
## `Prev E Score`  0.0089104  0.0103058  0.8646  0.38
838
## `Prev G Score`  0.0361143  0.0141702  2.5486  0.01
162 *
## `Prev S Score`  0.0098409  0.0157665  0.6242  0.53
329

```

```

## I(`Prev S Score` * cross_border) -0.0470361 0.0188104 -2.5005 0.01
327 *
## `firm size` 0.0759062 0.2349597 0.3231 0.74
701
## leverage -6.1535777 2.6405180 -2.3304 0.02
086 *
## `free cash flow` -8.9622004 6.0669892 -1.4772 0.14
131
## `Tobin's q` 0.2953358 0.2961400 0.9973 0.31
992
## preMTR -2.1699843 1.3124520 -1.6534 0.09
994 .
## deal_size 1.8685952 3.8109522 0.4903 0.62
448
## high_tech -0.2320098 0.5938241 -0.3907 0.69
646
## diversifying 0.3967474 0.5488270 0.7229 0.47
065
## public_target -1.5640006 0.7524009 -2.0787 0.03
902 *
## private_target -0.6648523 0.4681960 -1.4200 0.15
727
## all_cash_deal 0.2590593 0.6893726 0.3758 0.70
750
## stock_deal 2.9441389 1.7931967 1.6418 0.10
231
## cross_border 2.0693193 0.9808651 2.1097 0.03
622 *
## i_catmanufacture 1.0579391 0.8563943 1.2353 0.21
826
## i_catmining 0.1357922 1.1522547 0.1178 0.90
631
## i_catretail 3.2757175 3.5286364 0.9283 0.35
444
## i_catservices -0.6316581 1.2088405 -0.5225 0.60
192
## i_cattransportation 1.4470810 1.3773634 1.0506 0.29
480
## i_catwholesale 0.6144022 0.9027779 0.6806 0.49
699
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +

```



```

##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min        1Q    Median        3Q        Max
## -33.392  -1.748  -0.050    2.520   22.058
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          3.34150    4.38098   0.763  0.446
16
## `Prev E Score`      -0.01767    0.01807  -0.978  0.328
90
## `Prev G Score`     -0.01141    0.01629  -0.700  0.484
23
## `Prev S Score`      0.05555    0.02807   1.979  0.048
64 *
## I(`Prev S Score` * cross_border) -0.02578    0.02900  -0.889  0.374
65
## `firm size`        -0.11428    0.29016  -0.394  0.693
93
## leverage           -1.81549    3.21316  -0.565  0.572
44
## `free cash flow`  -17.95239    5.62655  -3.191  0.001
55 **
## `Tobin's q`        0.08090    0.38963   0.208  0.835
64
## preMTR             -2.81232    1.38777  -2.027  0.043
50 *
## deal_size          1.15962    2.57328   0.451  0.652
54
## hostile              NA            NA        NA
NA
## high_tech           0.78742    0.81254   0.969  0.333
19
## diversifying       -1.57269    0.63707  -2.469  0.014
06 *
## public_target      -0.35456    0.90688  -0.391  0.696
07
## private_target     -0.61383    0.68322  -0.898  0.369
59
## all_cash_deal      0.13312    0.87445   0.152  0.879
09
## stock_deal         0.45441    1.52441   0.298  0.765
82
## cross_border       1.43754    1.46521   0.981  0.327
24
## i_catfinance       -1.93231    3.47464  -0.556  0.578

```

```

50
## i_catmanufacture          -1.04042    3.32133  -0.313  0.754
28
## i_catmining                -7.82252    3.50671  -2.231  0.026
35 *
## i_catretail                -0.99581    3.64199  -0.273  0.784
69
## i_catservices              -1.73107    3.40217  -0.509  0.611
22
## i_cattransportation        -1.16449    3.47461  -0.335  0.737
73
## i_catwholesale             -4.85582    3.71653  -1.307  0.192
25
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.428 on 339 degrees of freedom
## Multiple R-squared:  0.1305, Adjusted R-squared:  0.0689
## F-statistic: 2.119 on 24 and 339 DF,  p-value: 0.00195
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 89.029, df = 24, p-value = 2.086e-09
##
##
## t test of coefficients:
##
##
##          Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          3.341497    6.920086  0.4829  0.62
950
## `Prev E Score`       -0.017669    0.015934 -1.1089  0.26
826
## `Prev G Score`       -0.011407    0.016164 -0.7057  0.48
086
## `Prev S Score`        0.055550    0.023963  2.3182  0.02
104 *
## I(`Prev S Score` * cross_border) -0.025783    0.027276 -0.9453  0.34
520
## `firm size`          -0.114283    0.245372 -0.4658  0.64
169
## leverage             -1.815488    2.921634 -0.6214  0.53
476
## `free cash flow`     -17.952385    8.185719 -2.1931  0.02
898 *
## `Tobin's q`          0.080900    0.564145  0.1434  0.88
606
## preMTR                -2.812319    1.862125 -1.5103  0.13

```

```

191
## deal_size          1.159624    3.927822    0.2952    0.76
800
## high_tech          0.787419    0.727064    1.0830    0.27
957
## diversifying      -1.572686    0.677339   -2.3219    0.02
083 *
## public_target     -0.354562    0.831485   -0.4264    0.67
007
## private_target    -0.613827    0.606425   -1.0122    0.31
216
## all_cash_deal      0.133120    0.672183    0.1980    0.84
313
## stock_deal         0.454414    1.994367    0.2278    0.81
990
## cross_border       1.437540    1.642572    0.8752    0.38
210
## i_catfinance      -1.932313    6.537818   -0.2956    0.76
775
## i_catmanufacture  -1.040416    6.577006   -0.1582    0.87
440
## i_catmining        -7.822517    7.000714   -1.1174    0.26
462
## i_catretail        -0.995811    6.602858   -0.1508    0.88
021
## i_catservices     -1.731066    6.616900   -0.2616    0.79
378
## i_cattransportation -1.164487    6.574881   -0.1771    0.85
953
## i_catwholesale    -4.855825    7.378829   -0.6581    0.51
094
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min      1Q  Median      3Q      Max
## -9.6204 -2.0549  0.0252  1.7208 14.5439
##
## Coefficients: (1 not defined because of singularities)

```

	Estimate	Std. Error	t value	Pr(> t)
)				
## (Intercept)	2.60711	3.74864	0.695	0.487
7				
## `Prev E Score`	0.03184	0.01691	1.882	0.061
4 .				
## `Prev G Score`	-0.01802	0.01498	-1.203	0.230
6				
## `Prev S Score`	-0.02715	0.03064	-0.886	0.376
7				
## I(`Prev S Score` * cross_border)	0.01025	0.02693	0.381	0.704
0				
## `firm size`	-0.07124	0.25776	-0.276	0.782
6				
## leverage	0.97811	2.86653	0.341	0.733
3				
## `free cash flow`	2.91788	3.03007	0.963	0.336
9				
## `Tobin's q`	0.02296	0.31356	0.073	0.941
7				
## preMTR	-0.36461	1.24473	-0.293	0.769
9				
## deal_size	-0.52457	0.90927	-0.577	0.564
7				
## hostile	NA	NA	NA	N
A				
## high_tech	-1.18107	0.75604	-1.562	0.120
1				
## diversifying	0.29924	0.61546	0.486	0.627
4				
## public_target	-0.49259	0.89749	-0.549	0.583
8				
## private_target	-0.05255	0.58782	-0.089	0.928
9				
## all_cash_deal	-1.42822	0.86290	-1.655	0.099
7 .				
## stock_deal	0.52655	1.30006	0.405	0.686
0				
## cross_border	0.40642	1.35790	0.299	0.765
1				
## i_catfinance	-0.29337	2.79757	-0.105	0.916
6				
## i_catmanufacture	0.92879	2.66213	0.349	0.727
6				
## i_catmining	1.78310	3.04993	0.585	0.559
5				
## i_catretail	-1.44264	3.20573	-0.450	0.653
3				
## i_catservices	0.22126	2.71149	0.082	0.935
1				

```

## i_cattransportation          -2.51408    2.83293  -0.887    0.376
1
## i_catwholesale                1.09140    2.93167   0.372    0.710
1
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.555 on 175 degrees of freedom
## Multiple R-squared:  0.1306, Adjusted R-squared:  0.01137
## F-statistic: 1.095 on 24 and 175 DF,  p-value: 0.3534
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 38.279, df = 24, p-value = 0.03245
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      2.607108   3.156758   0.8259  0.410
00
## `Prev E Score`    0.031836   0.016204   1.9647  0.051
03 .
## `Prev G Score`   -0.018022   0.016498  -1.0924  0.276
16
## `Prev S Score`   -0.027155   0.030327  -0.8954  0.371
81
## I(`Prev S Score` * cross_border) 0.010249   0.024382   0.4204  0.674
73
## `firm size`      -0.071240   0.256940  -0.2773  0.781
90
## leverage         0.978111   2.571995   0.3803  0.704
19
## `free cash flow` 2.917881   4.027863   0.7244  0.469
77
## `Tobin's q`      0.022959   0.413979   0.0555  0.955
84
## preMTR           -0.364609   1.056640  -0.3451  0.730
46
## deal_size        -0.524565   0.788660  -0.6651  0.506
84
## high_tech        -1.181075   0.720622  -1.6390  0.103
02
## diversifying      0.299240   0.571413   0.5237  0.601
16
## public_target    -0.492592   1.015047  -0.4853  0.628
08

```

```

## private_target      -0.052546   0.484840 -0.1084   0.913
82
## all_cash_deal      -1.428225   1.174925 -1.2156   0.225
78
## stock_deal         0.526546   1.818967  0.2895   0.772
56
## cross_border       0.406417   1.210221  0.3358   0.737
41
## i_catfinance       -0.293374   1.618312 -0.1813   0.856
35
## i_catmanufacture   0.928789   1.500765  0.6189   0.536
80
## i_catmining        1.783104   2.806800  0.6353   0.526
08
## i_catretail        -1.442642   2.041283 -0.7067   0.480
67
## i_catservices      0.221265   1.447013  0.1529   0.878
64
## i_cattransportation -2.514077   1.748739 -1.4377   0.152
32
## i_catwholesale     1.091401   1.790598  0.6095   0.542
97
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min      1Q  Median      3Q      Max
## -12.660  -1.694  -0.204   1.547  15.073
##
## Coefficients: (1 not defined because of singularities)
##               Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      3.221215   4.643198   0.694   0.48
86
## `Prev E Score`  -0.005018   0.016218  -0.309   0.75
73
## `Prev G Score`  -0.012091   0.012530  -0.965   0.33
56
## `Prev S Score`   0.033419   0.028475   1.174   0.24

```

```

18
## I(`Prev S Score` * cross_border) -0.006677    0.027503   -0.243    0.80
84
## `firm size`
80 *
## leverage
84
## `free cash flow`
90
## `Tobin's q`
48
## preMTR
63 *
## deal_size
71 *
## hostile
NA
NA
## high_tech
29
## diversifying
58
## public_target
74
## private_target
66
## all_cash_deal
73
## stock_deal
95
## cross_border
00
## i_catConstruction
63
## i_catfinance
04
## i_catmanufacture
20
## i_catmining
66
## i_catretail
19
## i_catservices
71
## i_cattransportation
18
## i_catwholesale
89
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##

```

```

## Residual standard error: 3.843 on 218 degrees of freedom
## Multiple R-squared:  0.1105, Adjusted R-squared:  0.008487
## F-statistic: 1.083 on 25 and 218 DF,  p-value: 0.3636
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 49.886, df = 25, p-value = 0.002201
##
##
## t test of coefficients:
##
##
##           Estimate Std. Error t value Pr(>
|t|)
## (Intercept)           3.2212155  2.1304208  1.5120  0.13
1980
## `Prev E Score`       -0.0050183  0.0123023 -0.4079  0.68
3737
## `Prev G Score`       -0.0120911  0.0103223 -1.1714  0.24
2736
## `Prev S Score`        0.0334195  0.0234689  1.4240  0.15
5880
## I(`Prev S Score` * cross_border) -0.0066769  0.0213434 -0.3128  0.75
4707
## `firm size`          -0.7197223  0.2591450 -2.7773  0.00
5959 **
## leverage             -0.1673893  2.4359767 -0.0687  0.94
5279
## `free cash flow`     0.3940227  5.6300334  0.0700  0.94
4269
## `Tobin's q`          0.1453338  0.3369722  0.4313  0.66
6681
## preMTR               -2.8321066  1.2340465 -2.2950  0.02
2686 *
## deal_size            0.8652406  0.1819175  4.7562  3.586
e-06 ***
## high_tech            -0.3070854  0.5671887 -0.5414  0.58
8773
## diversifying         -0.1083808  0.4828417 -0.2245  0.82
2606
## public_target        -0.0981208  0.8252275 -0.1189  0.90
5463
## private_target       0.1728915  0.4874153  0.3547  0.72
3149
## all_cash_deal        -0.1796530  0.5852483 -0.3070  0.75
9160
## stock_deal           -0.6047710  1.3783159 -0.4388  0.66
1259
## cross_border         0.8923308  1.0651255  0.8378  0.40

```



```

3077
## i_catConstruction          0.1888633  1.5480610  0.1220  0.90
3012
## i_catfinance              1.8563996  1.4296853  1.2985  0.19
5499
## i_catmanufacture         2.9122351  1.1195367  2.6013  0.00
9924 **
## i_catmining              3.2464211  1.8028807  1.8007  0.07
3135 .
## i_catretail              3.1366691  1.1160281  2.8106  0.00
5396 **
## i_catservices            2.4049771  1.3696127  1.7560  0.08
0501 .
## i_cattransportation      2.9862460  1.4672114  2.0353  0.04
3029 *
## i_catwholesale           2.7104510  1.3760088  1.9698  0.05
0128 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -18.4817  -1.5831  -0.1438   1.7716  14.6843
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          4.633275    7.104040   0.652  0.51
62
## `Prev E Score`      -0.029965    0.028333  -1.058  0.29
35
## `Prev G Score`     -0.001491    0.027574  -0.054  0.95
70
## `Prev S Score`      0.088892    0.052347   1.698  0.09
35 .
## I(`Prev S Score` * cross_border) -0.028125    0.045134  -0.623  0.53
50
## `firm size`        -0.524652    0.549675  -0.954  0.34
28

```

```

## leverage                3.818403    4.545217    0.840    0.40
34
## `free cash flow`       -7.553549    6.056836   -1.247    0.21
61
## `Tobin's q`            0.421454    0.430604    0.979    0.33
07
## preMTR                  0.574711    2.785640    0.206    0.83
71
## deal_size                3.925361    1.676238    2.342    0.02
17 *
## hostile                   NA             NA             NA
NA
## high_tech                0.537715    1.256689    0.428    0.66
99
## diversifying            -1.298361    0.967216   -1.342    0.18
34
## public_target           -1.506930    1.393715   -1.081    0.28
29
## private_target          -0.071097    1.026238   -0.069    0.94
49
## all_cash_deal           0.080291    1.622704    0.049    0.96
07
## stock_deal              4.633673    2.189053    2.117    0.03
75 *
## cross_border            -1.243179    2.067417   -0.601    0.54
94
## i_catfinance            -5.929309    4.968366   -1.193    0.23
63
## i_catmanufacture        -1.057768    4.519613   -0.234    0.81
56
## i_catmining             -5.387996    5.072331   -1.062    0.29
14
## i_catretail              1.209039    4.804879    0.252    0.80
20
## i_catservices           -3.787978    4.605898   -0.822    0.41
33
## i_cattransportation     -2.108681    5.201148   -0.405    0.68
63
## i_catwholesale          -1.040660    4.685759   -0.222    0.82
48
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.093 on 78 degrees of freedom
## Multiple R-squared:  0.3845, Adjusted R-squared:  0.1951
## F-statistic:  2.03 on 24 and 78 DF,  p-value: 0.01037
##
##
## studentized Breusch-Pagan test
##

```

```

## data:  reg_model
## BP = 36.498, df = 24, p-value = 0.04907
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>
|t|)
## (Intercept)           4.6332753   4.1345128   1.1206 0.265
8823
## `Prev E Score`
2136           -0.0299648   0.0259213  -1.1560 0.251
## `Prev G Score`
2368           -0.0014912   0.0238178  -0.0626 0.950
## `Prev S Score`
0648 *           0.0888920   0.0353850   2.5121 0.014
## I(`Prev S Score` * cross_border)
6496           -0.0281253   0.0298912  -0.9409 0.349
## `firm size`
3790           -0.5246524   0.4666925  -1.1242 0.264
## leverage
5042           3.8184033   3.8033568   1.0040 0.318
## `free cash flow`
7914 .           -7.5535492   4.3268129  -1.7458 0.084
## `Tobin's q`
7329           0.4214545   0.3310230   1.2732 0.206
## preMTR
3856           0.5747108   3.1651058   0.1816 0.856
## deal_size
2385 ***         3.9253611   1.0189366   3.8524 0.000
## high_tech
9204           0.5377148   1.3948704   0.3855 0.700
## diversifying
0607 .           -1.2983612   0.6523422  -1.9903 0.050
## public_target
6039           -1.5069297   1.4950712  -1.0079 0.316
## private_target
4265           -0.0710969   0.7889543  -0.0901 0.928
## all_cash_deal
7800           0.0802915   0.9349008   0.0859 0.931
## stock_deal
4996 **          4.6336725   1.7161628   2.7000 0.008
## cross_border
0082           -1.2431792   1.2949418  -0.9600 0.340
## i_catfinance
4914 *           -5.9293089   2.3454449  -2.5280 0.013
## i_catmanufacture
8256           -1.0577681   1.6321143  -0.6481 0.518
## i_catmining
3205 *           -5.3879955   2.6231003  -2.0541 0.043

```

```

## i_catretail                1.2090394  1.9149898  0.6314 0.529
6540
## i_catservices              -3.7879785  1.6376423 -2.3131 0.023
3552 *
## i_cattransportation        -2.1086806  2.2420442 -0.9405 0.349
8561
## i_catwholesale             -1.0406596  1.5172765 -0.6859 0.494
8266
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min      1Q  Median      3Q      Max
## -37.873  -1.821   0.206   2.148  21.613
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          -0.080282    5.566387  -0.014 0.9884
98
## `Prev E Score`        -0.020359    0.013288  -1.532 0.1260
77
## `Prev G Score`        -0.014192    0.012463  -1.139 0.2553
22
## `Prev S Score`         0.031504    0.023155   1.361 0.1742
34
## I(`Prev S Score` * cross_border) -0.003054    0.022863  -0.134 0.8937
75
## `firm size`           -0.149118    0.232176  -0.642 0.5209
81
## leverage              -1.483893    2.193592  -0.676 0.4990
39
## `free cash flow`     -9.266683    3.428990  -2.702 0.0071
04 **
## `Tobin's q`          -0.051851    0.274991  -0.189 0.8505
14
## preMTR                -1.835074    1.050509  -1.747 0.0812
44 .
## deal_size              3.321944    1.567093   2.120 0.0344

```

```

86 *
## hostile                NA                NA                NA
NA
## high_tech              0.339901      0.671402      0.506 0.6128
88
## diversifying           -0.249209      0.493561     -0.505 0.6138
24
## public_target          -2.666937      0.698055     -3.821 0.0001
49 ***
## private_target         -0.682724      0.510171     -1.338 0.1813
96
## all_cash_deal          0.016019      0.674462      0.024 0.9810
61
## stock_deal             1.149387      0.991271      1.160 0.2467
71
## cross_border           0.815139      1.179356      0.691 0.4897
60
## i_catConstruction      -1.285627      5.460678     -0.235 0.8139
63
## i_catfinance           1.141721      5.190822      0.220 0.8259
95
## i_catmanufacture       3.508401      5.177544      0.678 0.4983
09
## i_catmining            -2.006920      5.274005     -0.381 0.7037
04
## i_catretail            3.205773      5.324533      0.602 0.5473
81
## i_catservices          3.074325      5.216625      0.589 0.5558
90
## i_cattransportation    2.079062      5.244002      0.396 0.6919
22
## i_catwholesale         1.518640      5.301336      0.286 0.7746
35
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.102 on 530 degrees of freedom
## Multiple R-squared:  0.1134, Adjusted R-squared:  0.07158
## F-statistic: 2.712 on 25 and 530 DF,  p-value: 1.963e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 98.58, df = 25, p-value = 1.087e-10
##
##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>

```

t)				
## (Intercept)	-0.0802816	2.1423788	-0.0375	0.97
0122				
## `Prev E Score`	-0.0203588	0.0124597	-1.6340	0.10
2860				
## `Prev G Score`	-0.0141921	0.0130274	-1.0894	0.27
6472				
## `Prev S Score`	0.0315035	0.0231487	1.3609	0.17
4117				
## I(`Prev S Score` * cross_border)	-0.0030544	0.0223258	-0.1368	0.89
1233				
## `firm size`	-0.1491177	0.2050137	-0.7274	0.46
7330				
## leverage	-1.4838925	2.1419046	-0.6928	0.48
8744				
## `free cash flow`	-9.2666829	5.4630437	-1.6962	0.09
0426 .				
## `Tobin's q`	-0.0518510	0.3667889	-0.1414	0.88
7636				
## preMTR	-1.8350741	1.3485741	-1.3608	0.17
4171				
## deal_size	3.3219439	2.6109507	1.2723	0.20
3820				
## high_tech	0.3399012	0.6556336	0.5184	0.60
4374				
## diversifying	-0.2492092	0.5572875	-0.4472	0.65
4926				
## public_target	-2.6669370	0.8134359	-3.2786	0.00
1112 **				
## private_target	-0.6827239	0.4855774	-1.4060	0.16
0309				
## all_cash_deal	0.0160186	0.5745655	0.0279	0.97
7769				
## stock_deal	1.1493872	1.1130251	1.0327	0.30
2230				
## cross_border	0.8151386	1.2853475	0.6342	0.52
6239				
## i_catConstruction	-1.2856268	1.6224092	-0.7924	0.42
8471				
## i_catfinance	1.1417206	0.9077464	1.2578	0.20
9035				
## i_catmanufacture	3.5084009	0.8203284	4.2768	2.249
e-05 ***				
## i_catmining	-2.0069202	2.3784282	-0.8438	0.39
9161				
## i_catretail	3.2057728	1.0336089	3.1015	0.00
2028 **				
## i_catservices	3.0743246	1.0775350	2.8531	0.00
4499 **				
## i_cattransportation	2.0790621	1.0401551	1.9988	0.04

```

6140 *
## i_catwholesale          1.5186397  2.7458001  0.5531  0.58
0444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -26.5298  -1.6684   0.0363   2.1138  19.4518
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          2.092e+00  2.482e+00   0.843  0.39
968
## `Prev E Score`      -7.171e-03  1.220e-02  -0.588  0.55
706
## `Prev G Score`     -5.531e-03  1.067e-02  -0.518  0.60
457
## `Prev S Score`     1.642e-02  2.249e-02   0.730  0.46
562
## I(`Prev S Score` * cross_border) -9.855e-05  2.193e-02  -0.004  0.99
642
## `firm size`        -1.458e-01  1.956e-01  -0.745  0.45
647
## leverage           -1.118e+00  1.857e+00  -0.602  0.54
745
## `free cash flow`   2.217e+00  1.824e+00   1.215  0.22
477
## `Tobin's q`       -3.874e-01  2.216e-01  -1.748  0.08
106 .
## preMTR             -1.452e+00  1.003e+00  -1.448  0.14
828
## deal_size          9.072e-01  1.229e+00   0.738  0.46
063
## hostile                NA            NA            NA
NA
## high_tech          -2.078e+00  6.176e-01  -3.364  0.00
082 ***

```

```

## diversifying      6.503e-03  4.630e-01  0.014  0.98
880
## public_target    -3.751e-01  7.075e-01  -0.530  0.59
620
## private_target   -3.433e-01  4.286e-01  -0.801  0.42
348
## all_cash_deal    -3.792e-02  6.728e-01  -0.056  0.95
508
## stock_deal       -9.638e-01  9.237e-01  -1.043  0.29
719
## cross_border      7.547e-01  1.082e+00  0.697  0.48
588
## i_catfinance      -1.030e+00  1.673e+00  -0.615  0.53
851
## i_catmanufacture  6.655e-01  1.636e+00  0.407  0.68
433
## i_catmining        3.211e-01  1.971e+00  0.163  0.87
068
## i_catretail       -1.666e+00  1.888e+00  -0.883  0.37
776
## i_catservices     2.006e+00  1.702e+00  1.178  0.23
911
## i_cattransportation -9.470e-01  1.771e+00  -0.535  0.59
296
## i_catwholesale    -1.866e+00  2.003e+00  -0.931  0.35
205
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.612 on 560 degrees of freedom
## Multiple R-squared:  0.07518,    Adjusted R-squared:  0.03555
## F-statistic: 1.897 on 24 and 560 DF,  p-value: 0.006457
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 92.691, df = 24, p-value = 5.146e-10
##
##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(
>|t|)
## (Intercept)      2.0918e+00  2.1114e+00  0.9907 0.3
22269
## `Prev E Score`   -7.1710e-03  1.0391e-02  -0.6901 0.4
90398
## `Prev G Score`   -5.5310e-03  1.0693e-02  -0.5173 0.6
05176

```



```

## `Prev S Score`          1.6421e-02  2.2809e-02  0.7200 0.4
71856
## I(`Prev S Score` * cross_border) -9.8547e-05  2.1914e-02 -0.0045 0.9
96414
## `firm size`            -1.4579e-01  1.8499e-01 -0.7881 0.4
30968
## leverage                -1.1180e+00  1.7764e+00 -0.6294 0.5
29359
## `free cash flow`      2.2171e+00  2.2364e+00  0.9914 0.3
21932
## `Tobin's q`           -3.8735e-01  2.4604e-01 -1.5743 0.1
15978
## preMTR                  -1.4520e+00  1.5716e+00 -0.9239 0.3
55955
## deal_size              9.0721e-01  1.5815e+00  0.5737 0.5
66429
## high_tech              -2.0780e+00  7.7089e-01 -2.6956 0.0
07237 **
## diversifying           6.5029e-03  5.0362e-01  0.0129 0.9
89702
## public_target          -3.7510e-01  7.4506e-01 -0.5035 0.6
14845
## private_target         -3.4328e-01  4.1594e-01 -0.8253 0.4
09550
## all_cash_deal          -3.7916e-02  7.4627e-01 -0.0508 0.9
59497
## stock_deal             -9.6383e-01  1.2646e+00 -0.7622 0.4
46273
## cross_border           7.5468e-01  1.2201e+00  0.6185 0.5
36473
## i_catfinance           -1.0298e+00  9.6933e-01 -1.0624 0.2
88500
## i_catmanufacture       6.6547e-01  9.1929e-01  0.7239 0.4
69430
## i_catmining            3.2110e-01  1.4029e+00  0.2289 0.8
19041
## i_catretail            -1.6664e+00  1.9407e+00 -0.8587 0.3
90879
## i_catservices          2.0061e+00  1.0091e+00  1.9881 0.0
47289 *
## i_cattransportation    -9.4704e-01  1.1170e+00 -0.8479 0.3
96875
## i_catwholesale         -1.8659e+00  2.2320e+00 -0.8360 0.4
03529
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score

```

```

` +
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +
##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min      1Q  Median      3Q      Max
## -31.356  -2.401   0.311   2.307  50.955
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          -1.938199    6.499164  -0.298   0.76
57
## `Prev E Score`        -0.003724    0.017606  -0.212   0.83
26
## `Prev G Score`        -0.020406    0.015649  -1.304   0.19
29
## `Prev S Score`         0.026761    0.033102   0.808   0.41
93
## I(`Prev S Score` * cross_border) -0.023071    0.032123  -0.718   0.47
30
## `firm size`           0.159435    0.276108   0.577   0.56
39
## leverage              4.097880    2.356094   1.739   0.08
27 .
## `free cash flow`     -2.187609    3.558326  -0.615   0.53
90
## `Tobin's q`          0.468936    0.322654   1.453   0.14
68
## preMTR                -0.430657    1.060793  -0.406   0.68
49
## deal_size             9.242783    0.973897   9.491 < 2e-
16 ***
## hostile                NA              NA          NA
NA
## high_tech            -0.062627    0.966411  -0.065   0.94
84
## diversifying         -0.994176    0.669891  -1.484   0.13
85
## public_target        -5.643188    0.919847  -6.135 1.83e-
09 ***
## private_target        0.476667    0.682912   0.698   0.48
55
## all_cash_deal         0.046515    1.046733   0.044   0.96
46
## stock_deal           -2.952128    1.255799  -2.351   0.01

```

```

92 *
## cross_border          1.962780    1.639955    1.197    0.23
20
## i_catConstruction    -2.024965    6.735148   -0.301    0.76
38
## i_catfinance         -1.886487    6.364287   -0.296    0.76
70
## i_catmanufacture     -1.478133    6.324589   -0.234    0.81
53
## i_catmining          -3.804700    6.469451   -0.588    0.55
68
## i_catretail           0.548328    6.939630    0.079    0.93
71
## i_catservices        -1.164966    6.354505   -0.183    0.85
46
## i_cattransportation  0.136308    6.408016    0.021    0.98
30
## i_catwholesale       1.115433    6.523635    0.171    0.86
43
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.183 on 463 degrees of freedom
## Multiple R-squared:  0.2652, Adjusted R-squared:  0.2255
## F-statistic: 6.684 on 25 and 463 DF,  p-value: < 2.2e-16
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 233.85, df = 25, p-value < 2.2e-16
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept)    -1.9381988  1.9946920  -0.9717  0.3
3172
## `Prev E Score` -0.0037244  0.0145167  -0.2566  0.7
9763
## `Prev G Score` -0.0204063  0.0143938  -1.4177  0.1
5695
## `Prev S Score`  0.0267607  0.0283600   0.9436  0.3
4586
## I(`Prev S Score` * cross_border) -0.0230708  0.0275756  -0.8366  0.4
0323
## `firm size`    0.1594349  0.2768810   0.5758  0.5
6501
## leverage       4.0978799  2.4886352   1.6466  0.1

```

```

0031
## `free cash flow` -2.1876086 4.0600311 -0.5388 0.5
9027
## `Tobin's q` 0.4689357 0.3913135 1.1984 0.2
3139
## preMTR -0.4306565 1.6768026 -0.2568 0.7
9742
## deal_size 9.2427835 4.9268353 1.8760 0.0
6128 .
## high_tech -0.0626270 1.0462323 -0.0599 0.9
5229
## diversifying -0.9941756 0.6963540 -1.4277 0.1
5406
## public_target -5.6431880 1.2534757 -4.5020 8.527
e-06 ***
## private_target 0.4766671 0.7471527 0.6380 0.5
2380
## all_cash_deal 0.0465145 1.2106404 0.0384 0.9
6937
## stock_deal -2.9521283 2.4806380 -1.1901 0.2
3463
## cross_border 1.9627804 1.4559726 1.3481 0.1
7829
## i_catConstruction -2.0249651 1.9784906 -1.0235 0.3
0661
## i_catfinance -1.8864875 1.3858403 -1.3613 0.1
7409
## i_catmanufacture -1.4781329 1.4107339 -1.0478 0.2
9529
## i_catmining -3.8046996 2.5492033 -1.4925 0.1
3625
## i_catretail 0.5483282 3.6068691 0.1520 0.8
7923
## i_catservices -1.1649663 1.3566176 -0.8587 0.3
9093
## i_cattransportation 0.1363077 1.6276882 0.0837 0.9
3330
## i_catwholesale 1.1154331 2.9281129 0.3809 0.7
0342
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR11 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[

```

```

data1$year %in%
##      c(year, year + 4), ]
##
## Residuals:
##      Min        1Q    Median        3Q        Max
## -22.8235  -2.5537  -0.3212   2.6235  21.9455
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          6.714602    8.416028   0.798 0.4264
32
## `Prev E Score`      -0.011758    0.038033  -0.309 0.7576
96
## `Prev G Score`     -0.077603    0.030967  -2.506 0.0134
56 *
## `Prev S Score`      0.083126    0.067910   1.224 0.2231
58
## I(`Prev S Score` * cross_border) -0.007003    0.062902  -0.111 0.9115
29
## `firm size`        -0.356028    0.507557  -0.701 0.4842
83
## leverage            6.422420    5.114203   1.256 0.2114
58
## `free cash flow`   1.184047    4.283557   0.276 0.7826
70
## `Tobin's q`       -0.414192    0.390851  -1.060 0.2912
52
## preMTR             -0.823648    2.420601  -0.340 0.7342
10
## deal_size          -3.297065    0.879549  -3.749 0.0002
67 ***
## hostile                NA                NA                NA
NA
## high_tech            0.865625    1.487956   0.582 0.5617
48
## diversifying        -1.726018    1.286913  -1.341 0.1822
09
## public_target       -2.036159    2.006266  -1.015 0.3120
53
## private_target      -0.270565    1.273148  -0.213 0.8320
39
## all_cash_deal       0.805769    1.887297   0.427 0.6701
32
## stock_deal          3.464839    2.195410   1.578 0.1169
64
## cross_border         0.429994    2.854196   0.151 0.8804
84
## i_catfinance        -3.916511    6.796446  -0.576 0.5654
44

```

```

## i_catmanufacture          -1.855435    6.670547   -0.278 0.7813
40
## i_catmining                -3.084449    7.154043   -0.431 0.6670
81
## i_catretail                0.036421    6.962682    0.005 0.9958
34
## i_catservices             -4.135323    6.716322   -0.616 0.5391
69
## i_cattransportation       -6.470879    6.895381   -0.938 0.3497
74
## i_catwholesale            -2.271834    6.947288   -0.327 0.7441
90
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.243 on 129 degrees of freedom
## Multiple R-squared:  0.1997, Adjusted R-squared:  0.05075
## F-statistic: 1.341 on 24 and 129 DF,  p-value: 0.151
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 82.282, df = 24, p-value = 2.623e-08
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          6.7146020  4.0625885  1.6528 0.100
806
## `Prev E Score`      -0.0117584  0.0307176 -0.3828 0.702
505
## `Prev G Score`     -0.0776030  0.0276552 -2.8061 0.005
792 **
## `Prev S Score`      0.0831261  0.0451942  1.8393 0.068
169 .
## I(`Prev S Score` * cross_border) -0.0070028  0.0303905 -0.2304 0.818
125
## `firm size`        -0.3560283  0.4358320 -0.8169 0.415
495
## leverage           6.4224202  5.1062615  1.2578 0.210
753
## `free cash flow`   1.1840474  4.0796983  0.2902 0.772
107
## `Tobin's q`       -0.4141920  0.2935087 -1.4112 0.160
600
## preMTR             -0.8236484  2.3060301 -0.3572 0.721
547

```

```

## deal_size                -3.2970650  2.4921028 -1.3230 0.188
174
## high_tech                0.8656246  1.2586990  0.6877 0.492
868
## diversifying            -1.7260182  1.0506249 -1.6428 0.102
850
## public_target           -2.0361587  2.0909612 -0.9738 0.331
983
## private_target          -0.2705652  1.2042381 -0.2247 0.822
586
## all_cash_deal           0.8057692  1.4704214  0.5480 0.584
649
## stock_deal              3.4648389  1.7565620  1.9725 0.050
690 .
## cross_border            0.4299942  1.7613511  0.2441 0.807
520
## i_catfinance            -3.9165105  2.3609805 -1.6588 0.099
576 .
## i_catmanufacture        -1.8554355  2.2197190 -0.8359 0.404
764
## i_catmining             -3.0844492  4.6486164 -0.6635 0.508
182
## i_catretail             0.0364207  2.1773650  0.0167 0.986
680
## i_catservices          -4.1353232  2.5860695 -1.5991 0.112
250
## i_cattransportation     -6.4708792  1.9898905 -3.2519 0.001
463 **
## i_catwholesale          -2.2718338  1.9172335 -1.1850 0.238
214
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##CAR22 regression model

Create an empty list to store the model summaries

```
model_summaries <- list()
```

```
reg_model<-list()
```

```
start_year <- 2003
```

```
end_year <- 2015
```

Iterate over the range of years

```
for (year in start_year:end_year) {
```

Fit the regression model for the current year

```
reg_model <- lm(CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+I(`Prev S Score`*cross_border)+ `firm size` + leverage + `free cash flow`
+ `Tobin's q`
```

```
+ preMTR + deal_size + hostile + high_tech + diversif
```

```

ying + public_target + private_target + all_cash_deal + stock_deal + cr
oss_border + i_cat,
      data = data1[data1$year%in% c(year,year+4),])

# Store the summary of the regression model in the list
model_summaries[[year]] <- summary(reg_model)

# Print the summary for the current year
print(model_summaries[[year]])
##test heteroscedasticity problem
hetero_test <- bptest( reg_model)
print(hetero_test)
##use white's robustness standard error
coefstttt<-coefstest(reg_model, vcov = vcovHC(reg_model, type='HC0',
cluster='a_industry'))
print(coefstttt)
}

##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.5157  -2.7356  -0.2008   2.1907  19.5594
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      9.491153    5.193109   1.828  0.068
75 .
## `Prev E Score`    0.023157    0.018372   1.260  0.208
64
## `Prev G Score`    0.008393    0.013444   0.624  0.532
99
## `Prev S Score`   -0.024524    0.026357  -0.930  0.352
98
## I(`Prev S Score` * cross_border)  0.013545    0.029172   0.464  0.642
82
## `firm size`      -0.756852    0.280266  -2.700  0.007
38 **
## leverage         -2.840821    2.716608  -1.046  0.296

```



```

66
## `free cash flow`          -1.101475    4.398827   -0.250    0.802
47
## `Tobin's q`              -0.261578    0.234971   -1.113    0.266
64
## preMTR                   -2.149487    1.122865   -1.914    0.056
68 .
## deal_size                 -0.055059    1.757312   -0.031    0.975
03
## hostile                   0.428904    4.598391    0.093    0.925
76
## high_tech                 0.642814    0.735387    0.874    0.382
86
## diversifying             -0.053015    0.586990   -0.090    0.928
10
## public_target            -1.433603    0.780652   -1.836    0.067
44 .
## private_target           -1.285341    0.647130   -1.986    0.048
06 *
## all_cash_deal            -1.179538    0.841081   -1.402    0.161
99
## stock_deal               -2.596918    1.175851   -2.209    0.028
08 *
## cross_border             -0.498889    1.235312   -0.404    0.686
65
## i_catConstruction        -2.340039    5.433337   -0.431    0.667
06
## i_catfinance              0.120023    4.570003    0.026    0.979
07
## i_catmanufacture         1.285021    4.472503    0.287    0.774
10
## i_catmining              1.826751    4.527848    0.403    0.686
95
## i_catretail              0.517907    4.740106    0.109    0.913
08
## i_catservices            1.017463    4.507681    0.226    0.821
60
## i_cattransportation      1.522414    4.627098    0.329    0.742
40
## i_catwholesale           0.712060    4.944147    0.144    0.885
60
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.395 on 260 degrees of freedom
## Multiple R-squared:  0.1432, Adjusted R-squared:  0.05756
## F-statistic: 1.672 on 26 and 260 DF,  p-value: 0.02449
##
##
## studentized Breusch-Pagan test

```

```

##
## data:  reg_model
## BP = 51.563, df = 26, p-value = 0.002036
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|
t|)
## (Intercept)           9.4911531   2.9652227   3.2008 0.001
541 **
## `Prev E Score`           0.0231570   0.0156917   1.4758 0.141
220
## `Prev G Score`           0.0083926   0.0136693   0.6140 0.539
770
## `Prev S Score`          -0.0245245   0.0226238  -1.0840 0.279
364
## I(`Prev S Score` * cross_border) 0.0135448   0.0268486   0.5045 0.614
347
## `firm size`             -0.7568523   0.2903621  -2.6066 0.009
673 **
## leverage                 -2.8408212   2.6112866  -1.0879 0.277
646
## `free cash flow`        -1.1014752   5.1862467  -0.2124 0.831
974
## `Tobin's q`             -0.2615782   0.2440488  -1.0718 0.284
791
## preMTR                   -2.1494872   2.0788876  -1.0340 0.302
116
## deal_size                -0.0550593   3.2393244  -0.0170 0.986
452
## hostile                   0.4289036   1.4271623   0.3005 0.764
014
## high_tech                 0.6428144   0.7225640   0.8896 0.374
487
## diversifying             -0.0530153   0.5804718  -0.0913 0.927
300
## public_target            -1.4336029   0.7408193  -1.9352 0.054
055 .
## private_target           -1.2853415   0.6106816  -2.1048 0.036
272 *
## all_cash_deal            -1.1795375   0.7868572  -1.4990 0.135
074
## stock_deal                -2.5969180   1.3093316  -1.9834 0.048
376 *
## cross_border              -0.4988885   1.2884560  -0.3872 0.698
926
## i_catConstruction        -2.3400393   2.1029327  -1.1128 0.266
843
## i_catfinance              0.1200228   1.1526103   0.1041 0.917

```

```

145
## i_catmanufacture          1.2850211  0.9156516  1.4034 0.161
692
## i_catmining              1.8267512  1.0431293  1.7512 0.081
087 .
## i_catretail              0.5179070  1.7919253  0.2890 0.772
794
## i_catservices           1.0174633  1.0325440  0.9854 0.325
346
## i_cattransportation     1.5224138  1.2713312  1.1975 0.232
204
## i_catwholesale          0.7120596  1.1534543  0.6173 0.537
559
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min      1Q  Median      3Q      Max
## -19.732  -2.334  -0.298   2.216  17.245
##
## Coefficients: (1 not defined because of singularities)
##
##               Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          21.263332    5.181740   4.104 5.49e
-05 ***
## `Prev E Score`       -0.016048    0.022844  -0.703  0.4
830
## `Prev G Score`       0.008498    0.016998   0.500  0.6
176
## `Prev S Score`       0.026153    0.031073   0.842  0.4
008
## I(`Prev S Score` * cross_border) -0.024734    0.032723  -0.756  0.4
504
## `firm size`         -0.482374    0.379152  -1.272  0.2
044
## leverage            8.967230    4.291367   2.090  0.0
376 *
## `free cash flow`    -2.443238    5.688515  -0.430  0.6
679

```

```

## `Tobin's q`          0.390558  0.361130  1.081  0.2
805
## preMTR              -1.912825  1.474552 -1.297  0.1
957
## deal_size          -3.410355  2.530459 -1.348  0.1
789
## hostile              NA          NA          NA
NA
## high_tech           1.081399  0.907752  1.191  0.2
347
## diversifying        0.217146  0.717740  0.303  0.7
625
## public_target       1.546876  1.116616  1.385  0.1
672
## private_target      0.666621  0.807602  0.825  0.4
099
## all_cash_deal      -1.457344  1.116352 -1.305  0.1
929
## stock_deal          -2.818472  1.543513 -1.826  0.0
690 .
## cross_border        0.551000  1.415078  0.389  0.6
973
## i_catfinance        -17.367140  4.237309 -4.099 5.60e
-05 ***
## i_catmanufacture    -18.074783  3.976759 -4.545 8.50e
-06 ***
## i_catmining         -20.035246  4.174155 -4.800 2.71e
-06 ***
## i_catretail         -17.592630  4.368547 -4.027 7.46e
-05 ***
## i_catservices       -19.049119  3.992602 -4.771 3.09e
-06 ***
## i_cattransportation -18.443051  4.223168 -4.367 1.83e
-05 ***
## i_catwholesale      -21.110510  4.454081 -4.740 3.57e
-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.348 on 254 degrees of freedom
## Multiple R-squared:  0.1553, Adjusted R-squared:  0.0755
## F-statistic: 1.946 on 24 and 254 DF,  p-value: 0.006342
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 39.063, df = 24, p-value = 0.0269
##
##

```

```

## t test of coefficients:
##
##          Estimate Std. Error t value Pr(
>|t|)
## (Intercept)      21.2633323   7.7735848   2.7353 0.0
06671 **
## `Prev E Score`
04916          -0.0160483   0.0192364  -0.8343 0.4
## `Prev G Score`
87126           0.0084977   0.0156295   0.5437 0.5
## `Prev S Score`
02579           0.0261531   0.0311931   0.8384 0.4
## I(`Prev S Score` * cross_border)
46229          -0.0247341   0.0324211  -0.7629 0.4
## `firm size`
64167          -0.4823742   0.3457321  -1.3952 0.1
## leverage
23360 *         8.9672303   3.9307994   2.2813 0.0
## `free cash flow`
06599          -2.4432381   6.4833064  -0.3769 0.7
## `Tobin's q`
99398           0.3905582   0.3035536   1.2866 0.1
## preMTR
62053          -1.9128252   1.7017245  -1.1241 0.2
## deal_size
23605          -3.4103547   2.2074303  -1.5449 0.1
## high_tech
83736           1.0813990   0.8112710   1.3330 0.1
## diversifying
32717           0.2171463   0.6351365   0.3419 0.7
## public_target
58926           1.5468755   1.0948664   1.4128 0.1
## private_target
12199           0.6666215   0.8115849   0.8214 0.4
## all_cash_deal
71266 .        -1.4573443   0.8045564  -1.8114 0.0
## stock_deal
29295 *        -2.8184721   1.2858609  -2.1919 0.0
## cross_border
29020           0.5510004   1.5887591   0.3468 0.7
## i_catfinance
21677 *       -17.3671402   7.5174866  -2.3102 0.0
## i_catmanufacture
13064 *       -18.0747833   7.2309922  -2.4996 0.0
## i_catmining
07293 **      -20.0352462   7.4067635  -2.7050 0.0
## i_catretail
17896 *       -17.5926303   7.3817773  -2.3833 0.0
## i_catservices
08845 **      -19.0491189   7.2200245  -2.6384 0.0

```

```

## i_cattransportation          -18.4430508   7.3027572 -2.5255 0.0
12163 *
## i_catwholesale                -21.1105104   7.3499379 -2.8722 0.0
04420 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -11.466  -1.795   0.000   1.615  14.790
##
## Coefficients:
##
##               Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          9.6822153   4.0457532   2.393  0.0
176 *
## `Prev E Score`       0.0002815   0.0145039   0.019  0.9
845
## `Prev G Score`      -0.0136676   0.0147065  -0.929  0.3
538
## `Prev S Score`     -0.0095909   0.0340736  -0.281  0.7
786
## I(`Prev S Score` * cross_border)  0.0369683   0.0344737   1.072  0.2
848
## `firm size`        -0.7317126   0.3105117  -2.356  0.0
194 *
## leverage           -4.3557304   3.1624809  -1.377  0.1
699
## `free cash flow`   -4.0413842   4.3812748  -0.922  0.3
574
## `Tobin's q`        0.2867941   0.1997836   1.436  0.1
527
## preMTR             -2.7679612   1.0972982  -2.523  0.0
124 *
## deal_size          -1.4209623   1.0542404  -1.348  0.1
792
## hostile            -2.1444644   4.1027574  -0.523  0.6
018
## high_tech           0.4929077   0.6504973   0.758  0.4

```

```

495
## diversifying          -1.2358570  0.5882692  -2.101  0.0
369 *
## public_target        -1.1286150  0.8173603  -1.381  0.1
689
## private_target       -1.1469506  0.6303967  -1.819  0.0
703 .
## all_cash_deal        -0.2916000  0.7179557  -0.406  0.6
851
## stock_deal           -1.3610316  0.9803526  -1.388  0.1
666
## cross_border         -1.9597002  1.3888900  -1.411  0.1
598
## i_catfinance          2.4100307  2.9285160  0.823  0.4
115
## i_catmanufacture      0.8935936  2.8194988  0.317  0.7
516
## i_catmining           1.2115445  3.0578598  0.396  0.6
924
## i_catretail           7.0334412  3.3315139  2.111  0.0
360 *
## i_catservices        -0.1941515  2.8649715  -0.068  0.9
460
## i_cattransportation   0.2963982  3.0823879  0.096  0.9
235
## i_catwholesale       -2.0126526  4.0372393  -0.499  0.6
187
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.776 on 201 degrees of freedom
## Multiple R-squared:  0.1819, Adjusted R-squared:  0.08013
## F-statistic: 1.787 on 25 and 201 DF,  p-value: 0.01549
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 47.968, df = 25, p-value = 0.003762
##
##
## t test of coefficients:
##
##
##           Estimate Std. Error t value Pr
(>|t|)
## (Intercept)      9.68221526  2.94326535  3.2896 0.0
011846 **
## `Prev E Score`    0.00028152  0.01361783  0.0207 0.9
835268
## `Prev G Score`   -0.01366761  0.01393428 -0.9809 0.3

```

```

278398
## `Prev S Score`          -0.00959085  0.02812768 -0.3410 0.7
334781
## I(`Prev S Score` * cross_border) 0.03696832  0.02891612  1.2785 0.2
025589
## `firm size`            -0.73171260  0.37457578 -1.9534 0.0
521549 .
## leverage                -4.35573041  4.21069081 -1.0344 0.3
021709
## `free cash flow`      -4.04138419  5.59907197 -0.7218 0.4
712591
## `Tobin's q`           0.28679410  0.27727648  1.0343 0.3
022269
## preMTR                  -2.76796119  1.12928631 -2.4511 0.0
150976 *
## deal_size              -1.42096229  1.62710817 -0.8733 0.3
835388
## hostile                 -2.14446438  1.81636788 -1.1806 0.2
391437
## high_tech              0.49290767  0.58013999  0.8496 0.3
965385
## diversifying           -1.23585695  0.50651542 -2.4399 0.0
155575 *
## public_target          -1.12861501  0.68551888 -1.6464 0.1
012511
## private_target         -1.14695059  0.53500804 -2.1438 0.0
332501 *
## all_cash_deal         -0.29159998  0.62094744 -0.4696 0.6
391463
## stock_deal             -1.36103160  1.06222785 -1.2813 0.2
015648
## cross_border           -1.95970025  1.19409834 -1.6412 0.1
023291
## i_catfinance           2.41003074  1.59700531  1.5091 0.1
328451
## i_catmanufacture       0.89359363  0.86903784  1.0283 0.3
050651
## i_catmining            1.21154454  1.68691515  0.7182 0.4
734672
## i_catretail            7.03344125  1.86717069  3.7669 0.0
002171 ***
## i_catservices         -0.19415149  0.92905029 -0.2090 0.8
346767
## i_cattransportation    0.29639824  1.25381354  0.2364 0.8
133651
## i_catwholesale         -2.01265257  1.55577193 -1.2937 0.1
972647
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##

```



```

##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.6491  -1.9911  -0.0654   1.7021  15.6289
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept)          4.27783    4.70636   0.909  0.3643
## `Prev E Score`      -0.01001    0.01731  -0.578  0.5636
## `Prev G Score`      -0.01729    0.01300  -1.330  0.1848
## `Prev S Score`       0.01350    0.03179   0.425  0.6714
## I(`Prev S Score` * cross_border)  0.02697    0.03000   0.899  0.3696
## `firm size`        -0.41655    0.29738  -1.401  0.1626
## leverage            1.24273    2.76916   0.449  0.6540
## `free cash flow`   -3.21503    5.70625  -0.563  0.5737
## `Tobin's q`         0.28484    0.38980   0.731  0.4656
## preMTR              -3.75394    1.20922  -3.104  0.0021
## deal_size           0.98647    0.36699   2.688  0.0077
## hostile              NA          NA        NA      NA
## high_tech           -0.23481    0.67364  -0.349  0.7277
## diversifying         0.15082    0.59258   0.255  0.7993
## public_target       -0.72996    0.78589  -0.929  0.3539
## private_target      0.24572    0.58713   0.419  0.6759
##

```

```

## all_cash_deal          -0.44201    0.72184  -0.612  0.5409
2
## stock_deal            -1.15830    1.13608  -1.020  0.3090
1
## cross_border         -0.28409    1.35664  -0.209  0.8343
2
## i_catConstruction    -3.00060    4.82580  -0.622  0.5347
0
## i_catfinance         -1.71740    4.21156  -0.408  0.6838
1
## i_catmanufacture     0.13126    4.04678   0.032  0.9741
5
## i_catmining          -1.36108    4.29010  -0.317  0.7513
3
## i_catretail          0.89587    4.67632   0.192  0.8482
4
## i_catservices        0.62589    4.06713   0.154  0.8778
3
## i_cattransportation  -0.88830    4.15578  -0.214  0.8309
3
## i_catwholesale       -0.74125    4.31232  -0.172  0.8636
7
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.939 on 229 degrees of freedom
## Multiple R-squared:  0.1384, Adjusted R-squared:  0.04432
## F-statistic: 1.471 on 25 and 229 DF,  p-value: 0.07493
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 37.372, df = 25, p-value = 0.0532
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)    4.277828   1.979460   2.1611  0.031
724 *
## `Prev E Score` -0.010009   0.012874  -0.7775  0.437
694
## `Prev G Score` -0.017289   0.011651  -1.4839  0.139
212
## `Prev S Score`  0.013504   0.029739   0.4541  0.650
188
## I(`Prev S Score` * cross_border) 0.026972   0.026793   1.0067  0.315
140

```

```

## `firm size`                -0.416555    0.265816 -1.5671  0.118
477
## leverage                    1.242730    2.377717  0.5227  0.601
718
## `free cash flow`          -3.215033    6.593205 -0.4876  0.626
280
## `Tobin's q`                0.284838    0.413421  0.6890  0.491
535
## preMTR                      -3.753944    1.259932 -2.9795  0.003
199 **
## deal_size                   0.986467    0.150572  6.5515  3.717e
-10 ***
## high_tech                   -0.234810    0.624831 -0.3758  0.707
415
## diversifying                0.150825    0.538062  0.2803  0.779
492
## public_target               -0.729956    0.814755 -0.8959  0.371
236
## private_target              0.245723    0.511557  0.4803  0.631
442
## all_cash_deal              -0.442012    0.594177 -0.7439  0.457
696
## stock_deal                  -1.158296    1.326133 -0.8734  0.383
339
## cross_border                -0.284088    1.037174 -0.2739  0.784
404
## i_catConstruction           -3.000595    1.752075 -1.7126  0.088
141 .
## i_catfinance                -1.717402    1.391357 -1.2343  0.218
343
## i_catmanufacture            0.131263    0.974399  0.1347  0.892
958
## i_catmining                 -1.361081    2.291668 -0.5939  0.553
148
## i_catretail                 0.895868    1.144833  0.7825  0.434
710
## i_catservices               0.625889    1.237877  0.5056  0.613
613
## i_cattransportation         -0.888302    1.399377 -0.6348  0.526
203
## i_catwholesale              -0.741251    1.348128 -0.5498  0.582
967
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +

```

```

##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min      1Q  Median      3Q      Max
## -10.8188  -2.1824   0.1684   2.4274  12.0075
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept)      -2.47976     3.39214  -0.731  0.4656
8
## `Prev E Score`
##              0.01854     0.01858   0.998  0.3197
3
## `Prev G Score`
##              0.03654     0.01462   2.499  0.0133
0 *
## `Prev S Score`
##             -0.01949     0.02826  -0.690  0.4911
4
## I(`Prev S Score` * cross_border)
##            -0.03213     0.02959  -1.086  0.2790
3
## `firm size`
##              0.06459     0.31501   0.205  0.8377
7
## leverage
##            -7.18960     3.34534  -2.149  0.0329
2 *
## `free cash flow`
##            -4.67112     6.65496  -0.702  0.4836
2
## `Tobin's q`
##              0.30589     0.34551   0.885  0.3771
3
## preMTR
##            -4.35038     1.39525  -3.118  0.0021
1 **
## deal_size
##              1.35181     1.91471   0.706  0.4810
6
## hostile
##              NA          NA        NA        N
A
## high_tech
##            -0.43113     0.75722  -0.569  0.5698
0
## diversifying
##              0.62497     0.66479   0.940  0.3483
9
## public_target
##            -1.72983     0.83563  -2.070  0.0398
3 *
## private_target
##            -0.86927     0.68472  -1.270  0.2058
4
## all_cash_deal
##            -0.37921     0.90580  -0.419  0.6759
6
## stock_deal
##              1.80826     1.40675   1.285  0.2002
4
## cross_border
##              1.38946     1.40812   0.987  0.3250

```

```

5
## i_catmanufacture      2.67181    1.18862    2.248  0.0257
6 *
## i_catmining           2.33119    1.60507    1.452  0.1480
8
## i_catretail           3.59238    2.69737    1.332  0.1845
5
## i_catservices         1.04865    1.34462    0.780  0.4364
5
## i_cattransportation   2.15876    1.86541    1.157  0.2486
5
## i_catwholesale        1.48293    1.89819    0.781  0.4356
6
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.031 on 186 degrees of freedom
## Multiple R-squared:  0.204, Adjusted R-squared:  0.1056
## F-statistic: 2.073 on 23 and 186 DF,  p-value: 0.004247
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 63.341, df = 23, p-value = 1.239e-05
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)    -2.479763   3.046951  -0.8139 0.4167
71
## `Prev E Score`  0.018538   0.015139   1.2245 0.2223
05
## `Prev G Score`  0.036543   0.015553   2.3496 0.0198
44 *
## `Prev S Score` -0.019494   0.025295  -0.7707 0.4418
77
## I(`Prev S Score` * cross_border) -0.032126   0.025803  -1.2450 0.2146
83
## `firm size`     0.064588   0.310969   0.2077 0.8356
90
## leverage        -7.189605   3.688909  -1.9490 0.0528
02 .
## `free cash flow` -4.671119   6.926778  -0.6744 0.5009
22
## `Tobin's q`     0.305886   0.346066   0.8839 0.3778
93
## preMTR          -4.350375   1.458107  -2.9836 0.0032

```

```

31 **
## deal_size                1.351806    3.518740  0.3842 0.7012
89
## high_tech                -0.431134    0.711063 -0.6063 0.5450
40
## diversifying            0.624965    0.656760  0.9516 0.3425
40
## public_target          -1.729827    0.846679 -2.0431 0.0424
56 *
## private_target         -0.869274    0.598582 -1.4522 0.1481
25
## all_cash_deal          -0.379205    0.803655 -0.4719 0.6375
87
## stock_deal              1.808259    1.897463  0.9530 0.3418
33
## cross_border            1.389462    1.321157  1.0517 0.2943
01
## i_catmanufacture        2.671814    1.232771  2.1673 0.0314
81 *
## i_catmining             2.331193    1.682197  1.3858 0.1674
66
## i_catretail             3.592375    2.830168  1.2693 0.2059
15
## i_catservices          1.048654    1.514432  0.6924 0.4895
24
## i_cattransportation     2.158761    2.007592  1.0753 0.2836
34
## i_catwholesale          1.482925    1.464138  1.0128 0.3124
56
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +
##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -37.191  -2.469   0.209   3.093  19.231
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)

```

## (Intercept)	9.64243	4.86352	1.983	0.0482
19 *				
## `Prev E Score`	-0.01933	0.02006	-0.964	0.3358
81				
## `Prev G Score`	-0.01019	0.01808	-0.564	0.5733
66				
## `Prev S Score`	0.06122	0.03116	1.965	0.0502
75 .				
## I(`Prev S Score` * cross_border)	-0.03290	0.03220	-1.022	0.3075
61				
## `firm size`	-0.17032	0.32212	-0.529	0.5973
26				
## leverage	-1.41207	3.56708	-0.396	0.6924
56				
## `free cash flow`	-22.26474	6.24629	-3.564	0.0004
17 ***				
## `Tobin's q`	0.03911	0.43254	0.090	0.9280
00				
## preMTR	-4.64851	1.54063	-3.017	0.0027
43 **				
## deal_size	-0.25780	2.85672	-0.090	0.9281
46				
## hostile	NA	NA	NA	
NA				
## high_tech	1.42021	0.90204	1.574	0.1163
18				
## diversifying	-1.37553	0.70724	-1.945	0.0526
12 .				
## public_target	-0.18397	1.00677	-0.183	0.8551
16				
## private_target	-0.23643	0.75848	-0.312	0.7554
52				
## all_cash_deal	-0.27949	0.97076	-0.288	0.7735
91				
## stock_deal	-0.48699	1.69232	-0.288	0.7737
05				
## cross_border	1.44149	1.62660	0.886	0.3761
40				
## i_catfinance	-7.22367	3.85735	-1.873	0.0619
70 .				
## i_catmanufacture	-6.18347	3.68716	-1.677	0.0944
59 .				
## i_catmining	-13.30717	3.89296	-3.418	0.0007
07 ***				
## i_catretail	-5.97360	4.04314	-1.477	0.1404
79				
## i_catservices	-7.57331	3.77691	-2.005	0.0457
41 *				
## i_cattransportation	-6.78652	3.85732	-1.759	0.0794
14 .				

```

## i_catwholesale          -11.73841    4.12589   -2.845 0.0047
10 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.026 on 339 degrees of freedom
## Multiple R-squared:  0.1551, Adjusted R-squared:  0.09533
## F-statistic: 2.594 on 24 and 339 DF,  p-value: 8.92e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 87.674, df = 24, p-value = 3.485e-09
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)      9.642427   9.488076   1.0163  0.31
023
## `Prev E Score`   -0.019334   0.017257  -1.1203  0.26
336
## `Prev G Score`   -0.010193   0.018888  -0.5397  0.58
979
## `Prev S Score`   0.061223   0.032256   1.8980  0.05
854 .
## I(`Prev S Score` * cross_border) -0.032903   0.033416  -0.9846  0.32
551
## `firm size`      -0.170319   0.268019  -0.6355  0.52
555
## leverage         -1.412071   3.338194  -0.4230  0.67
256
## `free cash flow` -22.264741   8.787944  -2.5336  0.01
174 *
## `Tobin's q`      0.039114   0.597982   0.0654  0.94
789
## preMTR           -4.648509   1.964780  -2.3659  0.01
855 *
## deal_size        -0.257803   4.286988  -0.0601  0.95
208
## high_tech        1.420207   0.711304   1.9966  0.04
667 *
## diversifying     -1.375529   0.685560  -2.0064  0.04
560 *
## public_target    -0.183972   0.916192  -0.2008  0.84
097
## private_target   -0.236425   0.731407  -0.3232  0.74
671

```



```

## all_cash_deal      -0.279493    0.745695 -0.3748  0.70
804
## stock_deal        -0.486985    1.998994 -0.2436  0.80
768
## cross_border      1.441489    1.924560  0.7490  0.45
438
## i_catfinance      -7.223672    9.097626 -0.7940  0.42
774
## i_catmanufacture -6.183468    9.143112 -0.6763  0.49
931
## i_catmining       -13.307167   9.378546 -1.4189  0.15
685
## i_catretail       -5.973602    9.157058 -0.6523  0.51
462
## i_catservices     -7.573306    9.164412 -0.8264  0.40
917
## i_cattransportation -6.786524    9.152364 -0.7415  0.45
890
## i_catwholesale   -11.738413   9.904143 -1.1852  0.23
677
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##     c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -11.6017  -1.9910   0.1404   2.0951  13.0117
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept)    -0.87766     4.08127  -0.215   0.830
0
## `Prev E Score`  0.01691     0.01841   0.918   0.359
6
## `Prev G Score` -0.02116     0.01631  -1.297   0.196
2
## `Prev S Score` -0.03461     0.03336  -1.037   0.301
0
## I(`Prev S Score` * cross_border) 0.03316     0.02932   1.131   0.259

```

```

7
## `firm size`           0.20107    0.28063    0.716    0.474
6
## leverage            -0.29384    3.12089   -0.094    0.925
1
## `free cash flow`    4.85709    3.29894    1.472    0.142
7
## `Tobin's q`        -0.02592    0.34138   -0.076    0.939
6
## preMTR             -1.62448    1.35517   -1.199    0.232
3
## deal_size          1.91555    0.98996    1.935    0.054
6 .
## hostile              NA           NA          NA         N
A
## high_tech          -1.13017    0.82313   -1.373    0.171
5
## diversifying        0.04858    0.67007    0.073    0.942
3
## public_target      -0.20130    0.97712   -0.206    0.837
0
## private_target     -0.14985    0.63998   -0.234    0.815
1
## all_cash_deal     -1.81063    0.93946   -1.927    0.055
6 .
## stock_deal         -0.43609    1.41542   -0.308    0.758
4
## cross_border       -0.68331    1.47839   -0.462    0.644
5
## i_catfinance       1.96886    3.04581    0.646    0.518
9
## i_catmanufacture   3.25338    2.89835    1.122    0.263
2
## i_catmining        3.71448    3.32056    1.119    0.264
8
## i_catretail        1.58259    3.49019    0.453    0.650
8
## i_catservices      2.51625    2.95209    0.852    0.395
2
## i_cattransportation -0.02488    3.08431   -0.008    0.993
6
## i_catwholesale     3.51727    3.19180    1.102    0.272
0
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3.87 on 175 degrees of freedom
## Multiple R-squared:  0.1644, Adjusted R-squared:  0.04976
## F-statistic: 1.434 on 24 and 175 DF,  p-value: 0.09698
##

```

```

##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 39.495, df = 24, p-value = 0.02422
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      -0.877657   3.133227  -0.2801 0.7797
22
## `Prev E Score`    0.016912   0.017479   0.9676 0.3345
97
## `Prev G Score`   -0.021159   0.017709  -1.1948 0.2337
76
## `Prev S Score`   -0.034606   0.030809  -1.1232 0.2628
71
## I(`Prev S Score` * cross_border) 0.033158   0.025825   1.2840 0.2008
47
## `firm size`      0.201070   0.295332   0.6808 0.4968
82
## leverage        -0.293837   2.733427  -0.1075 0.9145
17
## `free cash flow` 4.857089   4.616975   1.0520 0.2942
47
## `Tobin's q`     -0.025918   0.404012  -0.0642 0.9489
22
## preMTR          -1.624482   1.159090  -1.4015 0.1628
31
## deal_size       1.915551   0.580129   3.3019 0.0011
64 **
## high_tech      -1.130170   0.818836  -1.3802 0.1692
81
## diversifying    0.048582   0.606594   0.0801 0.9362
58
## public_target  -0.201299   1.205981  -0.1669 0.8676
28
## private_target  -0.149846   0.543956  -0.2755 0.7832
77
## all_cash_deal  -1.810625   1.123858  -1.6111 0.1089
64
## stock_deal     -0.436095   1.738918  -0.2508 0.8022
74
## cross_border    -0.683306   1.316819  -0.5189 0.6044
81
## i_catfinance    1.968861   1.409855   1.3965 0.1643
33
## i_catmanufacture 3.253377   1.163939   2.7951 0.0057

```

```

67 **
## i_catmining          3.714485    3.033857    1.2243 0.2224
68
## i_catretail         1.582588    1.600189    0.9890 0.3240
28
## i_catservices      2.516255    1.189614    2.1152 0.0358
30 *
## i_cattransportation -0.024884    1.603129   -0.0155 0.9876
33
## i_catwholesale      3.517270    1.608098    2.1872 0.0300
52 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##     c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -12.1060  -2.1178  -0.0111   1.6830  14.5996
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          5.357264    4.979407   1.076  0.283
17
## `Prev E Score`         0.008198    0.017393   0.471  0.637
86
## `Prev G Score`       -0.015198    0.013437  -1.131  0.259
26
## `Prev S Score`         0.017688    0.030537   0.579  0.563
03
## I(`Prev S Score` * cross_border) -0.009046    0.029494  -0.307  0.759
37
## `firm size`          -0.639944    0.323699  -1.977  0.049
30 *
## leverage              0.443288    2.770107   0.160  0.873
01
## `free cash flow`     -4.708284    5.514328  -0.854  0.394
14
## `Tobin's q`           0.146765    0.348167   0.422  0.673
78

```

```

## preMTR                                -3.906125    1.254114   -3.115    0.002
09 **
## deal_size                              1.006613    0.386065    2.607    0.009
75 **
## hostile                                NA           NA           NA
NA
## high_tech                              -0.031763    0.731308   -0.043    0.965
40
## diversifying                           0.231399    0.597015    0.388    0.698
70
## public_target                          -0.644159    0.815231   -0.790    0.430
30
## private_target                         0.144254    0.623883    0.231    0.817
36
## all_cash_deal                          -0.632476    0.788994   -0.802    0.423
64
## stock_deal                             -1.285712    1.200209   -1.071    0.285
25
## cross_border                           1.585684    1.383825    1.146    0.253
11
## i_catConstruction                      -1.269697    4.791903   -0.265    0.791
29
## i_catfinance                           -1.229615    4.386699   -0.280    0.779
51
## i_catmanufacture                       0.739069    4.238665    0.174    0.861
74
## i_catmining                            -0.638972    4.466793   -0.143    0.886
38
## i_catretail                             1.608598    4.885961    0.329    0.742
30
## i_catservices                           0.424761    4.276313    0.099    0.920
97
## i_cattransportation                    0.154901    4.344305    0.036    0.971
59
## i_catwholesale                          0.447169    4.608192    0.097    0.922
79
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.121 on 218 degrees of freedom
## Multiple R-squared:  0.125, Adjusted R-squared:  0.02467
## F-statistic: 1.246 on 25 and 218 DF,  p-value: 0.202
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 36.828, df = 25, p-value = 0.05994
##
##

```

```

## t test of coefficients:
##
##          Estimate Std. Error t value Pr(>
|t|)
## (Intercept)          5.3572641  2.2181013  2.4152 0.01
6549 *
## `Prev E Score`
6637          0.0081980  0.0132464  0.6189 0.53
## `Prev G Score`
3501        -0.0151980  0.0113903 -1.3343 0.18
## `Prev S Score`
5374          0.0176878  0.0253090  0.6989 0.48
## I(`Prev S Score` * cross_border)
1066        -0.0090458  0.0227318 -0.3979 0.69
## `firm size`
8643 *        -0.6399444  0.2699795 -2.3703 0.01
## leverage
1295          0.4432881  2.5340433  0.1749 0.86
## `free cash flow`
7560        -4.7082838  6.4698294 -0.7277 0.46
## `Tobin's q`
2235          0.1467649  0.3833898  0.3828 0.70
## preMTR
3646 **       -3.9061246  1.3290074 -2.9391 0.00
## deal_size
e-08 ***      1.0066128  0.1784171  5.6419 5.191
## high_tech
1218        -0.0317635  0.6524738 -0.0487 0.96
## diversifying
5362          0.2313992  0.5021088  0.4609 0.64
## public_target
9038        -0.6441589  0.8493790 -0.7584 0.44
## private_target
8940          0.1442544  0.5382290  0.2680 0.78
## all_cash_deal
0157        -0.6324756  0.6616210 -0.9559 0.34
## stock_deal
1068        -1.2857124  1.3475060 -0.9541 0.34
## cross_border
2252          1.5856845  1.1037411  1.4366 0.15
## i_catConstruction
2112        -1.2696966  1.6488789 -0.7700 0.44
## i_catfinance
8708        -1.2296151  1.5176664 -0.8102 0.41
## i_catmanufacture
0830          0.7390693  1.1492151  0.6431 0.52
## i_catmining
0367        -0.6389720  2.0923731 -0.3054 0.76
## i_catretail
2502          1.6085978  1.3435560  1.1973 0.23

```

```

## i_catservices          0.4247606  1.5073869  0.2818  0.77
8375
## i_cattransportation   0.1549009  1.4387089  0.1077  0.91
4359
## i_catwholesale        0.4471690  1.3901880  0.3217  0.74
8018
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -19.8785  -2.1929   0.1795   2.2374  13.5287
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|
)
## (Intercept)          0.29740     7.97422   0.037  0.9703
5
## `Prev E Score`      -0.02076     0.03180  -0.653  0.5157
8
## `Prev G Score`     -0.01885     0.03095  -0.609  0.5443
4
## `Prev S Score`      0.07387     0.05876   1.257  0.2124
5
## I(`Prev S Score` * cross_border) -0.04620     0.05066  -0.912  0.3646
0
## `firm size`        -0.38042     0.61701  -0.617  0.5393
2
## leverage           1.52303     5.10197   0.299  0.7661
0
## `free cash flow`   -0.19479     6.79875  -0.029  0.9772
2
## `Tobin's q`        0.03063     0.48335   0.063  0.9496
3
## preMTR             3.78418     3.12686   1.210  0.2298
5
## deal_size          2.56821     1.88156   1.365  0.1762
0
## hostile              NA           NA       NA       N

```

```

A
## high_tech          0.62549    1.41062    0.443    0.6586
9
## diversifying      -0.05797    1.08569   -0.053    0.9575
5
## public_target     -1.06000    1.56443   -0.678    0.5000
5
## private_target    0.27004    1.15194    0.234    0.8152
7
## all_cash_deal     0.19990    1.82147    0.110    0.9128
9
## stock_deal        6.87567    2.45719    2.798    0.0064
7 **
## cross_border      -1.05861    2.32066   -0.456    0.6495
4
## i_catfinance      -5.86783    5.57695   -1.052    0.2959
8
## i_catmanufacture  2.76029    5.07323    0.544    0.5879
3
## i_catmining        0.67003    5.69365    0.118    0.9066
2
## i_catretail       5.93328    5.39344    1.100    0.2746
7
## i_catservices     0.91961    5.17008    0.178    0.8592
9
## i_cattransportation 0.86324    5.83824    0.148    0.8828
4
## i_catwholesale    2.05544    5.25972    0.391    0.6970
2
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.595 on 78 degrees of freedom
## Multiple R-squared:  0.4375, Adjusted R-squared:  0.2645
## F-statistic: 2.528 on 24 and 78 DF,  p-value: 0.001133
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 35.168, df = 24, p-value = 0.06595
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)    0.297399   4.843814  0.0614 0.9511
996
## `Prev E Score` -0.020763   0.030698 -0.6764 0.5008

```



```

112
## `Prev G Score`          -0.018848    0.025025 -0.7531 0.4536
306
## `Prev S Score`          0.073868    0.039891  1.8517 0.0678
489 .
## I(`Prev S Score` * cross_border) -0.046202    0.033312 -1.3870 0.1694
004
## `firm size`             -0.380424    0.532935 -0.7138 0.4774
641
## leverage                 1.523031    4.131718  0.3686 0.7134
100
## `free cash flow`       -0.194789    4.744740 -0.0411 0.9673
581
## `Tobin's q`            0.030634    0.362881  0.0844 0.9329
392
## preMTR                   3.784183    3.517901  1.0757 0.2853
804
## deal_size                2.568215    1.143552  2.2458 0.0275
455 *
## high_tech                0.625490    1.522049  0.4110 0.6822
342
## diversifying            -0.057974    0.725277 -0.0799 0.9364
948
## public_target           -1.060002    1.529017 -0.6933 0.4902
077
## private_target           0.270044    0.909179  0.2970 0.7672
406
## all_cash_deal           0.199903    1.136825  0.1758 0.8608
728
## stock_deal               6.875667    1.782687  3.8569 0.0002
348 ***
## cross_border            -1.058613    1.434480 -0.7380 0.4627
430
## i_catfinance            -5.867830    3.060224 -1.9175 0.0588
418 .
## i_catmanufacture        2.760295    1.776672  1.5536 0.1243
205
## i_catmining              0.670031    2.814616  0.2381 0.8124
634
## i_catretail              5.933284    2.094797  2.8324 0.0058
766 **
## i_catservices           0.919605    1.841188  0.4995 0.6188
592
## i_cattransportation     0.863239    2.620522  0.3294 0.7427
250
## i_catwholesale          2.055444    1.732699  1.1863 0.2391
177
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##

```

```

##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -45.142  -2.125   0.264   2.442  26.229
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept)          0.85273     6.09640   0.140 0.88881
2
## `Prev E Score`      -0.01264     0.01455  -0.869 0.38532
9
## `Prev G Score`      -0.01589     0.01365  -1.164 0.24477
4
## `Prev S Score`       0.02235     0.02536   0.881 0.37846
6
## I(`Prev S Score` * cross_border) -0.01383     0.02504  -0.552 0.58109
9
## `firm size`         -0.14585     0.25428  -0.574 0.56650
7
## leverage            -0.37533     2.40246  -0.156 0.87591
3
## `free cash flow`    -4.38002     3.75549  -1.166 0.24401
8
## `Tobin's q`         -0.26694     0.30117  -0.886 0.37584
6
## preMTR              -4.45327     1.15054  -3.871 0.00012
2 ***
## deal_size           3.13004     1.71631   1.824 0.06876
0 .
## hostile              NA           NA         NA         NA
A
## high_tech           0.75129     0.73533   1.022 0.30738
7
## diversifying        -0.23840     0.54056  -0.441 0.65937
1
## public_target       -3.08520     0.76452  -4.035 6.25e-0
5 ***
## private_target      -0.83713     0.55875  -1.498 0.13466
9

```

```

## all_cash_deal          0.14730    0.73868    0.199 0.84201
5
## stock_deal            0.98964    1.08566    0.912 0.36241
6
## cross_border          1.07981    1.29165    0.836 0.40353
7
## i_catConstruction     -1.77050    5.98063   -0.296 0.76731
6
## i_catfinance          1.12642    5.68508    0.198 0.84301
4
## i_catmanufacture      2.92642    5.67054    0.516 0.60601
7
## i_catmining           -1.07756    5.77618   -0.187 0.85208
3
## i_catretail           4.11194    5.83152    0.705 0.48104
4
## i_catservices         2.34939    5.71334    0.411 0.68108
4
## i_cattransportation   1.18392    5.74332    0.206 0.83676
2
## i_catwholesale        1.36447    5.80612    0.235 0.81429
5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.588 on 530 degrees of freedom
## Multiple R-squared:  0.1067, Adjusted R-squared:  0.06459
## F-statistic: 2.533 on 25 and 530 DF,  p-value: 7.37e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 82.746, df = 25, p-value = 4.209e-08
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)    0.852731   2.453040   0.3476 0.7282
621
## `Prev E Score` -0.012644   0.012432  -1.0170 0.3095
970
## `Prev G Score` -0.015894   0.014614  -1.0876 0.2772
858
## `Prev S Score`  0.022354   0.024629   0.9076 0.3644
955
## I(`Prev S Score` * cross_border) -0.013825   0.024134  -0.5729 0.5669
844

```

```

## `firm size`                -0.145847    0.221852 -0.6574 0.5112
047
## leverage                    -0.375332    2.553036 -0.1470 0.8831
768
## `free cash flow`          -4.380021    6.000809 -0.7299 0.4657
706
## `Tobin's q`               -0.266938    0.405865 -0.6577 0.5110
154
## preMTR                     -4.453274    1.441971 -3.0883 0.0021
184 **
## deal_size                  3.130035    3.027360  1.0339 0.3016
470
## high_tech                  0.751291    0.687152  1.0933 0.2747
411
## diversifying               -0.238402    0.577301 -0.4130 0.6798
035
## public_target              -3.085200    0.864679 -3.5680 0.0003
923 ***
## private_target             -0.837132    0.542300 -1.5437 0.1232
656
## all_cash_deal              0.147304    0.607057  0.2427 0.8083
681
## stock_deal                 0.989639    1.216514  0.8135 0.4162
943
## cross_border               1.079809    1.465999  0.7366 0.4617
106
## i_catConstruction          -1.770499    1.964938 -0.9010 0.3679
733
## i_catfinance                1.126421    0.943865  1.1934 0.2332
416
## i_catmanufacture           2.926425    0.854954  3.4229 0.0006
675 ***
## i_catmining                 -1.077562    2.299231 -0.4687 0.6395
041
## i_catretail                 4.111939    1.742712  2.3595 0.0186
610 *
## i_catservices               2.349389    1.156767  2.0310 0.0427
540 *
## i_cattransportation        1.183918    1.093259  1.0829 0.2793
341
## i_catwholesale             1.364472    2.924284  0.4666 0.6409
775
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +

```

```

##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -26.717  -2.167   0.154   2.230  22.536
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          3.091613    2.640474   1.171 0.2421
55
## `Prev E Score`       -0.017487    0.012985  -1.347 0.1786
13
## `Prev G Score`       -0.007144    0.011357  -0.629 0.5295
67
## `Prev S Score`       0.011575    0.023929   0.484 0.6287
62
## I(`Prev S Score` * cross_border) 0.023616    0.023328   1.012 0.3118
08
## `firm size`         -0.117340    0.208152  -0.564 0.5731
67
## leverage            -1.499829    1.976035  -0.759 0.4481
66
## `free cash flow`    0.337186    1.940973   0.174 0.8621
48
## `Tobin's q`        -0.514182    0.235803  -2.181 0.0296
32 *
## preMTR              -1.999965    1.067109  -1.874 0.0614
25 .
## deal_size           0.874408    1.307311   0.669 0.5038
60
## hostile              NA              NA         NA
NA
## high_tech           -2.270525    0.657133  -3.455 0.0005
92 ***
## diversifying        -0.140537    0.492588  -0.285 0.7755
17
## public_target       0.064804    0.752726   0.086 0.9314
24
## private_target      -0.305617    0.455971  -0.670 0.5029
72
## all_cash_deal       0.042590    0.715793   0.060 0.9525
74
## stock_deal          -0.312091    0.982749  -0.318 0.7509
30
## cross_border        -0.468047    1.151425  -0.406 0.6845

```

```

35
## i_catfinance          -1.373429    1.780313   -0.771 0.4407
64
## i_catmanufacture      0.402291    1.740550    0.231 0.8173
00
## i_catmining           -0.860273    2.097534   -0.410 0.6818
63
## i_catretail           -1.879246    2.008527   -0.936 0.3498
65
## i_catservices         2.324064    1.811104    1.283 0.1999
42
## i_cattransportation  -1.569750    1.883833   -0.833 0.4050
45
## i_catwholesale        -1.836553    2.131414   -0.862 0.3892
44
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.907 on 560 degrees of freedom
## Multiple R-squared:  0.08424,    Adjusted R-squared:  0.04499
## F-statistic: 2.146 on 24 and 560 DF,  p-value: 0.001321
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 84.856, df = 24, p-value = 1.006e-08
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)      3.0916132  2.2638800   1.3656 0.172
605
## `Prev E Score`   -0.0174870  0.0112851  -1.5496 0.121
809
## `Prev G Score`   -0.0071444  0.0118085  -0.6050 0.545
412
## `Prev S Score`    0.0115753  0.0244808   0.4728 0.636
517
## I(`Prev S Score` * cross_border) 0.0236161  0.0233920   1.0096 0.313
131
## `firm size`      -0.1173403  0.1979434  -0.5928 0.553
556
## leverage         -1.4998287  1.9062814  -0.7868 0.431
742
## `free cash flow`  0.3371856  2.7919717   0.1208 0.903
917
## `Tobin's q`      -0.5141815  0.2760558  -1.8626 0.063

```

```

042 .
## preMTR                -1.9999650  1.6092388 -1.2428 0.214
461
## deal_size              0.8744080  1.6581550  0.5273 0.598
168
## high_tech             -2.2705246  0.7676414 -2.9578 0.003
229 **
## diversifying          -0.1405369  0.5309749 -0.2647 0.791
356
## public_target         0.0648042  0.8120800  0.0798 0.936
425
## private_target        -0.3056167  0.4314798 -0.7083 0.479
054
## all_cash_deal         0.0425905  0.8254861  0.0516 0.958
870
## stock_deal            -0.3120914  1.2921983 -0.2415 0.809
241
## cross_border          -0.4680470  1.2956085 -0.3613 0.718
044
## i_catfinance          -1.3734286  1.2567980 -1.0928 0.274
952
## i_catmanufacture      0.4022905  1.2119536  0.3319 0.740
062
## i_catmining           -0.8602732  1.8299975 -0.4701 0.638
470
## i_catretail           -1.8792459  1.9864826 -0.9460 0.344
548
## i_catservices         2.3240637  1.3245008  1.7547 0.079
862 .
## i_cattransportation  -1.5697502  1.3968516 -1.1238 0.261
589
## i_catwholesale        -1.8365528  2.4266852 -0.7568 0.449
479
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
` +
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +
##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -28.975  -2.761   0.070   2.762  50.572

```

```

##
## Coefficients: (1 not defined because of singularities)
##           Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          -1.388210    6.980173  -0.199    0.84
24
## `Prev E Score`         0.006126    0.018909   0.324    0.74
61
## `Prev G Score`       -0.025498    0.016808  -1.517    0.12
99
## `Prev S Score`        0.012918    0.035552   0.363    0.71
65
## I(`Prev S Score` * cross_border) -0.033647    0.034501  -0.975    0.32
99
## `firm size`           0.310984    0.296543   1.049    0.29
49
## leverage              3.861869    2.530470   1.526    0.12
77
## `free cash flow`     3.334414    3.821680   0.872    0.38
34
## `Tobin's q`          0.090296    0.346534   0.261    0.79
45
## preMTR                -1.297362    1.139303  -1.139    0.25
54
## deal_size             8.470827    1.045976   8.098 4.97e-
15 ***
## hostile                NA                NA                NA
NA
## high_tech             0.957784    1.037936   0.923    0.35
66
## diversifying          -0.946740    0.719470  -1.316    0.18
89
## public_target         -5.896623    0.987926  -5.969 4.76e-
09 ***
## private_target        0.480919    0.733454   0.656    0.51
23
## all_cash_deal        0.073708    1.124203   0.066    0.94
78
## stock_deal           -2.348297    1.348742  -1.741    0.08
23 .
## cross_border          3.319214    1.761329   1.884    0.06
01 .
## i_catConstruction     -3.629821    7.233622  -0.502    0.61
60
## i_catfinance          -3.524426    6.835313  -0.516    0.60
64
## i_catmanufacture     -2.744726    6.792677  -0.404    0.68
63
## i_catmining           -4.677206    6.948260  -0.673    0.50
12

```



```

## i_catretail          -5.375772    7.453237  -0.721    0.47
11
## i_catservices       -2.990085    6.824807  -0.438    0.66
15
## i_cattransportation -1.186072    6.882278  -0.172    0.86
32
## i_catwholesale      -0.010545    7.006455  -0.002    0.99
88
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.64 on 463 degrees of freedom
## Multiple R-squared:  0.2527, Adjusted R-squared:  0.2124
## F-statistic: 6.264 on 25 and 463 DF,  p-value: < 2.2e-16
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 223.97, df = 25, p-value < 2.2e-16
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept)      -1.3882098  2.2209186  -0.6251  0.5
3224
## `Prev E Score`    0.0061257  0.0163296  0.3751  0.7
0774
## `Prev G Score`   -0.0254979  0.0148231  -1.7201  0.0
8607 .
## `Prev S Score`   0.0129175  0.0297140  0.4347  0.6
6396
## I(`Prev S Score` * cross_border) -0.0336474  0.0294226  -1.1436  0.2
5338
## `firm size`      0.3109844  0.3015410  1.0313  0.3
0293
## leverage         3.8618692  2.5500571  1.5144  0.1
3060
## `free cash flow` 3.3344137  4.3048084  0.7746  0.4
3898
## `Tobin's q`      0.0902965  0.4002021  0.2256  0.8
2159
## preMTR           -1.2973620  1.8582576  -0.6982  0.4
8543
## deal_size        8.4708273  4.9099243  1.7252  0.0
8515 .
## high_tech        0.9577843  1.1502237  0.8327  0.4
0545

```

```

## diversifying          -0.9467402  0.7202382 -1.3145  0.1
8933
## public_target        -5.8966233  1.3594919 -4.3374  1.771
e-05 ***
## private_target       0.4809189  0.7902160  0.6086  0.5
4309
## all_cash_deal        0.0737076  1.2941506  0.0570  0.9
5461
## stock_deal           -2.3482971  2.5257858 -0.9297  0.3
5300
## cross_border         3.3192137  1.4644673  2.2665  0.0
2388 *
## i_catConstruction    -3.6298207  2.2456476 -1.6164  0.1
0669
## i_catfinance         -3.5244262  1.3984789 -2.5202  0.0
1206 *
## i_catmanufacture     -2.7447260  1.4189888 -1.9343  0.0
5369 .
## i_catmining          -4.6772062  2.4238349 -1.9297  0.0
5426 .
## i_catretail          -5.3757725  2.8477674 -1.8877  0.0
5969 .
## i_catservices        -2.9900851  1.4396113 -2.0770  0.0
3835 *
## i_cattransportation  -1.1860725  1.5497265 -0.7653  0.4
4446
## i_catwholesale       -0.0105454  3.1073568 -0.0034  0.9
9729
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR22 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -21.9978  -3.0307   0.0463   2.9372  23.6794
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          2.201330    9.225249   0.239  0.811

```

78	## `Prev E Score`	-0.018690	0.041690	-0.448	0.654
68	## `Prev G Score`	-0.091244	0.033945	-2.688	0.008
14	**				
10	## `Prev S Score`	0.066534	0.074440	0.894	0.373
13	## I(`Prev S Score` * cross_border)	-0.002067	0.068950	-0.030	0.976
62	## `firm size`	-0.057657	0.556360	-0.104	0.917
61	## leverage	2.845510	5.605946	0.508	0.612
73	## `free cash flow`	6.640056	4.695432	1.414	0.159
07	## `Tobin's q`	-0.417990	0.428432	-0.976	0.331
51	## preMTR	-0.599816	2.653347	-0.226	0.821
91	## deal_size *	-2.116761	0.964120	-2.196	0.029
NA	## hostile	NA	NA	NA	
81	## high_tech	0.862584	1.631027	0.529	0.597
59	## diversifying	-1.065128	1.410652	-0.755	0.451
04	## public_target	-2.288319	2.199173	-1.041	0.300
02	## private_target	-1.143649	1.395564	-0.819	0.414
41	## all_cash_deal	0.534833	2.068765	0.259	0.796
06	## stock_deal	3.392227	2.406504	1.410	0.161
58	## cross_border	-0.332296	3.128634	-0.106	0.915
77	## i_catfinance	0.836542	7.449942	0.112	0.910
32	## i_catmanufacture	1.758591	7.311936	0.241	0.810
67	## i_catmining	4.182927	7.841921	0.533	0.594
80	## i_catretail	4.750024	7.632161	0.622	0.534
46	## i_catservices	0.615916	7.362112	0.084	0.933
79	## i_cattransportation	-2.246385	7.558389	-0.297	0.766
	## i_catwholesale	0.581401	7.615287	0.076	0.939

```

26
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.844 on 129 degrees of freedom
## Multiple R-squared:  0.1421, Adjusted R-squared:  -0.01752
## F-statistic: 0.8903 on 24 and 129 DF,  p-value: 0.6145
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 84.953, df = 24, p-value = 9.704e-09
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          2.2013303  4.8275359  0.4560 0.649
161
## `Prev E Score`      -0.0186903  0.0349905 -0.5342 0.594
154
## `Prev G Score`     -0.0912437  0.0314466 -2.9015 0.004
368 **
## `Prev S Score`      0.0665336  0.0523132  1.2718 0.205
721
## I(`Prev S Score` * cross_border) -0.0020669  0.0378575 -0.0546 0.956
544
## `firm size`        -0.0576571  0.4919111 -0.1172 0.906
876
## leverage           2.8455100  5.6541038  0.5033 0.615
637
## `free cash flow`   6.6400564  4.7220557  1.4062 0.162
075
## `Tobin's q`        -0.4179902  0.3167439 -1.3196 0.189
290
## preMTR             -0.5998160  2.4762646 -0.2422 0.808
990
## deal_size          -2.1167610  2.4838983 -0.8522 0.395
686
## high_tech           0.8625836  1.3867065  0.6220 0.535
015
## diversifying       -1.0651284  1.1504830 -0.9258 0.356
274
## public_target      -2.2883193  2.3023053 -0.9939 0.322
120
## private_target     -1.1436493  1.3034122 -0.8774 0.381
886
## all_cash_deal      0.5348325  1.6159758  0.3310 0.741

```

```

207
## stock_deal                3.3922269  1.9750582  1.7175 0.088
282 .
## cross_border              -0.3322963  1.9455151 -0.1708 0.864
648
## i_catfinance              0.8365423  2.5940236  0.3225 0.747
605
## i_catmanufacture          1.7585913  2.4996306  0.7035 0.482
987
## i_catmining                4.1829268  6.0172568  0.6952 0.488
208
## i_catretail                4.7500237  2.5643571  1.8523 0.066
265 .
## i_catservices              0.6159157  2.9402498  0.2095 0.834
406
## i_cattransportation       -2.2463846  2.0687954 -1.0858 0.279
574
## i_catwholesale             0.5814012  2.5108522  0.2316 0.817
250
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##CAR55 regression model

Create an empty list to store the model summaries

```
model_summaries <- list()
```

```
reg_model<-list()
```

```
start_year <- 2003
```

```
end_year <- 2015
```

Iterate over the range of years

```
for (year in start_year:end_year) {
```

Fit the regression model for the current year

```
reg_model <- lm(CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+I(`Prev S Score`*cross_border)+ `firm size` + leverage + `free cash flow`
+ `Tobin's q`
+ preMTR + deal_size + hostile + high_tech + diversifying
+ public_target + private_target + all_cash_deal + stock_deal + cross_border
+ i_cat,
data = data1[data1$year%in% c(year,year+4),])
```

Store the summary of the regression model in the list

```
model_summaries[[year]] <- summary(reg_model)
```

Print the summary for the current year

```
print(model_summaries[[year]])
```

##test heteroscedasticity problem

```

hetero_test <- bptest( reg_model)
print(hetero_test)
##use white's robustness standard error
coeftestttt<-coeftest(reg_model, vcov = vcovHC(reg_model, type='HC0',
cluster='a_industry'))
print(coeftestttt)

}

##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -18.1252  -2.7301  -0.2598   2.6479  21.9601
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          8.759324    6.583572   1.330  0.184
53
## `Prev E Score`       -0.001014    0.023291  -0.044  0.965
31
## `Prev G Score`        0.003134    0.017043   0.184  0.854
23
## `Prev S Score`      -0.014796    0.033414  -0.443  0.658
27
## I(`Prev S Score` * cross_border)  0.008304    0.036983   0.225  0.822
51
## `firm size`         -0.931929    0.355307  -2.623  0.009
23 **
## leverage            0.293110    3.443984   0.085  0.932
24
## `free cash flow`   -7.216040    5.576620  -1.294  0.196
82
## `Tobin's q`        -0.239699    0.297885  -0.805  0.421
74
## preMTR             -6.502060    1.423513  -4.568 7.62e-
06 ***
## deal_size          -0.566144    2.227835  -0.254  0.799
60
## hostile             1.410913    5.829617   0.242  0.808

```

```

95
## high_tech                -0.000306    0.932288    0.000    0.999
74
## diversifying             -0.067200    0.744157   -0.090    0.928
12
## public_target           0.265657    0.989672    0.268    0.788
58
## private_target         -0.847835    0.820399   -1.033    0.302
36
## all_cash_deal          -1.733459    1.066282   -1.626    0.105
22
## stock_deal              -3.724220    1.490687   -2.498    0.013
10 *
## cross_border            -0.908069    1.566069   -0.580    0.562
52
## i_catConstruction       -3.407259    6.888121   -0.495    0.621
26
## i_catfinance            1.216320    5.793629    0.210    0.833
88
## i_catmanufacture        4.846377    5.670023    0.855    0.393
48
## i_catmining             5.103016    5.740187    0.889    0.374
83
## i_catretail             3.090861    6.009277    0.514    0.607
45
## i_catservices           4.957975    5.714620    0.868    0.386
42
## i_cattransportation     4.522830    5.866010    0.771    0.441
39
## i_catwholesale          3.878620    6.267950    0.619    0.536
59
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.572 on 260 degrees of freedom
## Multiple R-squared:  0.2221, Adjusted R-squared:  0.1443
## F-statistic: 2.855 on 26 and 260 DF,  p-value: 1.199e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 40.093, df = 26, p-value = 0.0382
##
##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr
(>|t|)
## (Intercept) 8.75932429 3.76352904 2.3274 0.0

```

207109 *				
## `Prev E Score`	-0.00101390	0.02016987	-0.0503	0.9
599474				
## `Prev G Score`	0.00313428	0.01718401	0.1824	0.8
554146				
## `Prev S Score`	-0.01479585	0.02946595	-0.5021	0.6
159984				
## I(`Prev S Score` * cross_border)	0.00830452	0.03487640	0.2381	0.8
119811				
## `firm size`	-0.93192902	0.33860571	-2.7523	0.0
063354 **				
## leverage	0.29311006	3.43996504	0.0852	0.9
321622				
## `free cash flow`	-7.21603999	5.94848200	-1.2131	0.2
261966				
## `Tobin's q`	-0.23969938	0.26160884	-0.9163	0.3
603843				
## preMTR	-6.50206001	2.38507984	-2.7261	0.0
068436 **				
## deal_size	-0.56614420	3.68817158	-0.1535	0.8
781210				
## hostile	1.41091263	1.56259867	0.9029	0.3
674004				
## high_tech	-0.00030598	0.93099033	-0.0003	0.9
997380				
## diversifying	-0.06719968	0.73505643	-0.0914	0.9
272284				
## public_target	0.26565749	1.00835874	0.2635	0.7
924083				
## private_target	-0.84783526	0.84636425	-1.0017	0.3
174015				
## all_cash_deal	-1.73345926	1.01608265	-1.7060	0.0
891982 .				
## stock_deal	-3.72422040	1.57429133	-2.3656	0.0
187327 *				
## cross_border	-0.90806878	1.65740054	-0.5479	0.5
842393				
## i_catConstruction	-3.40725930	2.05079923	-1.6614	0.0
978324 .				
## i_catfinance	1.21631994	1.50299716	0.8093	0.4
191039				
## i_catmanufacture	4.84637667	1.08727019	4.4574	1.2
35e-05 ***				
## i_catmining	5.10301631	1.25822011	4.0557	6.6
11e-05 ***				
## i_catretail	3.09086129	1.80099897	1.7162	0.0
873179 .				
## i_catservices	4.95797490	1.34582649	3.6840	0.0
002794 ***				
## i_cattransportation	4.52283008	1.85016636	2.4446	0.0


```

151678 *
## i_catwholesale          3.87861989  1.44049553  2.6926 0.0
075512 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -32.933  -4.293   0.129   2.749  26.205
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          29.02491     7.50787   3.866 0.0001
41 ***
## `Prev E Score`        -0.02544     0.03310  -0.769 0.4428
43
## `Prev G Score`         0.02063     0.02463   0.838 0.4030
27
## `Prev S Score`         0.05241     0.04502   1.164 0.2454
74
## I(`Prev S Score` * cross_border) -0.06625     0.04741  -1.397 0.1635
65
## `firm size`          -0.92399     0.54936  -1.682 0.0938
08 .
## leverage              8.44796     6.21780   1.359 0.1754
55
## `free cash flow`    -1.39989     8.24214  -0.170 0.8652
67
## `Tobin's q`          0.83031     0.52324   1.587 0.1137
92
## preMTR                -3.81831     2.13649  -1.787 0.0750
99 .
## deal_size            -2.68262     3.66640  -0.732 0.4650
40
## hostile                NA           NA       NA
NA
## high_tech             1.33941     1.31525   1.018 0.3094
71

```

```

## diversifying          1.23228    1.03994    1.185 0.2371
42
## public_target        1.04435    1.61787    0.646 0.5191
82
## private_target       0.72647    1.17014    0.621 0.5352
64
## all_cash_deal        -2.04024    1.61749   -1.261 0.2083
36
## stock_deal           -4.29164    2.23641   -1.919 0.0561
06 .
## cross_border         1.21739    2.05032    0.594 0.5532
02
## i_catfinance         -22.53417    6.13947   -3.670 0.0002
95 ***
## i_catmanufacture     -23.77679    5.76196   -4.127 5.00e-
05 ***
## i_catmining          -26.05181    6.04797   -4.308 2.36e-
05 ***
## i_catretail          -18.66989    6.32962   -2.950 0.0034
79 **
## i_catservices        -24.33548    5.78492   -4.207 3.60e-
05 ***
## i_cattransportation  -23.33152    6.11898   -3.813 0.0001
72 ***
## i_catwholesale       -26.46617    6.45356   -4.101 5.54e-
05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.749 on 254 degrees of freedom
## Multiple R-squared:  0.1618, Adjusted R-squared:  0.08259
## F-statistic: 2.043 on 24 and 254 DF,  p-value: 0.003618
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 52.339, df = 24, p-value = 0.0007066
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)  29.024907  14.108027  2.0573  0.04
068 *
## `Prev E Score` -0.025440  0.028229 -0.9012  0.36
832
## `Prev G Score`  0.020629  0.023631  0.8730  0.38
351

```

```

## `Prev S Score`          0.052410  0.048545  1.0796  0.28
133
## I(`Prev S Score` * cross_border) -0.066246  0.050799 -1.3041  0.19
339
## `firm size`           -0.923989  0.575721 -1.6049  0.10
975
## leverage              8.447962  6.037612  1.3992  0.16
297
## `free cash flow`     -1.399887  8.881548 -0.1576  0.87
488
## `Tobin's q`          0.830308  0.453953  1.8291  0.06
856 .
## preMTR                -3.818311  2.439565 -1.5652  0.11
879
## deal_size            -2.682624  2.920538 -0.9185  0.35
921
## high_tech             1.339411  1.042001  1.2854  0.19
982
## diversifying          1.232285  0.921460  1.3373  0.18
232
## public_target         1.044347  1.406949  0.7423  0.45
860
## private_target        0.726467  1.165525  0.6233  0.53
365
## all_cash_deal        -2.040243  1.323181 -1.5419  0.12
434
## stock_deal            -4.291645  1.742448 -2.4630  0.01
444 *
## cross_border          1.217395  2.472158  0.4924  0.62
283
## i_catfinance          -22.534165 13.577888 -1.6596  0.09
822 .
## i_catmanufacture     -23.776794 13.283670 -1.7899  0.07
466 .
## i_catmining           -26.051808 13.442890 -1.9380  0.05
374 .
## i_catretail           -18.669888 13.295920 -1.4042  0.16
149
## i_catservices        -24.335483 13.270992 -1.8337  0.06
786 .
## i_cattransportation  -23.331519 13.370798 -1.7450  0.08
220 .
## i_catwholesale       -26.466175 13.328459 -1.9857  0.04
814 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score

```

```

` +
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +
##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min      1Q   Median      3Q      Max
## -24.4164  -3.0223  -0.3594   2.6912  17.0664
##
## Coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          8.5838044  5.7363107   1.496 0.136
118
## `Prev E Score`      -0.0027746  0.0205645  -0.135 0.892
810
## `Prev G Score`      0.0004409  0.0208517   0.021 0.983
153
## `Prev S Score`     -0.0304530  0.0483116  -0.630 0.529
184
## I(`Prev S Score` * cross_border)  0.0140936  0.0488789   0.288 0.773
385
## `firm size`        -0.8396584  0.4402620  -1.907 0.057
923 .
## leverage          -0.5451636  4.4839545  -0.122 0.903
352
## `free cash flow`   11.5192568  6.2120333   1.854 0.065
155 .
## `Tobin's q`        0.0645694  0.2832652   0.228 0.819
919
## preMTR            -6.0035109  1.5558149  -3.859 0.000
153 ***
## deal_size          2.3367337  1.4947650   1.563 0.119
560
## hostile           -6.3874225  5.8171346  -1.098 0.273
502
## high_tech          1.6762143  0.9223139   1.817 0.070
645 .
## diversifying       -0.0765444  0.8340832  -0.092 0.926
972
## public_target     -1.2369625  1.1589022  -1.067 0.287
091
## private_target    -0.1377724  0.8938142  -0.154 0.877
654
## all_cash_deal     -0.3038145  1.0179605  -0.298 0.765
665
## stock_deal        -2.5558445  1.3900024  -1.839 0.067

```

```

430 .
## cross_border -2.1728266 1.9692512 -1.103 0.271
183
## i_catfinance 2.2994962 4.1522251 0.554 0.580
332
## i_catmanufacture 1.7431668 3.9976540 0.436 0.663
270
## i_catmining 4.9187860 4.3356163 1.135 0.257
933
## i_catretail 9.8848018 4.7236195 2.093 0.037
637 *
## i_catservices 1.2574313 4.0621278 0.310 0.757
224
## i_cattransportation 1.1382062 4.3703938 0.260 0.794
794
## i_catwholesale -3.9109679 5.7242391 -0.683 0.495
249
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.353 on 201 degrees of freedom
## Multiple R-squared: 0.2234, Adjusted R-squared: 0.1268
## F-statistic: 2.313 on 25 and 201 DF, p-value: 0.0007392
##
##
## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 41.075, df = 25, p-value = 0.02255
##
##
## t test of coefficients:
##
## Estimate Std. Error t value Pr
(>|t|)
## (Intercept) 8.58380441 3.92493779 2.1870 0.
029897 *
## `Prev E Score` -0.00277457 0.01891790 -0.1467 0.
883544
## `Prev G Score` 0.00044087 0.01902014 0.0232 0.
981530
## `Prev S Score` -0.03045304 0.03551291 -0.8575 0.
392179
## I(`Prev S Score` * cross_border) 0.01409363 0.03766190 0.3742 0.
708639
## `firm size` -0.83965844 0.49357223 -1.7012 0.
090454 .
## leverage -0.54516364 6.21308080 -0.0877 0.
930167
## `free cash flow` 11.51925678 6.73472081 1.7104 0.

```

```

088730 .
## `Tobin's q`          0.06456938  0.37578173  0.1718  0.
863747
## preMTR              -6.00351086  2.24836498 -2.6702  0.
008202 **
## deal_size           2.33673373  1.74205273  1.3414  0.
181315
## hostile             -6.38742249  2.72292010 -2.3458  0.
019961 *
## high_tech           1.67621428  0.86952720  1.9277  0.
055298 .
## diversifying        -0.07654444  0.69407575 -0.1103  0.
912295
## public_target       -1.23696247  0.89814749 -1.3772  0.
169971
## private_target      -0.13777236  0.79505026 -0.1733  0.
862600
## all_cash_deal       -0.30381450  0.79560735 -0.3819  0.
702965
## stock_deal          -2.55584447  1.49310940 -1.7118  0.
088483 .
## cross_border        -2.17282658  1.52452771 -1.4252  0.
155637
## i_catfinance        2.29949623  1.90988267  1.2040  0.
230006
## i_catmanufacture    1.74316682  1.30973646  1.3309  0.
184720
## i_catmining         4.91878598  2.24016432  2.1957  0.
029256 *
## i_catretail         9.88480182  2.08685114  4.7367  4.0
99e-06 ***
## i_catservices       1.25743129  1.43951676  0.8735  0.
383428
## i_cattransportation 1.13820623  1.98005067  0.5748  0.
566044
## i_catwholesale      -3.91096787  2.36614789 -1.6529  0.
099916 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])

```

```

##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -15.259  -3.036  -0.273   2.809  17.530
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          4.0302453   5.9470649   0.678 0.498
655
## `Prev E Score`      -0.0246556   0.0218696  -1.127 0.260
756
## `Prev G Score`      0.0002746   0.0164252   0.017 0.986
677
## `Prev S Score`      0.0045883   0.0401755   0.114 0.909
175
## I(`Prev S Score` * cross_border) 0.0514954   0.0379123   1.358 0.175
712
## `firm size`        -0.3117195   0.3757787  -0.830 0.407
669
## leverage           2.9091237   3.4991687   0.831 0.406
627
## `free cash flow`   -2.2946428   7.2105486  -0.318 0.750
597
## `Tobin's q`        0.0722203   0.4925579   0.147 0.883
559
## preMTR             -6.6075742   1.5279943  -4.324 2.28e
-05 ***
## deal_size          1.6242898   0.4637353   3.503 0.000
554 ***
## hostile                NA                NA                NA
NA
## high_tech           0.2872309   0.8512225   0.337 0.736
099
## diversifying        0.9797904   0.7487997   1.308 0.192
022
## public_target      -0.5162517   0.9930703  -0.520 0.603
667
## private_target     -0.0647015   0.7419125  -0.087 0.930
582
## all_cash_deal      -0.1149241   0.9121307  -0.126 0.899
846
## stock_deal         -1.3734630   1.4355730  -0.957 0.339
710
## cross_border       -0.6844252   1.7142754  -0.399 0.690
081
## i_catConstruction  -1.9136523   6.0979973  -0.314 0.753
946
## i_catfinance       -3.9067410   5.3218251  -0.734 0.463
640

```

```

## i_catmanufacture      -1.8634458  5.1135979  -0.364  0.715
888
## i_catmining           -1.5700512  5.4210715  -0.290  0.772
369
## i_catretail           -0.8846634  5.9091010  -0.150  0.881
124
## i_catservices        -1.2188153  5.1393176  -0.237  0.812
748
## i_cattransportation  -3.8139964  5.2513389  -0.726  0.468
403
## i_catwholesale        -2.3225025  5.4491480  -0.426  0.670
352
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.978 on 229 degrees of freedom
## Multiple R-squared:  0.1847, Adjusted R-squared:  0.09568
## F-statistic: 2.075 on 25 and 229 DF,  p-value: 0.002791
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 34.77, df = 25, p-value = 0.09245
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr
(>|t|)
## (Intercept)      4.03024533  2.61916657  1.5388 0.1
252457
## `Prev E Score`  -0.02465559  0.01626128 -1.5162 0.1
308444
## `Prev G Score`   0.00027459  0.01472444  0.0186 0.9
851379
## `Prev S Score`   0.00458826  0.03204677  0.1432 0.8
862787
## I(`Prev S Score` * cross_border) 0.05149540  0.02946882  1.7475 0.0
818991 .
## `firm size`      -0.31171950  0.35336905 -0.8821 0.3
786283
## leverage         2.90912365  2.85276312  1.0198 0.3
089201
## `free cash flow` -2.29464281  6.59721063 -0.3478 0.7
282947
## `Tobin's q`      0.07222032  0.50553171  0.1429 0.8
865263
## preMTR           -6.60757425  1.79093553 -3.6895 0.0
002808 ***

```



```

## deal_size          1.62428984  0.19585033  8.2935  9.4
06e-15 ***
## high_tech          0.28723088  0.79120930  0.3630  0.7
169191
## diversifying      0.97979039  0.64555325  1.5178  0.1
304560
## public_target     -0.51625169  1.01958330 -0.5063  0.6
131079
## private_target    -0.06470152  0.64055324 -0.1010  0.9
196318
## all_cash_deal     -0.11492405  0.74983889 -0.1533  0.8
783243
## stock_deal        -1.37346302  1.53712152 -0.8935  0.3
725119
## cross_border      -0.68442516  1.30834050 -0.5231  0.6
013933
## i_catConstruction -1.91365231  2.26295274 -0.8456  0.3
986341
## i_catfinance      -3.90674098  1.85202056 -2.1094  0.0
359918 *
## i_catmanufacture  -1.86344578  1.25238565 -1.4879  0.1
381485
## i_catmining       -1.57005124  2.74786374 -0.5714  0.5
683081
## i_catretail       -0.88466339  1.97770271 -0.4473  0.6
550678
## i_catservices     -1.21881531  1.53866700 -0.7921  0.4
291081
## i_cattransportation -3.81399645  1.78936558 -2.1315  0.0
341150 *
## i_catwholesale    -2.32250254  1.79669376 -1.2927  0.1
974336
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` +
## + I(`Prev S Score` * cross_border) + `firm size` + leverage +
## + `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## + high_tech + diversifying + public_target + private_target +
## + all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -16.0173  -2.3722  -0.0897   2.5200  21.8051
##

```

```

## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      -5.929879    4.387302  -1.352  0.178
14
## `Prev E Score`   -0.014378    0.024033  -0.598  0.550
38
## `Prev G Score`   0.016520    0.018909   0.874  0.383
44
## `Prev S Score`   0.001713    0.036548   0.047  0.962
67
## I(`Prev S Score` * cross_border) -0.053859    0.038272  -1.407  0.161
02
## `firm size`      0.340059    0.407431   0.835  0.404
99
## leverage        -1.433593    4.326775  -0.331  0.740
77
## `free cash flow` -8.985451    8.607353  -1.044  0.297
87
## `Tobin's q`     -0.203300    0.446873  -0.455  0.649
68
## preMTR          -8.046904    1.804580  -4.459 1.42e-
05 ***
## deal_size       -0.734372    2.476431  -0.297  0.767
15
## hostile                NA                NA                NA
NA
## high_tech         -0.738113    0.979369  -0.754  0.452
01
## diversifying      0.663300    0.859827   0.771  0.441
43
## public_target    -1.099039    1.080784  -1.017  0.310
53
## private_target   -0.952794    0.885598  -1.076  0.283
38
## all_cash_deal    -0.118462    1.171532  -0.101  0.919
57
## stock_deal       2.600503    1.819448   1.429  0.154
60
## cross_border     1.821903    1.821229   1.000  0.318
43
## i_catmanufacture  5.065109    1.537324   3.295  0.001
18 **
## i_catmining      4.357987    2.075950   2.099  0.037
14 *
## i_catretail      8.311870    3.488703   2.383  0.018
20 *
## i_catservices    4.976746    1.739091   2.862  0.004
70 **
## i_cattransportation 1.853586    2.412668   0.768  0.443

```

```

30
## i_catwholesale          3.078824    2.455075    1.254  0.211
39
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.213 on 186 degrees of freedom
## Multiple R-squared:  0.2035, Adjusted R-squared:  0.105
## F-statistic: 2.067 on 23 and 186 DF,  p-value: 0.004389
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 44.288, df = 23, p-value = 0.004853
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)      -5.9298794   4.5143740  -1.3136 0.190
614
## `Prev E Score`   -0.0143785   0.0211910  -0.6785 0.498
287
## `Prev G Score`    0.0165201   0.0200156   0.8254 0.410
224
## `Prev S Score`    0.0017128   0.0322077   0.0532 0.957
646
## I(`Prev S Score` * cross_border) -0.0538587   0.0342247  -1.5737 0.117
261
## `firm size`       0.3400595   0.3769125   0.9022 0.368
105
## leverage         -1.4335926   4.4200413  -0.3243 0.746
046
## `free cash flow` -8.9854511  10.1248721  -0.8875 0.375
976
## `Tobin's q`      -0.2032996   0.3416547  -0.5950 0.552
537
## preMTR           -8.0469040   2.9763889  -2.7036 0.007
496 **
## deal_size        -0.7343720   2.8664209  -0.2562 0.798
081
## high_tech        -0.7381126   0.9067566  -0.8140 0.416
678
## diversifying      0.6632999   0.8210990   0.8078 0.420
226
## public_target    -1.0990391   0.9761248  -1.1259 0.261
650
## private_target   -0.9527942   0.8178410  -1.1650 0.245

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506
## all_cash_deal          -0.1184623  0.9818307 -0.1207 0.904
095
## stock_deal            2.6005033  1.8962572  1.3714 0.171
906
## cross_border          1.8219029  1.7471601  1.0428 0.298
404
## i_catmanufacture      5.0651089  1.7933421  2.8244 0.005
254 **
## i_catmining           4.3579868  2.1518807  2.0252 0.044
276 *
## i_catretail           8.3118696  3.0632919  2.7134 0.007
286 **
## i_catservices         4.9767457  2.2733329  2.1892 0.029
828 *
## i_cattransportation  1.8535864  2.4573749  0.7543 0.451
626
## i_catwholesale        3.0788242  1.7871154  1.7228 0.086
589 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -33.088  -3.031   0.182   3.735  26.897
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          15.350287    5.945337   2.582 0.010
245 *
## `Prev E Score`       -0.029810    0.024525  -1.216 0.225
009
## `Prev G Score`       -0.005431    0.022107  -0.246 0.806
088
## `Prev S Score`        0.075059    0.038095   1.970 0.049
615 *
## I(`Prev S Score` * cross_border) -0.060959    0.039360  -1.549 0.122
368

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## `firm size`                -0.115971    0.393767   -0.295 0.768
544
## leverage                    -4.260184    4.360519   -0.977 0.329
271
## `free cash flow`          -21.563070    7.635681   -2.824 0.005
024 **
## `Tobin's q`                0.206455    0.528757    0.390 0.696
446
## preMTR                      -6.168980    1.883317   -3.276 0.001
163 **
## deal_size                   -2.059504    3.492149   -0.590 0.555
749
## hostile                       NA            NA            NA
NA
## high_tech                   1.525378    1.102682    1.383 0.167
473
## diversifying                -0.234425    0.864560   -0.271 0.786
441
## public_target               -0.806810    1.230712   -0.656 0.512
550
## private_target              -0.520339    0.927189   -0.561 0.575
031
## all_cash_deal               -0.941266    1.186696   -0.793 0.428
226
## stock_deal                  1.146250    2.068751    0.554 0.579
891
## cross_border                 2.385589    1.988413    1.200 0.231
076
## i_catfinance                -13.179946    4.715361   -2.795 0.005
484 **
## i_catmanufacture            -12.767665    4.507313   -2.833 0.004
892 **
## i_catmining                 -20.274683    4.758890   -4.260 2.65e
-05 ***
## i_catretail                 -10.553674    4.942468   -2.135 0.033
453 *
## i_catservices               -13.196223    4.617022   -2.858 0.004
524 **
## i_cattransportation         -12.989232    4.715321   -2.755 0.006
192 **
## i_catwholesale              -17.940749    5.043623   -3.557 0.000
428 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.367 on 339 degrees of freedom
## Multiple R-squared:  0.1444, Adjusted R-squared:  0.08388
## F-statistic: 2.385 on 24 and 339 DF,  p-value: 0.0003576
##
##

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## studentized Breusch-Pagan test
##
## data: reg_model
## BP = 69.507, df = 24, p-value = 2.596e-06
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(
>|t|)
## (Intercept)      15.3502874  11.8670289   1.2935 0.1
96711
## `Prev E Score`   -0.0298104   0.0215080  -1.3860 0.1
66654
## `Prev G Score`   -0.0054309   0.0233441  -0.2326 0.8
16178
## `Prev S Score`    0.0750588   0.0456859   1.6429 0.1
01324
## I(`Prev S Score` * cross_border) -0.0609592   0.0460048  -1.3251 0.1
86043
## `firm size`      -0.1159708   0.3626880  -0.3198 0.7
49352
## leverage         -4.2601840   3.9478525  -1.0791 0.2
81304
## `free cash flow` -21.5630696   9.6770251  -2.2283 0.0
26518 *
## `Tobin's q`      0.2064552   0.6846351   0.3016 0.7
63176
## preMTR           -6.1689803   2.2928889  -2.6905 0.0
07488 **
## deal_size        -2.0595045   4.4800636  -0.4597 0.6
46023
## high_tech         1.5253777   0.8971396   1.7003 0.0
89998 .
## diversifying      -0.2344255   0.8367592  -0.2802 0.7
79527
## public_target     -0.8068095   1.0502693  -0.7682 0.4
42907
## private_target    -0.5203392   0.8794395  -0.5917 0.5
54465
## all_cash_deal     -0.9412658   0.9063232  -1.0386 0.2
99752
## stock_deal        1.1462501   2.2083265   0.5191 0.6
04059
## cross_border      2.3855892   2.5267586   0.9441 0.3
45775
## i_catfinance     -13.1799458  11.3425817  -1.1620 0.2
46058
## i_catmanufacture -12.7676649  11.3188258  -1.1280 0.2
60117

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## i_catmining -20.2746826 11.4736153 -1.7671 0.0
78116 .
## i_catretail -10.5536736 11.2917458 -0.9346 0.3
50641
## i_catservices -13.1962228 11.3792742 -1.1597 0.2
46999
## i_cattransportation -12.9892325 11.3453632 -1.1449 0.2
53061
## i_catwholesale -17.9407491 11.7641788 -1.5250 0.1
28183
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
## Min 1Q Median 3Q Max
## -12.2436 -2.6398 -0.0974 2.6311 13.6226
##
## Coefficients: (1 not defined because of singularities)
## Estimate Std. Error t value Pr(>|t
|)
## (Intercept) -2.879919 5.112492 -0.563 0.57
39
## `Prev E Score` 0.004495 0.023067 0.195 0.84
57
## `Prev G Score` -0.028197 0.020432 -1.380 0.16
93
## `Prev S Score` -0.080091 0.041791 -1.916 0.05
69 .
## I(`Prev S Score` * cross_border) 0.065141 0.036730 1.774 0.07
79 .
## `firm size` 0.669291 0.351541 1.904 0.05
86 .
## leverage 4.187467 3.909448 1.071 0.28
56
## `free cash flow` 9.593825 4.132489 2.322 0.02
14 *
## `Tobin's q` 0.238114 0.427638 0.557 0.57
84
## preMTR -2.681987 1.697588 -1.580 0.11

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```

59
## deal_size          3.181064    1.240092    2.565    0.01
12 *
## hostile            NA          NA          NA
NA
## high_tech         -2.076638    1.031111   -2.014    0.04
55 *
## diversifying      0.826301    0.839374    0.984    0.32
63
## public_target     -0.496417    1.224014   -0.406    0.68
56
## private_target    -0.236646    0.801679   -0.295    0.76
82
## all_cash_deal     -1.634142    1.176840   -1.389    0.16
67
## stock_deal        -1.069138    1.773055   -0.603    0.54
73
## cross_border      -2.694837    1.851939   -1.455    0.14
74
## i_catfinance      0.271241    3.815405    0.071    0.94
34
## i_catmanufacture  2.009247    3.630686    0.553    0.58
07
## i_catmining        2.182587    4.159575    0.525    0.60
04
## i_catretail        3.207549    4.372062    0.734    0.46
41
## i_catservices     1.409465    3.697996    0.381    0.70
36
## i_cattransportation 0.147206    3.863629    0.038    0.96
97
## i_catwholesale    2.437848    3.998283    0.610    0.54
28
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.848 on 175 degrees of freedom
## Multiple R-squared:  0.212, Adjusted R-squared:  0.1039
## F-statistic: 1.961 on 24 and 175 DF,  p-value: 0.007185
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 31.943, df = 24, p-value = 0.1284
##
##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>|

```



```

t|)
## (Intercept) -2.8799191 4.6520677 -0.6191 0.536
680
## `Prev E Score` 0.0044947 0.0222798 0.2017 0.840
357
## `Prev G Score` -0.0281969 0.0218561 -1.2901 0.198
711
## `Prev S Score` -0.0800907 0.0391388 -2.0463 0.042
220 *
## I(`Prev S Score` * cross_border) 0.0651407 0.0319860 2.0365 0.043
203 *
## `firm size` 0.6692905 0.3504606 1.9097 0.057
802 .
## leverage 4.1874675 3.9005722 1.0736 0.284
502
## `free cash flow` 9.5938254 3.2320074 2.9684 0.003
413 **
## `Tobin's q` 0.2381136 0.4304696 0.5531 0.580
868
## preMTR -2.6819870 2.1353585 -1.2560 0.210
794
## deal_size 3.1810638 1.5249207 2.0861 0.038
424 *
## high_tech -2.0766381 1.0435282 -1.9900 0.048
146 *
## diversifying 0.8263014 0.8001153 1.0327 0.303
156
## public_target -0.4964173 1.3791246 -0.3600 0.719
318
## private_target -0.2366464 0.6964403 -0.3398 0.734
419
## all_cash_deal -1.6341416 1.3059010 -1.2514 0.212
476
## stock_deal -1.0691381 1.8433556 -0.5800 0.562
664
## cross_border -2.6948369 1.5594304 -1.7281 0.085
736 .
## i_catfinance 0.2712409 3.3386078 0.0812 0.935
341
## i_catmanufacture 2.0092472 3.1754950 0.6327 0.527
733
## i_catmining 2.1825870 4.4177842 0.4940 0.621
893
## i_catretail 3.2075491 3.6402025 0.8811 0.379
447
## i_catservices 1.4094652 3.2329956 0.4360 0.663
401
## i_cattransportation 0.1472060 3.5089141 0.0420 0.966
585
## i_catwholesale 2.4378480 3.4084653 0.7152 0.475

```

```

418
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##      I(`Prev S Score` * cross_border) + `firm size` + leverage +
##      `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##      high_tech + diversifying + public_target + private_target +
##      all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##      c(year, year + 4), ])
##
## Residuals:
##      Min        1Q    Median        3Q        Max
## -13.4633  -2.6270  -0.1528   2.3265  17.4867
##
## Coefficients: (1 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          5.531631    6.020209   0.919   0.35
92
## `Prev E Score`       -0.008372    0.021028  -0.398   0.69
09
## `Prev G Score`       -0.008850    0.016245  -0.545   0.58
65
## `Prev S Score`        0.020547    0.036920   0.557   0.57
84
## I(`Prev S Score` * cross_border)  0.015045    0.035659   0.422   0.67
35
## `firm size`          -0.586687    0.391358  -1.499   0.13
53
## leverage              2.627988    3.349118   0.785   0.43
35
## `free cash flow`     -8.332058    6.666939  -1.250   0.21
27
## `Tobin's q`          0.454416    0.420942   1.080   0.28
15
## preMTR                -6.127852    1.516250  -4.041 7.37e-
05 ***
## deal_size             1.520436    0.466761   3.257   0.00
13 **
## hostile                NA            NA         NA
NA
## high_tech            -0.008712    0.884167  -0.010   0.99
21
## diversifying          0.890385    0.721804   1.234   0.21
87

```

```

## public_target          0.070605   0.985631   0.072   0.94
30
## private_target        -0.201992   0.754288  -0.268   0.78
91
## all_cash_deal         -0.281256   0.953910  -0.295   0.76
84
## stock_deal            -1.169707   1.451078  -0.806   0.42
11
## cross_border           0.048439   1.673074   0.029   0.97
69
## i_catConstruction     -1.713770   5.793512  -0.296   0.76
77
## i_catfinance          -3.398487   5.303612  -0.641   0.52
23
## i_catmanufacture      -1.166780   5.124635  -0.228   0.82
01
## i_catmining           -0.016478   5.400447  -0.003   0.99
76
## i_catretail           -0.415521   5.907230  -0.070   0.94
40
## i_catservices         -1.469799   5.170153  -0.284   0.77
65
## i_cattransportation   -2.489918   5.252357  -0.474   0.63
59
## i_catwholesale        -0.028745   5.571402  -0.005   0.99
59
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.982 on 218 degrees of freedom
## Multiple R-squared:  0.1549, Adjusted R-squared:  0.05798
## F-statistic: 1.598 on 25 and 218 DF,  p-value: 0.04059
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 36.483, df = 25, p-value = 0.06458
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept)      5.5316312  2.8939801  1.9114 0.05
7261 .
## `Prev E Score`   -0.0083718  0.0161957 -0.5169 0.60
5740
## `Prev G Score`   -0.0088504  0.0142914 -0.6193 0.53
6377

```

```

## `Prev S Score`          0.0205469  0.0286009  0.7184  0.47
3279
## I(`Prev S Score` * cross_border) 0.0150454  0.0266819  0.5639  0.57
3415
## `firm size`            -0.5866869  0.3461284 -1.6950  0.09
1504 .
## leverage                2.6279884  2.8506500  0.9219  0.35
7605
## `free cash flow`      -8.3320578  7.4900606 -1.1124  0.26
7185
## `Tobin's q`           0.4544165  0.4317700  1.0525  0.29
3758
## preMTR                  -6.1278523  1.8908903 -3.2407  0.00
1379 **
## deal_size              1.5204363  0.1981749  7.6722  5.576
e-13 ***
## high_tech              -0.0087122  0.8218536 -0.0106  0.99
1552
## diversifying           0.8903850  0.5959405  1.4941  0.13
6600
## public_target          0.0706053  1.0217638  0.0691  0.94
4972
## private_target         -0.2019917  0.6657479 -0.3034  0.76
1870
## all_cash_deal          -0.2812556  0.8129998 -0.3459  0.72
9716
## stock_deal             -1.1697071  1.5164010 -0.7714  0.44
1323
## cross_border           0.0484387  1.3546532  0.0358  0.97
1509
## i_catConstruction      -1.7137701  1.7405035 -0.9846  0.32
5892
## i_catfinance           -3.3984868  1.8185057 -1.8688  0.06
2987 .
## i_catmanufacture       -1.1667802  1.4088339 -0.8282  0.40
8469
## i_catmining            -0.0164784  2.3247856 -0.0071  0.99
4351
## i_catretail            -0.4155210  1.7952602 -0.2315  0.81
7179
## i_catservices          -1.4697986  1.7409996 -0.8442  0.39
9468
## i_cattransportation    -2.4899178  1.7622937 -1.4129  0.15
9116
## i_catwholesale         -0.0287451  1.6479191 -0.0174  0.98
6099
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##

```

```

## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
## +
## I(`Prev S Score` * cross_border) + `firm size` + leverage +
## `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +
## all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
## c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -27.6539  -3.1524   0.1448   2.9385  12.8407
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          -9.03238    10.29629  -0.877 0.3830
47
## `Prev E Score`        -0.03163     0.04107  -0.770 0.4434
35
## `Prev G Score`       -0.01383     0.03996  -0.346 0.7302
15
## `Prev S Score`        0.11349     0.07587   1.496 0.1387
12
## I(`Prev S Score` * cross_border) -0.09713     0.06542  -1.485 0.1416
07
## `firm size`          -0.33473     0.79668  -0.420 0.6755
26
## leverage              6.82230     6.58764   1.036 0.3035
79
## `free cash flow`    -30.54921     8.77852  -3.480 0.0008
24 ***
## `Tobin's q`          0.88002     0.62410   1.410 0.1624
94
## preMTR                -0.70167     4.03739  -0.174 0.8624
78
## deal_size             0.92811     2.42947   0.382 0.7034
84
## hostile                NA              NA        NA
NA
## high_tech             0.11289     1.82139   0.062 0.9507
39
## diversifying          -0.10009     1.40184  -0.071 0.9432
63
## public_target         -1.14045     2.01999  -0.565 0.5739
79
## private_target        -0.83190     1.48739  -0.559 0.5775
59
## all_cash_deal        -1.87733     2.35188  -0.798 0.4271

```

```

63
## stock_deal          5.47514      3.17272      1.726 0.0883
62 .
## cross_border       1.11336      2.99642      0.372 0.7112
27
## i_catfinance      -0.17139      7.20094     -0.024 0.9810
72
## i_catmanufacture  12.01382      6.55053      1.834 0.0704
65 .
## i_catmining        7.98387      7.35162      1.086 0.2808
23
## i_catretail       16.99438      6.96398      2.440 0.0169
42 *
## i_catservices     10.91596      6.67559      1.635 0.1060
36
## i_cattransportation 6.95470      7.53832      0.923 0.3590
71
## i_catwholesale    11.09441      6.79134      1.634 0.1063
71
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.932 on 78 degrees of freedom
## Multiple R-squared:  0.4001, Adjusted R-squared:  0.2155
## F-statistic: 2.167 on 24 and 78 DF,  p-value: 0.005669
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 26.262, df = 24, p-value = 0.34
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept) -9.032377    6.284252 -1.4373 0.154
6313
## `Prev E Score` -0.031634    0.044203 -0.7156 0.476
3524
## `Prev G Score` -0.013831    0.030445 -0.4543 0.650
8803
## `Prev S Score`  0.113494    0.048592  2.3356 0.022
0806 *
## I(`Prev S Score` * cross_border) -0.097135    0.038320 -2.5349 0.013
2508 *
## `firm size`    -0.334728    0.740774 -0.4519 0.652
6218
## leverage       6.822300    5.255687  1.2981 0.198

```

```

0853
## `free cash flow`          -30.549210    7.793149 -3.9200 0.000
1889 ***
## `Tobin's q`              0.880023    0.529112  1.6632 0.100
2845
## preMTR                   -0.701669    4.678378 -0.1500 0.881
1665
## deal_size                 0.928109    1.849854  0.5017 0.617
2779
## high_tech                 0.112887    1.955485  0.0577 0.954
1126
## diversifying             -0.100091    0.906846 -0.1104 0.912
3978
## public_target            -1.140448    1.954784 -0.5834 0.561
2979
## private_target           -0.831897    1.053597 -0.7896 0.432
1682
## all_cash_deal            -1.877330    1.390701 -1.3499 0.180
9474
## stock_deal                5.475141    2.028648  2.6989 0.008
5254 **
## cross_border             1.113356    1.630734  0.6827 0.496
7981
## i_catfinance             -0.171393    3.354352 -0.0511 0.959
3799
## i_catmanufacture         12.013819    2.015872  5.9596 6.917
e-08 ***
## i_catmining              7.983875    3.132423  2.5488 0.012
7727 *
## i_catretail              16.994377    2.588767  6.5647 5.240
e-09 ***
## i_catservices            10.915961    2.337677  4.6696 1.236
e-05 ***
## i_cattransportation      6.954703    3.261786  2.1322 0.036
1392 *
## i_catwholesale           11.094410    2.327340  4.7670 8.517
e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##     I(`Prev S Score` * cross_border) + `firm size` + leverage +
##     `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##     high_tech + diversifying + public_target + private_target +
##     all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##     c(year, year + 4), ])

```

```

##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -43.260  -3.100   0.286   3.221  23.988
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)          0.412928    7.307603   0.057  0.954
96
## `Prev E Score`      -0.008463    0.017444  -0.485  0.627
76
## `Prev G Score`     -0.015703    0.016361  -0.960  0.337
60
## `Prev S Score`     -0.002974    0.030398  -0.098  0.922
09
## I(`Prev S Score` * cross_border) -0.007411    0.030015  -0.247  0.805
09
## `firm size`         0.064293    0.304803   0.211  0.833
02
## leverage            0.867472    2.879767   0.301  0.763
36
## `free cash flow`   -6.237711    4.501609  -1.386  0.166
43
## `Tobin's q`        -0.008153    0.361011  -0.023  0.981
99
## preMTR              -6.963494    1.379118  -5.049 6.11e-
07 ***
## deal_size           2.924325    2.057294   1.421  0.155
78
## hostile              NA              NA         NA
NA
## high_tech           0.370391    0.881423   0.420  0.674
50
## diversifying        -0.057307    0.647951  -0.088  0.929
56
## public_target       -2.879704    0.916413  -3.142  0.001
77 **
## private_target      -1.250386    0.669757  -1.867  0.062
46 .
## all_cash_deal       1.616896    0.885439   1.826  0.068
40 .
## stock_deal          3.384337    1.301349   2.601  0.009
56 **
## cross_border        0.578706    1.548270   0.374  0.708
72
## i_catConstruction   -1.541764    7.168827  -0.215  0.829
80
## i_catfinance        -0.818269    6.814558  -0.120  0.904
47

```



```

## i_catmanufacture          1.038702    6.797127    0.153    0.878
60
## i_catmining               -4.698740    6.923761   -0.679    0.497
66
## i_catretail               1.559951    6.990095    0.223    0.823
49
## i_catservices             0.289433    6.848432    0.042    0.966
31
## i_cattransportation      -1.608009    6.884373   -0.234    0.815
41
## i_catwholesale           -0.009786    6.959642   -0.001    0.998
88
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.698 on 530 degrees of freedom
## Multiple R-squared:  0.1134, Adjusted R-squared:  0.07159
## F-statistic: 2.712 on 25 and 530 DF,  p-value: 1.959e-05
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 67.982, df = 25, p-value = 7.639e-06
##
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept)          0.4129278  2.7877686  0.1481  0.8
8230
## `Prev E Score`      -0.0084631  0.0147599 -0.5734  0.5
6662
## `Prev G Score`     -0.0157034  0.0162970 -0.9636  0.3
3570
## `Prev S Score`     -0.0029742  0.0274973 -0.1082  0.9
1391
## I(`Prev S Score` * cross_border) -0.0074106  0.0266201 -0.2784  0.7
8083
## `firm size`         0.0642933  0.2565505  0.2506  0.8
0222
## leverage            0.8674720  3.3628207  0.2580  0.7
9654
## `free cash flow`   -6.2377111  5.8925343 -1.0586  0.2
9027
## `Tobin's q`        -0.0081526  0.4041289 -0.0202  0.9
8391
## preMTR              -6.9634943  1.7514052 -3.9759  7.983
e-05 ***

```

```

## deal_size                2.9243254  3.2482332  0.9003  0.3
6838
## high_tech                0.3703906  0.8779046  0.4219  0.6
7327
## diversifying            -0.0573070  0.6856901 -0.0836  0.9
3343
## public_target           -2.8797042  0.9263451 -3.1087  0.0
0198 **
## private_target          -1.2503863  0.6173787 -2.0253  0.0
4334 *
## all_cash_deal           1.6168965  0.9224046  1.7529  0.0
8019 .
## stock_deal              3.3843369  1.6272443  2.0798  0.0
3802 *
## cross_border            0.5787056  1.5739827  0.3677  0.7
1327
## i_catConstruction       -1.5417639  2.7499082 -0.5607  0.5
7527
## i_catfinance            -0.8182689  1.1030463 -0.7418  0.4
5852
## i_catmanufacture        1.0387019  1.0186969  1.0196  0.3
0837
## i_catmining             -4.6987403  2.3838437 -1.9711  0.0
4923 *
## i_catretail             1.5599506  2.0921614  0.7456  0.4
5623
## i_catservices           0.2894331  1.3190469  0.2194  0.8
2640
## i_cattransportation     -1.6080085  1.3630838 -1.1797  0.2
3866
## i_catwholesale          -0.0097862  2.7095685 -0.0036  0.9
9712
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score` +
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -40.660  -2.681   0.053   2.850  23.476
##

```

```

## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      5.143032   3.060788   1.680 0.0934
57 .
## `Prev E Score`  -0.027989   0.015052  -1.860 0.0634
78 .
## `Prev G Score`  -0.015266   0.013165  -1.160 0.2467
16
## `Prev S Score`  -0.003537   0.027738  -0.128 0.8985
76
## I(`Prev S Score` * cross_border) 0.045298   0.027041   1.675 0.0944
65 .
## `firm size`      0.027299   0.241286   0.113 0.9099
61
## leverage        -0.850336   2.290583  -0.371 0.7106
06
## `free cash flow` 1.565577   2.249939   0.696 0.4868
23
## `Tobin's q`     -0.449912   0.273339  -1.646 0.1003
27
## preMTR          -5.543465   1.236973  -4.481 8.99e-
06 ***
## deal_size       -0.208197   1.515410  -0.137 0.8907
75
## hostile                NA                NA                NA
NA
## high_tech        -2.576572   0.761736  -3.382 0.0007
68 ***
## diversifying     -0.669531   0.570999  -1.173 0.2414
70
## public_target    -0.537670   0.872546  -0.616 0.5380
07
## private_target   -0.372467   0.528553  -0.705 0.4812
95
## all_cash_deal    -0.744015   0.829734  -0.897 0.3702
69
## stock_deal       1.279184   1.139185   1.123 0.2619
64
## cross_border     -1.354249   1.334711  -1.015 0.3107
16
## i_catfinance     -2.499818   2.063706  -1.211 0.2262
82
## i_catmanufacture -0.788011   2.017614  -0.391 0.6962
67
## i_catmining      -3.052294   2.431423  -1.255 0.2098
74
## i_catretail      -1.835425   2.328247  -0.788 0.4308
38
## i_catservices    0.716787   2.099398   0.341 0.7329

```

```

12
## i_cattransportation          -2.341255    2.183704   -1.072 0.2841
15
## i_catwholesale                -3.298506    2.470695   -1.335 0.1824
02
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.688 on 560 degrees of freedom
## Multiple R-squared:  0.1068, Adjusted R-squared:  0.06852
## F-statistic:  2.79 on 24 and 560 DF,  p-value: 1.452e-05
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 50.495, df = 24, p-value = 0.001224
##
##
## ttest of coefficients:
##
##              Estimate Std. Error t value Pr(>
|t|)
## (Intercept)          5.1430324  2.8170679  1.8257 0.068
4326 .
## `Prev E Score`      -0.0279890  0.0128412 -2.1796 0.029
7009 *
## `Prev G Score`     -0.0152659  0.0137328 -1.1116 0.266
7696
## `Prev S Score`     -0.0035371  0.0286708 -0.1234 0.901
8583
## I(`Prev S Score` * cross_border) 0.0452982  0.0268447  1.6874 0.092
0803 .
## `firm size`         0.0272988  0.2339175  0.1167 0.907
1374
## leverage           -0.8503358  2.1488589 -0.3957 0.692
4660
## `free cash flow`   1.5655772  2.7858371  0.5620 0.574
3564
## `Tobin's q`        -0.4499125  0.3510003 -1.2818 0.200
4430
## preMTR              -5.5434649  1.5299560 -3.6233 0.000
3174 ***
## deal_size          -0.2081968  1.6965980 -0.1227 0.902
3774
## high_tech          -2.5765719  0.7333877 -3.5132 0.000
4784 ***
## diversifying       -0.6695312  0.6366545 -1.0516 0.293
4184
## public_target      -0.5376702  0.8845610 -0.6078 0.543

```

```

5410
## private_target          -0.3724666  0.5012568 -0.7431 0.457
7537
## all_cash_deal          -0.7440148  0.9493712 -0.7837 0.433
5521
## stock_deal             1.2791835  1.3253418  0.9652 0.334
8750
## cross_border          -1.3542495  1.4708332 -0.9207 0.357
5846
## i_catfinance          -2.4998177  1.8095430 -1.3815 0.167
6874
## i_catmanufacture      -0.7880112  1.8087134 -0.4357 0.663
2404
## i_catmining           -3.0522937  2.2783785 -1.3397 0.180
8934
## i_catretail           -1.8354247  2.0667431 -0.8881 0.374
8812
## i_catservices         0.7167869  1.9380254  0.3699 0.711
6309
## i_cattransportation  -2.3412546  1.9889983 -1.1771 0.239
6547
## i_catwholesale        -3.2985060  3.4811815 -0.9475 0.343
7801
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##   Min      1Q  Median      3Q      Max
## -29.554  -3.215  -0.053   3.588  54.860
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t
|)
## (Intercept)      0.244708    8.288819   0.030   0.97
65
## `Prev E Score`    0.008448    0.022453   0.376   0.70
69
## `Prev G Score`   -0.039003    0.019959  -1.954   0.05
13 .

```

```

## `Prev S Score` -0.012313 0.042217 -0.292 0.77
07
## I(`Prev S Score` * cross_border) -0.011862 0.040969 -0.290 0.77
23
## `firm size` 0.351283 0.352139 0.998 0.31
90
## leverage 3.496954 3.004884 1.164 0.24
51
## `free cash flow` 9.378177 4.538171 2.067 0.03
93 *
## `Tobin's q` 0.120716 0.411502 0.293 0.76
94
## preMTR -6.105897 1.352901 -4.513 8.11e-
06 ***
## deal_size 8.815601 1.242076 7.097 4.80e-
12 ***
## hostile NA NA NA
NA
## high_tech 1.406384 1.232529 1.141 0.25
44
## diversifying -1.573892 0.854357 -1.842 0.06
61 .
## public_target -5.418776 1.173142 -4.619 5.00e-
06 ***
## private_target 1.418354 0.870963 1.628 0.10
41
## all_cash_deal -0.693225 1.334969 -0.519 0.60
38
## stock_deal -3.568162 1.601604 -2.228 0.02
64 *
## cross_border 2.989446 2.091544 1.429 0.15
36
## i_catConstruction -2.474362 8.589785 -0.288 0.77
34
## i_catfinance -4.342078 8.116801 -0.535 0.59
29
## i_catmanufacture -3.910415 8.066171 -0.485 0.62
81
## i_catmining -6.116375 8.250923 -0.741 0.45
89
## i_catretail -4.625192 8.850574 -0.523 0.60
15
## i_catservices -2.906306 8.104325 -0.359 0.72
00
## i_cattransportation -1.799456 8.172571 -0.220 0.82
58
## i_catwholesale 1.420813 8.320028 0.171 0.86
45
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

```

##
## Residual standard error: 7.885 on 463 degrees of freedom
## Multiple R-squared:  0.2598, Adjusted R-squared:  0.2198
## F-statistic: 6.499 on 25 and 463 DF,  p-value: < 2.2e-16
##
##
## studentized Breusch-Pagan test
##
## data:  reg_model
## BP = 209.13, df = 25, p-value < 2.2e-16
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>
|t|)
## (Intercept)           0.2447084  2.4947790  0.0981 0.921
9047
## `Prev E Score`           0.0084485  0.0198456  0.4257 0.670
5169
## `Prev G Score`          -0.0390031  0.0194203 -2.0084 0.045
1840 *
## `Prev S Score`          -0.0123132  0.0386517 -0.3186 0.750
1983
## I(`Prev S Score` * cross_border) -0.0118620  0.0376289 -0.3152 0.752
7247
## `firm size`             0.3512827  0.3156218  1.1130 0.266
2919
## leverage                3.4969536  3.1167396  1.1220 0.262
4478
## `free cash flow`        9.3781774  4.3991189  2.1318 0.033
5466 *
## `Tobin's q`             0.1207157  0.4467448  0.2702 0.787
1178
## preMTR                  -6.1058973  1.9095629 -3.1975 0.001
4810 **
## deal_size               8.8156010  5.3193400  1.6573 0.098
1416 .
## high_tech               1.4063839  1.2200986  1.1527 0.249
6363
## diversifying            -1.5738922  0.8668532 -1.8156 0.070
0725 .
## public_target           -5.4187764  1.4970759 -3.6196 0.000
3276 ***
## private_target          1.4183542  0.9429574  1.5042 0.133
2232
## all_cash_deal           -0.6932246  1.4986990 -0.4626 0.643
9036
## stock_deal              -3.5681617  2.7726030 -1.2869 0.198
7598

```

```

## cross_border                2.9894464  1.7898410  1.6702 0.095
5497 .
## i_catConstruction          -2.4743621  2.6123933 -0.9472 0.344
0498
## i_catfinance               -4.3420779  1.6823611 -2.5809 0.010
1597 *
## i_catmanufacture          -3.9104152  1.6602165 -2.3554 0.018
9208 *
## i_catmining                -6.1163755  3.1420831 -1.9466 0.052
1873 .
## i_catretail                -4.6251917  4.0863799 -1.1319 0.258
2810
## i_catservices              -2.9063060  1.7564100 -1.6547 0.098
6660 .
## i_cattransportation       -1.7994558  1.7799435 -1.0110 0.312
5625
## i_catwholesale             1.4208133  3.3736333  0.4212 0.673
8393
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
##
## Call:
## lm(formula = CAR55 ~ `Prev E Score` + `Prev G Score` + `Prev S Score`
+
##   I(`Prev S Score` * cross_border) + `firm size` + leverage +
##   `free cash flow` + `Tobin's q` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat, data = data1[
data1$year %in%
##   c(year, year + 4), ])
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -26.9453  -3.9292  -0.0112   4.1018  24.3779
##
## Coefficients: (1 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)          -8.3206590  11.5006098  -0.723  0.4
707
## `Prev E Score`         0.0009675   0.0519726   0.019  0.9
852
## `Prev G Score`       -0.0987690   0.0423173  -2.334  0.0
211 *
## `Prev S Score`        0.0144996   0.0927996   0.156  0.8
761
## I(`Prev S Score` * cross_border) 0.0104745  0.0859564   0.122  0.9
032
## `firm size`           0.3502990   0.6935833   0.505  0.6

```



```

144
## leverage                4.8640564  6.9886244  0.696  0.4
877
## `free cash flow`      4.3406782  5.8535357  0.742  0.4
597
## `Tobin's q`          -0.2866131  0.5341024 -0.537  0.5
925
## preMTR                 -7.0176368  3.3077820 -2.122  0.0
358 *
## deal_size             -5.8201763  1.2019147 -4.842 3.61e
-06 ***
## hostile                NA                NA                NA
NA
## high_tech              0.8545757  2.0333111  0.420  0.6
750
## diversifying          -2.5466063  1.7585826 -1.448  0.1
500
## public_target         -2.9378341  2.7415879 -1.072  0.2
859
## private_target        -1.5966525  1.7397729 -0.918  0.3
605
## all_cash_deal         1.4396310  2.5790156  0.558  0.5
777
## stock_deal            4.7764197  3.0000559  1.592  0.1
138
## cross_border          -0.5794306  3.9002959 -0.149  0.8
821
## i_catfinance          10.6348847  9.2874315  1.145  0.2
543
## i_catmanufacture      10.6172914  9.1153880  1.165  0.2
463
## i_catmining           17.0340165  9.7760911  1.742  0.0
838 .
## i_catretail           14.9076518  9.5145947  1.567  0.1
196
## i_catservices         10.5645973  9.1779397  1.151  0.2
518
## i_cattransportation   6.0097266  9.4226270  0.638  0.5
247
## i_catwholesale        12.7040035  9.4935585  1.338  0.1
832
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 8.532 on 129 degrees of freedom
## Multiple R-squared:  0.2599, Adjusted R-squared:  0.1222
## F-statistic: 1.887 on 24 and 129 DF,  p-value: 0.01291
##
##
## studentized Breusch-Pagan test

```

```

##
## data:  reg_model
## BP = 67.464, df = 24, p-value = 5.259e-06
##
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr
(>|t|)
## (Intercept)      -8.32065902  6.86557698 -1.2119 0.2
277510
## `Prev E Score`    0.00096749  0.04455631  0.0217 0.9
827097
## `Prev G Score`   -0.09876902  0.04148335 -2.3809 0.0
187313 *
## `Prev S Score`   0.01449958  0.06516445  0.2225 0.8
242707
## I(`Prev S Score` * cross_border) 0.01047452  0.05060718  0.2070 0.8
363542
## `firm size`      0.35029897  0.64078320  0.5467 0.5
855477
## leverage         4.86405637  7.30914149  0.6655 0.5
069344
## `free cash flow` 4.34067816  7.15644509  0.6065 0.5
452214
## `Tobin's q`     -0.28661310  0.42743568 -0.6705 0.5
037118
## preMTR          -7.01763681  3.02534148 -2.3196 0.0
219327 *
## deal_size       -5.82017628  2.17937721 -2.6706 0.0
085474 **
## high_tech        0.85457567  1.90896829  0.4477 0.6
551468
## diversifying    -2.54660631  1.48908329 -1.7102 0.0
896359 .
## public_target   -2.93783412  2.89601556 -1.0144 0.3
122717
## private_target  -1.59665247  1.56582306 -1.0197 0.3
097845
## all_cash_deal   1.43963096  1.82120481  0.7905 0.4
306967
## stock_deal      4.77641965  2.40616185  1.9851 0.0
492571 *
## cross_border    -0.57943064  2.84775331 -0.2035 0.8
390888
## i_catfinance    10.63488469  3.14575807  3.3807 0.0
009571 ***
## i_catmanufacture 10.61729144  3.09847222  3.4266 0.0
008204 ***
## i_catmining     17.03401649  8.28232916  2.0567 0.0

```

```

417339 *
## i_catretail                14.90765179  3.06629557  4.8618 3.3
21e-06 ***
## i_catservices              10.56459734  3.35727743  3.1468 0.0
020504 **
## i_cattransportation        6.00972658  3.05954024  1.9643 0.0
516502 .
## i_catwholesale             12.70400349  3.11396915  4.0797 7.8
49e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##hypothesis 3

##CAR11

```

reg1D<-lm(CAR11~`Prev ESG Score.x`+ I(target_ESG*target_dummy) +target_
dummy+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + diversifying + pu
blic_target + private_target + all_cash_deal + stock_deal+cross_border+
i_cat*y_cat , data=data1)

```

```
summary(reg1D)
```

```

##
## Call:
## lm(formula = CAR11 ~ `Prev ESG Score.x` + I(target_ESG * target_dumm
y) +
##   target_dummy + `firm size` + leverage + `free cash flow` +
##   `Tobin's q` + preMTR + deal_size + hostile + high_tech +
##   diversifying + public_target + private_target + all_cash_deal +
##   stock_deal + cross_border + i_cat * y_cat, data = data1)
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -49.057  -1.866  -0.039   1.876  85.450
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.325198    5.125268   0.454   0.6501
## `Prev ESG Score.x` -0.005405    0.006629  -0.815   0.4149
## I(target_ESG * target_dummy) -0.051054    0.057713  -0.885   0.3764
## target_dummy      0.711246    1.785662   0.398   0.6904
## `firm size`     -0.173121    0.095765  -1.808   0.0708
.

```

## leverage	0.791722	0.927533	0.854	0.3934
## `free cash flow`	0.436872	1.139746	0.383	0.7015
## `Tobin's q`	-0.120452	0.095427	-1.262	0.2070
## preMTR	-0.684952	0.419125	-1.634	0.1023
## deal_size	1.481281	0.309083	4.792	1.74e-06

## hostile	-3.322465	3.667301	-0.906	0.3650
## high_tech	0.114277	0.274312	0.417	0.6770
## diversifying	-0.426816	0.217246	-1.965	0.0496
*				
## public_target	-1.670993	0.311386	-5.366	8.71e-08

## private_target	-0.231612	0.222772	-1.040	0.2986
## all_cash_deal	-0.081596	0.308947	-0.264	0.7917
## stock_deal	-0.647234	0.413464	-1.565	0.1176
## cross_border	0.512056	0.237621	2.155	0.0313
*				
## i_catConstruction	-3.353180	6.194563	-0.541	0.5883
## i_catfinance	-0.917347	5.407987	-0.170	0.8653
## i_catmanufacture	-0.439235	5.095792	-0.086	0.9313
## i_catmining	-0.219271	5.305261	-0.041	0.9670
## i_catretail	-0.585282	5.539622	-0.106	0.9159
## i_catservices	0.844717	5.151006	0.164	0.8698
## i_cattransportation	-0.456728	5.405473	-0.084	0.9327
## i_catwholesale	0.952558	7.165027	0.133	0.8942
## y_cat2004	-1.762626	5.661598	-0.311	0.7556
## y_cat2005	-1.437736	6.192602	-0.232	0.8164
## y_cat2006	-1.427991	5.548856	-0.257	0.7969

## y_cat2007	-0.639823	5.662958	-0.113	0.9101
## y_cat2008	-2.084703	6.199839	-0.336	0.7367
## y_cat2009	-1.350667	7.160410	-0.189	0.8504
## y_cat2010	-0.466672	7.156642	-0.065	0.9480
## y_cat2011	-0.087076	5.849016	-0.015	0.9881
## y_cat2012	-5.952946	5.419081	-1.099	0.2721
## y_cat2013	0.580416	5.419234	0.107	0.9147
## y_cat2014	-0.339350	7.159568	-0.047	0.9622
## y_cat2015	-3.060580	5.852263	-0.523	0.6010
## y_cat2016	-2.083075	7.157592	-0.291	0.7711
## y_cat2017	-5.225351	5.340512	-0.978	0.3279
## y_cat2018	-1.329181	7.159081	-0.186	0.8527
## y_cat2019	-2.022684	5.667950	-0.357	0.7212
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.232215	6.240133	0.358	0.7206
## i_catmanufacture:y_cat2004	2.804111	5.720337	0.490	0.6240
## i_catmining:y_cat2004	-0.588842	6.029383	-0.098	0.9222
## i_catretail:y_cat2004	1.150665	6.761052	0.170	0.8649
## i_catservices:y_cat2004	0.088176	5.827663	0.015	0.9879
## i_cattransportation:y_cat2004	1.269337	6.323412	0.201	0.8409
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	2.573049	6.566841	0.392	0.6952
## i_catmanufacture:y_cat2005	1.945627	6.241254	0.312	0.7553

## i_catmining:y_cat2005	0.160963	6.539779	0.025	0.9804
## i_catretail:y_cat2005	5.244393	6.971314	0.752	0.4519
## i_catservices:y_cat2005	1.332934	6.332523	0.210	0.8333
## i_cattransportation:y_cat2005	1.175328	6.801026	0.173	0.8628
## i_catwholesale:y_cat2005	-0.149208	9.475181	-0.016	0.9874
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.991456	6.871757	0.144	0.8853
## i_catmanufacture:y_cat2006	3.003001	5.680155	0.529	0.5971
## i_catmining:y_cat2006	0.419191	6.802643	0.062	0.9509
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	0.468701	5.792953	0.081	0.9355
## i_cattransportation:y_cat2006	-0.620799	6.876071	-0.090	0.9281
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.825537	6.098610	0.135	0.8923
## i_catmanufacture:y_cat2007	1.756991	5.720089	0.307	0.7587
## i_catmining:y_cat2007	1.716017	6.040466	0.284	0.7764
## i_catretail:y_cat2007	6.030307	7.075442	0.852	0.3941
## i_catservices:y_cat2007	-0.981649	5.824499	-0.169	0.8662
## i_cattransportation:y_cat2007	1.741222	6.397004	0.272	0.7855
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	14.877580	8.006253	1.858	0.0632
## i_catfinance:y_cat2008	7.313235	6.963968	1.050	0.2937
## i_catmanufacture:y_cat2008	1.917225	6.262085	0.306	0.7595

## i_catmining:y_cat2008	0.696453	6.539204	0.107	0.9152
## i_catretail:y_cat2008	3.573473	6.976375	0.512	0.6085
## i_catservices:y_cat2008	1.185039	6.343884	0.187	0.8518
## i_cattransportation:y_cat2008	2.797857	6.651233	0.421	0.6740
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	3.003382	7.285246	0.412	0.6802
## i_catmining:y_cat2009	7.687588	8.913916	0.862	0.3885
## i_catretail:y_cat2009	-7.650600	9.147419	-0.836	0.4030
## i_catservices:y_cat2009	1.562151	7.350908	0.213	0.8317
## i_cattransportation:y_cat2009	0.916078	7.971019	0.115	0.9085
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	1.423159	8.525537	0.167	0.8674
## i_catfinance:y_cat2010	0.185334	7.477043	0.025	0.9802
## i_catmanufacture:y_cat2010	1.320712	7.199293	0.183	0.8545
## i_catmining:y_cat2010	0.504861	7.480431	0.067	0.9462
## i_catretail:y_cat2010	2.230732	8.051961	0.277	0.7818
## i_catservices:y_cat2010	0.002406	7.282553	0.000	0.9997
## i_cattransportation:y_cat2010	0.860425	7.522430	0.114	0.9089
## i_catwholesale:y_cat2010	-0.194439	9.061808	-0.021	0.9829
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-2.904615	6.555259	-0.443	0.6577
## i_catmanufacture:y_cat2011	1.007356	5.943955	0.169	0.8654

## i_catmining:y_cat2011	0.628622	7.059371	0.089	0.9291
## i_catretail:y_cat2011	1.912202	8.053905	0.237	0.8123
## i_catservices:y_cat2011	-2.184395	6.191254	-0.353	0.7243
## i_cattransportation:y_cat2011	-1.367973	6.813026	-0.201	0.8409
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-2.080301	8.284451	-0.251	0.8017
## i_catfinance:y_cat2012	6.018760	5.801180	1.038	0.2996
## i_catmanufacture:y_cat2012	7.118477	5.468323	1.302	0.1931
## i_catmining:y_cat2012	-0.042634	5.864500	-0.007	0.9942
## i_catretail:y_cat2012	6.391644	6.138147	1.041	0.2978
## i_catservices:y_cat2012	5.781095	5.580456	1.036	0.3003
## i_cattransportation:y_cat2012	7.690342	5.888248	1.306	0.1916
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	3.770569	7.423423	0.508	0.6115
## i_catfinance:y_cat2013	0.132362	5.828004	0.023	0.9819
## i_catmanufacture:y_cat2013	1.220819	5.482352	0.223	0.8238
## i_catmining:y_cat2013	0.283272	6.025353	0.047	0.9625
## i_catretail:y_cat2013	0.796375	6.394211	0.125	0.9009
## i_catservices:y_cat2013	-1.767754	5.576265	-0.317	0.7513
## i_cattransportation:y_cat2013	-2.597229	5.947352	-0.437	0.6624
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	1.993352	9.462989	0.211	0.8332
## i_catfinance:y_cat2014	2.305732	8.227504	0.280	0.7793
## i_catmanufacture:y_cat2014	2.297443	7.275823	0.316	0.7522

## i_catmining:y_cat2014	7.656878	8.173004	0.937	0.3489
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-1.066761	7.400832	-0.144	0.8854
## i_cattransportation:y_cat2014	4.161293	8.228050	0.506	0.6131
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	6.297659	8.517822	0.739	0.4598
## i_catfinance:y_cat2015	5.986174	7.127314	0.840	0.4010
## i_catmanufacture:y_cat2015	4.053075	5.968148	0.679	0.4971
## i_catmining:y_cat2015	0.539828	7.054582	0.077	0.9390
## i_catretail:y_cat2015	7.084830	6.672054	1.062	0.2884
## i_catservices:y_cat2015	1.622506	6.168548	0.263	0.7925
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.764240	8.222710	0.458	0.6471
## i_catfinance:y_cat2016	2.292197	7.440110	0.308	0.7580
## i_catmanufacture:y_cat2016	3.236787	7.192551	0.450	0.6527
## i_catmining:y_cat2016	2.382560	7.410467	0.322	0.7478
## i_catretail:y_cat2016	4.268648	7.744387	0.551	0.5815
## i_catservices:y_cat2016	2.168530	7.258333	0.299	0.7651
## i_cattransportation:y_cat2016	1.015093	7.491339	0.136	0.8922
## i_catwholesale:y_cat2016	2.691270	8.887515	0.303	0.7621
## i_catConstruction:y_cat2017	8.151360	6.712354	1.214	0.2247
## i_catfinance:y_cat2017	4.959640	5.692502	0.871	0.3837
## i_catmanufacture:y_cat2017	5.816064	5.386568	1.080	0.2804

```

## i_catmining:y_cat2017      5.107024    5.784157    0.883    0.3773
## i_catretail:y_cat2017      3.903440    5.927582    0.659    0.5103
## i_catservices:y_cat2017    5.521982    5.459974    1.011    0.3119
## i_cattransportation:y_cat2017 4.431801    5.758907    0.770    0.4416
## i_catwholesale:y_cat2017      NA          NA          NA          NA
## i_catConstruction:y_cat2018  1.544483    8.231393    0.188    0.8512
## i_catfinance:y_cat2018      1.571435    7.425264    0.212    0.8324
## i_catmanufacture:y_cat2018  1.220901    7.193517    0.170    0.8652
## i_catmining:y_cat2018      -2.405467    7.431303   -0.324    0.7462
## i_catretail:y_cat2018      4.231246    7.846188    0.539    0.5897
## i_catservices:y_cat2018      0.860540    7.241126    0.119    0.9054
## i_cattransportation:y_cat2018 2.274813    7.459067    0.305    0.7604
## i_catwholesale:y_cat2018      4.050535    8.859343    0.457    0.6476
## i_catConstruction:y_cat2019      NA          NA          NA          NA
## i_catfinance:y_cat2019      2.138673    6.103495    0.350    0.7261
## i_catmanufacture:y_cat2019  2.680930    5.777886    0.464    0.6427
## i_catmining:y_cat2019      -2.938332    6.599171   -0.445    0.6562
## i_catretail:y_cat2019      2.194177    6.763012    0.324    0.7456
## i_catservices:y_cat2019      0.212659    5.795304    0.037    0.9707
## i_cattransportation:y_cat2019 -0.607025    6.276632   -0.097    0.9230
## i_catwholesale:y_cat2019      NA          NA          NA          NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.054 on 2740 degrees of freedom
## Multiple R-squared:  0.08418,    Adjusted R-squared:  0.03538
## F-statistic: 1.725 on 146 and 2740 DF,  p-value: 3.381e-07

```

##test heteroskedasticity problem

```
hetero_test <- bptest(reg1D)
print(hetero_test)
```

```
##
## studentized Breusch-Pagan test
##
## data: reg1D
## BP = 608.43, df = 146, p-value < 2.2e-16
```

##solve heteroskedasticity problem

```
coefTest(reg1D, vcov = vcovHC(reg1D, type='HC0', cluster='a_industry'))
```

```
##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept)      2.3251980   0.8979742   2.5894 0.009665
7 **
## `Prev ESG Score.x` -0.0054046   0.0061944  -0.8725 0.383013
4
## I(target_ESG * target_dummy) -0.0510544   0.0544282  -0.9380 0.348320
5
## target_dummy      0.7112463   1.9755904   0.3600 0.718862
1
## `firm size`      -0.1731211   0.0997217  -1.7360 0.082668
8 .
## leverage          0.7917219   1.0074634   0.7859 0.432019
4
## `free cash flow`  0.4368720   1.5246609   0.2865 0.774488
4
## `Tobin's q`      -0.1204524   0.1058582  -1.1379 0.255276
2
## preMTR            -0.6849524   0.5817538  -1.1774 0.239141
2
## deal_size         1.4812805   1.6549533   0.8951 0.370834
3
## hostile           -3.3224655   0.8205296  -4.0492 5.282e-0
5 ***
## high_tech         0.1142770   0.2971638   0.3846 0.700594
1
## diversifying      -0.4268159   0.2116438  -2.0167 0.043827
2 *
## public_target     -1.6709930   0.3715905  -4.4969 7.183e-0
6 ***
## private_target    -0.2316117   0.2318991  -0.9988 0.317999
0
## all_cash_deal     -0.0815961   0.3264915  -0.2499 0.802669
6
```

## stock_deal	-0.6472342	0.7010933	-0.9232	0.355995
5				
## cross_border	0.5120563	0.2236162	2.2899	0.022103
5 *				
## i_catConstruction	-3.3531801	0.3637590	-9.2181	< 2.2e-1
6 ***				
## i_catfinance	-0.9173472	0.4939550	-1.8571	0.063397
4 .				
## i_catmanufacture	-0.4392346	0.5362193	-0.8191	0.412782
1				
## i_catmining	-0.2192711	1.2760670	-0.1718	0.863581
1				
## i_catretail	-0.5852823	0.7784206	-0.7519	0.452185
2				
## i_catservices	0.8447166	1.0292710	0.8207	0.411892
0				
## i_cattransportation	-0.4567278	1.5631203	-0.2922	0.770163
6				
## i_catwholesale	0.9525576	0.6371643	1.4950	0.135030
8				
## y_cat2004	-1.7626263	0.9035292	-1.9508	0.051179
8 .				
## y_cat2005	-1.4377361	0.3916721	-3.6708	0.000246
4 ***				
## y_cat2006	-1.4279907	0.8803830	-1.6220	0.104916
1				
## y_cat2007	-0.6398229	0.6138493	-1.0423	0.297358
7				
## y_cat2008	-2.0847030	0.9480255	-2.1990	0.027961
6 *				
## y_cat2009	-1.3506667	0.6284445	-2.1492	0.031704
2 *				
## y_cat2010	-0.4666717	0.4247936	-1.0986	0.272045
8				
## y_cat2011	-0.0870758	0.6094554	-0.1429	0.886399
6				
## y_cat2012	-5.9529462	5.4670211	-1.0889	0.276301
3				
## y_cat2013	0.5804164	1.2440093	0.4666	0.640845
2				
## y_cat2014	-0.3393501	0.4076793	-0.8324	0.405258
8				
## y_cat2015	-3.0605801	1.5274449	-2.0037	0.045197
8 *				
## y_cat2016	-2.0830754	0.3409159	-6.1102	1.136e-0
9 ***				
## y_cat2017	-5.2253509	3.2878467	-1.5893	0.112109
7				
## y_cat2018	-1.3291806	0.3820508	-3.4791	0.000511
0 ***				

## y_cat2019	-2.0226836	0.9845657	-2.0544	0.040032
5 *				
## i_catfinance:y_cat2004	2.2322149	2.3293914	0.9583	0.338004
9				
## i_catmanufacture:y_cat2004	2.8041112	1.1597289	2.4179	0.015675
1 *				
## i_catmining:y_cat2004	-0.5888422	1.7338306	-0.3396	0.734169
3				
## i_catretail:y_cat2004	1.1506654	1.7934757	0.6416	0.521197
0				
## i_catservices:y_cat2004	0.0881762	1.4614082	0.0603	0.951892
0				
## i_cattransportation:y_cat2004	1.2693372	1.8325314	0.6927	0.488576
2				
## i_catfinance:y_cat2005	2.5730491	0.9263601	2.7776	0.005513
6 **				
## i_catmanufacture:y_cat2005	1.9456268	0.6787815	2.8664	0.004184
0 **				
## i_catmining:y_cat2005	0.1609630	2.0281209	0.0794	0.936747
7				
## i_catretail:y_cat2005	5.2443928	1.7672315	2.9676	0.003027
6 **				
## i_catservices:y_cat2005	1.3329337	1.3416076	0.9935	0.320537
2				
## i_cattransportation:y_cat2005	1.1753284	1.9517292	0.6022	0.547091
9				
## i_catwholesale:y_cat2005	-0.1492082	0.9725844	-0.1534	0.878083
0				
## i_catfinance:y_cat2006	0.9914559	1.0320646	0.9607	0.336811
4				
## i_catmanufacture:y_cat2006	3.0030013	1.2152381	2.4711	0.013529
4 *				
## i_catmining:y_cat2006	0.4191915	2.2684405	0.1848	0.853405
2				
## i_catservices:y_cat2006	0.4687014	1.5009572	0.3123	0.754860
4				
## i_cattransportation:y_cat2006	-0.6207995	2.1343003	-0.2909	0.771174
4				
## i_catfinance:y_cat2007	0.8255368	1.0260063	0.8046	0.421113
5				
## i_catmanufacture:y_cat2007	1.7569906	0.8213118	2.1392	0.032503
6 *				
## i_catmining:y_cat2007	1.7160173	1.7368991	0.9880	0.323250
9				
## i_catretail:y_cat2007	6.0303067	6.1234538	0.9848	0.324814
9				
## i_catservices:y_cat2007	-0.9816489	1.4450688	-0.6793	0.496999
2				
## i_cattransportation:y_cat2007	1.7412225	1.9631078	0.8870	0.375171
6				

## i_catConstruction:y_cat2008	14.8775800	4.4704537	3.3280	0.000886
3 ***				
## i_catfinance:y_cat2008	7.3132350	2.3300917	3.1386	0.001715
6 **				
## i_catmanufacture:y_cat2008	1.9172251	1.2008233	1.5966	0.110472
0				
## i_catmining:y_cat2008	0.6964527	2.6667127	0.2612	0.793984
7				
## i_catretail:y_cat2008	3.5734729	2.1546425	1.6585	0.097331
2 .				
## i_catservices:y_cat2008	1.1850392	1.5573029	0.7610	0.446748
8				
## i_cattransportation:y_cat2008	2.7978572	1.9545863	1.4314	0.152420
5				
## i_catmanufacture:y_cat2009	3.0033815	1.3190138	2.2770	0.022863
6 *				
## i_catmining:y_cat2009	7.6875881	1.5121724	5.0838	3.949e-0
7 ***				
## i_catretail:y_cat2009	-7.6505997	5.4186705	-1.4119	0.158094
1				
## i_catservices:y_cat2009	1.5621510	1.3324072	1.1724	0.241127
3				
## i_cattransportation:y_cat2009	0.9160781	1.7813575	0.5143	0.607112
8				
## i_catConstruction:y_cat2010	1.4231593	0.9747363	1.4600	0.144392
2				
## i_catfinance:y_cat2010	0.1853341	1.3007866	0.1425	0.886712
5				
## i_catmanufacture:y_cat2010	1.3207118	0.7331335	1.8015	0.071740
0 .				
## i_catmining:y_cat2010	0.5048614	2.1680240	0.2329	0.815882
0				
## i_catretail:y_cat2010	2.2307319	0.9048492	2.4653	0.013750
4 *				
## i_catservices:y_cat2010	0.0024060	1.3694067	0.0018	0.998598
3				
## i_cattransportation:y_cat2010	0.8604254	1.8375568	0.4682	0.639647
2				
## i_catwholesale:y_cat2010	-0.1944391	1.0967973	-0.1773	0.859302
3				
## i_catfinance:y_cat2011	-2.9046149	0.7726308	-3.7594	0.000173
9 ***				
## i_catmanufacture:y_cat2011	1.0073562	1.0579054	0.9522	0.341070
6				
## i_catmining:y_cat2011	0.6286216	2.3197524	0.2710	0.786421
8				
## i_catretail:y_cat2011	1.9122023	0.9834384	1.9444	0.051948
9 .				
## i_catservices:y_cat2011	-2.1843949	1.2094087	-1.8062	0.071001
8 .				

## i_cattransportation:y_cat2011	-1.3679726	1.9539777	-0.7001	0.483926	6
## i_catConstruction:y_cat2012	-2.0803010	5.6065596	-0.3710	0.710630	7
## i_catfinance:y_cat2012	6.0187604	5.4774760	1.0988	0.271943	1
## i_catmanufacture:y_cat2012	7.1184771	5.4838408	1.2981	0.194368	3
## i_catmining:y_cat2012	-0.0426344	6.8091853	-0.0063	0.995004	7
## i_catretail:y_cat2012	6.3916436	5.6235283	1.1366	0.255809	3
## i_catservices:y_cat2012	5.7810946	5.6313877	1.0266	0.304706	8
## i_cattransportation:y_cat2012	7.6903422	5.7340107	1.3412	0.179973	1
## i_catConstruction:y_cat2013	3.7705689	1.4324229	2.6323	0.008528	5 **
## i_catfinance:y_cat2013	0.1323621	1.3705370	0.0966	0.923069	5
## i_catmanufacture:y_cat2013	1.2208193	1.3548268	0.9011	0.367620	3
## i_catmining:y_cat2013	0.2832716	2.7600543	0.1026	0.918262	1
## i_catretail:y_cat2013	0.7963751	1.6079574	0.4953	0.620448	4
## i_catservices:y_cat2013	-1.7677542	1.6948732	-1.0430	0.297039	9
## i_cattransportation:y_cat2013	-2.5972293	2.3030979	-1.1277	0.259540	6
## i_catConstruction:y_cat2014	1.9933523	0.5076931	3.9263	8.839e-0	5 ***
## i_catfinance:y_cat2014	2.3057319	1.3131923	1.7558	0.079230	5 .
## i_catmanufacture:y_cat2014	2.2974433	1.1101848	2.0694	0.038599	8 *
## i_catmining:y_cat2014	7.6568780	1.7888130	4.2804	1.929e-0	5 ***
## i_catservices:y_cat2014	-1.0667614	1.3383630	-0.7971	0.425482	7
## i_cattransportation:y_cat2014	4.1612931	6.7449439	0.6169	0.537319	0
## i_catConstruction:y_cat2015	6.2976589	1.5976436	3.9418	8.288e-0	5 ***
## i_catfinance:y_cat2015	5.9861741	2.4163341	2.4774	0.013295	0 *
## i_catmanufacture:y_cat2015	4.0530754	1.9465203	2.0822	0.037415	3 *
## i_catmining:y_cat2015	0.5398275	5.3882694	0.1002	0.920204	2

## i_catretail:y_cat2015	7.0848296	2.1144916	3.3506	0.000817
3 ***				
## i_catservices:y_cat2015	1.6225057	2.0254234	0.8011	0.423160
6				
## i_catConstruction:y_cat2016	3.7642404	0.8059619	4.6705	3.150e-0
6 ***				
## i_catfinance:y_cat2016	2.2921966	0.6563398	3.4924	0.000486
3 ***				
## i_catmanufacture:y_cat2016	3.2367866	0.6639955	4.8747	1.152e-0
6 ***				
## i_catmining:y_cat2016	2.3825601	1.8482523	1.2891	0.197476
3				
## i_catretail:y_cat2016	4.2686480	1.4489157	2.9461	0.003245
2 **				
## i_catservices:y_cat2016	2.1685295	1.4058504	1.5425	0.123066
7				
## i_cattransportation:y_cat2016	1.0150932	1.7881879	0.5677	0.570308
4				
## i_catwholesale:y_cat2016	2.6912703	2.8430539	0.9466	0.343919
8				
## i_catConstruction:y_cat2017	8.1513601	3.4633327	2.3536	0.018662
0 *				
## i_catfinance:y_cat2017	4.9596401	3.3292083	1.4897	0.136408
9				
## i_catmanufacture:y_cat2017	5.8160640	3.3392032	1.7418	0.081664
1 .				
## i_catmining:y_cat2017	5.1070237	3.8018197	1.3433	0.179282
7				
## i_catretail:y_cat2017	3.9034404	3.8394886	1.0167	0.309406
7				
## i_catservices:y_cat2017	5.5219823	3.4715796	1.5906	0.111809
3				
## i_cattransportation:y_cat2017	4.4318010	3.7461675	1.1830	0.236902
8				
## i_catConstruction:y_cat2018	1.5444826	1.3649069	1.1316	0.257915
8				
## i_catfinance:y_cat2018	1.5714355	0.6535167	2.4046	0.016256
9 *				
## i_catmanufacture:y_cat2018	1.2209007	0.7645516	1.5969	0.110406
7				
## i_catmining:y_cat2018	-2.4054669	2.2256825	-1.0808	0.279891
3				
## i_catretail:y_cat2018	4.2312462	3.1053112	1.3626	0.173125
7				
## i_catservices:y_cat2018	0.8605397	1.2102192	0.7111	0.477107
0				
## i_cattransportation:y_cat2018	2.2748134	1.7842420	1.2749	0.202436
2				
## i_catwholesale:y_cat2018	4.0505349	5.1094351	0.7928	0.427988
7				


```

## i_catfinance:y_cat2019      2.1386729  1.0588400  2.0198 0.043498
6 *
## i_catmanufacture:y_cat2019  2.6809305  1.5070885  1.7789 0.075370
2 .
## i_catmining:y_cat2019      -2.9383320  5.9103486 -0.4972 0.619122
9
## i_catretail:y_cat2019      2.1941766  2.0266912  1.0826 0.279063
6
## i_catservices:y_cat2019     0.2126593  1.9473204  0.1092 0.913047
0
## i_cattransportation:y_cat2019 -0.6070253  1.9057820 -0.3185 0.750116
5
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values1D <- vif(lm(CAR11~`Prev ESG Score.x`+ I(target_ESG*target_dum
my) +target_dummy+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + dive
rsifying + public_target + private_target + all_cash_deal + stock_deal+
cross_border,data=data1))
print(vif_values1D)

```

```

##          `Prev ESG Score.x` I(target_ESG * target_dummy)
##                1.488024                5.226083
##          target_dummy          `firm size`
##                5.289897                1.737876
##          leverage          `free cash flow`
##                1.569563                1.230388
##          `Tobin's q`          preMTR
##                1.433071                1.065627
##          deal_size          hostile
##                1.272514                1.009384
##          high_tech          diversifying
##                1.190477                1.091625
##          public_target          private_target
##                1.412516                1.283821
##          all_cash_deal          stock_deal
##                1.898920                2.047151
##          cross_border
##                1.043852

```

##CAR11---without acquiror ESG

```

reg1D.1<-lm(CAR11~ I(target_ESG*target_dummy) +target_dummy+`firm size`
+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+i_cat*y_cat , data=data1)

summary(reg1D.1)

```

```

##
## Call:
## lm(formula = CAR11 ~ I(target_ESG * target_dummy) + target_dummy +
##     `firm size` + leverage + `free cash flow` + `Tobin's q` +
##     preMTR + deal_size + hostile + high_tech + diversifying +
##     public_target + private_target + all_cash_deal + stock_deal +
##     cross_border + i_cat * y_cat, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -49.011  -1.847  -0.037   1.888  85.438
##
## Coefficients: (23 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)          2.51360     5.11974   0.491  0.62349
## I(target_ESG * target_dummy) -0.05012     0.05770  -0.869  0.38513
## target_dummy          0.68314     1.78522   0.383  0.70200
## `firm size`         -0.21962     0.07692  -2.855  0.00434 *
## *
## leverage            0.83642     0.92585   0.903  0.36639
## `free cash flow`    0.39737     1.13865   0.349  0.72713
## `Tobin's q`        -0.11108     0.09473  -1.173  0.24103
## preMTR              -0.68609     0.41910  -1.637  0.10173
## deal_size           1.46723     0.30858   4.755 2.09e-06 **
## **
## hostile             -3.22096     3.66496  -0.879  0.37956
## high_tech           0.09904     0.27366   0.362  0.71745
## diversifying        -0.43143     0.21716  -1.987  0.04706 *
## public_target       -1.67280     0.31136  -5.373 8.41e-08 **
## **
## private_target      -0.23160     0.22276  -1.040  0.29858
## all_cash_deal       -0.07217     0.30871  -0.234  0.81516
## stock_deal          -0.63281     0.41306  -1.532  0.12564
## cross_border         0.50607     0.23749   2.131  0.03319 *

```

## i_catConstruction	-3.26879	6.19332	-0.528	0.59769
## i_catfinance	-0.85073	5.40704	-0.157	0.87499
## i_catmanufacture	-0.40683	5.09533	-0.080	0.93637
## i_catmining	-0.16704	5.30455	-0.031	0.97488
## i_catretail	-0.55424	5.53915	-0.100	0.92031
## i_catservices	0.89295	5.15035	0.173	0.86237
## i_cattransportation	-0.38395	5.40441	-0.071	0.94337
## i_catwholesale	1.07687	7.16297	0.150	0.88051
## y_cat2004	-1.77755	5.66122	-0.314	0.75356
## y_cat2005	-1.49396	6.19184	-0.241	0.80936
## y_cat2006	-1.44972	5.54845	-0.261	0.79389
## y_cat2007	-0.67862	5.66241	-0.120	0.90461
## y_cat2008	-2.14155	6.19907	-0.345	0.72977
## y_cat2009	-1.39915	7.15973	-0.195	0.84508
## y_cat2010	-0.41154	7.15589	-0.058	0.95414
## y_cat2011	-0.20895	5.84675	-0.036	0.97149
## y_cat2012	-6.09135	5.41609	-1.125	0.26082
## y_cat2013	0.47544	5.41737	0.088	0.93007
## y_cat2014	-0.60484	7.15172	-0.085	0.93261
## y_cat2015	-3.17323	5.85027	-0.542	0.58758
## y_cat2016	-2.31482	7.15151	-0.324	0.74620
## y_cat2017	-5.34055	5.33832	-1.000	0.31720
## y_cat2018	-1.40801	7.15799	-0.197	0.84407
## y_cat2019	-2.19656	5.66359	-0.388	0.69817

## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.23848	6.23975	0.359	0.71981
## i_catmanufacture:y_cat2004	2.84662	5.71975	0.498	0.61875
## i_catmining:y_cat2004	-0.59998	6.02900	-0.100	0.92074
## i_catretail:y_cat2004	1.26322	6.75923	0.187	0.85176
## i_catservices:y_cat2004	0.11306	5.82723	0.019	0.98452
## i_cattransportation:y_cat2004	1.30633	6.32286	0.207	0.83633
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	2.60665	6.56631	0.397	0.69142
## i_catmanufacture:y_cat2005	2.02418	6.24013	0.324	0.74567
## i_catmining:y_cat2005	0.24530	6.53856	0.038	0.97008
## i_catretail:y_cat2005	5.38153	6.96886	0.772	0.44005
## i_catservices:y_cat2005	1.37581	6.33192	0.217	0.82800
## i_cattransportation:y_cat2005	1.22277	6.80036	0.180	0.85731
## i_catwholesale:y_cat2005	-0.16138	9.47459	-0.017	0.98641
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	1.01273	6.87129	0.147	0.88284
## i_catmanufacture:y_cat2006	2.99975	5.67981	0.528	0.59744
## i_catmining:y_cat2006	0.54578	6.80046	0.080	0.93604
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	0.48868	5.79255	0.084	0.93277
## i_cattransportation:y_cat2006	-0.55381	6.87516	-0.081	0.93580
## i_catwholesale:y_cat2006	NA	NA	NA	NA

## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.83738	6.09822	0.137	0.89079
## i_catmanufacture:y_cat2007	1.80741	5.71941	0.316	0.75202
## i_catmining:y_cat2007	1.74523	6.03999	0.289	0.77264
## i_catretail:y_cat2007	6.09166	7.07461	0.861	0.38928
## i_catservices:y_cat2007	-0.94818	5.82400	-0.163	0.87068
## i_cattransportation:y_cat2007	1.83020	6.39568	0.286	0.77478
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	14.94611	8.00532	1.867	0.06201
## i_catfinance:y_cat2008	7.24867	6.96309	1.041	0.29796
## i_catmanufacture:y_cat2008	1.97430	6.26131	0.315	0.75254
## i_catmining:y_cat2008	0.78550	6.53789	0.120	0.90438
## i_catretail:y_cat2008	3.55802	6.97592	0.510	0.61006
## i_catservices:y_cat2008	1.20656	6.34344	0.190	0.84916
## i_cattransportation:y_cat2008	2.82301	6.65075	0.424	0.67126
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.98872	7.28478	0.410	0.68164
## i_catmining:y_cat2009	7.72005	8.91328	0.866	0.38650
## i_catretail:y_cat2009	-7.72980	9.14634	-0.845	0.39812
## i_catservices:y_cat2009	1.56230	7.35046	0.213	0.83170
## i_cattransportation:y_cat2009	0.77140	7.96856	0.097	0.92289
## i_catwholesale:y_cat2009	NA	NA	NA	NA

## i_catConstruction:y_cat2010	1.32688	8.52420	0.156	0.87631
## i_catfinance:y_cat2010	0.04050	7.47448	0.005	0.99568
## i_catmanufacture:y_cat2010	1.20526	7.19746	0.167	0.86702
## i_catmining:y_cat2010	0.42402	7.47932	0.057	0.95479
## i_catretail:y_cat2010	2.05382	8.04855	0.255	0.79860
## i_catservices:y_cat2010	-0.10614	7.28089	-0.015	0.98837
## i_cattransportation:y_cat2010	0.72953	7.52026	0.097	0.92273
## i_catwholesale:y_cat2010	-0.37707	9.05849	-0.042	0.96680
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-2.88879	6.55483	-0.441	0.65946
## i_catmanufacture:y_cat2011	1.09646	5.94259	0.185	0.85363
## i_catmining:y_cat2011	0.63089	7.05894	0.089	0.92879
## i_catretail:y_cat2011	1.87267	8.05327	0.233	0.81614
## i_catservices:y_cat2011	-2.14391	6.19068	-0.346	0.72913
## i_cattransportation:y_cat2011	-1.27105	6.81157	-0.187	0.85199
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-1.99283	8.28325	-0.241	0.80989
## i_catfinance:y_cat2012	6.05994	5.80061	1.045	0.29625
## i_catmanufacture:y_cat2012	7.17232	5.46759	1.312	0.18970
## i_catmining:y_cat2012	0.01061	5.86378	0.002	0.99856
## i_catretail:y_cat2012	6.43724	6.13752	1.049	0.29435
## i_catservices:y_cat2012	5.86700	5.57912	1.052	0.29308
## i_cattransportation:y_cat2012	7.73958	5.88758	1.315	0.18877
## i_catwholesale:y_cat2012	NA	NA	NA	NA

## i_catConstruction:y_cat2013	3.85097	7.42231	0.519	0.60392
## i_catfinance:y_cat2013	0.11131	5.82759	0.019	0.98476
## i_catmanufacture:y_cat2013	1.25135	5.48189	0.228	0.81945
## i_catmining:y_cat2013	0.35966	6.02426	0.060	0.95240
## i_catretail:y_cat2013	0.79680	6.39382	0.125	0.90083
## i_catservices:y_cat2013	-1.70812	5.57544	-0.306	0.75935
## i_cattransportation:y_cat2013	-2.60004	5.94699	-0.437	0.66200
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	2.20203	9.45895	0.233	0.81593
## i_catfinance:y_cat2014	2.53675	8.22212	0.309	0.75770
## i_catmanufacture:y_cat2014	2.53346	7.26962	0.349	0.72749
## i_catmining:y_cat2014	7.80263	8.17055	0.955	0.33968
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-0.83728	7.39503	-0.113	0.90986
## i_cattransportation:y_cat2014	4.29073	8.22601	0.522	0.60199
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	6.36577	8.51689	0.747	0.45487
## i_catfinance:y_cat2015	6.03401	7.12664	0.847	0.39725
## i_catmanufacture:y_cat2015	4.16469	5.96621	0.698	0.48521
## i_catmining:y_cat2015	0.36126	7.05075	0.051	0.95914
## i_catretail:y_cat2015	7.11204	6.67156	1.066	0.28651
## i_catservices:y_cat2015	1.66666	6.16793	0.270	0.78702
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA

## i_catConstruction:y_cat2016	3.80577	8.22205	0.463	0.64349
## i_catfinance:y_cat2016	2.44490	7.43730	0.329	0.74238
## i_catmanufacture:y_cat2016	3.40467	7.18916	0.474	0.63583
## i_catmining:y_cat2016	2.54045	7.40748	0.343	0.73166
## i_catretail:y_cat2016	4.44356	7.74094	0.574	0.56599
## i_catservices:y_cat2016	2.34999	7.25448	0.324	0.74601
## i_cattransportation:y_cat2016	1.18573	7.48796	0.158	0.87419
## i_catwholesale:y_cat2016	2.75346	8.88664	0.310	0.75670
## i_catConstruction:y_cat2017	8.16552	6.71192	1.217	0.22387
## i_catfinance:y_cat2017	4.98518	5.69207	0.876	0.38121
## i_catmanufacture:y_cat2017	5.84679	5.38611	1.086	0.27778
## i_catmining:y_cat2017	5.12762	5.78375	0.887	0.37540
## i_catretail:y_cat2017	3.94455	5.92700	0.666	0.50577
## i_catservices:y_cat2017	5.54655	5.45956	1.016	0.30975
## i_cattransportation:y_cat2017	4.47172	5.75835	0.777	0.43748
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.55481	8.23088	0.189	0.85019
## i_catfinance:y_cat2018	1.53762	7.42469	0.207	0.83595
## i_catmanufacture:y_cat2018	1.20527	7.19305	0.168	0.86694
## i_catmining:y_cat2018	-2.44096	7.43072	-0.328	0.74256
## i_catretail:y_cat2018	4.18368	7.84549	0.533	0.59390
## i_catservices:y_cat2018	0.84648	7.24066	0.117	0.90694
## i_cattransportation:y_cat2018	2.22115	7.45832	0.298	0.76587
## i_catwholesale:y_cat2018	3.99455	8.85854	0.451	0.65208


```

## i_catConstruction:y_cat2019      NA      NA      NA      NA
## i_catfinance:y_cat2019           2.21088  6.10248  0.362  0.71716
## i_catmanufacture:y_cat2019       2.76082  5.77670  0.478  0.63274
## i_catmining:y_cat2019            -2.88287  6.59842 -0.437  0.66222
## i_catretail:y_cat2019            2.25394  6.76220  0.333  0.73892
## i_catservices:y_cat2019          0.28908  5.79419  0.050  0.96021
## i_cattransportation:y_cat2019    -0.56753  6.27606 -0.090  0.92795
## i_catwholesale:y_cat2019         NA      NA      NA      NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.054 on 2741 degrees of freedom
## Multiple R-squared:  0.08395,    Adjusted R-squared:  0.0355
## F-statistic: 1.732 on 145 and 2741 DF,  p-value: 2.939e-07

##test heteroskedasticity problem
hetero_test <- bptest(reg1D.1)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg1D.1
## BP = 609.03, df = 145, p-value < 2.2e-16

##solve heteroskedasticity problem
coeftest(reg1D.1, vcov = vcovHC(reg1D.1, type='HC0',cluster='a_industry
'))

##
## t test of coefficients:
##
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      2.513600   0.849843   2.9577 0.0031257
## **
## I(target_ESG * target_dummy) -0.050117   0.053998  -0.9281 0.3534188
## target_dummy      0.683143   1.964472   0.3477 0.7280556
## `firm size`      -0.219623   0.077498  -2.8339 0.0046315

```

```

**
## leverage                0.836421    1.001767    0.8349 0.4038207
## `free cash flow`        0.397372    1.528516    0.2600 0.7949048
## `Tobin's q`             -0.111083    0.105011   -1.0578 0.2902266
## preMTR                   -0.686086    0.581285   -1.1803 0.2379867
## deal_size                1.467227    1.653308    0.8874 0.3749149
## hostile                   -3.220957    0.815797   -3.9482 8.071e-05
***
## high_tech                0.099039    0.296258    0.3343 0.7381786
## diversifying             -0.431426    0.211313   -2.0416 0.0412826
*
## public_target            -1.672803    0.371979   -4.4970 7.177e-06
***
## private_target          -0.231598    0.231908   -0.9987 0.3180452
## all_cash_deal           -0.072175    0.327732   -0.2202 0.8257117
## stock_deal              -0.632810    0.702706   -0.9005 0.3679159
## cross_border             0.506067    0.223956    2.2597 0.0239197
*
## i_catConstruction       -3.268786    0.345121   -9.4714 < 2.2e-16
***
## i_catfinance            -0.850732    0.488210   -1.7426 0.0815241
.
## i_catmanufacture        -0.406828    0.534517   -0.7611 0.4466552
## i_catmining             -0.167039    1.278710   -0.1306 0.8960770
## i_catretail             -0.554239    0.788566   -0.7028 0.4822123
## i_catservices           0.892949    1.026215    0.8701 0.3843009
## i_cattransportation     -0.383949    1.552877   -0.2473 0.8047333
## i_catwholesale          1.076871    0.608921    1.7685 0.0770899
.
## y_cat2004               -1.777546    0.897389   -1.9808 0.0477137
*
## y_cat2005               -1.493964    0.389918   -3.8315 0.0001302
***
## y_cat2006               -1.449724    0.877792   -1.6516 0.0987393
.

```

## y_cat2007	-0.678620	0.612624	-1.1077	0.2680776
## y_cat2008	-2.141548	0.906940	-2.3613	0.0182811
* ## y_cat2009	-1.399152	0.624586	-2.2401	0.0251624
* ## y_cat2010	-0.411542	0.429099	-0.9591	0.3376005
## y_cat2011	-0.208947	0.584150	-0.3577	0.7206000
## y_cat2012	-6.091349	5.468314	-1.1139	0.2654045
## y_cat2013	0.475441	1.243902	0.3822	0.7023299
## y_cat2014	-0.604843	0.252144	-2.3988	0.0165154
* ## y_cat2015	-3.173230	1.518565	-2.0896	0.0367436
* ## y_cat2016	-2.314819	0.241712	-9.5768	< 2.2e-16
*** ## y_cat2017	-5.340553	3.292023	-1.6223	0.1048604
## y_cat2018	-1.408010	0.373751	-3.7672	0.0001685
*** ## y_cat2019	-2.196555	0.949030	-2.3145	0.0207125
* ## i_catfinance:y_cat2004	2.238482	2.339481	0.9568	0.3387383
## i_catmanufacture:y_cat2004	2.846624	1.152751	2.4694	0.0135938
* ## i_catmining:y_cat2004	-0.599980	1.738759	-0.3451	0.7300740
## i_catretail:y_cat2004	1.263217	1.817275	0.6951	0.4870415
## i_catservices:y_cat2004	0.113062	1.457798	0.0776	0.9381861
## i_cattransportation:y_cat2004	1.306326	1.823831	0.7163	0.4738958
## i_catfinance:y_cat2005	2.606648	0.918752	2.8372	0.0045851
** ## i_catmanufacture:y_cat2005	2.024180	0.676762	2.9910	0.0028056
** ## i_catmining:y_cat2005	0.245295	2.038529	0.1203	0.9042309
## i_catretail:y_cat2005	5.381531	1.760051	3.0576	0.0022527
** ## i_catservices:y_cat2005	1.375810	1.336423	1.0295	0.3033489
## i_cattransportation:y_cat2005	1.222774	1.945505	0.6285	0.5297207

## i_catwholesale:y_cat2005	-0.161379	0.972393	-0.1660	0.8681998
## i_catfinance:y_cat2006	1.012732	1.029320	0.9839	0.3252593
## i_catmanufacture:y_cat2006	2.999749	1.215372	2.4682	0.0136411
* ## i_catmining:y_cat2006	0.545780	2.262716	0.2412	0.8094138
## i_catservices:y_cat2006	0.488684	1.497555	0.3263	0.7442063
## i_cattransportation:y_cat2006	-0.553813	2.137074	-0.2591	0.7955426
## i_catfinance:y_cat2007	0.837376	1.025315	0.8167	0.4141705
## i_catmanufacture:y_cat2007	1.807413	0.820490	2.2028	0.0276886
* ## i_catmining:y_cat2007	1.745234	1.738906	1.0036	0.3156412
## i_catretail:y_cat2007	6.091664	6.139142	0.9923	0.3211552
## i_catservices:y_cat2007	-0.948175	1.440850	-0.6581	0.5105508
## i_cattransportation:y_cat2007	1.830197	1.954723	0.9363	0.3492039
## i_catConstruction:y_cat2008	14.946110	4.457437	3.3531	0.0008101
*** ## i_catfinance:y_cat2008	7.248670	2.315210	3.1309	0.0017611
** ## i_catmanufacture:y_cat2008	1.974303	1.169357	1.6884	0.0914546
. ## i_catmining:y_cat2008	0.785497	2.660197	0.2953	0.7678040
## i_catretail:y_cat2008	3.558019	2.160751	1.6467	0.0997429
. ## i_catservices:y_cat2008	1.206559	1.530761	0.7882	0.4306430
## i_cattransportation:y_cat2008	2.823007	1.931660	1.4614	0.1440092
## i_catmanufacture:y_cat2009	2.988718	1.322218	2.2604	0.0238757
* ## i_catmining:y_cat2009	7.720051	1.516907	5.0893	3.836e-07
*** ## i_catretail:y_cat2009	-7.729801	5.418063	-1.4267	0.1537882
## i_catservices:y_cat2009	1.562302	1.334042	1.1711	0.2416590
## i_cattransportation:y_cat2009	0.771401	1.771345	0.4355	0.6632419

## i_catConstruction:y_cat2010	1.326883	0.982356	1.3507	0.1768985
## i_catfinance:y_cat2010	0.040496	1.300058	0.0311	0.9751524
## i_catmanufacture:y_cat2010	1.205256	0.727337	1.6571	0.0976179
·				
## i_catmining:y_cat2010	0.424024	2.177085	0.1948	0.8455900
## i_catretail:y_cat2010	2.053820	0.896435	2.2911	0.0220334
*				
## i_catservices:y_cat2010	-0.106135	1.362062	-0.0779	0.9378955
## i_cattransportation:y_cat2010	0.729526	1.830575	0.3985	0.6902759
## i_catwholesale:y_cat2010	-0.377065	1.074012	-0.3511	0.7255545
## i_catfinance:y_cat2011	-2.888794	0.768713	-3.7580	0.0001749

## i_catmanufacture:y_cat2011	1.096457	1.046046	1.0482	0.2946425
## i_catmining:y_cat2011	0.630889	2.279387	0.2768	0.7819700
## i_catretail:y_cat2011	1.872673	0.990621	1.8904	0.0588095
·				
## i_catservices:y_cat2011	-2.143906	1.201981	-1.7836	0.0745921
·				
## i_cattransportation:y_cat2011	-1.271047	1.975139	-0.6435	0.5199386
## i_catConstruction:y_cat2012	-1.992827	5.606277	-0.3555	0.7222697
## i_catfinance:y_cat2012	6.059936	5.478888	1.1061	0.2688010
## i_catmanufacture:y_cat2012	7.172322	5.485608	1.3075	0.1911595
## i_catmining:y_cat2012	0.010612	6.819300	0.0016	0.9987585
## i_catretail:y_cat2012	6.437237	5.630504	1.1433	0.2530227
## i_catservices:y_cat2012	5.867003	5.635143	1.0411	0.2978999
## i_cattransportation:y_cat2012	7.739578	5.734058	1.3498	0.1772058
## i_catConstruction:y_cat2013	3.850967	1.430351	2.6923	0.0071388
**				
## i_catfinance:y_cat2013	0.111314	1.380156	0.0807	0.9357238
## i_catmanufacture:y_cat2013	1.251354	1.362304	0.9186	0.3584083

## i_catmining:y_cat2013	0.359658	2.777608	0.1295	0.8969835
## i_catretail:y_cat2013	0.796801	1.629224	0.4891	0.6248331
## i_catservices:y_cat2013	-1.708118	1.698573	-1.0056	0.3146874
## i_cattransportation:y_cat2013	-2.600038	2.297705	-1.1316	0.2579100
## i_catConstruction:y_cat2014	2.202033	0.426067	5.1683	2.532e-07

## i_catfinance:y_cat2014	2.536753	1.290077	1.9664	0.0493580
*				
## i_catmanufacture:y_cat2014	2.533463	1.091087	2.3220	0.0203079
*				
## i_catmining:y_cat2014	7.802625	1.752040	4.4535	8.788e-06

## i_catservices:y_cat2014	-0.837276	1.306865	-0.6407	0.5217874
## i_cattransportation:y_cat2014	4.290734	6.743391	0.6363	0.5246423
## i_catConstruction:y_cat2015	6.365775	1.590938	4.0013	6.467e-05

## i_catfinance:y_cat2015	6.034006	2.402359	2.5117	0.0120722
*				
## i_catmanufacture:y_cat2015	4.164691	1.938026	2.1489	0.0317269
*				
## i_catmining:y_cat2015	0.361256	5.382757	0.0671	0.9464962
## i_catretail:y_cat2015	7.112036	2.125920	3.3454	0.0008327

## i_catservices:y_cat2015	1.666656	2.021635	0.8244	0.4097784
## i_catConstruction:y_cat2016	3.805767	0.770060	4.9422	8.191e-07

## i_catfinance:y_cat2016	2.444897	0.635751	3.8457	0.0001230

## i_catmanufacture:y_cat2016	3.404671	0.646446	5.2668	1.496e-07

## i_catmining:y_cat2016	2.540445	1.833008	1.3859	0.1658770
## i_catretail:y_cat2016	4.443563	1.455187	3.0536	0.0022828
**				
## i_catservices:y_cat2016	2.349988	1.394607	1.6851	0.0920920
.				
## i_cattransportation:y_cat2016	1.185727	1.777472	0.6671	0.5047733
## i_catwholesale:y_cat2016	2.753461	2.846691	0.9672	0.3335046

```

## i_catConstruction:y_cat2017      8.165516    3.470732    2.3527 0.0187091
*
## i_catfinance:y_cat2017           4.985179    3.336501    1.4941 0.1352557
## i_catmanufacture:y_cat2017       5.846790    3.347350    1.7467 0.0808028
.
## i_catmining:y_cat2017            5.127618    3.812644    1.3449 0.1787694
## i_catretail:y_cat2017            3.944546    3.850060    1.0245 0.3056700
## i_catservices:y_cat2017          5.546550    3.478652    1.5945 0.1109497
## i_cattransportation:y_cat2017    4.471724    3.751257    1.1921 0.2333409
## i_catConstruction:y_cat2018      1.554808    1.362993    1.1407 0.2540816
## i_catfinance:y_cat2018           1.537624    0.651645    2.3596 0.0183641
*
## i_catmanufacture:y_cat2018       1.205274    0.764106    1.5774 0.1148270
## i_catmining:y_cat2018            -2.440964    2.222894   -1.0981 0.2722566
## i_catretail:y_cat2018            4.183676    3.100685    1.3493 0.1773602
## i_catservices:y_cat2018          0.846475    1.209453    0.6999 0.4840599
## i_cattransportation:y_cat2018    2.221150    1.775782    1.2508 0.2111139
## i_catwholesale:y_cat2018         3.994548    5.118274    0.7804 0.4351944
## i_catfinance:y_cat2019           2.210878    1.047687    2.1102 0.0349276
*
## i_catmanufacture:y_cat2019       2.760817    1.500371    1.8401 0.0658632
.
## i_catmining:y_cat2019           -2.882868    5.908273   -0.4879 0.6256331
## i_catretail:y_cat2019            2.253940    1.998318    1.1279 0.2594532
## i_catservices:y_cat2019          0.289077    1.945683    0.1486 0.8819011
## i_cattransportation:y_cat2019   -0.567532    1.906293   -0.2977 0.7659433

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##test multicollinearity problem
vif_values1D.1 <- vif(lm(CAR11~ I(target_ESG*target_dummy)+target_dummy
+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + di

```

```
versifying + public_target + private_target + all_cash_deal + stock_deal + cross_border, data=data1))
print(vif_values1D.1)
```

```
## I(target_ESG * target_dummy)          target_dummy
##           5.222626                    5.283432
##           `firm size`                 leverage
##           1.293011                    1.569481
##           `free cash flow`            `Tobin's q`
##           1.225310                    1.422219
##           preMTR                       deal_size
##           1.064501                    1.269053
##           hostile                       high_tech
##           1.007455                    1.187563
##           diversifying                 public_target
##           1.089691                    1.412402
##           private_target              all_cash_deal
##           1.283652                    1.897877
##           stock_deal                  cross_border
##           2.044621                    1.043388
```

##CAR22

```
reg2D<-lm(CAR22~`Prev ESG Score.x`+I(target_ESG*target_dummy) + target_
dummy+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + diversifying + pu
blic_target + private_target + all_cash_deal + stock_deal+cross_border+
i_cat*y_cat , data=data1)
```

```
summary(reg2D)
```

```
##
## Call:
## lm(formula = CAR22 ~ `Prev ESG Score.x` + I(target_ESG * target_dumm
y) +
##   target_dummy + `firm size` + leverage + `free cash flow` +
##   `Tobin's q` + preMTR + deal_size + hostile + high_tech +
##   diversifying + public_target + private_target + all_cash_deal +
##   stock_deal + cross_border + i_cat * y_cat, data = data1)
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -42.586  -2.281   0.020   2.399  81.892
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.854149    5.541613   0.335   0.7380
## `Prev ESG Score.x` -0.013251    0.007167  -1.849   0.0646
.
```


## I(target_ESG * target_dummy)	-0.062517	0.062401	-1.002	0.3165
## target_dummy	1.254223	1.930718	0.650	0.5160
## `firm size`	-0.105208	0.103544	-1.016	0.3097
## leverage	1.261842	1.002880	1.258	0.2084
## `free cash flow`	2.248574	1.232332	1.825	0.0682
·				
## `Tobin's q`	-0.205249	0.103179	-1.989	0.0468
*				
## preMTR	-2.048245	0.453172	-4.520	6.45e-06

## deal_size	1.480684	0.334191	4.431	9.76e-06

## hostile	-1.482957	3.965210	-0.374	0.7084
## high_tech	0.279281	0.296595	0.942	0.3465
## diversifying	-0.266627	0.234894	-1.135	0.2564
## public_target	-1.894121	0.336681	-5.626	2.03e-08

## private_target	-0.298816	0.240869	-1.241	0.2149
## all_cash_deal	-0.317458	0.334044	-0.950	0.3420
## stock_deal	-0.565015	0.447051	-1.264	0.2064
## cross_border	0.570892	0.256924	2.222	0.0264
*				
## i_catConstruction	-3.642690	6.697771	-0.544	0.5866
## i_catfinance	-0.852822	5.847298	-0.146	0.8841
## i_catmanufacture	0.471997	5.509742	0.086	0.9317
## i_catmining	0.692577	5.736228	0.121	0.9039
## i_catretail	-0.957197	5.989627	-0.160	0.8730
## i_catservices	0.872710	5.569442	0.157	0.8755
## i_cattransportation	0.300933	5.844580	0.051	0.9589
## i_catwholesale	-0.986383	7.747070	-0.127	0.8987

## y_cat2004	-1.088125	6.121511	-0.178	0.8589
## y_cat2005	0.044430	6.695651	0.007	0.9947
## y_cat2006	-0.675768	5.999611	-0.113	0.9103
## y_cat2007	1.253637	6.122982	0.205	0.8378
## y_cat2008	-1.921635	6.703476	-0.287	0.7744
## y_cat2009	-2.112865	7.742077	-0.273	0.7849
## y_cat2010	1.606985	7.738004	0.208	0.8355
## y_cat2011	1.277002	6.324154	0.202	0.8400
## y_cat2012	-5.124411	5.859293	-0.875	0.3819
## y_cat2013	3.389622	5.859459	0.578	0.5630
## y_cat2014	1.009886	7.741167	0.130	0.8962
## y_cat2015	-0.898446	6.327665	-0.142	0.8871
## y_cat2016	-1.456717	7.739031	-0.188	0.8507
## y_cat2017	-3.228599	5.774342	-0.559	0.5761
## y_cat2018	-0.432943	7.740640	-0.056	0.9554
## y_cat2019	-1.444558	6.128379	-0.236	0.8137
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	1.600592	6.747043	0.237	0.8125
## i_catmanufacture:y_cat2004	1.967037	6.185022	0.318	0.7505
## i_catmining:y_cat2004	-1.963801	6.519173	-0.301	0.7633
## i_catretail:y_cat2004	2.382508	7.310278	0.326	0.7445
## i_catservices:y_cat2004	-0.235783	6.301066	-0.037	0.9702
## i_cattransportation:y_cat2004	-1.186705	6.837087	-0.174	0.8622
## i_catwholesale:y_cat2004	NA	NA	NA	NA

## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	0.705019	7.100291	0.099	0.9209
## i_catmanufacture:y_cat2005	-0.042694	6.748255	-0.006	0.9950
## i_catmining:y_cat2005	-0.461777	7.071030	-0.065	0.9479
## i_catretail:y_cat2005	5.628034	7.537620	0.747	0.4553
## i_catservices:y_cat2005	-0.268360	6.846938	-0.039	0.9687
## i_cattransportation:y_cat2005	-1.269066	7.353499	-0.173	0.8630
## i_catwholesale:y_cat2005	0.626898	10.244886	0.061	0.9512
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.522281	7.429976	0.070	0.9440
## i_catmanufacture:y_cat2006	1.467143	6.141576	0.239	0.8112
## i_catmining:y_cat2006	-2.164166	7.355248	-0.294	0.7686
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	1.042075	6.263537	0.166	0.8679
## i_cattransportation:y_cat2006	-3.556320	7.434641	-0.478	0.6324
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-1.314907	6.594023	-0.199	0.8420
## i_catmanufacture:y_cat2007	-0.465824	6.184754	-0.075	0.9400
## i_catmining:y_cat2007	-0.438145	6.531156	-0.067	0.9465
## i_catretail:y_cat2007	4.699328	7.650207	0.614	0.5391
## i_catservices:y_cat2007	-2.581340	6.297645	-0.410	0.6819
## i_cattransportation:y_cat2007	-0.919354	6.916657	-0.133	0.8943
## i_catwholesale:y_cat2007	NA	NA	NA	NA

## i_catConstruction:y_cat2008	23.578192	8.656631	2.724	0.0065
**				
## i_catfinance:y_cat2008	5.834873	7.529677	0.775	0.4385
## i_catmanufacture:y_cat2008	1.302621	6.770778	0.192	0.8475
## i_catmining:y_cat2008	0.163793	7.070409	0.023	0.9815
## i_catretail:y_cat2008	4.706779	7.543092	0.624	0.5327
## i_catservices:y_cat2008	1.310429	6.859222	0.191	0.8485
## i_cattransportation:y_cat2008	2.298625	7.191538	0.320	0.7493
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.978705	7.877055	0.378	0.7053
## i_catmining:y_cat2009	4.891999	9.638027	0.508	0.6118
## i_catretail:y_cat2009	6.642503	9.890499	0.672	0.5019
## i_catservices:y_cat2009	1.578067	7.948050	0.199	0.8426
## i_cattransportation:y_cat2009	1.053744	8.618536	0.122	0.9027
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	-0.077927	9.218099	-0.008	0.9933
## i_catfinance:y_cat2010	-1.598328	8.084432	-0.198	0.8433
## i_catmanufacture:y_cat2010	-1.408252	7.784119	-0.181	0.8564
## i_catmining:y_cat2010	-2.931309	8.088094	-0.362	0.7171
## i_catretail:y_cat2010	1.189687	8.706053	0.137	0.8913
## i_catservices:y_cat2010	-1.097628	7.874142	-0.139	0.8891
## i_cattransportation:y_cat2010	-2.040139	8.133506	-0.251	0.8020
## i_catwholesale:y_cat2010	-0.023297	9.797933	-0.002	0.9981

## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-10.558743	7.087768	-1.490	0.1364
## i_catmanufacture:y_cat2011	-0.601997	6.426805	-0.094	0.9254
## i_catmining:y_cat2011	0.519093	7.632830	0.068	0.9458
## i_catretail:y_cat2011	0.153514	8.708154	0.018	0.9859
## i_catservices:y_cat2011	-2.650225	6.694194	-0.396	0.6922
## i_cattransportation:y_cat2011	-5.038628	7.366474	-0.684	0.4940
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-3.932056	8.957428	-0.439	0.6607
## i_catfinance:y_cat2012	6.063966	6.272432	0.967	0.3337
## i_catmanufacture:y_cat2012	5.915266	5.912536	1.000	0.3172
## i_catmining:y_cat2012	-1.756796	6.340896	-0.277	0.7818
## i_catretail:y_cat2012	6.355196	6.636772	0.958	0.3384
## i_catservices:y_cat2012	4.639653	6.033777	0.769	0.4420
## i_cattransportation:y_cat2012	5.790710	6.366572	0.910	0.3631
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	-1.388421	8.026456	-0.173	0.8627
## i_catfinance:y_cat2013	-3.310117	6.301435	-0.525	0.5994
## i_catmanufacture:y_cat2013	-2.486340	5.927704	-0.419	0.6749
## i_catmining:y_cat2013	-3.581739	6.514815	-0.550	0.5825
## i_catretail:y_cat2013	-1.335755	6.913637	-0.193	0.8468
## i_catservices:y_cat2013	-3.936028	6.029246	-0.653	0.5139
## i_cattransportation:y_cat2013	-6.535400	6.430478	-1.016	0.3096
## i_catwholesale:y_cat2013	NA	NA	NA	NA

## i_catConstruction:y_cat2014	2.754219	10.231704	0.269	0.7878
## i_catfinance:y_cat2014	-2.247918	8.895856	-0.253	0.8005
## i_catmanufacture:y_cat2014	0.772238	7.866866	0.098	0.9218
## i_catmining:y_cat2014	3.119415	8.836928	0.353	0.7241
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-3.312462	8.002029	-0.414	0.6789
## i_cattransportation:y_cat2014	2.219712	8.896446	0.250	0.8030
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-0.253036	9.209757	-0.027	0.9781
## i_catfinance:y_cat2015	2.268770	7.706293	0.294	0.7685
## i_catmanufacture:y_cat2015	0.955448	6.452963	0.148	0.8823
## i_catmining:y_cat2015	-6.751736	7.627653	-0.885	0.3761
## i_catretail:y_cat2015	6.614592	7.214050	0.917	0.3593
## i_catservices:y_cat2015	0.324297	6.669642	0.049	0.9612
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.953556	8.890672	0.445	0.6566
## i_catfinance:y_cat2016	1.699413	8.044499	0.211	0.8327
## i_catmanufacture:y_cat2016	1.911516	7.776830	0.246	0.8059
## i_catmining:y_cat2016	2.132294	8.012448	0.266	0.7902
## i_catretail:y_cat2016	6.877947	8.373493	0.821	0.4115
## i_catservices:y_cat2016	1.727134	7.847955	0.220	0.8258
## i_cattransportation:y_cat2016	-0.183200	8.099889	-0.023	0.9820
## i_catwholesale:y_cat2016	5.901445	9.609482	0.614	0.5392

## i_catConstruction:y_cat2017	7.540825	7.257624	1.039	0.2989
## i_catfinance:y_cat2017	3.268283	6.154926	0.531	0.5955
## i_catmanufacture:y_cat2017	3.326279	5.824139	0.571	0.5680
## i_catmining:y_cat2017	1.810519	6.254026	0.289	0.7722
## i_catretail:y_cat2017	2.593878	6.409102	0.405	0.6857
## i_catservices:y_cat2017	4.775211	5.903508	0.809	0.4187
## i_cattransportation:y_cat2017	1.570244	6.226725	0.252	0.8009
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.620227	8.900061	0.182	0.8556
## i_catfinance:y_cat2018	0.496086	8.028446	0.062	0.9507
## i_catmanufacture:y_cat2018	-0.471621	7.777873	-0.061	0.9517
## i_catmining:y_cat2018	-3.482346	8.034976	-0.433	0.6648
## i_catretail:y_cat2018	-0.210824	8.483564	-0.025	0.9802
## i_catservices:y_cat2018	0.008647	7.829350	0.001	0.9991
## i_cattransportation:y_cat2018	1.190038	8.064995	0.148	0.8827
## i_catwholesale:y_cat2018	6.028682	9.579021	0.629	0.5292
## i_catConstruction:y_cat2019	NA	NA	NA	NA
## i_catfinance:y_cat2019	1.446312	6.599305	0.219	0.8265
## i_catmanufacture:y_cat2019	0.840392	6.247246	0.135	0.8930
## i_catmining:y_cat2019	1.608208	7.135247	0.225	0.8217
## i_catretail:y_cat2019	2.548138	7.312397	0.348	0.7275
## i_catservices:y_cat2019	0.461481	6.266079	0.074	0.9413
## i_cattransportation:y_cat2019	-1.910151	6.786506	-0.281	0.7784
## i_catwholesale:y_cat2019	NA	NA	NA	NA

```

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.465 on 2740 degrees of freedom
## Multiple R-squared:  0.1029, Adjusted R-squared:  0.05512
## F-statistic: 2.153 on 146 and 2740 DF,  p-value: 2.611e-13

##test heteroskedasticity problem
hetero_test <- bptest(reg2D)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg2D
## BP = 591.71, df = 146, p-value < 2.2e-16

##solve heteroskedasticity problem
coeftest(reg2D, vcov = vcovHC(reg2D, type='HC0',cluster='a_industry'))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|
t|)
## (Intercept)      1.8541492   0.9406191   1.9712 0.0488
014 *
## `Prev ESG Score.x`
613 .
## I(target_ESG * target_dummy)
624
## target_dummy
386
## `firm size`
383
## leverage
494
## `free cash flow`
374
## `Tobin's q`
671 .
## preMTR
220 **
## deal_size
329
## hostile
913 .
## high_tech
630
## diversifying
564

```


## public_target -06 ***	-1.8941212	0.3994096	-4.7423	2.221e
## private_target 806	-0.2988158	0.2478590	-1.2056	0.2280
## all_cash_deal 671	-0.3174585	0.3472346	-0.9142	0.3606
## stock_deal 085	-0.5650151	0.7007032	-0.8064	0.4201
## cross_border 173 *	0.5708924	0.2513711	2.2711	0.0232
## i_catConstruction 389 *	-3.6426899	1.5230724	-2.3917	0.0168
## i_catfinance 879	-0.8528220	1.1749161	-0.7259	0.4679
## i_catmanufacture 652	0.4719973	0.6918673	0.6822	0.4951
## i_catmining 426	0.6925767	1.2306729	0.5628	0.5736
## i_catretail 890	-0.9571965	1.0557891	-0.9066	0.3646
## i_catservices 435	0.8727098	1.0359933	0.8424	0.3996
## i_cattransportation 191	0.3009327	1.3925064	0.2161	0.8289
## i_catwholesale 407	-0.9863826	0.6667319	-1.4794	0.1391
## y_cat2004 193	-1.0881252	1.9020732	-0.5721	0.5673
## y_cat2005 103	0.0444304	0.6697157	0.0663	0.9471
## y_cat2006 191	-0.6757676	1.0435481	-0.6476	0.5173
## y_cat2007 445	1.2536370	0.9254403	1.3546	0.1756
## y_cat2008 108	-1.9216345	2.3898047	-0.8041	0.4214
## y_cat2009 562 **	-2.1128648	0.6444352	-3.2786	0.0010
## y_cat2010 352 ***	1.6069849	0.4475016	3.5910	0.0003
## y_cat2011 096	1.2770025	1.4998474	0.8514	0.3946
## y_cat2012 869	-5.1244106	6.2774373	-0.8163	0.4143
## y_cat2013 167 *	3.3896222	1.3205607	2.5668	0.0103
## y_cat2014 953 *	1.0098864	0.4477907	2.2553	0.0241
## y_cat2015 825	-0.8984458	1.6852087	-0.5331	0.5939

## y_cat2016 -05 ***	-1.4567165	0.3708280	-3.9283	8.767e
## y_cat2017 179	-3.2285995	3.4483720	-0.9363	0.3492
## y_cat2018 178	-0.4329434	0.4164522	-1.0396	0.2986
## y_cat2019 986	-1.4445584	1.6212478	-0.8910	0.3729
## i_catfinance:y_cat2004 474	1.6005922	3.3858882	0.4727	0.6364
## i_catmanufacture:y_cat2004 448	1.9670373	2.0570943	0.9562	0.3390
## i_catmining:y_cat2004 647	-1.9638010	2.4231657	-0.8104	0.4177
## i_catretail:y_cat2004 187	2.3825085	2.4308597	0.9801	0.3271
## i_catservices:y_cat2004 282	-0.2357835	2.2768388	-0.1036	0.9175
## i_cattransportation:y_cat2004 982	-1.1867051	2.4459835	-0.4852	0.6275
## i_catfinance:y_cat2005 366	0.7050195	1.5690823	0.4493	0.6532
## i_catmanufacture:y_cat2005 185	-0.0426941	0.9733985	-0.0439	0.9650
## i_catmining:y_cat2005 472	-0.4617771	2.1095712	-0.2189	0.8267
## i_catretail:y_cat2005 274 ***	5.6280336	1.6636885	3.3829	0.0007
## i_catservices:y_cat2005 989	-0.2683602	1.4652998	-0.1831	0.8546
## i_cattransportation:y_cat2005 101	-1.2690659	1.8998893	-0.6680	0.5042
## i_catwholesale:y_cat2005 187	0.6268985	1.1282943	0.5556	0.5785
## i_catfinance:y_cat2006 599	0.5222810	1.5905445	0.3284	0.7426
## i_catmanufacture:y_cat2006 719	1.4671432	1.4631253	1.0027	0.3160
## i_catmining:y_cat2006 785	-2.1641664	3.4479876	-0.6277	0.5302
## i_catservices:y_cat2006 537	1.0420747	1.6248330	0.6413	0.5213
## i_cattransportation:y_cat2006 482 .	-3.5563201	1.9811283	-1.7951	0.0727
## i_catfinance:y_cat2007 326	-1.3149075	1.7432103	-0.7543	0.4507
## i_catmanufacture:y_cat2007 985	-0.4658245	1.1587013	-0.4020	0.6876
## i_catmining:y_cat2007 763	-0.4381452	1.9856432	-0.2207	0.8253

## i_catretail:y_cat2007 032	4.6993280	5.1053040	0.9205	0.3574
## i_catservices:y_cat2007 157	-2.5813403	1.6458989	-1.5683	0.1169
## i_cattransportation:y_cat2007 696	-0.9193538	2.0583733	-0.4466	0.6551
## i_catConstruction:y_cat2008 112 **	23.5781919	8.0202000	2.9399	0.0033
## i_catfinance:y_cat2008 787	5.8348729	3.8673627	1.5087	0.1314
## i_catmanufacture:y_cat2008 210	1.3026209	2.5810597	0.5047	0.6138
## i_catmining:y_cat2008 166	0.1637932	3.5513285	0.0461	0.9632
## i_catretail:y_cat2008 792	4.7067785	3.7363817	1.2597	0.2078
## i_catservices:y_cat2008 877	1.3104294	2.7222569	0.4814	0.6302
## i_cattransportation:y_cat2008 329	2.2986246	3.0305941	0.7585	0.4482
## i_catmanufacture:y_cat2009 345 .	2.9787047	1.6095878	1.8506	0.0643
## i_catmining:y_cat2009 491 **	4.8919990	1.4912254	3.2805	0.0010
## i_catretail:y_cat2009 232	6.6425032	5.1373166	1.2930	0.1961
## i_catservices:y_cat2009 783	1.5780670	1.3267555	1.1894	0.2343
## i_cattransportation:y_cat2009 726	1.0537439	1.7642501	0.5973	0.5503
## i_catConstruction:y_cat2010 016	-0.0779275	1.7458888	-0.0446	0.9644
## i_catfinance:y_cat2010 304	-1.5983280	1.6899092	-0.9458	0.3443
## i_catmanufacture:y_cat2010 969 .	-1.4082523	0.8403601	-1.6758	0.0938
## i_catmining:y_cat2010 502	-2.9313091	2.1489066	-1.3641	0.1726
## i_catretail:y_cat2010 134	1.1896867	1.1026530	1.0789	0.2807
## i_catservices:y_cat2010 432	-1.0976281	1.4285450	-0.7684	0.4423
## i_cattransportation:y_cat2010 863	-2.0401394	1.7880904	-1.1410	0.2539
## i_catwholesale:y_cat2010 350	-0.0232972	1.0520938	-0.0221	0.9823
## i_catfinance:y_cat2011 -05 ***	-10.5587434	2.6315541	-4.0124	6.172e
## i_catmanufacture:y_cat2011 202	-0.6019969	1.7736106	-0.3394	0.7343

## i_catmining:y_cat2011 980	0.5190933	2.6071779	0.1991	0.8421
## i_catretail:y_cat2011 716	0.1535140	1.8277950	0.0840	0.9330
## i_catservices:y_cat2011 908	-2.6502245	1.8725378	-1.4153	0.1570
## i_cattransportation:y_cat2011 462 .	-5.0386276	2.6615367	-1.8931	0.0584
## i_catConstruction:y_cat2012 602	-3.9320561	6.5748643	-0.5980	0.5498
## i_catfinance:y_cat2012 866	6.0639657	6.3763879	0.9510	0.3416
## i_catmanufacture:y_cat2012 816	5.9152656	6.3017344	0.9387	0.3479
## i_catmining:y_cat2012 550	-1.7567956	7.3320722	-0.2396	0.8106
## i_catretail:y_cat2012 220	6.3551960	6.4868965	0.9797	0.3273
## i_catservices:y_cat2012 175	4.6396526	6.4212121	0.7226	0.4700
## i_cattransportation:y_cat2012 130	5.7907099	6.4815390	0.8934	0.3717
## i_catConstruction:y_cat2013 569	-1.3884211	2.3539559	-0.5898	0.5553
## i_catfinance:y_cat2013 797 .	-3.3101166	1.8016589	-1.8373	0.0662
## i_catmanufacture:y_cat2013 344 .	-2.4863397	1.4761711	-1.6843	0.0922
## i_catmining:y_cat2013 177	-3.5817390	3.1953399	-1.1209	0.2624
## i_catretail:y_cat2013 344	-1.3357554	1.8093885	-0.7382	0.4604
## i_catservices:y_cat2013 995 *	-3.9360275	1.7799859	-2.2113	0.0270
## i_cattransportation:y_cat2013 810 **	-6.5354000	2.3088963	-2.8305	0.0046
## i_catConstruction:y_cat2014 232 .	2.7542193	1.5659657	1.7588	0.0787
## i_catfinance:y_cat2014 731	-2.2479182	2.1954481	-1.0239	0.3059
## i_catmanufacture:y_cat2014 028	0.7722380	1.2376312	0.6240	0.5327
## i_catmining:y_cat2014 184	3.1194149	2.2642726	1.3777	0.1684
## i_catservices:y_cat2014 887 *	-3.3124624	1.5685040	-2.1119	0.0347
## i_cattransportation:y_cat2014 241	2.2197121	4.5059767	0.4926	0.6223
## i_catConstruction:y_cat2015 013	-0.2530359	2.2815952	-0.1109	0.9117

## i_catfinance:y_cat2015 887	2.2687697	3.4035340	0.6666	0.5050
## i_catmanufacture:y_cat2015 677	0.9554485	2.1803379	0.4382	0.6612
## i_catmining:y_cat2015 629 .	-6.7517363	3.4487553	-1.9577	0.0503
## i_catretail:y_cat2015 397 *	6.6145917	2.6940408	2.4553	0.0141
## i_catservices:y_cat2015 684	0.3242965	2.2472636	0.1443	0.8852
## i_catConstruction:y_cat2016 619 .	3.9535561	2.0168119	1.9603	0.0500
## i_catfinance:y_cat2016 579	1.6994128	1.2592036	1.3496	0.1772
## i_catmanufacture:y_cat2016 706 *	1.9115161	0.8030858	2.3802	0.0173
## i_catmining:y_cat2016 035	2.1322937	1.7974199	1.1863	0.2356
## i_catretail:y_cat2016 325 *	6.8779470	3.2100825	2.1426	0.0322
## i_catservices:y_cat2016 017	1.7271340	1.5179536	1.1378	0.2553
## i_cattransportation:y_cat2016 640	-0.1832001	1.6437181	-0.1115	0.9112
## i_catwholesale:y_cat2016 195 *	5.9014447	2.3313873	2.5313	0.0114
## i_catConstruction:y_cat2017 374 .	7.5408252	3.9736144	1.8977	0.0578
## i_catfinance:y_cat2017 038	3.2682833	3.6474267	0.8961	0.3703
## i_catmanufacture:y_cat2017 640	3.3262792	3.5163844	0.9459	0.3442
## i_catmining:y_cat2017 073	1.8105189	4.0031443	0.4523	0.6511
## i_catretail:y_cat2017 348	2.5938778	3.9819274	0.6514	0.5148
## i_catservices:y_cat2017 593	4.7752107	3.6439951	1.3104	0.1901
## i_cattransportation:y_cat2017 294	1.5702439	3.8284812	0.4101	0.6817
## i_catConstruction:y_cat2018 822	1.6202273	2.1818045	0.7426	0.4577
## i_catfinance:y_cat2018 047	0.4960858	1.2521797	0.3962	0.6920
## i_catmanufacture:y_cat2018 088	-0.4716211	0.9418869	-0.5007	0.6166
## i_catmining:y_cat2018 772 .	-3.4823463	2.0267675	-1.7182	0.0858
## i_catretail:y_cat2018 458	-0.2108239	2.5473125	-0.0828	0.9340

```

## i_catservices:y_cat2018      0.0086469    1.2526447    0.0069 0.9944
928
## i_cattransportation:y_cat2018 1.1900383    1.6442300    0.7238 0.4692
710
## i_catwholesale:y_cat2018      6.0286825    5.0258386    1.1995 0.2304
227
## i_catfinance:y_cat2019       1.4463122    1.9917137    0.7262 0.4677
998
## i_catmanufacture:y_cat2019    0.8403923    2.1168140    0.3970 0.6913
924
## i_catmining:y_cat2019        1.6082081    8.6693509    0.1855 0.8528
467
## i_catretail:y_cat2019        2.5481382    3.1683647    0.8042 0.4213
259
## i_catservices:y_cat2019      0.4614814    2.2967370    0.2009 0.8407
689
## i_cattransportation:y_cat2019 -1.9101506    2.1565998   -0.8857 0.3758
444
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values2D <- vif(lm(CAR22~`Prev ESG Score.x`+I(target_ESG*target_dum
my) + target_dummy+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + dive
rsifying + public_target + private_target + all_cash_deal + stock_deal+
cross_border,data=data1))
print(vif_values2D)

```

```

##          `Prev ESG Score.x`  I(target_ESG * target_dummy)
##          1.488024              5.226083
##          target_dummy          `firm size`
##          5.289897              1.737876
##          leverage              `free cash flow`
##          1.569563              1.230388
##          `Tobin's q`          preMTR
##          1.433071              1.065627
##          deal_size            hostile
##          1.272514              1.009384
##          high_tech            diversifying
##          1.190477              1.091625
##          public_target        private_target
##          1.412516              1.283821
##          all_cash_deal        stock_deal
##          1.898920              2.047151
##          cross_border
##          1.043852

```

##CAR22---without acquiror ESG

```

reg2D.1<-lm(CAR22~I(target_ESG*target_dummy)+ target_dummy+`firm size`+

```

```
leverage+`free cash flow`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+i_cat*y_cat , data=data1)
```

```
summary(reg2D.1)
```

```
##
## Call:
## lm(formula = CAR22 ~ I(target_ESG * target_dummy) + target_dummy +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat * y_cat, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -42.473  -2.217   0.046   2.374  81.863
##
## Coefficients: (23 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)          2.31606     5.53842   0.418  0.67585
## I(target_ESG * target_dummy) -0.06022     0.06242  -0.965  0.33473
## target_dummy          1.18532     1.93121   0.614  0.53942
## `firm size`         -0.21922     0.08321  -2.634  0.00848
## **
## leverage            1.37143     1.00157   1.369  0.17102
##
## `free cash flow`    2.15173     1.23176   1.747  0.08077
## .
## `Tobin's q`        -0.18228     0.10247  -1.779  0.07538
## .
## preMTR             -2.05102     0.45337  -4.524 6.33e-06
## ***
## deal_size           1.44623     0.33382   4.332 1.53e-05
## ***
## hostile            -1.23409     3.96467  -0.311  0.75562
##
## high_tech           0.24192     0.29604   0.817  0.41388
##
## diversifying       -0.27793     0.23492  -1.183  0.23687
##
## public_target      -1.89856     0.33682  -5.637 1.91e-08
## ***
## private_target     -0.29878     0.24097  -1.240  0.21512
```

## all_cash_deal	-0.29436	0.33396	-0.881	0.37816
## stock_deal	-0.52965	0.44684	-1.185	0.23599
## cross_border	0.55621	0.25691	2.165	0.03048
* ## i_catConstruction	-3.43578	6.69979	-0.513	0.60812
## i_catfinance	-0.68950	5.84921	-0.118	0.90617
## i_catmanufacture	0.55145	5.51200	0.100	0.92032
## i_catmining	0.82064	5.73834	0.143	0.88629
## i_catretail	-0.88109	5.99213	-0.147	0.88311
## i_catservices	0.99096	5.57153	0.178	0.85884
## i_cattransportation	0.47937	5.84636	0.082	0.93466
## i_catwholesale	-0.68160	7.74873	-0.088	0.92991
## y_cat2004	-1.12470	6.12418	-0.184	0.85430
## y_cat2005	-0.09342	6.69819	-0.014	0.98887
## y_cat2006	-0.72905	6.00219	-0.121	0.90333
## y_cat2007	1.15852	6.12547	0.189	0.85000
## y_cat2008	-2.06100	6.70601	-0.307	0.75861
## y_cat2009	-2.23174	7.74522	-0.288	0.77326
## y_cat2010	1.74215	7.74107	0.225	0.82196
## y_cat2011	0.97821	6.32488	0.155	0.87710
## y_cat2012	-5.46374	5.85900	-0.933	0.35114
## y_cat2013	3.13225	5.86039	0.534	0.59305
## y_cat2014	0.35897	7.73657	0.046	0.96300
## y_cat2015	-1.17463	6.32869	-0.186	0.85277
## y_cat2016	-2.02489	7.73634	-0.262	0.79354

## y_cat2017	-3.51104	5.77487	-0.608	0.54325
## y_cat2018	-0.62621	7.74335	-0.081	0.93555
## y_cat2019	-1.87084	6.12674	-0.305	0.76012
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	1.61596	6.75001	0.239	0.81081
## i_catmanufacture:y_cat2004	2.07127	6.18749	0.335	0.73784
## i_catmining:y_cat2004	-1.99111	6.52203	-0.305	0.76017
## i_catretail:y_cat2004	2.65845	7.31198	0.364	0.71620
## i_catservices:y_cat2004	-0.17477	6.30376	-0.028	0.97788
## i_cattransportation:y_cat2004	-1.09602	6.83993	-0.160	0.87270
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	0.78739	7.10328	0.111	0.91174
## i_catmanufacture:y_cat2005	0.14990	6.75043	0.022	0.98229
## i_catmining:y_cat2005	-0.25502	7.07326	-0.036	0.97124
## i_catretail:y_cat2005	5.96426	7.53875	0.791	0.42893
## i_catservices:y_cat2005	-0.16324	6.84972	-0.024	0.98099
## i_cattransportation:y_cat2005	-1.15274	7.35647	-0.157	0.87549
## i_catwholesale:y_cat2005	0.59706	10.24939	0.058	0.95355
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.57444	7.43320	0.077	0.93841
## i_catmanufacture:y_cat2006	1.45917	6.14428	0.237	0.81230
## i_catmining:y_cat2006	-1.85381	7.35657	-0.252	0.80107
## i_catretail:y_cat2006	NA	NA	NA	NA

## i_catservices:y_cat2006	1.09107	6.26624	0.174	0.86179
## i_cattransportation:y_cat2006	-3.39209	7.43739	-0.456	0.64836
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-1.28588	6.59691	-0.195	0.84547
## i_catmanufacture:y_cat2007	-0.34220	6.18712	-0.055	0.95590
## i_catmining:y_cat2007	-0.36651	6.53392	-0.056	0.95527
## i_catretail:y_cat2007	4.84976	7.65315	0.634	0.52633
## i_catservices:y_cat2007	-2.49927	6.30027	-0.397	0.69162
## i_cattransportation:y_cat2007	-0.70121	6.91870	-0.101	0.91928
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	23.74621	8.65997	2.742	0.00615
**				
## i_catfinance:y_cat2008	5.67658	7.53251	0.754	0.45115
## i_catmanufacture:y_cat2008	1.44256	6.77334	0.213	0.83136
## i_catmining:y_cat2008	0.38211	7.07254	0.054	0.95692
## i_catretail:y_cat2008	4.66889	7.54639	0.619	0.53617
## i_catservices:y_cat2008	1.36319	6.86219	0.199	0.84255
## i_cattransportation:y_cat2008	2.36029	7.19463	0.328	0.74289
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.94275	7.88050	0.373	0.70886
## i_catmining:y_cat2009	4.97159	9.64218	0.516	0.60617
## i_catretail:y_cat2009	6.44832	9.89430	0.652	0.51464

## i_catservices:y_cat2009	1.57844	7.95156	0.199	0.84266
## i_cattransportation:y_cat2009	0.69904	8.62020	0.081	0.93537
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	-0.31397	9.22128	-0.034	0.97284
## i_catfinance:y_cat2010	-1.95343	8.08571	-0.242	0.80912
## i_catmanufacture:y_cat2010	-1.69132	7.78604	-0.217	0.82805
## i_catmining:y_cat2010	-3.12950	8.09095	-0.387	0.69894
## i_catretail:y_cat2010	0.75595	8.70673	0.087	0.93082
## i_catservices:y_cat2010	-1.36374	7.87630	-0.173	0.86255
## i_cattransportation:y_cat2010	-2.36107	8.13524	-0.290	0.77166
## i_catwholesale:y_cat2010	-0.47104	9.79926	-0.048	0.96166
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-10.51995	7.09086	-1.484	0.13803
## i_catmanufacture:y_cat2011	-0.38355	6.42855	-0.060	0.95243
## i_catmining:y_cat2011	0.52465	7.63620	0.069	0.94523
## i_catretail:y_cat2011	0.05660	8.71184	0.006	0.99482
## i_catservices:y_cat2011	-2.55096	6.69693	-0.381	0.70330
## i_cattransportation:y_cat2011	-4.80099	7.36860	-0.652	0.51475
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-3.71759	8.96063	-0.415	0.67826
## i_catfinance:y_cat2012	6.16492	6.27496	0.982	0.32596
## i_catmanufacture:y_cat2012	6.04728	5.91471	1.022	0.30668
## i_catmining:y_cat2012	-1.62625	6.34330	-0.256	0.79768
## i_catretail:y_cat2012	6.46698	6.63942	0.974	0.33013

## i_catservices:y_cat2012	4.85028	6.03536	0.804	0.42167
## i_cattransportation:y_cat2012	5.91142	6.36905	0.928	0.35341
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	-1.19131	8.02929	-0.148	0.88206
## i_catfinance:y_cat2013	-3.36172	6.30415	-0.533	0.59390
## i_catmanufacture:y_cat2013	-2.41148	5.93018	-0.407	0.68430
## i_catmining:y_cat2013	-3.39446	6.51690	-0.521	0.60250
## i_catretail:y_cat2013	-1.33471	6.91669	-0.193	0.84700
## i_catservices:y_cat2013	-3.78982	6.03139	-0.628	0.52983
## i_cattransportation:y_cat2013	-6.54228	6.43331	-1.017	0.30927
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	3.26585	10.23247	0.319	0.74963
## i_catfinance:y_cat2014	-1.68152	8.89450	-0.189	0.85007
## i_catmanufacture:y_cat2014	1.35089	7.86410	0.172	0.86362
## i_catmining:y_cat2014	3.47675	8.83871	0.393	0.69409
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-2.74983	7.99977	-0.344	0.73107
## i_cattransportation:y_cat2014	2.53707	8.89871	0.285	0.77559
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-0.08603	9.21338	-0.009	0.99255
## i_catfinance:y_cat2015	2.38604	7.70943	0.309	0.75697
## i_catmanufacture:y_cat2015	1.22910	6.45411	0.190	0.84898
## i_catmining:y_cat2015	-7.18954	7.62734	-0.943	0.34597
## i_catretail:y_cat2015	6.68130	7.21714	0.926	0.35466

## i_catservices:y_cat2015	0.43254	6.67233	0.065	0.94832
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	4.05537	8.89442	0.456	0.64847
## i_catfinance:y_cat2016	2.07379	8.04550	0.258	0.79661
## i_catmanufacture:y_cat2016	2.32312	7.77707	0.299	0.76518
## i_catmining:y_cat2016	2.51938	8.01324	0.314	0.75324
## i_catretail:y_cat2016	7.30679	8.37397	0.873	0.38298
## i_catservices:y_cat2016	2.17202	7.84772	0.277	0.78198
## i_cattransportation:y_cat2016	0.23515	8.10030	0.029	0.97684
## i_catwholesale:y_cat2016	6.05392	9.61337	0.630	0.52892
## i_catConstruction:y_cat2017	7.57553	7.26080	1.043	0.29688
## i_catfinance:y_cat2017	3.33090	6.15755	0.541	0.58859
## i_catmanufacture:y_cat2017	3.40161	5.82657	0.584	0.55940
## i_catmining:y_cat2017	1.86101	6.25672	0.297	0.76615
## i_catretail:y_cat2017	2.69466	6.41170	0.420	0.67432
## i_catservices:y_cat2017	4.83544	5.90602	0.819	0.41301
## i_cattransportation:y_cat2017	1.66812	6.22925	0.268	0.78888
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.64554	8.90398	0.185	0.85339
## i_catfinance:y_cat2018	0.41319	8.03186	0.051	0.95898
## i_catmanufacture:y_cat2018	-0.50993	7.78128	-0.066	0.94775
## i_catmining:y_cat2018	-3.56937	8.03838	-0.444	0.65705
## i_catretail:y_cat2018	-0.32745	8.48707	-0.039	0.96923

```

## i_catservices:y_cat2018      -0.02583    7.83278  -0.003  0.99737
## i_cattransportation:y_cat2018  1.05847    8.06824  0.131  0.89563
## i_catwholesale:y_cat2018      5.89142    9.58296  0.615  0.53875
## i_catConstruction:y_cat2019      NA          NA          NA          NA
## i_catfinance:y_cat2019        1.62334    6.60152  0.246  0.80578
## i_catmanufacture:y_cat2019     1.03625    6.24910  0.166  0.86831
## i_catmining:y_cat2019         1.74419    7.13801  0.244  0.80698
## i_catretail:y_cat2019         2.69466    7.31519  0.368  0.71263
## i_catservices:y_cat2019        0.64884    6.26802  0.104  0.91756
## i_cattransportation:y_cat2019  -1.81332    6.78930  -0.267  0.78942
## i_catwholesale:y_cat2019      NA          NA          NA          NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.467 on 2741 degrees of freedom
## Multiple R-squared:  0.1018, Adjusted R-squared:  0.05428
## F-statistic: 2.142 on 145 and 2741 DF,  p-value: 4.489e-13

###test heteroskedasticity problem
hetero_test <- bptest(reg2D.1)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg2D.1
## BP = 593.98, df = 145, p-value < 2.2e-16

###solve heteroskedasticity problem
coeftest(reg2D.1, vcov = vcovHC(reg2D.1, type='HC0', cluster='a_industry
'))

##
## t test of coefficients:
##
##
## Estimate Std. Error t value Pr(>|t|
## )
## (Intercept) 2.316057 0.887993 2.6082 0.009151

```

```

6 **
## I(target_ESG * target_dummy) -0.060220 0.049019 -1.2285 0.219360
4
## target_dummy 1.185321 1.870411 0.6337 0.526315
1
## `firm size` -0.219218 0.081921 -2.6760 0.007495
5 **
## leverage 1.371432 1.045417 1.3119 0.189679
9
## `free cash flow` 2.151730 1.820825 1.1817 0.237413
9
## `Tobin's q` -0.182279 0.111047 -1.6415 0.100817
8
## preMTR -2.051023 0.659122 -3.1118 0.001879
0 **
## deal_size 1.446228 1.537209 0.9408 0.346882
8
## hostile -1.234087 0.858434 -1.4376 0.150660
7
## high_tech 0.241923 0.313816 0.7709 0.440829
8
## diversifying -0.277931 0.227284 -1.2228 0.221497
8
## public_target -1.898560 0.400027 -4.7461 2.180e-0
6 ***
## private_target -0.298783 0.247943 -1.2050 0.228289
1
## all_cash_deal -0.294361 0.348454 -0.8448 0.398318
1
## stock_deal -0.529651 0.702744 -0.7537 0.451100
6
## cross_border 0.556209 0.251667 2.2101 0.027180
5 *
## i_catConstruction -3.435780 1.545201 -2.2235 0.026262
3 *
## i_catfinance -0.689500 1.128987 -0.6107 0.541432
8
## i_catmanufacture 0.551450 0.688824 0.8006 0.423451
4
## i_catmining 0.820635 1.249453 0.6568 0.511367
6
## i_catretail -0.881088 1.088794 -0.8092 0.418451
3
## i_catservices 0.990962 1.033125 0.9592 0.337548
4
## i_cattransportation 0.479366 1.372475 0.3493 0.726912
4
## i_catwholesale -0.681600 0.634813 -1.0737 0.283050
2
## y_cat2004 -1.124705 1.877103 -0.5992 0.549108

```

7					
## y_cat2005	-0.093425	0.663265	-0.1409	0.887994	
4					
## y_cat2006	-0.729051	1.040456	-0.7007	0.483547	
7					
## y_cat2007	1.158518	0.894964	1.2945	0.195606	
5					
## y_cat2008	-2.061002	2.276283	-0.9054	0.365320	
2					
## y_cat2009	-2.231737	0.638866	-3.4933	0.000484	
7 ***					
## y_cat2010	1.742147	0.451092	3.8621	0.000115	
0 ***					
## y_cat2011	0.978209	1.506781	0.6492	0.516260	
7					
## y_cat2012	-5.463736	6.282234	-0.8697	0.384533	
9					
## y_cat2013	3.132252	1.323045	2.3675	0.017979	
9 *					
## y_cat2014	0.358972	0.273258	1.3137	0.189065	
3					
## y_cat2015	-1.174631	1.673198	-0.7020	0.482721	
7					
## y_cat2016	-2.024886	0.257188	-7.8732	4.938e-1	
5 ***					
## y_cat2017	-3.511042	3.461406	-1.0143	0.310510	
2					
## y_cat2018	-0.626211	0.405008	-1.5462	0.122178	
9					
## y_cat2019	-1.870843	1.634528	-1.1446	0.252484	
5					
## i_catfinance:y_cat2004	1.615958	3.384563	0.4774	0.633080	
2					
## i_catmanufacture:y_cat2004	2.071267	2.032239	1.0192	0.308196	
1					
## i_catmining:y_cat2004	-1.991108	2.419693	-0.8229	0.410649	
9					
## i_catretail:y_cat2004	2.658453	2.440578	1.0893	0.276129	
7					
## i_catservices:y_cat2004	-0.174770	2.258135	-0.0774	0.938314	
6					
## i_cattransportation:y_cat2004	-1.096020	2.415900	-0.4537	0.650102	
8					
## i_catfinance:y_cat2005	0.787394	1.526915	0.5157	0.606122	
2					
## i_catmanufacture:y_cat2005	0.149897	0.966797	0.1550	0.876797	
1					
## i_catmining:y_cat2005	-0.255018	2.132869	-0.1196	0.904836	
0					
## i_catretail:y_cat2005	5.964258	1.660195	3.5925	0.000333	


```

3 ***
## i_catservices:y_cat2005      -0.163239    1.459433  -0.1119  0.910949
6
## i_cattransportation:y_cat2005 -1.152743    1.879678  -0.6133  0.539751
1
## i_catwholesale:y_cat2005      0.597058    1.125793   0.5303  0.595916
2
## i_catfinance:y_cat2006       0.574443    1.559418   0.3684  0.712625
9
## i_catmanufacture:y_cat2006   1.459169    1.461822   0.9982  0.318277
8
## i_catmining:y_cat2006       -1.853807    3.445442  -0.5380  0.590588
8
## i_catservices:y_cat2006      1.091066    1.617838   0.6744  0.500115
3
## i_cattransportation:y_cat2006 -3.392087    1.988874  -1.7055  0.088208
7 .
## i_catfinance:y_cat2007      -1.285882    1.701455  -0.7558  0.449861
4
## i_catmanufacture:y_cat2007   -0.342202    1.133253  -0.3020  0.762702
0
## i_catmining:y_cat2007       -0.366513    1.978062  -0.1853  0.853016
1
## i_catretail:y_cat2007        4.849759    5.140679   0.9434  0.345555
2
## i_catservices:y_cat2007     -2.499272    1.620827  -1.5420  0.123195
5
## i_cattransportation:y_cat2007 -0.701213    2.022345  -0.3467  0.728818
9
## i_catConstruction:y_cat2008  23.746209    7.985327   2.9737  0.002967
7 **
## i_catfinance:y_cat2008       5.676578    3.786405   1.4992  0.133937
0
## i_catmanufacture:y_cat2008   1.442560    2.476213   0.5826  0.560232
7
## i_catmining:y_cat2008       0.382105    3.489867   0.1095  0.912822
0
## i_catretail:y_cat2008       4.668889    3.735222   1.2500  0.211419
8
## i_catservices:y_cat2008     1.363189    2.620940   0.5201  0.603025
8
## i_cattransportation:y_cat2008  2.360285    2.935017   0.8042  0.421362
2
## i_catmanufacture:y_cat2009   2.942753    1.624168   1.8119  0.070118
3 .
## i_catmining:y_cat2009       4.971589    1.508420   3.2959  0.000993
6 ***
## i_catretail:y_cat2009       6.448324    5.137661   1.2551  0.209546
3
## i_catservices:y_cat2009     1.578436    1.327726   1.1888  0.234610

```

9					
##	i_cattransportation:y_cat2009	0.699036	1.782090	0.3923	0.694899
2					
##	i_catConstruction:y_cat2010	-0.313970	1.768243	-0.1776	0.859081
2					
##	i_catfinance:y_cat2010	-1.953429	1.659404	-1.1772	0.239223
0					
##	i_catmanufacture:y_cat2010	-1.691318	0.834151	-2.0276	0.042698
4 *					
##	i_catmining:y_cat2010	-3.129500	2.171062	-1.4415	0.149568
9					
##	i_catretail:y_cat2010	0.755949	1.113120	0.6791	0.497115
5					
##	i_catservices:y_cat2010	-1.363740	1.414426	-0.9642	0.335048
1					
##	i_cattransportation:y_cat2010	-2.361069	1.776686	-1.3289	0.183985
9					
##	i_catwholesale:y_cat2010	-0.471045	1.016736	-0.4633	0.643192
6					
##	i_catfinance:y_cat2011	-10.519955	2.632554	-3.9961	6.609e-0
5 ***					
##	i_catmanufacture:y_cat2011	-0.383547	1.778549	-0.2157	0.829275
4					
##	i_catmining:y_cat2011	0.524651	2.542933	0.2063	0.836558
4					
##	i_catretail:y_cat2011	0.056600	1.861945	0.0304	0.975751
4					
##	i_catservices:y_cat2011	-2.550958	1.882405	-1.3552	0.175478
5					
##	i_cattransportation:y_cat2011	-4.800994	2.755405	-1.7424	0.081552
1 .					
##	i_catConstruction:y_cat2012	-3.717594	6.583792	-0.5647	0.572352
3					
##	i_catfinance:y_cat2012	6.164916	6.375057	0.9670	0.333610
8					
##	i_catmanufacture:y_cat2012	6.047278	6.307321	0.9588	0.337758
6					
##	i_catmining:y_cat2012	-1.626251	7.361793	-0.2209	0.825183
5					
##	i_catretail:y_cat2012	6.466978	6.507152	0.9938	0.320395
2					
##	i_catservices:y_cat2012	4.850275	6.427820	0.7546	0.450568
5					
##	i_cattransportation:y_cat2012	5.911423	6.484067	0.9117	0.362015
0					
##	i_catConstruction:y_cat2013	-1.191307	2.374388	-0.5017	0.615896
1					
##	i_catfinance:y_cat2013	-3.361721	1.788449	-1.8797	0.060257
0 .					
##	i_catmanufacture:y_cat2013	-2.411478	1.487137	-1.6216	0.105013

1					
## i_catmining:y_cat2013	-3.394461	3.240236	-1.0476	0.294916	
8					
## i_catretail:y_cat2013	-1.334712	1.843669	-0.7239	0.469162	
1					
## i_catservices:y_cat2013	-3.789816	1.790343	-2.1168	0.034365	
9 *					
## i_cattransportation:y_cat2013	-6.542285	2.285546	-2.8625	0.004235	
6 **					
## i_catConstruction:y_cat2014	3.265845	1.566020	2.0854	0.037121	
5 *					
## i_catfinance:y_cat2014	-1.681519	2.170904	-0.7746	0.438660	
1					
## i_catmanufacture:y_cat2014	1.350893	1.214440	1.1124	0.266081	
6					
## i_catmining:y_cat2014	3.476746	2.146712	1.6196	0.105440	
1					
## i_catservices:y_cat2014	-2.749829	1.524297	-1.8040	0.071341	
3 .					
## i_cattransportation:y_cat2014	2.537065	4.501901	0.5636	0.573103	
6					
## i_catConstruction:y_cat2015	-0.086034	2.294095	-0.0375	0.970087	
1					
## i_catfinance:y_cat2015	2.386041	3.357826	0.7106	0.477398	
2					
## i_catmanufacture:y_cat2015	1.229099	2.168218	0.5669	0.570848	
5					
## i_catmining:y_cat2015	-7.189543	3.442151	-2.0887	0.036828	
8 *					
## i_catretail:y_cat2015	6.681295	2.722561	2.4540	0.014187	
6 *					
## i_catservices:y_cat2015	0.432540	2.249628	0.1923	0.847543	
5					
## i_catConstruction:y_cat2016	4.055368	2.018678	2.0089	0.044643	
2 *					
## i_catfinance:y_cat2016	2.073790	1.212327	1.7106	0.087270	
7 .					
## i_catmanufacture:y_cat2016	2.323123	0.785220	2.9586	0.003117	
2 **					
## i_catmining:y_cat2016	2.519384	1.799322	1.4002	0.161571	
1					
## i_catretail:y_cat2016	7.306789	3.236774	2.2574	0.024059	
6 *					
## i_catservices:y_cat2016	2.172019	1.510473	1.4380	0.150556	
1					
## i_cattransportation:y_cat2016	0.235145	1.624939	0.1447	0.884950	
2					
## i_catwholesale:y_cat2016	6.053918	2.356895	2.5686	0.010263	
6 *					
## i_catConstruction:y_cat2017	7.575531	3.999002	1.8944	0.058283	

```

0 .
## i_catfinance:y_cat2017      3.330898    3.650296    0.9125    0.361585
4
## i_catmanufacture:y_cat2017  3.401610    3.532458    0.9630    0.335653
3
## i_catmining:y_cat2017      1.861011    4.024428    0.4624    0.643810
6
## i_catretail:y_cat2017      2.694657    4.004882    0.6728    0.501103
8
## i_catservices:y_cat2017    4.835445    3.659800    1.3212    0.186534
3
## i_cattransportation:y_cat2017 1.668124    3.841466    0.4342    0.664147
2
## i_catConstruction:y_cat2018 1.645543    2.196568    0.7491    0.453835
3
## i_catfinance:y_cat2018      0.413189    1.213612    0.3405    0.733534
6
## i_catmanufacture:y_cat2018 -0.509934    0.940515   -0.5422    0.587734
6
## i_catmining:y_cat2018     -3.569374    2.035473   -1.7536    0.079613
4 .
## i_catretail:y_cat2018     -0.327454    2.556774   -0.1281    0.898100
6
## i_catservices:y_cat2018    -0.025835    1.253823   -0.0206    0.983562
3
## i_cattransportation:y_cat2018 1.058470    1.631362    0.6488    0.516505
2
## i_catwholesale:y_cat2018    5.891418    5.039754    1.1690    0.242509
6
## i_catfinance:y_cat2019      1.623339    1.997685    0.8126    0.416512
3
## i_catmanufacture:y_cat2019  1.036251    2.142343    0.4837    0.628637
7
## i_catmining:y_cat2019      1.744190    8.677565    0.2010    0.840713
6
## i_catretail:y_cat2019      2.694661    3.128340    0.8614    0.389109
2
## i_catservices:y_cat2019     0.648836    2.320597    0.2796    0.779806
6
## i_cattransportation:y_cat2019 -1.813324    2.190168   -0.8279    0.407777
4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values2D.1 <- vif(lm(CAR22~I(target_ESG*target_dummy)+ target_dummy
+ `firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea

```

```

l+cross_border,data=data1))
print(vif_values2D.1)

## I(target_ESG * target_dummy)          target_dummy
##           5.222626                    5.283432
##           `firm size`                 leverage
##           1.293011                    1.569481
##           `free cash flow`            `Tobin's q`
##           1.225310                    1.422219
##           preMTR                       deal_size
##           1.064501                    1.269053
##           hostile                       high_tech
##           1.007455                    1.187563
##           diversifying                  public_target
##           1.089691                    1.412402
##           private_target               all_cash_deal
##           1.283652                    1.897877
##           stock_deal                   cross_border
##           2.044621                    1.043388

##CAR55
reg3D<-lm(CAR55~`Prev ESG Score.x`+ I(target_ESG*target_dummy)+ target_
dummy+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + diversifying + pu
blic_target + private_target + all_cash_deal + stock_deal+cross_border+
i_cat*y_cat , data=data1)

summary(reg3D)

##
## Call:
## lm(formula = CAR55 ~ `Prev ESG Score.x` + I(target_ESG * target_dumm
y) +
##   target_dummy + `firm size` + leverage + `free cash flow` +
##   `Tobin's q` + preMTR + deal_size + hostile + high_tech +
##   diversifying + public_target + private_target + all_cash_deal +
##   stock_deal + cross_border + i_cat * y_cat, data = data1)
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -56.370  -3.093  -0.086   3.265  89.903
##
## Coefficients: (23 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)          -1.411065    6.877812  -0.205  0.837461
## `Prev ESG Score.x`    -0.029677    0.008895  -3.336  0.000860
## ***
## I(target_ESG * target_dummy) -0.104361    0.077448  -1.348  0.177928

```

## target_dummy	3.617554	2.396255	1.510	0.131243
## `firm size`	-0.048401	0.128511	-0.377	0.706480
## leverage	2.351500	1.244696	1.889	0.058968
•				
## `free cash flow`	3.805667	1.529473	2.488	0.012897
*				
## `Tobin's q`	-0.197891	0.128057	-1.545	0.122382
## preMTR	-5.332372	0.562441	-9.481	< 2e-16

## deal_size	1.096017	0.414772	2.642	0.008278
**				
## hostile	-3.342431	4.921305	-0.679	0.497084
## high_tech	0.309630	0.368111	0.841	0.400346
## diversifying	-0.183207	0.291531	-0.628	0.529774
## public_target	-1.863597	0.417862	-4.460	8.53e-06

## private_target	-0.238351	0.298947	-0.797	0.425345
## all_cash_deal	-0.393521	0.414589	-0.949	0.342611
## stock_deal	-0.473196	0.554845	-0.853	0.393820
## cross_border	0.494877	0.318873	1.552	0.120788
## i_catConstruction	-4.630886	8.312744	-0.557	0.577516
## i_catfinance	1.067750	7.257204	0.147	0.883040
## i_catmanufacture	4.208762	6.838256	0.615	0.538294
## i_catmining	4.130455	7.119353	0.580	0.561846
## i_catretail	1.764330	7.433851	0.237	0.812413
## i_catservices	4.351714	6.912351	0.630	0.529037
## i_cattransportation	3.648603	7.253831	0.503	0.615012
## i_catwholesale	3.603559	9.615050	0.375	0.707851
## y_cat2004	-2.406081	7.597536	-0.317	0.751501

## y_cat2005	1.316495	8.310112	0.158	0.874137
## y_cat2006	-2.272636	7.446243	-0.305	0.760233
## y_cat2007	-0.369697	7.599361	-0.049	0.961203
## y_cat2008	-3.989661	8.319824	-0.480	0.631595
## y_cat2009	-5.682883	9.608854	-0.591	0.554287
## y_cat2010	5.842066	9.603798	0.608	0.543034
## y_cat2011	-0.462472	7.849040	-0.059	0.953019
## y_cat2012	-5.561133	7.272092	-0.765	0.444503
## y_cat2013	2.677230	7.272298	0.368	0.712797
## y_cat2014	0.786774	9.607724	0.082	0.934740
## y_cat2015	-2.292362	7.853397	-0.292	0.770390
## y_cat2016	4.370078	9.605073	0.455	0.649163
## y_cat2017	-5.096790	7.166657	-0.711	0.477033
## y_cat2018	1.871076	9.607071	0.195	0.845595
## y_cat2019	1.272834	7.606060	0.167	0.867111
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.795720	8.373896	0.334	0.738510
## i_catmanufacture:y_cat2004	2.557802	7.676360	0.333	0.739005
## i_catmining:y_cat2004	-4.161313	8.091082	-0.514	0.607078
## i_catretail:y_cat2004	6.710144	9.072940	0.740	0.459620
## i_catservices:y_cat2004	0.362010	7.820385	0.046	0.963082
## i_cattransportation:y_cat2004	0.140480	8.485652	0.017	0.986793
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA

## i_catfinance:y_cat2005	0.009609	8.812319	0.001	0.999130
## i_catmanufacture:y_cat2005	-1.357779	8.375400	-0.162	0.871227
## i_catmining:y_cat2005	-0.934481	8.776004	-0.106	0.915208
## i_catretail:y_cat2005	6.973844	9.355098	0.745	0.456058
## i_catservices:y_cat2005	-1.834768	8.497878	-0.216	0.829075
## i_cattransportation:y_cat2005	-3.740355	9.126582	-0.410	0.681962
## i_catwholesale:y_cat2005	-3.194790	12.715142	-0.251	0.801633
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	6.124322	9.221499	0.664	0.506660
## i_catmanufacture:y_cat2006	2.914148	7.622438	0.382	0.702260
## i_catmining:y_cat2006	-7.130183	9.128752	-0.781	0.434830
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	3.095661	7.773806	0.398	0.690501
## i_cattransportation:y_cat2006	-2.463617	9.227288	-0.267	0.789495
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.145990	8.183980	0.018	0.985769
## i_catmanufacture:y_cat2007	0.397616	7.676028	0.052	0.958692
## i_catmining:y_cat2007	1.664102	8.105955	0.205	0.837358
## i_catretail:y_cat2007	7.147521	9.494832	0.753	0.451647
## i_catservices:y_cat2007	-0.349686	7.816139	-0.045	0.964319
## i_cattransportation:y_cat2007	-0.052934	8.584408	-0.006	0.995081
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	35.501562	10.743926	3.304	0.000964

## i_catfinance:y_cat2008	11.397156	9.345240	1.220	0.222734
## i_catmanufacture:y_cat2008	2.421731	8.403355	0.288	0.773226
## i_catmining:y_cat2008	3.146930	8.775232	0.359	0.719911
## i_catretail:y_cat2008	12.262287	9.361889	1.310	0.190370
## i_catservices:y_cat2008	4.101847	8.513124	0.482	0.629968
## i_cattransportation:y_cat2008	3.213202	8.925569	0.360	0.718875
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	4.776336	9.776377	0.489	0.625193
## i_catmining:y_cat2009	7.669184	11.961957	0.641	0.521491
## i_catretail:y_cat2009	26.163897	12.275305	2.131	0.033143
*				
## i_catservices:y_cat2009	6.182789	9.864492	0.627	0.530861
## i_cattransportation:y_cat2009	4.727594	10.696645	0.442	0.658546
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	2.551633	11.440776	0.223	0.823529
## i_catfinance:y_cat2010	-3.639259	10.033757	-0.363	0.716856
## i_catmanufacture:y_cat2010	-6.291888	9.661032	-0.651	0.514930
## i_catmining:y_cat2010	-5.136011	10.038303	-0.512	0.608943
## i_catretail:y_cat2010	-1.760897	10.805264	-0.163	0.870557
## i_catservices:y_cat2010	-6.415873	9.772763	-0.657	0.511554
## i_cattransportation:y_cat2010	-7.618182	10.094665	-0.755	0.450509
## i_catwholesale:y_cat2010	-4.702813	12.160420	-0.387	0.698985
## i_catConstruction:y_cat2011	NA	NA	NA	NA

## i_catfinance:y_cat2011	-7.196043	8.796777	-0.818	0.413410
## i_catmanufacture:y_cat2011	-0.485212	7.976443	-0.061	0.951498
## i_catmining:y_cat2011	-1.874154	9.473265	-0.198	0.843188
## i_catretail:y_cat2011	6.478236	10.807872	0.599	0.548956
## i_catservices:y_cat2011	0.145612	8.308304	0.018	0.986018
## i_cattransportation:y_cat2011	-7.209998	9.142686	-0.789	0.430409
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	9.912938	11.117252	0.892	0.372647
## i_catfinance:y_cat2012	7.657232	7.784847	0.984	0.325396
## i_catmanufacture:y_cat2012	5.591486	7.338172	0.762	0.446142
## i_catmining:y_cat2012	-3.207098	7.869818	-0.408	0.683659
## i_catretail:y_cat2012	7.814213	8.237036	0.949	0.342873
## i_catservices:y_cat2012	5.249993	7.488647	0.701	0.483325
## i_cattransportation:y_cat2012	6.729303	7.901686	0.852	0.394495
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	3.696404	9.961803	0.371	0.710623
## i_catfinance:y_cat2013	-1.739347	7.820843	-0.222	0.824020
## i_catmanufacture:y_cat2013	-2.384805	7.356997	-0.324	0.745846
## i_catmining:y_cat2013	-4.762936	8.085673	-0.589	0.555870
## i_catretail:y_cat2013	1.288641	8.580659	0.150	0.880634
## i_catservices:y_cat2013	-4.367730	7.483023	-0.584	0.559480
## i_cattransportation:y_cat2013	-4.810454	7.981001	-0.603	0.546733
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	4.294957	12.698782	0.338	0.735225

## i_catfinance:y_cat2014	-0.546614	11.040832	-0.050	0.960518
## i_catmanufacture:y_cat2014	-0.958716	9.763732	-0.098	0.921787
## i_catmining:y_cat2014	7.747651	10.967697	0.706	0.479996
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-1.992512	9.931486	-0.201	0.841006
## i_cattransportation:y_cat2014	2.426661	11.041565	0.220	0.826063
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-1.930721	11.430423	-0.169	0.865879
## i_catfinance:y_cat2015	5.711956	9.564441	0.597	0.550418
## i_catmanufacture:y_cat2015	1.366556	8.008907	0.171	0.864528
## i_catmining:y_cat2015	7.207896	9.466839	0.761	0.446493
## i_catretail:y_cat2015	9.181468	8.953509	1.025	0.305237
## i_catservices:y_cat2015	0.498342	8.277833	0.060	0.951999
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.737543	11.034399	0.339	0.734849
## i_catfinance:y_cat2016	-2.271176	9.984196	-0.227	0.820070
## i_catmanufacture:y_cat2016	-4.032951	9.651986	-0.418	0.676100
## i_catmining:y_cat2016	-3.628384	9.944417	-0.365	0.715239
## i_catretail:y_cat2016	0.539003	10.392517	0.052	0.958640
## i_catservices:y_cat2016	-4.293054	9.740262	-0.441	0.659426
## i_cattransportation:y_cat2016	-7.558690	10.052942	-0.752	0.452183
## i_catwholesale:y_cat2016	-0.754516	11.926529	-0.063	0.949561
## i_catConstruction:y_cat2017	15.379972	9.007589	1.707	0.087852

```

.
## i_catfinance:y_cat2017      6.220721    7.639008    0.814 0.415523
## i_catmanufacture:y_cat2017  4.764206    7.228461    0.659 0.509893
## i_catmining:y_cat2017       3.767867    7.762003    0.485 0.627414
## i_catretail:y_cat2017       6.717006    7.954470    0.844 0.398502
## i_catservices:y_cat2017     6.681439    7.326968    0.912 0.361903
## i_cattransportation:y_cat2017 3.882842    7.728119    0.502 0.615405
## i_catwholesale:y_cat2017      NA           NA           NA     NA
## i_catConstruction:y_cat2018  5.991820   11.046052    0.542 0.587560
## i_catfinance:y_cat2018     -1.469570    9.964272   -0.147 0.882761
## i_catmanufacture:y_cat2018  -3.849262    9.653282   -0.399 0.690107
## i_catmining:y_cat2018      -8.848037    9.972377   -0.887 0.375020
## i_catretail:y_cat2018       0.120487   10.529128    0.011 0.990871
## i_catservices:y_cat2018     -2.046652    9.717170   -0.211 0.833198
## i_cattransportation:y_cat2018 -1.643699   10.009634   -0.164 0.869577
## i_catwholesale:y_cat2018     4.476468   11.888724    0.377 0.706552
## i_catConstruction:y_cat2019      NA           NA           NA     NA
## i_catfinance:y_cat2019     -0.578633    8.190536   -0.071 0.943684
## i_catmanufacture:y_cat2019  -3.127338    7.753588   -0.403 0.686729
## i_catmining:y_cat2019      -5.879609    8.855704   -0.664 0.506788
## i_catretail:y_cat2019       3.020993    9.075569    0.333 0.739257
## i_catservices:y_cat2019     -1.978062    7.776962   -0.254 0.799245
## i_cattransportation:y_cat2019 -6.220788    8.422875   -0.739 0.460238
## i_catwholesale:y_cat2019      NA           NA           NA     NA
## ---

```

```

## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.783 on 2740 degrees of freedom
## Multiple R-squared:  0.1239, Adjusted R-squared:  0.0772
## F-statistic: 2.654 on 146 and 2740 DF,  p-value: < 2.2e-16

###test heteroskedasticity problem
hetero_test <- bptest(reg3D)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg3D
## BP = 587.81, df = 146, p-value < 2.2e-16

###solve heteroskedasticity problem
coeftest(reg3D, vcov = vcovHC(reg3D, type='HC0',cluster='a_industry'))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept) -1.4110654  1.2003928 -1.1755 0.239895
7
## `Prev ESG Score.x` -0.0296771  0.0085785 -3.4595 0.000549
5 ***
## I(target_ESG * target_dummy) -0.1043613  0.0484899 -2.1522 0.031466
3 *
## target_dummy 3.6175540  1.7855393  2.0260 0.042858
6 *
## `firm size` -0.0484005  0.1352573 -0.3578 0.720490
3
## leverage 2.3514996  1.3053574  1.8014 0.071746
3 .
## `free cash flow` 3.8056671  2.2763769  1.6718 0.094676
2 .
## `Tobin's q` -0.1978909  0.1398267 -1.4153 0.157106
3
## preMTR -5.3323721  0.7421603 -7.1849 8.629e-1
3 ***
## deal_size 1.0960167  1.8254196  0.6004 0.548276
7
## hostile -3.3424311  1.9026873 -1.7567 0.079082
4 .
## high_tech 0.3096303  0.3590986  0.8622 0.388629
1
## diversifying -0.1832075  0.2863972 -0.6397 0.522423
1
## public_target -1.8635975  0.4717235 -3.9506 7.992e-0

```

```

5 ***
## private_target          -0.2383509  0.3049542 -0.7816 0.434519
7
## all_cash_deal          -0.3935212  0.4377324 -0.8990 0.368732
0
## stock_deal             -0.4731963  0.7987864 -0.5924 0.553635
6
## cross_border           0.4948775  0.3139516  1.5763 0.115075
4
## i_catConstruction      -4.6308863  1.7977464 -2.5759 0.010048
7 *
## i_catfinance           1.0677501  1.5342412  0.6959 0.486521
2
## i_catmanufacture       4.2087622  0.8495283  4.9542 7.703e-0
7 ***
## i_catmining            4.1304550  1.7796879  2.3209 0.020366
0 *
## i_catretail            1.7643301  1.9160206  0.9208 0.357220
0
## i_catservices          4.3517143  1.2420925  3.5035 0.000466
5 ***
## i_cattransportation    3.6486027  2.6090200  1.3985 0.162089
0
## i_catwholesale         3.6035589  0.8048647  4.4772 7.871e-0
6 ***
## y_cat2004              -2.4060812  2.3802435 -1.0109 0.312175
1
## y_cat2005              1.3164953  0.2829473  4.6528 3.430e-0
6 ***
## y_cat2006              -2.2726360  1.4104768 -1.6113 0.107239
6
## y_cat2007              -0.3696972  0.8520684 -0.4339 0.664408
3
## y_cat2008              -3.9896612  1.9579392 -2.0377 0.041677
4 *
## y_cat2009              -5.6828830  0.7452513 -7.6255 3.331e-1
4 ***
## y_cat2010              5.8420660  0.5460282 10.6992 < 2.2e-1
6 ***
## y_cat2011              -0.4624725  1.3825968 -0.3345 0.738031
2
## y_cat2012              -5.5611330  5.3265294 -1.0440 0.296557
0
## y_cat2013              2.6772301  1.2840116  2.0851 0.037157
0 *
## y_cat2014              0.7867745  0.5550958  1.4174 0.156489
4
## y_cat2015              -2.2923620  2.9281423 -0.7829 0.433769
7
## y_cat2016              4.3700779  0.4612742  9.4739 < 2.2e-1

```

```

6 ***
## y_cat2017                -5.0967900  5.0373828 -1.0118  0.311726
2
## y_cat2018                1.8710762  0.5265157  3.5537  0.000386
3 ***
## y_cat2019                1.2728338  0.9276627  1.3721  0.170148
7
## i_catfinance:y_cat2004  2.7957195  4.2080314  0.6644  0.506504
9
## i_catmanufacture:y_cat2004 2.5578015  2.6111215  0.9796  0.327380
1
## i_catmining:y_cat2004   -4.1613133  3.1017329 -1.3416  0.179833
9
## i_catretail:y_cat2004   6.7101438  3.5535452  1.8883  0.059091
8 .
## i_catservices:y_cat2004  0.3620101  2.8491231  0.1271  0.898902
1
## i_cattransportation:y_cat2004 0.1404805  3.6451037  0.0385  0.969260
3
## i_catfinance:y_cat2005  0.0096095  1.8026546  0.0053  0.995747
1
## i_catmanufacture:y_cat2005 -1.3577788  0.9248093 -1.4682  0.142172
4
## i_catmining:y_cat2005   -0.9344806  2.5242689 -0.3702  0.711263
2
## i_catretail:y_cat2005   6.9738440  2.1977815  3.1731  0.001524
8 **
## i_catservices:y_cat2005  -1.8347684  1.8577158 -0.9876  0.323412
5
## i_cattransportation:y_cat2005 -3.7403552  3.6152143 -1.0346  0.300940
0
## i_catwholesale:y_cat2005 -3.1947897  1.0792837 -2.9601  0.003101
8 **
## i_catfinance:y_cat2006  6.1243221  2.1883973  2.7985  0.005169
3 **
## i_catmanufacture:y_cat2006 2.9141479  2.0016416  1.4559  0.145540
6
## i_catmining:y_cat2006   -7.1301832  5.8743093 -1.2138  0.224932
2
## i_catservices:y_cat2006  3.0956606  2.0923386  1.4795  0.139115
9
## i_cattransportation:y_cat2006 -2.4636174  3.9836629 -0.6184  0.536343
2
## i_catfinance:y_cat2007  0.1459904  2.1392006  0.0682  0.945595
4
## i_catmanufacture:y_cat2007 0.3976159  1.2306416  0.3231  0.746646
9
## i_catmining:y_cat2007   1.6641019  2.4189846  0.6879  0.491552
5
## i_catretail:y_cat2007   7.1475207  4.7006305  1.5205  0.128489

```

4					
## i_catservices:y_cat2007	-0.3496858	1.9710609	-0.1774	0.859199	
5					
## i_cattransportation:y_cat2007	-0.0529338	2.8838855	-0.0184	0.985357	
0					
## i_catConstruction:y_cat2008	35.5015621	13.5187489	2.6261	0.008685	
1 **					
## i_catfinance:y_cat2008	11.3971557	4.7843978	2.3822	0.017279	
7 *					
## i_catmanufacture:y_cat2008	2.4217306	2.4317108	0.9959	0.319388	
7					
## i_catmining:y_cat2008	3.1469298	4.0056013	0.7856	0.432150	
9					
## i_catretail:y_cat2008	12.2622870	2.9874981	4.1045	4.170e-0	
5 ***					
## i_catservices:y_cat2008	4.1018469	2.6044160	1.5750	0.115381	
5					
## i_cattransportation:y_cat2008	3.2132015	3.8544007	0.8336	0.404553	
8					
## i_catmanufacture:y_cat2009	4.7763360	1.6509836	2.8930	0.003845	
6 **					
## i_catmining:y_cat2009	7.6691843	2.0204565	3.7958	0.000150	
4 ***					
## i_catretail:y_cat2009	26.1638974	6.2098373	4.2133	2.598e-0	
5 ***					
## i_catservices:y_cat2009	6.1827887	2.1067041	2.9348	0.003365	
2 **					
## i_cattransportation:y_cat2009	4.7275940	2.9551503	1.5998	0.109762	
4					
## i_catConstruction:y_cat2010	2.5516325	2.2397162	1.1393	0.254691	
8					
## i_catfinance:y_cat2010	-3.6392589	2.2557318	-1.6133	0.106786	
2					
## i_catmanufacture:y_cat2010	-6.2918884	1.0465312	-6.0121	2.074e-0	
9 ***					
## i_catmining:y_cat2010	-5.1360107	2.4146738	-2.1270	0.033509	
2 *					
## i_catretail:y_cat2010	-1.7608970	2.0114831	-0.8754	0.381420	
9					
## i_catservices:y_cat2010	-6.4158733	1.7861740	-3.5920	0.000334	
0 ***					
## i_cattransportation:y_cat2010	-7.6181817	2.9555817	-2.5776	0.010001	
9 *					
## i_catwholesale:y_cat2010	-4.7028134	1.3792694	-3.4096	0.000659	
9 ***					
## i_catfinance:y_cat2011	-7.1960431	2.5267456	-2.8479	0.004433	
0 **					
## i_catmanufacture:y_cat2011	-0.4852124	1.8016501	-0.2693	0.787707	
1					
## i_catmining:y_cat2011	-1.8741538	2.6528861	-0.7065	0.479963	

2					
## i_catretail:y_cat2011	6.4782359	2.3539608	2.7521	0.005961	
2 **					
## i_catservices:y_cat2011	0.1456118	1.9473244	0.0748	0.940399	
0					
## i_cattransportation:y_cat2011	-7.2099981	3.7637437	-1.9156	0.055514	
2 .					
## i_catConstruction:y_cat2012	9.9129383	5.7857890	1.7133	0.086765	
8 .					
## i_catfinance:y_cat2012	7.6572317	5.5345239	1.3835	0.166612	
2					
## i_catmanufacture:y_cat2012	5.5914859	5.3823782	1.0389	0.298966	
0					
## i_catmining:y_cat2012	-3.2070975	6.4656098	-0.4960	0.619917	
3					
## i_catretail:y_cat2012	7.8142130	5.8303943	1.3403	0.180273	
7					
## i_catservices:y_cat2012	5.2499930	5.5574900	0.9447	0.344910	
8					
## i_cattransportation:y_cat2012	6.7293031	5.9980375	1.1219	0.261995	
8					
## i_catConstruction:y_cat2013	3.6964042	3.6944416	1.0005	0.317141	
8					
## i_catfinance:y_cat2013	-1.7393472	2.0398521	-0.8527	0.393909	
6					
## i_catmanufacture:y_cat2013	-2.3848047	1.5470451	-1.5415	0.123305	
2					
## i_catmining:y_cat2013	-4.7629363	3.7352593	-1.2751	0.202371	
8					
## i_catretail:y_cat2013	1.2886406	2.6765945	0.4814	0.630236	
7					
## i_catservices:y_cat2013	-4.3677305	1.9648292	-2.2230	0.026300	
0 *					
## i_cattransportation:y_cat2013	-4.8104542	3.3679675	-1.4283	0.153320	
7					
## i_catConstruction:y_cat2014	4.2949566	1.8496496	2.3220	0.020303	
8 *					
## i_catfinance:y_cat2014	-0.5466136	1.7264647	-0.3166	0.751564	
7					
## i_catmanufacture:y_cat2014	-0.9587163	1.5392200	-0.6229	0.533429	
3					
## i_catmining:y_cat2014	7.7476508	3.6649098	2.1140	0.034604	
7 *					
## i_catservices:y_cat2014	-1.9925122	1.9282392	-1.0333	0.301539	
5					
## i_cattransportation:y_cat2014	2.4266610	6.2894070	0.3858	0.699650	
3					
## i_catConstruction:y_cat2015	-1.9307209	3.4388975	-0.5614	0.574546	
2					
## i_catfinance:y_cat2015	5.7119564	5.9445694	0.9609	0.336702	

5					
## i_catmanufacture:y_cat2015	1.3665560	3.4012533	0.4018	0.687877	
2					
## i_catmining:y_cat2015	7.2078965	12.8936704	0.5590	0.576189	
7					
## i_catretail:y_cat2015	9.1814681	3.9236652	2.3400	0.019354	
0 *					
## i_catservices:y_cat2015	0.4983423	3.3045363	0.1508	0.880140	
2					
## i_catConstruction:y_cat2016	3.7375427	3.4828038	1.0731	0.283302	
0					
## i_catfinance:y_cat2016	-2.2711758	1.7109889	-1.3274	0.184485	
2					
## i_catmanufacture:y_cat2016	-4.0329506	1.0482962	-3.8471	0.000122	
2 ***					
## i_catmining:y_cat2016	-3.6283841	2.6587167	-1.3647	0.172455	
5					
## i_catretail:y_cat2016	0.5390027	3.9985429	0.1348	0.892780	
1					
## i_catservices:y_cat2016	-4.2930542	1.8004851	-2.3844	0.017175	
2 *					
## i_cattransportation:y_cat2016	-7.5586902	2.9059990	-2.6011	0.009343	
5 **					
## i_catwholesale:y_cat2016	-0.7545155	2.3721969	-0.3181	0.750459	
0					
## i_catConstruction:y_cat2017	15.3799722	5.6341436	2.7298	0.006378	
2 **					
## i_catfinance:y_cat2017	6.2207212	5.2885119	1.1763	0.239588	
9					
## i_catmanufacture:y_cat2017	4.7642057	5.1172624	0.9310	0.351932	
1					
## i_catmining:y_cat2017	3.7678673	5.5628887	0.6773	0.498258	
8					
## i_catretail:y_cat2017	6.7170057	5.5316311	1.2143	0.224741	
6					
## i_catservices:y_cat2017	6.6814391	5.2306467	1.2774	0.201582	
0					
## i_cattransportation:y_cat2017	3.8828421	5.7709086	0.6728	0.501112	
0					
## i_catConstruction:y_cat2018	5.9918200	2.3197030	2.5830	0.009845	
6 **					
## i_catfinance:y_cat2018	-1.4695699	1.6315968	-0.9007	0.367830	
0					
## i_catmanufacture:y_cat2018	-3.8492621	1.1496816	-3.3481	0.000824	
6 ***					
## i_catmining:y_cat2018	-8.8480374	3.0183447	-2.9314	0.003402	
1 **					
## i_catretail:y_cat2018	0.1204873	4.0439802	0.0298	0.976233	
3					
## i_catservices:y_cat2018	-2.0466521	1.5054391	-1.3595	0.174098	

```

5
## i_cattransportation:y_cat2018 -1.6436986 2.7823241 -0.5908 0.554726
9
## i_catwholesale:y_cat2018 4.4764680 5.4786051 0.8171 0.413952
8
## i_catfinance:y_cat2019 -0.5786329 1.9408085 -0.2981 0.765618
8
## i_catmanufacture:y_cat2019 -3.1273381 2.1876070 -1.4296 0.152954
4
## i_catmining:y_cat2019 -5.8796094 10.6795069 -0.5506 0.581986
6
## i_catretail:y_cat2019 3.0209929 3.0830618 0.9799 0.327237
9
## i_catservices:y_cat2019 -1.9780625 2.1919790 -0.9024 0.366918
7
## i_cattransportation:y_cat2019 -6.2207883 3.3895331 -1.8353 0.066570
5 .
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values3D <- vif(lm(CAR55~`Prev ESG Score.x`+ I(target_ESG*target_du
ummy) + target_dummy+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + dive
rsifying + public_target + private_target + all_cash_deal + stock_deal+
cross_border, data=data1))
print(vif_values3D)

```

```

##          `Prev ESG Score.x` I(target_ESG * target_dummy)
##          1.488024          5.226083
##          target_dummy          `firm size`
##          5.289897          1.737876
##          leverage          `free cash flow`
##          1.569563          1.230388
##          `Tobin's q`          preMTR
##          1.433071          1.065627
##          deal_size          hostile
##          1.272514          1.009384
##          high_tech          diversifying
##          1.190477          1.091625
##          public_target          private_target
##          1.412516          1.283821
##          all_cash_deal          stock_deal
##          1.898920          2.047151
##          cross_border
##          1.043852

```

##CAR55---without acquiror ESG

```

reg3D.1<-lm(CAR55~ I(target_ESG*target_dummy)+target_dummy +`firm size`

```

```
+leverage+`free cash flow`+`Tobin's q`
      + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+i_cat*y_cat , data=data1)
```

```
summary(reg3D.1)
```

```
##
## Call:
## lm(formula = CAR55 ~ I(target_ESG * target_dummy) + target_dummy +
##   `firm size` + leverage + `free cash flow` + `Tobin's q` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal +
##   cross_border + i_cat * y_cat, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -56.118  -3.084  -0.064   3.218  89.838
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -0.376543    6.883504  -0.055  0.956380
## I(target_ESG * target_dummy) -0.099216    0.077575  -1.279  0.201016
## target_dummy           3.463236    2.400232   1.443  0.149170
## `firm size`         -0.303745    0.103424  -2.937  0.003343
## **
## leverage            2.596946    1.244814   2.086  0.037052
## *
## `free cash flow`    3.588768    1.530912   2.344  0.019139
## *
## `Tobin's q`        -0.146446    0.127360  -1.150  0.250305
##
## preMTR              -5.338596    0.563477  -9.474 < 2e-16
## ***
## deal_size           1.018847    0.414891   2.456  0.014123
## *
## hostile             -2.785044    4.927550  -0.565  0.571985
##
## high_tech           0.225959    0.367933   0.614  0.539181
##
## diversifying        -0.208523    0.291971  -0.714  0.475170
##
## public_target       -1.873538    0.418622  -4.475  7.93e-06
## ***
## private_target      -0.238276    0.299499  -0.796  0.426344
```

## all_cash_deal	-0.341790	0.415064	-0.823	0.410317
## stock_deal	-0.393992	0.555360	-0.709	0.478115
## cross_border	0.461992	0.319309	1.447	0.148054
## i_catConstruction	-4.167475	8.326929	-0.500	0.616776
## i_catfinance	1.433538	7.269773	0.197	0.843692
## i_catmanufacture	4.386711	6.850673	0.640	0.522010
## i_catmining	4.417264	7.131977	0.619	0.535730
## i_catretail	1.934788	7.447400	0.260	0.795042
## i_catservices	4.616560	6.924657	0.667	0.505030
## i_cattransportation	4.048236	7.266233	0.557	0.577484
## i_catwholesale	4.286171	9.630621	0.445	0.656314
## y_cat2004	-2.488007	7.611523	-0.327	0.743788
## y_cat2005	1.007745	8.324939	0.121	0.903659
## y_cat2006	-2.391972	7.459905	-0.321	0.748505
## y_cat2007	-0.582732	7.613122	-0.077	0.938993
## y_cat2008	-4.301799	8.334658	-0.516	0.605803
## y_cat2009	-5.949119	9.626263	-0.618	0.536621
## y_cat2010	6.144785	9.621100	0.639	0.523086
## y_cat2011	-1.131673	7.860964	-0.144	0.885542
## y_cat2012	-6.321109	7.281943	-0.868	0.385442
## y_cat2013	2.100805	7.283668	0.288	0.773042
## y_cat2014	-0.671061	9.615502	-0.070	0.944366
## y_cat2015	-2.910926	7.865704	-0.370	0.711353
## y_cat2016	3.097565	9.615217	0.322	0.747362

## y_cat2017	-5.729368	7.177376	-0.798	0.424792
## y_cat2018	1.438219	9.623930	0.149	0.881216
## y_cat2019	0.318097	7.614708	0.042	0.966682
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.830134	8.389351	0.337	0.735880
## i_catmanufacture:y_cat2004	2.791241	7.690213	0.363	0.716663
## i_catmining:y_cat2004	-4.222472	8.106000	-0.521	0.602474
## i_catretail:y_cat2004	7.328169	9.087796	0.806	0.420097
## i_catservices:y_cat2004	0.498661	7.834716	0.064	0.949255
## i_cattransportation:y_cat2004	0.343585	8.501100	0.040	0.967764
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	0.194101	8.828416	0.022	0.982461
## i_catmanufacture:y_cat2005	-0.926437	8.389864	-0.110	0.912082
## i_catmining:y_cat2005	-0.471408	8.791107	-0.054	0.957239
## i_catretail:y_cat2005	7.726877	9.369642	0.825	0.409630
## i_catservices:y_cat2005	-1.599332	8.513274	-0.188	0.850998
## i_cattransportation:y_cat2005	-3.479830	9.143097	-0.381	0.703532
## i_catwholesale:y_cat2005	-3.261622	12.738602	-0.256	0.797937
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	6.241147	9.238458	0.676	0.499376
## i_catmanufacture:y_cat2006	2.896287	7.636510	0.379	0.704518
## i_catmining:y_cat2006	-6.435080	9.143224	-0.704	0.481612
## i_catretail:y_cat2006	NA	NA	NA	NA

## i_catservices:y_cat2006	3.205386	7.788089	0.412	0.680683
## i_cattransportation:y_cat2006	-2.095790	9.243665	-0.227	0.820653
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.210998	8.199067	0.026	0.979471
## i_catmanufacture:y_cat2007	0.674489	7.689750	0.088	0.930111
## i_catmining:y_cat2007	1.824534	8.120778	0.225	0.822249
## i_catretail:y_cat2007	7.484437	9.511825	0.787	0.431434
## i_catservices:y_cat2007	-0.165880	7.830376	-0.021	0.983100
## i_cattransportation:y_cat2007	0.435631	8.599006	0.051	0.959600
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	35.877866	10.763169	3.333	0.000869

## i_catfinance:y_cat2008	11.042626	9.361889	1.180	0.238290
## i_catmanufacture:y_cat2008	2.735148	8.418344	0.325	0.745279
## i_catmining:y_cat2008	3.635877	8.790208	0.414	0.679179
## i_catretail:y_cat2008	12.177427	9.379140	1.298	0.194276
## i_catservices:y_cat2008	4.220011	8.528768	0.495	0.620783
## i_cattransportation:y_cat2008	3.351301	8.941952	0.375	0.707850
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	4.695816	9.794398	0.479	0.631665
## i_catmining:y_cat2009	7.847440	11.983923	0.655	0.512632
## i_catretail:y_cat2009	25.729000	12.297276	2.092	0.036508

```

*
## i_catservices:y_cat2009      6.183616    9.882704    0.626 0.531563
## i_cattransportation:y_cat2009 3.933165   10.713738    0.367 0.713562
## i_catwholesale:y_cat2009           NA           NA           NA           NA
## i_catConstruction:y_cat2010    2.022974   11.460799    0.177 0.859904
## i_catfinance:y_cat2010       -4.434570   10.049445   -0.441 0.659049
## i_catmanufacture:y_cat2010   -6.925862    9.676997   -0.716 0.474235
## i_catmining:y_cat2010        -5.579894   10.055954   -0.555 0.579019
## i_catretail:y_cat2010        -2.732328   10.821283   -0.252 0.800677
## i_catservices:y_cat2010       -7.011877    9.789170   -0.716 0.473874
## i_cattransportation:y_cat2010 -8.336958   10.110999   -0.825 0.409703
## i_catwholesale:y_cat2010     -5.705621   12.179149   -0.468 0.639483
## i_catConstruction:y_cat2011           NA           NA           NA           NA
## i_catfinance:y_cat2011       -7.109169    8.812980   -0.807 0.419926
## i_catmanufacture:y_cat2011    0.004044    7.989819    0.001 0.999596
## i_catmining:y_cat2011       -1.861706    9.490755   -0.196 0.844499
## i_catretail:y_cat2011         6.261181   10.827631    0.578 0.563136
## i_catservices:y_cat2011         0.367936    8.323376    0.044 0.964744
## i_cattransportation:y_cat2011 -6.677778    9.158171   -0.729 0.465966
## i_catwholesale:y_cat2011           NA           NA           NA           NA
## i_catConstruction:y_cat2012   10.393263   11.136844    0.933 0.350782
## i_catfinance:y_cat2012         7.883328    7.798925    1.011 0.312191
## i_catmanufacture:y_cat2012    5.887150    7.351184    0.801 0.423292
## i_catmining:y_cat2012       -2.914720    7.883860   -0.370 0.711629
## i_catretail:y_cat2012         8.064568    8.251902    0.977 0.328508

```


## i_catservices:y_cat2012	5.721719	7.501136	0.763	0.445660
## i_cattransportation:y_cat2012	6.999661	7.915859	0.884	0.376635
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	4.137875	9.979315	0.415	0.678434
## i_catfinance:y_cat2013	-1.854925	7.835206	-0.237	0.812874
## i_catmanufacture:y_cat2013	-2.217140	7.370409	-0.301	0.763577
## i_catmining:y_cat2013	-4.343495	8.099622	-0.536	0.591823
## i_catretail:y_cat2013	1.290977	8.596502	0.150	0.880638
## i_catservices:y_cat2013	-4.040265	7.496194	-0.539	0.589948
## i_cattransportation:y_cat2013	-4.825874	7.995735	-0.604	0.546189
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	5.440831	12.717574	0.428	0.668816
## i_catfinance:y_cat2014	0.721936	11.054656	0.065	0.947935
## i_catmanufacture:y_cat2014	0.337280	9.774014	0.035	0.972475
## i_catmining:y_cat2014	8.547955	10.985318	0.778	0.436562
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-0.732397	9.942625	-0.074	0.941284
## i_cattransportation:y_cat2014	3.137428	11.059892	0.284	0.776680
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-1.556692	11.450976	-0.136	0.891875
## i_catfinance:y_cat2015	5.974606	9.581775	0.624	0.532983
## i_catmanufacture:y_cat2015	1.979443	8.021583	0.247	0.805109
## i_catmining:y_cat2015	6.227353	9.479746	0.657	0.511293
## i_catretail:y_cat2015	9.330862	8.969928	1.040	0.298321

## i_catservices:y_cat2015	0.740773	8.292797	0.089	0.928828
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	3.965569	11.054560	0.359	0.719827
## i_catfinance:y_cat2016	-1.432693	9.999460	-0.143	0.886082
## i_catmanufacture:y_cat2016	-3.111087	9.665843	-0.322	0.747580
## i_catmining:y_cat2016	-2.761429	9.959375	-0.277	0.781594
## i_catretail:y_cat2016	1.499468	10.407709	0.144	0.885454
## i_catservices:y_cat2016	-3.296659	9.753657	-0.338	0.735395
## i_cattransportation:y_cat2016	-6.621733	10.067571	-0.658	0.510768
## i_catwholesale:y_cat2016	-0.413026	11.948109	-0.035	0.972427
## i_catConstruction:y_cat2017	15.457702	9.024190	1.713	0.086841
## i_catfinance:y_cat2017	6.360957	7.652996	0.831	0.405949
## i_catmanufacture:y_cat2017	4.932922	7.241630	0.681	0.495809
## i_catmining:y_cat2017	3.880953	7.776260	0.499	0.617765
## i_catretail:y_cat2017	6.942719	7.968868	0.871	0.383705
## i_catservices:y_cat2017	6.816343	7.340384	0.929	0.353174
## i_cattransportation:y_cat2017	4.102062	7.742107	0.530	0.596267
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	6.048519	11.066433	0.547	0.584722
## i_catfinance:y_cat2018	-1.655231	9.982514	-0.166	0.868316
## i_catmanufacture:y_cat2018	-3.935071	9.671070	-0.407	0.684120
## i_catmining:y_cat2018	-9.042951	9.990617	-0.905	0.365468
## i_catretail:y_cat2018	-0.140725	10.548277	-0.013	0.989357

```

## i_catservices:y_cat2018      -2.123880    9.735083   -0.218  0.827315
## i_cattransportation:y_cat2018 -1.938369   10.027724  -0.193  0.846738
## i_catwholesale:y_cat2018      4.169041   11.910316   0.350  0.726338
## i_catConstruction:y_cat2019      NA          NA          NA          NA
## i_catfinance:y_cat2019        -0.182152    8.204794  -0.022  0.982290
## i_catmanufacture:y_cat2019     -2.688680    7.766786  -0.346  0.729237
## i_catmining:y_cat2019         -5.575055    8.871583  -0.628  0.529783
## i_catretail:y_cat2019         3.349155    9.091791   0.368  0.712625
## i_catservices:y_cat2019       -1.558450    7.790302  -0.200  0.841456
## i_cattransportation:y_cat2019  -6.003928    8.438175  -0.712  0.476823
## i_catwholesale:y_cat2019      NA          NA          NA          NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.795 on 2741 degrees of freedom
## Multiple R-squared:  0.1203, Adjusted R-squared:  0.07379
## F-statistic: 2.586 on 145 and 2741 DF,  p-value: < 2.2e-16

###test heteroskedasticity problem
hetero_test <- bptest(reg3D.1)
print(hetero_test)

##
## studentized Breusch-Pagan test
##
## data:  reg3D.1
## BP = 593.22, df = 145, p-value < 2.2e-16

###solve heteroskedasticity problem
coeftest(reg3D.1, vcov = vcovHC(reg3D.1, type='HC0', cluster='a_industry
'))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|
## )
## (Intercept) -0.3765427  1.1432704 -0.3294 0.741912

```

0				
## I(target_ESG * target_dummy)	-0.0992164	0.0470840	-2.1072	0.035189
1 *				
## target_dummy	3.4632363	1.7553797	1.9729	0.048604
2 *				
## `firm size`	-0.3037455	0.1049221	-2.8950	0.003822
0 **				
## leverage	2.5969463	1.2963249	2.0033	0.045241
8 *				
## `free cash flow`	3.5887683	2.2918923	1.5659	0.117498
3				
## `Tobin's q`	-0.1464456	0.1384397	-1.0578	0.290226
2				
## preMTR	-5.3385957	0.7400527	-7.2138	7.009e-1
3 ***				
## deal_size	1.0188467	1.8234181	0.5588	0.576373
6				
## hostile	-2.7850437	1.8815226	-1.4802	0.138932
8				
## high_tech	0.2259588	0.3594741	0.6286	0.529675
4				
## diversifying	-0.2085229	0.2862867	-0.7284	0.466448
8				
## public_target	-1.8735383	0.4730838	-3.9603	7.677e-0
5 ***				
## private_target	-0.2382763	0.3053750	-0.7803	0.435296
7				
## all_cash_deal	-0.3417895	0.4386667	-0.7792	0.435955
5				
## stock_deal	-0.3939917	0.8017597	-0.4914	0.623176
8				
## cross_border	0.4619923	0.3143720	1.4696	0.141792
5				
## i_catConstruction	-4.1674753	1.8495970	-2.2532	0.024326
5 *				
## i_catfinance	1.4335378	1.4308963	1.0018	0.316506
4				
## i_catmanufacture	4.3867109	0.8424132	5.2073	2.058e-0
7 ***				
## i_catmining	4.4172642	1.8076117	2.4437	0.014600
1 *				
## i_catretail	1.9347884	1.9585736	0.9879	0.323310
4				
## i_catservices	4.6165604	1.2449907	3.7081	0.000213
0 ***				
## i_cattransportation	4.0482355	2.5445762	1.5909	0.111741
3				
## i_catwholesale	4.2861709	0.7639281	5.6107	2.217e-0
8 ***				
## y_cat2004	-2.4880073	2.3183806	-1.0732	0.283291

1					
## y_cat2005	1.0077453	0.2835780	3.5537	0.000386	
3 ***					
## y_cat2006	-2.3919724	1.4090910	-1.6975	0.089710	
3 .					
## y_cat2007	-0.5827323	0.8129483	-0.7168	0.473550	
3					
## y_cat2008	-4.3017991	1.7149030	-2.5085	0.012182	
5 *					
## y_cat2009	-5.9491186	0.7413489	-8.0247	1.494e-1	
5 ***					
## y_cat2010	6.1447850	0.5446171	11.2828	< 2.2e-1	
6 ***					
## y_cat2011	-1.1316726	1.4696945	-0.7700	0.441363	
1					
## y_cat2012	-6.3211095	5.3341473	-1.1850	0.236109	
4					
## y_cat2013	2.1008050	1.3507161	1.5553	0.119983	
7					
## y_cat2014	-0.6710609	0.3338348	-2.0102	0.044512	
2 *					
## y_cat2015	-2.9109260	2.9168067	-0.9980	0.318375	
3					
## y_cat2016	3.0975647	0.3218829	9.6233	< 2.2e-1	
6 ***					
## y_cat2017	-5.7293676	5.0666696	-1.1308	0.258240	
1					
## y_cat2018	1.4382191	0.5115972	2.8112	0.004970	
3 **					
## y_cat2019	0.3180966	0.8810921	0.3610	0.718108	
3					
## i_catfinance:y_cat2004	2.8301336	4.1844847	0.6763	0.498882	
0					
## i_catmanufacture:y_cat2004	2.7912412	2.5515666	1.0939	0.274080	
8					
## i_catmining:y_cat2004	-4.2224723	3.0883189	-1.3672	0.171662	
3					
## i_catretail:y_cat2004	7.3281695	3.5006731	2.0934	0.036408	
7 *					
## i_catservices:y_cat2004	0.4986613	2.8098933	0.1775	0.859155	
3					
## i_cattransportation:y_cat2004	0.3435855	3.5479756	0.0968	0.922860	
6					
## i_catfinance:y_cat2005	0.1941013	1.7068949	0.1137	0.909471	
2					
## i_catmanufacture:y_cat2005	-0.9264374	0.9162991	-1.0111	0.312074	
8					
## i_catmining:y_cat2005	-0.4714079	2.5533299	-0.1846	0.853537	
0					
## i_catretail:y_cat2005	7.7268772	2.1615972	3.5746	0.000356	

```

8 ***
## i_catservices:y_cat2005      -1.5993322  1.8533998 -0.8629 0.388258
0
## i_cattransportation:y_cat2005 -3.4798301  3.5494846 -0.9804 0.326987
0
## i_catwholesale:y_cat2005      -3.2616225  1.0826583 -3.0126 0.002613
8 **
## i_catfinance:y_cat2006        6.2411473  2.1225639  2.9404 0.003305
5 **
## i_catmanufacture:y_cat2006    2.8962873  1.9848234  1.4592 0.144620
1
## i_catmining:y_cat2006         -6.4350796  5.8717038 -1.0959 0.273198
0
## i_catservices:y_cat2006        3.2053857  2.0941456  1.5306 0.125973
5
## i_cattransportation:y_cat2006 -2.0957897  4.0127474 -0.5223 0.601515
5
## i_catfinance:y_cat2007         0.2109980  2.0671852  0.1021 0.918708
4
## i_catmanufacture:y_cat2007     0.6744893  1.1990806  0.5625 0.573817
7
## i_catmining:y_cat2007          1.8245342  2.4229840  0.7530 0.451507
8
## i_catretail:y_cat2007          7.4844375  4.7802091  1.5657 0.117531
2
## i_catservices:y_cat2007       -0.1658797  1.9394477 -0.0855 0.931846
8
## i_cattransportation:y_cat2007  0.4356305  2.8096184  0.1550 0.876793
5
## i_catConstruction:y_cat2008   35.8778663 13.4780570  2.6619 0.007814
4 **
## i_catfinance:y_cat2008        11.0426264  4.6589115  2.3702 0.017846
5 *
## i_catmanufacture:y_cat2008     2.7351481  2.2378988  1.2222 0.221739
1
## i_catmining:y_cat2008          3.6358767  3.9265763  0.9260 0.354545
1
## i_catretail:y_cat2008         12.1774272  2.9455087  4.1342 3.668e-0
5 ***
## i_catservices:y_cat2008        4.2200110  2.4249747  1.7402 0.081931
1 .
## i_cattransportation:y_cat2008  3.3513007  3.7137891  0.9024 0.366926
9
## i_catmanufacture:y_cat2009     4.6958165  1.6804904  2.7943 0.005237
2 **
## i_catmining:y_cat2009          7.8474398  2.0493849  3.8292 0.000131
5 ***
## i_catretail:y_cat2009         25.7289996  6.2218202  4.1353 3.652e-0
5 ***
## i_catservices:y_cat2009        6.1836158  2.0912166  2.9569 0.003133

```

```

6 **
## i_cattransportation:y_cat2009 3.9331655 2.8780524 1.3666 0.171860
7
## i_catConstruction:y_cat2010 2.0229739 2.2653735 0.8930 0.371936
7
## i_catfinance:y_cat2010 -4.4345696 2.1892370 -2.0256 0.042900
1 *
## i_catmanufacture:y_cat2010 -6.9258623 1.0330118 -6.7045 2.444e-1
1 ***
## i_catmining:y_cat2010 -5.5798937 2.4224576 -2.3034 0.021330
7 *
## i_catretail:y_cat2010 -2.7323277 2.0499671 -1.3329 0.182687
2
## i_catservices:y_cat2010 -7.0118770 1.7705602 -3.9603 7.677e-0
5 ***
## i_cattransportation:y_cat2010 -8.3369580 2.8981994 -2.8766 0.004050
9 **
## i_catwholesale:y_cat2010 -5.7056213 1.2981952 -4.3950 1.150e-0
5 ***
## i_catfinance:y_cat2011 -7.1091689 2.5465843 -2.7916 0.005280
4 **
## i_catmanufacture:y_cat2011 0.0040441 1.8675630 0.0022 0.998272
4
## i_catmining:y_cat2011 -1.8617062 2.6358687 -0.7063 0.480063
5
## i_catretail:y_cat2011 6.2611812 2.4494848 2.5561 0.010638
1 *
## i_catservices:y_cat2011 0.3679363 2.0133652 0.1827 0.855010
1
## i_cattransportation:y_cat2011 -6.6777780 3.9691124 -1.6824 0.092598
2 .
## i_catConstruction:y_cat2012 10.3932628 5.8087887 1.7892 0.073688
1 .
## i_catfinance:y_cat2012 7.8833285 5.5224183 1.4275 0.153545
8
## i_catmanufacture:y_cat2012 5.8871501 5.3912534 1.0920 0.274937
1
## i_catmining:y_cat2012 -2.9147201 6.5476595 -0.4452 0.656243
2
## i_catretail:y_cat2012 8.0645679 5.8676233 1.3744 0.169424
3
## i_catservices:y_cat2012 5.7217191 5.5705054 1.0271 0.304442
6
## i_cattransportation:y_cat2012 6.9996614 5.9837930 1.1698 0.242195
3
## i_catConstruction:y_cat2013 4.1378747 3.7509213 1.1032 0.270053
6
## i_catfinance:y_cat2013 -1.8549251 2.0386697 -0.9099 0.362970
9
## i_catmanufacture:y_cat2013 -2.2171399 1.6114370 -1.3759 0.168972

```

0					
## i_catmining:y_cat2013	-4.3434947	3.8719811	-1.1218	0.262056	
0					
## i_catretail:y_cat2013	1.2909769	2.7168638	0.4752	0.634702	
4					
## i_catservices:y_cat2013	-4.0402648	2.0409208	-1.9796	0.047845	
2 *					
## i_cattransportation:y_cat2013	-4.8258744	3.3080501	-1.4588	0.144727	
2					
## i_catConstruction:y_cat2014	5.4408314	1.8763474	2.8997	0.003765	
0 **					
## i_catfinance:y_cat2014	0.7219355	1.6027387	0.4504	0.652429	
8					
## i_catmanufacture:y_cat2014	0.3372801	1.5173320	0.2223	0.824108	
6					
## i_catmining:y_cat2014	8.5479545	3.3627362	2.5420	0.011077	
8 *					
## i_catservices:y_cat2014	-0.7323973	1.8578247	-0.3942	0.693447	
1					
## i_cattransportation:y_cat2014	3.1374285	6.2688869	0.5005	0.616780	
0					
## i_catConstruction:y_cat2015	-1.5566921	3.4637871	-0.4494	0.653164	
9					
## i_catfinance:y_cat2015	5.9746057	5.8480519	1.0216	0.307041	
3					
## i_catmanufacture:y_cat2015	1.9794434	3.3861934	0.5846	0.558889	
7					
## i_catmining:y_cat2015	6.2273525	12.8715953	0.4838	0.628562	
3					
## i_catretail:y_cat2015	9.3308624	3.9396231	2.3685	0.017931	
0 *					
## i_catservices:y_cat2015	0.7407726	3.2958435	0.2248	0.822183	
0					
## i_catConstruction:y_cat2016	3.9655688	3.5919615	1.1040	0.269684	
8					
## i_catfinance:y_cat2016	-1.4326931	1.6169975	-0.8860	0.375684	
1					
## i_catmanufacture:y_cat2016	-3.1110871	1.0196562	-3.0511	0.002301	
8 **					
## i_catmining:y_cat2016	-2.7614286	2.6614220	-1.0376	0.299558	
8					
## i_catretail:y_cat2016	1.4994683	4.0348706	0.3716	0.710199	
1					
## i_catservices:y_cat2016	-3.2966587	1.8015260	-1.8299	0.067369	
6 .					
## i_cattransportation:y_cat2016	-6.6217334	2.8503077	-2.3232	0.020243	
2 *					
## i_catwholesale:y_cat2016	-0.4130256	2.4206382	-0.1706	0.864529	
9					
## i_catConstruction:y_cat2017	15.4577019	5.6637155	2.7293	0.006388	


```

4 **
## i_catfinance:y_cat2017      6.3609568  5.2898801  1.2025 0.229282
8
## i_catmanufacture:y_cat2017  4.9329220  5.1443884  0.9589 0.337696
8
## i_catmining:y_cat2017      3.8809531  5.5896896  0.6943 0.487549
4
## i_catretail:y_cat2017      6.9427187  5.5780641  1.2446 0.213368
1
## i_catservices:y_cat2017    6.8163432  5.2613646  1.2955 0.195240
8
## i_cattransportation:y_cat2017 4.1020625  5.7729565  0.7106 0.477414
1
## i_catConstruction:y_cat2018 6.0485195  2.3535217  2.5700 0.010222
6 *
## i_catfinance:y_cat2018     -1.6552314  1.5424901 -1.0731 0.283325
0
## i_catmanufacture:y_cat2018 -3.9350706  1.1484144 -3.4265 0.000620
4 ***
## i_catmining:y_cat2018     -9.0429511  3.0718087 -2.9439 0.003268
8 **
## i_catretail:y_cat2018     -0.1407251  4.0327913 -0.0349 0.972165
8
## i_catservices:y_cat2018    -2.1238801  1.5153320 -1.4016 0.161149
8
## i_cattransportation:y_cat2018 -1.9383686  2.7267239 -0.7109 0.477220
2
## i_catwholesale:y_cat2018    4.1690409  5.4941135  0.7588 0.448025
7
## i_catfinance:y_cat2019     -0.1821517  1.8850992 -0.0966 0.923029
6
## i_catmanufacture:y_cat2019 -2.6886799  2.2022640 -1.2209 0.222239
9
## i_catmining:y_cat2019     -5.5750551 10.5631220 -0.5278 0.597691
4
## i_catretail:y_cat2019      3.3491549  2.9709923  1.1273 0.259720
7
## i_catservices:y_cat2019    -1.5584504  2.2055372 -0.7066 0.479870
1
## i_cattransportation:y_cat2019 -6.0039284  3.4597038 -1.7354 0.082784
5 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

##test multicollenarity problem

```

vif_values3D.1 <- vif(lm(CAR55~I(target_ESG*target_dummy) + target_dumm
y+`firm size`+leverage+`free cash flow`+`Tobin's q`
+ preMTR+ deal_size + hostile + high_tech + di
versifying + public_target + private_target + all_cash_deal + stock_dea

```

```

l+cross_border, data=data1))
print(vif_values3D.1)

## I(target_ESG * target_dummy)          target_dummy
##           5.222626                    5.283432
##           `firm size`                 leverage
##           1.293011                    1.569481
##           `free cash flow`            `Tobin's q`
##           1.225310                    1.422219
##           preMTR                       deal_size
##           1.064501                    1.269053
##           hostile                       high_tech
##           1.007455                    1.187563
##           diversifying                 public_target
##           1.089691                    1.412402
##           private_target              all_cash_deal
##           1.283652                    1.897877
##           stock_deal                  cross_border
##           2.044621                    1.043388

##green and brown
data1$difference<-data1$`Prev ESG Score.x`-data1$target_ESG

reg11<-lm(data1$CAR11~(data1$difference))
summary(reg11)

##
## Call:
## lm(formula = data1$CAR11 ~ (data1$difference))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -40.390  -1.745  -0.051   1.782  97.407
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.588791   0.206224   2.855  0.00433 **
## data1$difference -0.009462   0.004828  -1.960  0.05010 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.144 on 2885 degrees of freedom
## Multiple R-squared:  0.00133,    Adjusted R-squared:  0.0009835
## F-statistic: 3.841 on 1 and 2885 DF,  p-value: 0.0501

reg22<-lm(data1$CAR22~data1$difference)
summary(reg22)

##
## Call:
## lm(formula = data1$CAR22 ~ data1$difference)

```

```

##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -45.946  -2.208   0.029   2.248  94.302
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.659693   0.225222   2.929  0.00343 **
## data1$difference -0.012544   0.005273  -2.379  0.01742 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.618 on 2885 degrees of freedom
## Multiple R-squared:  0.001958, Adjusted R-squared:  0.001612
## F-statistic:  5.66 on 1 and 2885 DF, p-value: 0.01742

reg55<-lm(data1$CAR55~data1$difference)
summary(reg55)

##
## Call:
## lm(formula = data1$CAR55 ~ data1$difference)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -49.890  -3.109   0.038   3.343 102.088
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.724438   0.282709   2.562  0.01044 *
## data1$difference -0.019411   0.006618  -2.933  0.00339 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.052 on 2885 degrees of freedom
## Multiple R-squared:  0.002973, Adjusted R-squared:  0.002627
## F-statistic:  8.601 on 1 and 2885 DF, p-value: 0.003385

##2SLS model

reg_1<-lm(`Prev ESG Score.x`~ `religion rank (2)`+ `blue state (dummy)
new` + `firm size`+leverage+`Tobin's q`+`free cash flow`
+ preMTR+ i_cat*y_cat, data=data1)
summary(reg_1)

##
## Call:
## lm(formula = `Prev ESG Score.x` ~ `religion rank (2)` + `blue state
(dummy) new` +
## `firm size` + leverage + `Tobin's q` + `free cash flow` +
## preMTR + i_cat * y_cat, data = data1)

```

```

##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -52.730  -9.408  -0.673   8.859  50.341
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)

## (Intercept)          -32.65879    14.71545  -2.219  0.02654
*
## `religion rank (2)`    -0.11032     0.02126  -5.189 2.26e-07
***
## `blue state (dummy) new`  0.17288     0.65308   0.265  0.79125

## `firm size`           8.63620     0.21300  40.546 < 2e-16
***
## leverage              -7.37060     2.58167  -2.855  0.00434
**
## `Tobin's q`          -1.72335     0.27006  -6.381 2.05e-10
***
## `free cash flow`      5.58385     3.23598   1.726  0.08454
.
## preMTR                 0.40345     1.20320   0.335  0.73742

## i_catConstruction     -15.51157    17.84081  -0.869  0.38468

## i_catfinance          -13.09629    15.57268  -0.841  0.40043

## i_catmanufacture      -4.64646    14.67064  -0.317  0.75148

## i_catmining           -8.77171    15.27678  -0.574  0.56589

## i_catretail           -4.18477    15.95914  -0.262  0.79317

## i_catservices         -8.49333    14.83119  -0.573  0.56692

## i_cattransportation   -13.49184    15.56967  -0.867  0.38627

## i_catwholesale        -24.99182    20.61026  -1.213  0.22539

## y_cat2004              4.55788    16.28433   0.280  0.77958

## y_cat2005             10.94994    17.83678   0.614  0.53933

## y_cat2006              5.17370    15.95483   0.324  0.74576

## y_cat2007              8.66564    16.28375   0.532  0.59465

```

## y_cat2008	12.06486	17.83897	0.676	0.49889
## y_cat2009	8.75642	20.59661	0.425	0.67077
## y_cat2010	-9.39760	20.60713	-0.456	0.64840
## y_cat2011	24.43598	16.82031	1.453	0.14640
## y_cat2012	28.36599	15.57737	1.821	0.06872
.				
## y_cat2013	21.72484	15.57875	1.395	0.16327
## y_cat2014	48.83892	20.59640	2.371	0.01780
*				
## y_cat2015	22.88991	16.82098	1.361	0.17369
## y_cat2016	43.26480	20.59548	2.101	0.03576
*				
## y_cat2017	23.37791	15.35348	1.523	0.12796
## y_cat2018	12.10603	20.60672	0.587	0.55693
## y_cat2019	36.02490	16.29929	2.210	0.02717
*				
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	-1.94959	17.94539	-0.109	0.91350
## i_catmanufacture:y_cat2004	-9.55972	16.44659	-0.581	0.56111
## i_catmining:y_cat2004	0.37405	17.34083	0.022	0.98279
## i_catretail:y_cat2004	-25.69783	19.45750	-1.321	0.18671
## i_catservices:y_cat2004	-6.72745	16.76312	-0.401	0.68821
## i_cattransportation:y_cat2004	-8.59482	18.19147	-0.472	0.63663
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	-6.25537	18.91270	-0.331	0.74086
## i_catmanufacture:y_cat2005	-14.56146	17.97553	-0.810	0.41797
## i_catmining:y_cat2005	-15.98350	18.83123	-0.849	0.39608

## i_catretail:y_cat2005	-27.10088	20.07622	-1.350	0.17716
## i_catservices:y_cat2005	-7.59850	18.23400	-0.417	0.67691
## i_cattransportation:y_cat2005	-8.39343	19.59146	-0.428	0.66838
## i_catwholesale:y_cat2005	2.36045	27.24575	0.087	0.93097
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	-2.50847	19.77760	-0.127	0.89908
## i_catmanufacture:y_cat2006	-1.14840	16.33704	-0.070	0.94396
## i_catmining:y_cat2006	-25.53868	19.54324	-1.307	0.19140
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	-4.03869	16.66082	-0.242	0.80848
## i_cattransportation:y_cat2006	-14.32297	19.77499	-0.724	0.46894
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-2.81821	17.54961	-0.161	0.87243
## i_catmanufacture:y_cat2007	-10.87603	16.45075	-0.661	0.50859
## i_catmining:y_cat2007	-7.10086	17.37230	-0.409	0.68276
## i_catretail:y_cat2007	-13.48633	20.36125	-0.662	0.50780
## i_catservices:y_cat2007	-6.39773	16.74823	-0.382	0.70250
## i_cattransportation:y_cat2007	-14.73348	18.38277	-0.801	0.42292
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	-13.49695	23.05135	-0.586	0.55825
## i_catfinance:y_cat2008	10.87658	20.03894	0.543	0.58733
## i_catmanufacture:y_cat2008	-12.79508	18.02494	-0.710	0.47785
## i_catmining:y_cat2008	-18.68554	18.81220	-0.993	0.32067

## i_catretail:y_cat2008	0.39441	20.08026	0.020	0.98433
## i_catservices:y_cat2008	-4.71284	18.26348	-0.258	0.79639
## i_cattransportation:y_cat2008	-4.47147	19.13748	-0.234	0.81527
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	2.40255	20.95253	0.115	0.90872
## i_catmining:y_cat2009	-5.20128	25.64241	-0.203	0.83928
## i_catretail:y_cat2009	24.05676	26.08891	0.922	0.35655
## i_catservices:y_cat2009	1.01651	21.14180	0.048	0.96166
## i_cattransportation:y_cat2009	27.06096	22.92831	1.180	0.23801
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	16.41847	24.53086	0.669	0.50336
## i_catfinance:y_cat2010	28.73717	21.51964	1.335	0.18186
## i_catmanufacture:y_cat2010	20.46474	20.72459	0.987	0.32350
## i_catmining:y_cat2010	12.52597	21.53436	0.582	0.56083
## i_catretail:y_cat2010	29.77065	23.18944	1.284	0.19932
## i_catservices:y_cat2010	20.46289	20.96544	0.976	0.32914
## i_cattransportation:y_cat2010	24.10194	21.65268	1.113	0.26576
## i_catwholesale:y_cat2010	34.81846	26.07825	1.335	0.18194
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-3.12730	18.86440	-0.166	0.86834
## i_catmanufacture:y_cat2011	-18.93334	17.10005	-1.107	0.26830
## i_catmining:y_cat2011	-2.71023	20.26479	-0.134	0.89362

## i_catretail:y_cat2011	1.88781	23.20838	0.081	0.93518
## i_catservices:y_cat2011	-7.56515	17.80793	-0.425	0.67100
## i_cattransportation:y_cat2011	-20.46093	19.60690	-1.044	0.29678
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-18.98798	23.70140	-0.801	0.42312
## i_catfinance:y_cat2012	-8.37358	16.68261	-0.502	0.61575
## i_catmanufacture:y_cat2012	-12.84076	15.73034	-0.816	0.41440
## i_catmining:y_cat2012	-13.29670	16.84441	-0.789	0.42996
## i_catretail:y_cat2012	-11.53358	17.65824	-0.653	0.51371
## i_catservices:y_cat2012	-17.24607	16.04287	-1.075	0.28247
## i_cattransportation:y_cat2012	-11.37337	16.92111	-0.672	0.50155
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	-17.60797	21.33638	-0.825	0.40930
## i_catfinance:y_cat2013	2.83047	16.76004	0.169	0.86590
## i_catmanufacture:y_cat2013	-8.45635	15.77041	-0.536	0.59185
## i_catmining:y_cat2013	-17.59297	17.33866	-1.015	0.31035
## i_catretail:y_cat2013	-0.93061	18.38954	-0.051	0.95964
## i_catservices:y_cat2013	-11.38435	16.03805	-0.710	0.47787
## i_cattransportation:y_cat2013	-0.20475	17.10304	-0.012	0.99045
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	-38.02047	27.25093	-1.395	0.16307
## i_catfinance:y_cat2014	-39.11176	23.68688	-1.651	0.09881
•				
## i_catmanufacture:y_cat2014	-44.16542	20.93802	-2.109	0.03501
*				
## i_catmining:y_cat2014	-26.12589	23.50437	-1.112	0.26644

## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-39.66151	21.28944	-1.863	0.06257
## i_cattransportation:y_cat2014	-24.45486	23.68001	-1.033	0.30182
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-14.42096	24.51586	-0.588	0.55643
## i_catfinance:y_cat2015	-9.49784	20.48343	-0.464	0.64291
## i_catmanufacture:y_cat2015	-22.51576	17.15124	-1.313	0.18937
## i_catmining:y_cat2015	29.93950	20.29716	1.475	0.14031
## i_catretail:y_cat2015	-6.88403	19.17823	-0.359	0.71966
## i_catservices:y_cat2015	-9.80719	17.72499	-0.553	0.58010
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	-7.11291	23.68148	-0.300	0.76393
## i_catfinance:y_cat2016	-26.69028	21.42588	-1.246	0.21298
## i_catmanufacture:y_cat2016	-31.62100	20.70296	-1.527	0.12679
## i_catmining:y_cat2016	-30.23482	21.32510	-1.418	0.15636
## i_catretail:y_cat2016	-33.20013	22.29405	-1.489	0.13655
## i_catservices:y_cat2016	-32.43109	20.88789	-1.553	0.12063
## i_cattransportation:y_cat2016	-29.92887	21.56817	-1.388	0.16536
## i_catwholesale:y_cat2016	-8.86006	25.57821	-0.346	0.72908
## i_catConstruction:y_cat2017	-4.53139	19.29201	-0.235	0.81432
## i_catfinance:y_cat2017	-4.48958	16.36589	-0.274	0.78385
## i_catmanufacture:y_cat2017	-7.90031	15.49386	-0.510	0.61016
## i_catmining:y_cat2017	-5.63583	16.62977	-0.339	0.73471

```

## i_catretail:y_cat2017      -10.47201    17.03888   -0.615    0.53887
## i_catservices:y_cat2017    -4.84748    15.69450   -0.309    0.75745
## i_cattransportation:y_cat2017 -7.20007    16.54973   -0.435    0.66356
## i_catwholesale:y_cat2017           NA           NA           NA           NA
## i_catConstruction:y_cat2018     1.09648    23.69420    0.046    0.96309
## i_catfinance:y_cat2018        10.86745    21.39137    0.508    0.61147
## i_catmanufacture:y_cat2018     5.37119    20.70551    0.259    0.79534
## i_catmining:y_cat2018         9.33920    21.38634    0.437    0.66237
## i_catretail:y_cat2018        11.65709    22.57652    0.516    0.60566
## i_catservices:y_cat2018         6.50066    20.84453    0.312    0.75517
## i_cattransportation:y_cat2018  12.76675    21.47803    0.594    0.55229
## i_catwholesale:y_cat2018       15.67824    25.50113    0.615    0.53873
## i_catConstruction:y_cat2019           NA           NA           NA           NA
## i_catfinance:y_cat2019        -15.41967    17.55242   -0.878    0.37975
## i_catmanufacture:y_cat2019    -18.62807    16.62078   -1.121    0.26248
## i_catmining:y_cat2019        -10.60373    18.91386   -0.561    0.57509
## i_catretail:y_cat2019        -16.34196    19.47724   -0.839    0.40153
## i_catservices:y_cat2019       -15.85050    16.66875   -0.951    0.34173
## i_cattransportation:y_cat2019 -11.84784    18.06354   -0.656    0.51194
## i_catwholesale:y_cat2019           NA           NA           NA           NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 14.56 on 2750 degrees of freedom
## Multiple R-squared:  0.4814, Adjusted R-squared:  0.4558
## F-statistic: 18.77 on 136 and 2750 DF,  p-value: < 2.2e-16

```

```

data3<-cbind(reg_1$model,reg_1$fitted.values)
data4<-merge(data1,data3,all.y=TRUE)
data5<-data4[!duplicated(data4),]

reg_2 <- lm(CAR11~ `reg_1$fitted.values`+`firm size`+leverage+`Tobin's
q`+`free cash flow`
      + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+ i_cat *y_cat , data = data5)

summary(reg_2)

##
## Call:
## lm(formula = CAR11 ~ `reg_1$fitted.values` + `firm size` + leverage
+
##   `Tobin's q` + `free cash flow` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat * y_cat,
##   data = data5)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -48.281  -1.836  -0.031   1.869  85.057
##
## Coefficients: (23 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -1.45507     5.68711  -0.256   0.7981
## `reg_1$fitted.values` -0.11858     0.06736  -1.761   0.0784 .
## `firm size`       0.77171     0.58734   1.314   0.1890
## leverage        -0.16804     1.09241  -0.154   0.8778
## `Tobin's q`     -0.26422     0.15602  -1.693   0.0905 .
## `free cash flow`  0.98443     1.27195   0.774   0.4390
## preMTR          -0.60849     0.42406  -1.435   0.1514
## deal_size        1.39607     0.30747   4.541 5.86e-06 *
## **
## hostile          -3.53870     3.69275  -0.958   0.3380
## high_tech        0.09964     0.27710   0.360   0.7192

```

## diversifying	-0.41291	0.22029	-1.874	0.0610	.
## public_target	-1.66312	0.31275	-5.318	1.14e-07	*
**					
## private_target	-0.24838	0.22594	-1.099	0.2717	
## all_cash_deal	-0.08330	0.31234	-0.267	0.7897	
## stock_deal	-0.64839	0.42026	-1.543	0.1230	
## cross_border	0.46960	0.24062	1.952	0.0511	.
## i_catConstruction	-5.06111	6.32147	-0.801	0.4234	
## i_catfinance	-2.20440	5.49997	-0.401	0.6886	
## i_catmanufacture	-0.81215	5.14442	-0.158	0.8746	
## i_catmining	-1.27583	5.37834	-0.237	0.8125	
## i_catretail	-1.26503	5.59147	-0.226	0.8210	
## i_catservices	-0.14208	5.21822	-0.027	0.9783	
## i_cattransportation	-1.94226	5.51621	-0.352	0.7248	
## i_catwholesale	-1.64032	7.38583	-0.222	0.8243	
## y_cat2004	-1.32216	5.70826	-0.232	0.8168	
## y_cat2005	-0.22988	6.27717	-0.037	0.9708	
## y_cat2006	-0.87341	5.59904	-0.156	0.8761	
## y_cat2007	0.29123	5.73193	0.051	0.9595	
## y_cat2008	-0.76785	6.29118	-0.122	0.9029	
## y_cat2009	-0.41769	7.23467	-0.058	0.9540	
## y_cat2010	-1.61145	7.23442	-0.223	0.8237	
## y_cat2011	2.56408	6.10063	0.420	0.6743	
## y_cat2012	-3.01842	5.74308	-0.526	0.5992	
## y_cat2013	2.80567	5.62664	0.499	0.6181	

## y_cat2014	5.09452	7.90954	0.644	0.5196
## y_cat2015	-0.59078	6.08079	-0.097	0.9226
## y_cat2016	2.86276	7.77556	0.368	0.7128
## y_cat2017	-2.71673	5.58458	-0.486	0.6267
## y_cat2018	0.14602	7.27195	0.020	0.9840
## y_cat2019	1.63610	6.13678	0.267	0.7898
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	1.92856	6.28700	0.307	0.7591
## i_catmanufacture:y_cat2004	1.69236	5.79246	0.292	0.7702
## i_catmining:y_cat2004	-0.30799	6.09262	-0.051	0.9597
## i_catretail:y_cat2004	-1.44209	6.97944	-0.207	0.8363
## i_catservices:y_cat2004	-0.56259	5.88086	-0.096	0.9238
## i_cattransportation:y_cat2004	0.37308	6.39027	0.058	0.9534
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	1.81070	6.62853	0.273	0.7847
## i_catmanufacture:y_cat2005	0.13400	6.35679	0.021	0.9832
## i_catmining:y_cat2005	-1.64026	6.67302	-0.246	0.8059
## i_catretail:y_cat2005	2.40258	7.22556	0.333	0.7395
## i_catservices:y_cat2005	0.44575	6.39485	0.070	0.9444
## i_cattransportation:y_cat2005	0.18476	6.87352	0.027	0.9786
## i_catwholesale:y_cat2005	0.11246	9.54311	0.012	0.9906
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	0.44074	6.92833	0.064	0.9493

## i_catmanufacture:y_cat2006	2.89437	5.73121	0.505	0.6136
## i_catmining:y_cat2006	-2.46876	7.06639	-0.349	0.7268
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	0.16948	5.83755	0.029	0.9768
## i_cattransportation:y_cat2006	-2.02592	6.97768	-0.290	0.7716
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	0.46136	6.14555	0.075	0.9402
## i_catmanufacture:y_cat2007	0.37257	5.80475	0.064	0.9488
## i_catmining:y_cat2007	0.95010	6.10279	0.156	0.8763
## i_catretail:y_cat2007	4.73419	7.16111	0.661	0.5086
## i_catservices:y_cat2007	-1.71994	5.88087	-0.292	0.7700
## i_cattransportation:y_cat2007	0.13522	6.52386	0.021	0.9835
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	13.26134	8.11600	1.634	0.1024
## i_catfinance:y_cat2008	8.44917	7.04407	1.199	0.2305
## i_catmanufacture:y_cat2008	0.36419	6.35663	0.057	0.9543
## i_catmining:y_cat2008	-1.36079	6.69582	-0.203	0.8390
## i_catretail:y_cat2008	3.84923	7.02639	0.548	0.5839
## i_catservices:y_cat2008	0.66576	6.39491	0.104	0.9171
## i_cattransportation:y_cat2008	2.23074	6.70537	0.333	0.7394
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA

## i_catmanufacture:y_cat2009	3.20323	7.34124	0.436	0.6626
## i_catmining:y_cat2009	7.09100	8.98382	0.789	0.4300
## i_catretail:y_cat2009	-5.39377	9.35732	-0.576	0.5644
## i_catservices:y_cat2009	1.57648	7.40179	0.213	0.8314
## i_cattransportation:y_cat2009	4.05502	8.22961	0.493	0.6222
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	3.31979	8.65553	0.384	0.7013
## i_catfinance:y_cat2010	3.35704	7.75208	0.433	0.6650
## i_catmanufacture:y_cat2010	3.57382	7.38799	0.484	0.6286
## i_catmining:y_cat2010	2.09251	7.58795	0.276	0.7827
## i_catretail:y_cat2010	5.96642	8.38936	0.711	0.4770
## i_catservices:y_cat2010	2.35602	7.45702	0.316	0.7521
## i_cattransportation:y_cat2010	3.55657	7.74002	0.460	0.6459
## i_catwholesale:y_cat2010	3.72959	9.41304	0.396	0.6920
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-3.37499	6.86214	-0.492	0.6229
## i_catmanufacture:y_cat2011	-1.18805	6.10007	-0.195	0.8456
## i_catmining:y_cat2011	0.36393	7.09301	0.051	0.9591
## i_catretail:y_cat2011	2.65529	8.12012	0.327	0.7437
## i_catservices:y_cat2011	-3.01651	6.25757	-0.482	0.6298
## i_cattransportation:y_cat2011	-3.43192	6.96920	-0.492	0.6224
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-4.57570	8.37155	-0.547	0.5847
## i_catfinance:y_cat2012	5.26968	5.87852	0.896	0.3701

## i_catmanufacture:y_cat2012	5.77912	5.55589	1.040	0.2984
## i_catmining:y_cat2012	-1.23024	5.94758	-0.207	0.8361
## i_catretail:y_cat2012	5.45875	6.20951	0.879	0.3794
## i_catservices:y_cat2012	4.09875	5.71882	0.717	0.4736
## i_cattransportation:y_cat2012	6.67842	5.96481	1.120	0.2630
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	2.06979	7.55288	0.274	0.7841
## i_catfinance:y_cat2013	0.57251	5.87802	0.097	0.9224
## i_catmanufacture:y_cat2013	0.37086	5.54040	0.067	0.9466
## i_catmining:y_cat2013	-1.45631	6.15636	-0.237	0.8130
## i_catretail:y_cat2013	0.94367	6.43906	0.147	0.8835
## i_catservices:y_cat2013	-2.86452	5.65811	-0.506	0.6127
## i_cattransportation:y_cat2013	-2.46411	5.98905	-0.411	0.6808
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	-2.28684	9.86943	-0.232	0.8168
## i_catfinance:y_cat2014	-2.45215	8.75547	-0.280	0.7794
## i_catmanufacture:y_cat2014	-2.75445	7.87506	-0.350	0.7265
## i_catmining:y_cat2014	4.74945	8.41268	0.565	0.5724
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-5.73072	7.94980	-0.721	0.4711
## i_cattransportation:y_cat2014	1.56209	8.42481	0.185	0.8529
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	4.71249	8.63227	0.546	0.5852
## i_catfinance:y_cat2015	4.76363	7.21429	0.660	0.5091

## i_catmanufacture:y_cat2015	1.47543	6.18367	0.239	0.8114
## i_catmining:y_cat2015	4.10300	7.40974	0.554	0.5798
## i_catretail:y_cat2015	6.51039	6.73162	0.967	0.3336
## i_catservices:y_cat2015	0.32218	6.24195	0.052	0.9588
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	2.79977	8.29729	0.337	0.7358
## i_catfinance:y_cat2016	-1.18473	7.74256	-0.153	0.8784
## i_catmanufacture:y_cat2016	-0.61583	7.55170	-0.082	0.9350
## i_catmining:y_cat2016	-1.43237	7.73421	-0.185	0.8531
## i_catretail:y_cat2016	0.57191	8.10265	0.071	0.9437
## i_catservices:y_cat2016	-1.65452	7.64483	-0.216	0.8287
## i_cattransportation:y_cat2016	-2.52497	7.82325	-0.323	0.7469
## i_catwholesale:y_cat2016	1.37873	8.97863	0.154	0.8780
## i_catConstruction:y_cat2017	7.77626	6.76117	1.150	0.2502
## i_catfinance:y_cat2017	4.30503	5.74758	0.749	0.4539
## i_catmanufacture:y_cat2017	4.82171	5.44602	0.885	0.3760
## i_catmining:y_cat2017	4.57921	5.83492	0.785	0.4326
## i_catretail:y_cat2017	3.02164	5.99655	0.504	0.6144
## i_catservices:y_cat2017	4.94056	5.50720	0.897	0.3697
## i_cattransportation:y_cat2017	4.25704	5.82745	0.731	0.4651
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.46568	8.28908	0.177	0.8597
## i_catfinance:y_cat2018	2.35279	7.49012	0.314	0.7535

```

## i_catmanufacture:y_cat2018      1.62489      7.24904      0.224      0.8227
## i_catmining:y_cat2018           -1.48136      7.49821     -0.198      0.8434
## i_catretail:y_cat2018           5.54676      7.92701      0.700      0.4842
## i_catservices:y_cat2018         1.32434      7.29568      0.182      0.8560
## i_cattransportation:y_cat2018   3.46722      7.54442      0.460      0.6459
## i_catwholesale:y_cat2018        6.09398      8.97322      0.679      0.4971
## i_catConstruction:y_cat2019      NA            NA            NA            NA
## i_catfinance:y_cat2019           0.55990      6.22688      0.090      0.9284
## i_catmanufacture:y_cat2019       0.72365      5.91835      0.122      0.9027
## i_catmining:y_cat2019           -3.63869      6.66937     -0.546      0.5854
## i_catretail:y_cat2019            0.86790      6.85910      0.127      0.8993
## i_catservices:y_cat2019         -1.31734      5.91219     -0.223      0.8237
## i_cattransportation:y_cat2019   -1.02498      6.46472     -0.159      0.8740
## i_catwholesale:y_cat2019         NA            NA            NA            NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.089 on 2682 degrees of freedom
## Multiple R-squared:  0.08128,    Adjusted R-squared:  0.03195
## F-statistic: 1.648 on 144 and 2682 DF,  p-value: 3.559e-06

reg_3 <- lm(CAR22~ `reg_1$fitted.values`+`firm size`+leverage+`Tobin's
q`+`free cash flow`
            + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+cross_borde
r+ i_cat *y_cat , data = data5)

summary(reg_3)

##
## Call:
## lm(formula = CAR22 ~ `reg_1$fitted.values` + `firm size` + leverage
+
## `Tobin's q` + `free cash flow` + preMTR + deal_size + hostile +
## high_tech + diversifying + public_target + private_target +

```

```

##      all_cash_deal + stock_deal + cross_border + i_cat * y_cat,
##      data = data5)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -41.273  -2.228   0.038   2.278  81.818
##
## Coefficients: (23 not defined because of singularities)
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -3.22891     6.12540  -0.527  0.5981
## `reg_1$fitted.values` -0.16881     0.07255  -2.327  0.0200 *
## `firm size`       1.18844     0.63260   1.879  0.0604 .
## leverage         -0.20478     1.17660  -0.174  0.8618
## `Tobin's q`      -0.37779     0.16804  -2.248  0.0246 *
## `free cash flow`  2.05871     1.36997   1.503  0.1330
## preMTR           -1.97606     0.45674  -4.326 1.57e-05 **
## deal_size         1.34167     0.33116   4.051 5.24e-05 **
## hostile          -1.82011     3.97734  -0.458  0.6473
## high_tech         0.18633     0.29846   0.624  0.5325
## diversifying     -0.32925     0.23726  -1.388  0.1653
## public_target    -1.67611     0.33685  -4.976 6.91e-07 **
## private_target   -0.31665     0.24336  -1.301  0.1933
## all_cash_deal    -0.26554     0.33641  -0.789  0.4300
## stock_deal       -0.68921     0.45265  -1.523  0.1280
## cross_border      0.41261     0.25917   1.592  0.1115
## i_catConstruction -5.87588     6.80865  -0.863  0.3882
## i_catfinance     -2.55112     5.92384  -0.431  0.6668
## i_catmanufacture -0.17478     5.54089  -0.032  0.9748

```

## i_catmining	-0.80586	5.79284	-0.139	0.8894
## i_catretail	-1.91016	6.02239	-0.317	0.7511
## i_catservices	-0.43501	5.62037	-0.077	0.9383
## i_cattransportation	-1.75835	5.94133	-0.296	0.7673
## i_catwholesale	-4.30922	7.95504	-0.542	0.5881
## y_cat2004	-0.70729	6.14819	-0.115	0.9084
## y_cat2005	1.77423	6.76093	0.262	0.7930
## y_cat2006	-0.11585	6.03055	-0.019	0.9847
## y_cat2007	2.29928	6.17368	0.372	0.7096
## y_cat2008	-0.27194	6.77602	-0.040	0.9680
## y_cat2009	-1.10105	7.79223	-0.141	0.8876
## y_cat2010	-0.14727	7.79196	-0.019	0.9849
## y_cat2011	4.76106	6.57079	0.725	0.4688
## y_cat2012	-1.29983	6.18569	-0.210	0.8336
## y_cat2013	6.21059	6.06028	1.025	0.3055
## y_cat2014	8.38940	8.51911	0.985	0.3248
## y_cat2015	2.23178	6.54942	0.341	0.7333
## y_cat2016	5.43155	8.37480	0.649	0.5167
## y_cat2017	0.01936	6.01497	0.003	0.9974
## y_cat2018	1.52866	7.83238	0.195	0.8453
## y_cat2019	3.43293	6.60972	0.519	0.6035
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	1.37594	6.77152	0.203	0.8390
## i_catmanufacture:y_cat2004	0.73011	6.23887	0.117	0.9068

## i_catmining:y_cat2004	-1.56777	6.56216	-0.239	0.8112
## i_catretail:y_cat2004	-1.12054	7.51733	-0.149	0.8815
## i_catservices:y_cat2004	-0.96598	6.33409	-0.153	0.8788
## i_cattransportation:y_cat2004	-2.16664	6.88275	-0.315	0.7529
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	-0.38059	7.13937	-0.053	0.9575
## i_catmanufacture:y_cat2005	-2.41398	6.84669	-0.353	0.7244
## i_catmining:y_cat2005	-3.05683	7.18730	-0.425	0.6706
## i_catretail:y_cat2005	1.64392	7.78242	0.211	0.8327
## i_catservices:y_cat2005	-1.59293	6.88769	-0.231	0.8171
## i_cattransportation:y_cat2005	-2.70003	7.40324	-0.365	0.7154
## i_catwholesale:y_cat2005	0.62308	10.27858	0.061	0.9517
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	-0.05654	7.46228	-0.008	0.9940
## i_catmanufacture:y_cat2006	1.63232	6.17290	0.264	0.7915
## i_catmining:y_cat2006	-5.94817	7.61098	-0.782	0.4346
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	0.77752	6.28744	0.124	0.9016
## i_cattransportation:y_cat2006	-5.21111	7.51543	-0.693	0.4881
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-1.65192	6.61918	-0.250	0.8029
## i_catmanufacture:y_cat2007	-1.96291	6.25211	-0.314	0.7536

## i_catmining:y_cat2007	-1.25419	6.57312	-0.191	0.8487
## i_catretail:y_cat2007	2.91297	7.71300	0.378	0.7057
## i_catservices:y_cat2007	-3.40655	6.33409	-0.538	0.5908
## i_cattransportation:y_cat2007	-2.82550	7.02664	-0.402	0.6876
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	21.36719	8.74149	2.444	0.0146 *
## i_catfinance:y_cat2008	7.49268	7.58694	0.988	0.3234
## i_catmanufacture:y_cat2008	-0.55117	6.84652	-0.081	0.9358
## i_catmining:y_cat2008	-2.55126	7.21185	-0.354	0.7235
## i_catretail:y_cat2008	5.19860	7.56790	0.687	0.4922
## i_catservices:y_cat2008	0.67441	6.88775	0.098	0.9220
## i_cattransportation:y_cat2008	1.73728	7.22214	0.241	0.8099
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	3.76866	7.90701	0.477	0.6337
## i_catmining:y_cat2009	4.46287	9.67619	0.461	0.6447
## i_catretail:y_cat2009	10.48034	10.07847	1.040	0.2985
## i_catservices:y_cat2009	1.90909	7.97223	0.239	0.8108
## i_cattransportation:y_cat2009	5.69051	8.86384	0.642	0.5209
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	2.67068	9.32259	0.286	0.7745
## i_catfinance:y_cat2010	2.96633	8.34952	0.355	0.7224
## i_catmanufacture:y_cat2010	2.03931	7.95737	0.256	0.7978

## i_catmining:y_cat2010	-0.60469	8.17274	-0.074	0.9410
## i_catretail:y_cat2010	6.40406	9.03590	0.709	0.4786
## i_catservices:y_cat2010	2.28819	8.03172	0.285	0.7757
## i_cattransportation:y_cat2010	1.91792	8.33653	0.230	0.8181
## i_catwholesale:y_cat2010	5.36848	10.13848	0.530	0.5965
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-9.63771	7.39099	-1.304	0.1924
## i_catmanufacture:y_cat2011	-3.23884	6.57019	-0.493	0.6221
## i_catmining:y_cat2011	0.37396	7.63966	0.049	0.9610
## i_catretail:y_cat2011	1.35230	8.74592	0.155	0.8771
## i_catservices:y_cat2011	-3.61746	6.73983	-0.537	0.5915
## i_cattransportation:y_cat2011	-7.68140	7.50630	-1.023	0.3062
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	-6.67452	9.01672	-0.740	0.4592
## i_catfinance:y_cat2012	4.94573	6.33156	0.781	0.4348
## i_catmanufacture:y_cat2012	4.47711	5.98407	0.748	0.4544
## i_catmining:y_cat2012	-3.07718	6.40594	-0.480	0.6310
## i_catretail:y_cat2012	5.32021	6.68806	0.795	0.4264
## i_catservices:y_cat2012	2.51927	6.15956	0.409	0.6826
## i_cattransportation:y_cat2012	4.67418	6.42450	0.728	0.4669
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	-3.46816	8.13496	-0.426	0.6699
## i_catfinance:y_cat2013	-2.55076	6.33103	-0.403	0.6871
## i_catmanufacture:y_cat2013	-3.23744	5.96739	-0.543	0.5875

## i_catmining:y_cat2013	-6.02165	6.63081	-0.908	0.3639
## i_catretail:y_cat2013	-0.85210	6.93531	-0.123	0.9022
## i_catservices:y_cat2013	-5.21942	6.09417	-0.856	0.3918
## i_cattransportation:y_cat2013	-6.02748	6.45062	-0.934	0.3502
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	-3.13548	10.63004	-0.295	0.7680
## i_catfinance:y_cat2014	-8.84287	9.43024	-0.938	0.3485
## i_catmanufacture:y_cat2014	-5.95344	8.48197	-0.702	0.4828
## i_catmining:y_cat2014	-0.84907	9.06103	-0.094	0.9254
## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-9.66827	8.56247	-1.129	0.2589
## i_cattransportation:y_cat2014	-1.22533	9.07409	-0.135	0.8926
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-2.26213	9.29754	-0.243	0.8078
## i_catfinance:y_cat2015	0.75010	7.77028	0.097	0.9231
## i_catmanufacture:y_cat2015	-2.10169	6.66023	-0.316	0.7524
## i_catmining:y_cat2015	-1.86496	7.98079	-0.234	0.8153
## i_catretail:y_cat2015	6.18710	7.25041	0.853	0.3935
## i_catservices:y_cat2015	-1.18094	6.72300	-0.176	0.8606
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	2.46201	8.93674	0.275	0.7830
## i_catfinance:y_cat2016	-3.07038	8.33927	-0.368	0.7128
## i_catmanufacture:y_cat2016	-3.29851	8.13370	-0.406	0.6851

## i_catmining:y_cat2016	-3.25890	8.33027	-0.391	0.6957
## i_catretail:y_cat2016	1.79153	8.72710	0.205	0.8374
## i_catservices:y_cat2016	-3.66704	8.23400	-0.445	0.6561
## i_cattransportation:y_cat2016	-5.10195	8.42617	-0.605	0.5449
## i_catwholesale:y_cat2016	3.83153	9.67060	0.396	0.6920
## i_catConstruction:y_cat2017	7.24788	7.28224	0.995	0.3197
## i_catfinance:y_cat2017	2.45267	6.19053	0.396	0.6920
## i_catmanufacture:y_cat2017	2.31296	5.86573	0.394	0.6934
## i_catmining:y_cat2017	1.35043	6.28461	0.215	0.8299
## i_catretail:y_cat2017	1.67694	6.45869	0.260	0.7952
## i_catservices:y_cat2017	4.11218	5.93163	0.693	0.4882
## i_cattransportation:y_cat2017	1.27784	6.27656	0.204	0.8387
## i_catwholesale:y_cat2017	NA	NA	NA	NA
## i_catConstruction:y_cat2018	1.43882	8.92791	0.161	0.8720
## i_catfinance:y_cat2018	1.62386	8.06737	0.201	0.8405
## i_catmanufacture:y_cat2018	0.66301	7.80770	0.085	0.9323
## i_catmining:y_cat2018	-2.09627	8.07608	-0.260	0.7952
## i_catretail:y_cat2018	1.76449	8.53793	0.207	0.8363
## i_catservices:y_cat2018	0.72200	7.85794	0.092	0.9268
## i_cattransportation:y_cat2018	2.97444	8.12585	0.366	0.7144
## i_catwholesale:y_cat2018	8.40650	9.66476	0.870	0.3845
## i_catConstruction:y_cat2019	NA	NA	NA	NA
## i_catfinance:y_cat2019	-0.61021	6.70677	-0.091	0.9275
## i_catmanufacture:y_cat2019	-1.56711	6.37446	-0.246	0.8058

```

## i_catmining:y_cat2019      0.90188    7.18336    0.126    0.9001
## i_catretail:y_cat2019     0.90398    7.38772    0.122    0.9026
## i_catservices:y_cat2019  -1.54977    6.36783   -0.243    0.8077
## i_cattransportation:y_cat2019 -2.40594    6.96295   -0.346    0.7297
## i_catwholesale:y_cat2019      NA          NA          NA          NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.482 on 2682 degrees of freedom
## Multiple R-squared:  0.09318,    Adjusted R-squared:  0.04449
## F-statistic: 1.914 on 144 and 2682 DF,  p-value: 1.246e-09

reg_4 <- lm(CAR55~ `reg_1$fitted.values`+`firm size`+leverage+`Tobin's
q`+`free cash flow`
            + preMTR+ deal_size + hostile + high_tech + diversifying +
public_target + private_target + all_cash_deal + stock_deal+ cross_bord
er+i_cat * y_cat , data = data5)

summary(reg_4)

##
## Call:
## lm(formula = CAR55 ~ `reg_1$fitted.values` + `firm size` + leverage
+
##   `Tobin's q` + `free cash flow` + preMTR + deal_size + hostile +
##   high_tech + diversifying + public_target + private_target +
##   all_cash_deal + stock_deal + cross_border + i_cat * y_cat,
##   data = data5)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -54.876  -3.038  -0.100   3.236  89.538
##
## Coefficients: (23 not defined because of singularities)
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      -9.47085     7.60239  -1.246  0.212957
## `reg_1$fitted.values` -0.26845     0.09004  -2.981  0.002895
## **
## `firm size`      1.95794     0.78514   2.494  0.012700
## *
## leverage         0.29801     1.46031   0.204  0.838312

```

## `Tobin's q`	-0.49401	0.20856	-2.369	0.017924
*				
## `free cash flow`	3.97219	1.70031	2.336	0.019557
*				
## preMTR	-5.21179	0.56687	-9.194	< 2e-16

## deal_size	0.94311	0.41101	2.295	0.021833
*				
## hostile	-3.76149	4.93637	-0.762	0.446130
## high_tech	0.17677	0.37042	0.477	0.633240
## diversifying	-0.26623	0.29447	-0.904	0.366028
## public_target	-1.50354	0.41807	-3.596	0.000329

## private_target	-0.24689	0.30204	-0.817	0.413758
## all_cash_deal	-0.28568	0.41752	-0.684	0.493890
## stock_deal	-0.48147	0.56180	-0.857	0.391513
## cross_border	0.28534	0.32166	0.887	0.375115
## i_catConstruction	-8.11507	8.45038	-0.960	0.336981
## i_catfinance	-1.58284	7.35223	-0.215	0.829560
## i_catmanufacture	3.07760	6.87694	0.448	0.654532
## i_catmining	1.82142	7.18964	0.253	0.800025
## i_catretail	0.33157	7.47454	0.044	0.964621
## i_catservices	2.33099	6.97558	0.334	0.738282
## i_cattransportation	0.45823	7.37393	0.062	0.950454
## i_catwholesale	-1.66627	9.87320	-0.169	0.865993
## y_cat2004	-1.66381	7.63067	-0.218	0.827413
## y_cat2005	3.96562	8.39116	0.473	0.636541
## y_cat2006	-1.22007	7.48466	-0.163	0.870523
## y_cat2007	1.40486	7.66231	0.183	0.854540

## y_cat2008	-1.31883	8.40989	-0.157	0.875399
## y_cat2009	-3.93563	9.67113	-0.407	0.684080
## y_cat2010	3.14147	9.67079	0.325	0.745327
## y_cat2011	5.04135	8.15518	0.618	0.536511
## y_cat2012	0.48921	7.67722	0.064	0.949196
## y_cat2013	7.19333	7.52156	0.956	0.338976
## y_cat2014	12.16711	10.57328	1.151	0.249941
## y_cat2015	2.67312	8.12865	0.329	0.742294
## y_cat2016	14.91995	10.39417	1.435	0.151285
## y_cat2017	0.04684	7.46534	0.006	0.994994
## y_cat2018	4.98403	9.72097	0.513	0.608197
## y_cat2019	8.94397	8.20349	1.090	0.275695
## i_catConstruction:y_cat2004	NA	NA	NA	NA
## i_catfinance:y_cat2004	2.28408	8.40431	0.272	0.785816
## i_catmanufacture:y_cat2004	0.77940	7.74322	0.101	0.919832
## i_catmining:y_cat2004	-3.44803	8.14446	-0.423	0.672068
## i_catretail:y_cat2004	1.20652	9.32995	0.129	0.897116
## i_catservices:y_cat2004	-0.87331	7.86139	-0.111	0.911554
## i_cattransportation:y_cat2004	-1.48087	8.54235	-0.173	0.862384
## i_catwholesale:y_cat2004	NA	NA	NA	NA
## i_catConstruction:y_cat2005	NA	NA	NA	NA
## i_catfinance:y_cat2005	-1.67954	8.86085	-0.190	0.849680
## i_catmanufacture:y_cat2005	-4.83435	8.49760	-0.569	0.569467
## i_catmining:y_cat2005	-4.92590	8.92033	-0.552	0.580850

## i_catretail:y_cat2005	0.82777	9.65895	0.086	0.931712
## i_catservices:y_cat2005	-3.81237	8.54848	-0.446	0.655654
## i_cattransportation:y_cat2005	-5.95374	9.18835	-0.648	0.517062
## i_catwholesale:y_cat2005	-2.96787	12.75700	-0.233	0.816054
## i_catConstruction:y_cat2006	NA	NA	NA	NA
## i_catfinance:y_cat2006	5.07391	9.26163	0.548	0.583846
## i_catmanufacture:y_cat2006	2.78299	7.66134	0.363	0.716446
## i_catmining:y_cat2006	-13.12916	9.44618	-1.390	0.164677
## i_catretail:y_cat2006	NA	NA	NA	NA
## i_catservices:y_cat2006	2.54104	7.80350	0.326	0.744731
## i_cattransportation:y_cat2006	-5.19678	9.32759	-0.557	0.577478
## i_catwholesale:y_cat2006	NA	NA	NA	NA
## i_catConstruction:y_cat2007	NA	NA	NA	NA
## i_catfinance:y_cat2007	-0.49611	8.21522	-0.060	0.951850
## i_catmanufacture:y_cat2007	-1.90724	7.75965	-0.246	0.805864
## i_catmining:y_cat2007	0.24684	8.15807	0.030	0.975865
## i_catretail:y_cat2007	4.28891	9.57280	0.448	0.654167
## i_catservices:y_cat2007	-1.73870	7.86140	-0.221	0.824977
## i_cattransportation:y_cat2007	-3.17405	8.72093	-0.364	0.715918
## i_catwholesale:y_cat2007	NA	NA	NA	NA
## i_catConstruction:y_cat2008	32.07564	10.84928	2.956	0.003139
**				
## i_catfinance:y_cat2008	13.85431	9.41634	1.471	0.141326
## i_catmanufacture:y_cat2008	-0.42977	8.49739	-0.051	0.959667
## i_catmining:y_cat2008	-1.11763	8.95081	-0.125	0.900641

## i_catretail:y_cat2008	12.85394	9.39271	1.369	0.171270
## i_catservices:y_cat2008	3.03260	8.54856	0.355	0.722805
## i_cattransportation:y_cat2008	2.31136	8.96358	0.258	0.796534
## i_catwholesale:y_cat2008	NA	NA	NA	NA
## i_catConstruction:y_cat2009	NA	NA	NA	NA
## i_catfinance:y_cat2009	NA	NA	NA	NA
## i_catmanufacture:y_cat2009	5.98453	9.81359	0.610	0.542032
## i_catmining:y_cat2009	6.83600	12.00936	0.569	0.569252
## i_catretail:y_cat2009	33.02282	12.50864	2.640	0.008339
**				
## i_catservices:y_cat2009	6.56655	9.89454	0.664	0.506969
## i_cattransportation:y_cat2009	11.64416	11.00114	1.058	0.289945
## i_catwholesale:y_cat2009	NA	NA	NA	NA
## i_catConstruction:y_cat2010	6.82584	11.57051	0.590	0.555284
## i_catfinance:y_cat2010	3.42054	10.36280	0.330	0.741366
## i_catmanufacture:y_cat2010	-0.85919	9.87609	-0.087	0.930680
## i_catmining:y_cat2010	-1.54659	10.14339	-0.152	0.878826
## i_catretail:y_cat2010	6.19256	11.21469	0.552	0.580869
## i_catservices:y_cat2010	-1.18985	9.96836	-0.119	0.904997
## i_cattransportation:y_cat2010	-1.46588	10.34668	-0.142	0.887346
## i_catwholesale:y_cat2010	3.75892	12.58312	0.299	0.765171
## i_catConstruction:y_cat2011	NA	NA	NA	NA
## i_catfinance:y_cat2011	-6.88661	9.17315	-0.751	0.452877
## i_catmanufacture:y_cat2011	-4.48565	8.15443	-0.550	0.582305
## i_catmining:y_cat2011	-1.44496	9.48177	-0.152	0.878888

## i_catretail:y_cat2011	8.14915	10.85478	0.751	0.452873
## i_catservices:y_cat2011	-1.49829	8.36497	-0.179	0.857861
## i_cattransportation:y_cat2011	-11.42746	9.31626	-1.227	0.220075
## i_catwholesale:y_cat2011	NA	NA	NA	NA
## i_catConstruction:y_cat2012	6.81099	11.19088	0.609	0.542828
## i_catfinance:y_cat2012	5.88774	7.85826	0.749	0.453777
## i_catmanufacture:y_cat2012	3.37068	7.42698	0.454	0.649978
## i_catmining:y_cat2012	-5.19675	7.95057	-0.654	0.513405
## i_catretail:y_cat2012	6.02078	8.30072	0.725	0.468311
## i_catservices:y_cat2012	1.81266	7.64478	0.237	0.812589
## i_cattransportation:y_cat2012	4.81774	7.97361	0.604	0.545754
## i_catwholesale:y_cat2012	NA	NA	NA	NA
## i_catConstruction:y_cat2013	0.28400	10.09650	0.028	0.977562
## i_catfinance:y_cat2013	-0.50408	7.85760	-0.064	0.948854
## i_catmanufacture:y_cat2013	-3.60025	7.40627	-0.486	0.626930
## i_catmining:y_cat2013	-8.59896	8.22967	-1.045	0.296176
## i_catretail:y_cat2013	1.80103	8.60758	0.209	0.834278
## i_catservices:y_cat2013	-6.47137	7.56363	-0.856	0.392301
## i_cattransportation:y_cat2013	-4.08691	8.00602	-0.510	0.609758
## i_catwholesale:y_cat2013	NA	NA	NA	NA
## i_catConstruction:y_cat2014	-4.76510	13.19321	-0.361	0.717995
## i_catfinance:y_cat2014	-10.69460	11.70411	-0.914	0.360932
## i_catmanufacture:y_cat2014	-11.17636	10.52718	-1.062	0.288482
## i_catmining:y_cat2014	1.48891	11.24587	0.132	0.894681

## i_catretail:y_cat2014	NA	NA	NA	NA
## i_catservices:y_cat2014	-11.77785	10.62710	-1.108	0.267839
## i_cattransportation:y_cat2014	-2.93894	11.26208	-0.261	0.794144
## i_catwholesale:y_cat2014	NA	NA	NA	NA
## i_catConstruction:y_cat2015	-5.14079	11.53941	-0.445	0.655996
## i_catfinance:y_cat2015	3.17214	9.64389	0.329	0.742236
## i_catmanufacture:y_cat2015	-3.40877	8.26618	-0.412	0.680097
## i_catmining:y_cat2015	14.70232	9.90516	1.484	0.137845
## i_catretail:y_cat2015	8.26626	8.99866	0.919	0.358382
## i_catservices:y_cat2015	-1.81742	8.34408	-0.218	0.827594
## i_cattransportation:y_cat2015	NA	NA	NA	NA
## i_catwholesale:y_cat2015	NA	NA	NA	NA
## i_catConstruction:y_cat2016	1.54908	11.09161	0.140	0.888937
## i_catfinance:y_cat2016	-9.77608	10.35007	-0.945	0.344978
## i_catmanufacture:y_cat2016	-11.84109	10.09493	-1.173	0.240910
## i_catmining:y_cat2016	-11.81952	10.33890	-1.143	0.253054
## i_catretail:y_cat2016	-7.33049	10.83142	-0.677	0.498604
## i_catservices:y_cat2016	-12.54966	10.21942	-1.228	0.219547
## i_cattransportation:y_cat2016	-15.09409	10.45793	-1.443	0.149049
## i_catwholesale:y_cat2016	-3.74181	12.00242	-0.312	0.755251
## i_catConstruction:y_cat2017	14.98942	9.03817	1.658	0.097342
## i_catfinance:y_cat2017	4.86835	7.68322	0.634	0.526373
## i_catmanufacture:y_cat2017	3.21688	7.28010	0.442	0.658617
## i_catmining:y_cat2017	2.88319	7.79998	0.370	0.711679


```

## i_catretail:y_cat2017      5.08103      8.01604      0.634 0.526228
## i_catservices:y_cat2017    5.59886      7.36189      0.761 0.447011
## i_cattransportation:y_cat2017 2.98712      7.79000      0.383 0.701412
## i_catwholesale:y_cat2017           NA           NA           NA           NA
## i_catConstruction:y_cat2018    5.61447     11.08065      0.507 0.612413
## i_catfinance:y_cat2018        0.29204     10.01262      0.029 0.976733
## i_catmanufacture:y_cat2018   -2.19649      9.69034     -0.227 0.820699
## i_catmining:y_cat2018        -6.79135     10.02342     -0.678 0.498117
## i_catretail:y_cat2018         2.97029     10.59664      0.280 0.779265
## i_catservices:y_cat2018       -0.97957      9.75268     -0.100 0.920001
## i_cattransportation:y_cat2018  1.07080     10.08520      0.106 0.915451
## i_catwholesale:y_cat2018       7.99006     11.99518      0.666 0.505401
## i_catConstruction:y_cat2019           NA           NA           NA           NA
## i_catfinance:y_cat2019        -3.89231      8.32394     -0.468 0.640106
## i_catmanufacture:y_cat2019   -6.83718      7.91150     -0.864 0.387551
## i_catmining:y_cat2019        -7.35556      8.91545     -0.825 0.409425
## i_catretail:y_cat2019         0.34795      9.16908      0.038 0.969732
## i_catservices:y_cat2019       -5.19001      7.90327     -0.657 0.511435
## i_cattransportation:y_cat2019  -5.89047      8.64189     -0.682 0.495539
## i_catwholesale:y_cat2019           NA           NA           NA           NA

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.803 on 2682 degrees of freedom
## Multiple R-squared:  0.1124, Adjusted R-squared:  0.06474
## F-statistic: 2.359 on 144 and 2682 DF,  p-value: < 2.2e-16

```

```

iv_mode2<-ivreg(CAR11~`firm size`+leverage+`Tobin's q`+`free cash flow`
+ preMTR+ deal_size + hostile + high_tech + diversifyin
g + public_target + private_target + all_cash_deal + stock_deal+ cross_
border+i_cat *y_cat+`Prev ESG Score.x`|`firm size`+leverage+`Tobin's q`
+`free cash flow`
+ preMTR+ deal_size + hostile + high_tech + diversifyin
g + public_target + private_target + all_cash_deal + stock_deal+cross_b
order+ i_cat *y_cat + `blue state (dummy) old` + `religion rank (2)`, d
ata = data1)

```

```
summary(iv_mode2, diagnostics = TRUE)
```

```

##
## Call:
## ivreg(formula = CAR11 ~ `firm size` + leverage + `Tobin's q` +
## `free cash flow` + preMTR + deal_size + hostile + high_tech +
## diversifying + public_target + private_target + all_cash_deal +
## stock_deal + cross_border + i_cat * y_cat + `Prev ESG Score.x` |
## `firm size` + leverage + `Tobin's q` + `free cash flow` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal
+
## cross_border + i_cat * y_cat + `blue state (dummy) old` +
## `religion rank (2)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -49.85891  -2.42999  -0.01381   2.44583  85.96584
##
## Coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -2.29197     5.92348  -0.387   0.6988
## `firm size`      0.97029     0.55530   1.747   0.0807 .
## leverage       -0.34216     1.12265  -0.305   0.7606
## `Tobin's q`    -0.34940     0.14977  -2.333   0.0197 *
## `free cash flow`  1.40053     1.30744   1.071   0.2842
## preMTR         -0.66775     0.44904  -1.487   0.1371
## deal_size      1.77266     0.36545   4.851 1.30e-06 **
## hostile        -5.78300     4.10832  -1.408   0.1594

```

## high_tech	0.49377	0.34438	1.434	0.1518
## diversifying	-0.30634	0.23924	-1.280	0.2005
## public_target	-1.66545	0.32791	-5.079	4.05e-07 *
**				
## private_target	-0.23660	0.23877	-0.991	0.3218
## all_cash_deal	-0.29945	0.34847	-0.859	0.3902
## stock_deal	-1.00489	0.47311	-2.124	0.0338 *
## cross_border	0.67736	0.26456	2.560	0.0105 *
## i_catConstruction	-5.44694	6.71435	-0.811	0.4173
## i_catfinance	-2.55418	5.85006	-0.437	0.6624
## i_catmanufacture	-1.22052	5.47601	-0.223	0.8236
## i_catmining	-1.49480	5.72023	-0.261	0.7939
## i_catretail	-1.35229	5.94973	-0.227	0.8202
## i_catservices	-0.34253	5.55098	-0.062	0.9508
## i_cattransportation	-2.24612	5.85746	-0.383	0.7014
## i_catwholesale	-2.11733	7.81886	-0.271	0.7866
## y_cat2004	-1.38714	6.07192	-0.228	0.8193
## y_cat2005	-0.04413	6.67137	-0.007	0.9947
## y_cat2006	-0.89120	5.95405	-0.150	0.8810
## y_cat2007	0.32895	6.08804	0.054	0.9569
## y_cat2008	-0.68166	6.67996	-0.102	0.9187
## y_cat2009	-0.14780	7.69745	-0.019	0.9847
## y_cat2010	-1.80656	7.69947	-0.235	0.8145
## y_cat2011	2.92214	6.43199	0.454	0.6496
## y_cat2012	-2.52444	6.03300	-0.418	0.6757

## y_cat2013	3.18241	5.93931	0.536	0.5921
## y_cat2014	6.24329	8.28494	0.754	0.4512
## y_cat2015	-0.25621	6.41206	-0.040	0.9681
## y_cat2016	3.66670	8.14164	0.450	0.6525
## y_cat2017	-2.36607	5.88339	-0.402	0.6876
## y_cat2018	0.60980	7.73043	0.079	0.9371
## y_cat2019	2.27329	6.41050	0.355	0.7229
## `Prev ESG Score.x`	-0.13946	0.06389	-2.183	0.0291 *
## i_catfinance:y_cat2004	2.07490	6.68998	0.310	0.7565
## i_catmanufacture:y_cat2004	1.73933	6.15264	0.283	0.7774
## i_catmining:y_cat2004	-0.33029	6.46493	-0.051	0.9593
## i_catretail:y_cat2004	-1.61808	7.36765	-0.220	0.8262
## i_catservices:y_cat2004	-0.53120	6.25426	-0.085	0.9323
## i_cattransportation:y_cat2004	0.34176	6.79277	0.050	0.9599
## i_catfinance:y_cat2005	1.74794	7.05083	0.248	0.8042
## i_catmanufacture:y_cat2005	-0.01472	6.75394	-0.002	0.9983
## i_catmining:y_cat2005	-1.90792	7.08030	-0.269	0.7876
## i_catretail:y_cat2005	1.86404	7.64500	0.244	0.8074
## i_catservices:y_cat2005	0.26990	6.80735	0.040	0.9684
## i_cattransportation:y_cat2005	0.01602	7.31213	0.002	0.9983
## i_catwholesale:y_cat2005	0.17848	10.15864	0.018	0.9860
## i_catfinance:y_cat2006	0.45226	7.37101	0.061	0.9511
## i_catmanufacture:y_cat2006	3.08522	6.08929	0.507	0.6124
## i_catmining:y_cat2006	-2.72162	7.44324	-0.366	0.7147

## i_catservices:y_cat2006	-0.02652	6.21468	-0.004	0.9966
## i_cattransportation:y_cat2006	-2.27950	7.41341	-0.307	0.7585
## i_catfinance:y_cat2007	0.52321	6.53936	0.080	0.9362
## i_catmanufacture:y_cat2007	0.45780	6.16098	0.074	0.9408
## i_catmining:y_cat2007	0.98859	6.48468	0.152	0.8788
## i_catretail:y_cat2007	4.54091	7.61934	0.596	0.5512
## i_catservices:y_cat2007	-1.84906	6.25669	-0.296	0.7676
## i_cattransportation:y_cat2007	-0.44115	6.93685	-0.064	0.9493
## i_catConstruction:y_cat2008	13.18716	8.62059	1.530	0.1262
## i_catfinance:y_cat2008	8.91018	7.50390	1.187	0.2352
## i_catmanufacture:y_cat2008	0.51199	6.74657	0.076	0.9395
## i_catmining:y_cat2008	-1.50356	7.08775	-0.212	0.8320
## i_catretail:y_cat2008	3.99594	7.48085	0.534	0.5933
## i_catservices:y_cat2008	0.66466	6.80549	0.098	0.9222
## i_cattransportation:y_cat2008	2.15117	7.13620	0.301	0.7631
## i_catmanufacture:y_cat2009	3.30745	7.81162	0.423	0.6720
## i_catmining:y_cat2009	6.85335	9.56370	0.717	0.4737
## i_catretail:y_cat2009	-6.54789	9.81960	-0.667	0.5049
## i_catservices:y_cat2009	1.43901	7.87987	0.183	0.8551
## i_cattransportation:y_cat2009	4.49210	8.71153	0.516	0.6061
## i_catConstruction:y_cat2010	3.78977	9.20975	0.411	0.6807
## i_catfinance:y_cat2010	3.73766	8.19483	0.456	0.6484
## i_catmanufacture:y_cat2010	4.14854	7.83652	0.529	0.5966
## i_catmining:y_cat2010	2.48414	8.07547	0.308	0.7584

## i_catretail:y_cat2010	6.63741	8.87934	0.748	0.4548
## i_catservices:y_cat2010	2.67033	7.91095	0.338	0.7357
## i_cattransportation:y_cat2010	4.00946	8.20882	0.488	0.6253
## i_catwholesale:y_cat2010	4.30789	9.94972	0.433	0.6651
## i_catfinance:y_cat2011	-3.30494	7.02990	-0.470	0.6383
## i_catmanufacture:y_cat2011	-1.26155	6.45787	-0.195	0.8451
## i_catmining:y_cat2011	0.66805	7.55059	0.088	0.9295
## i_catretail:y_cat2011	2.90295	8.64628	0.336	0.7371
## i_catservices:y_cat2011	-3.17628	6.65425	-0.477	0.6332
## i_cattransportation:y_cat2011	-3.75846	7.39239	-0.508	0.6112
## i_catConstruction:y_cat2012	-5.03131	8.90565	-0.565	0.5721
## i_catfinance:y_cat2012	4.98625	6.23775	0.799	0.4241
## i_catmanufacture:y_cat2012	5.77430	5.89597	0.979	0.3275
## i_catmining:y_cat2012	-1.39799	6.31577	-0.221	0.8248
## i_catretail:y_cat2012	5.27047	6.60217	0.798	0.4248
## i_catservices:y_cat2012	3.66345	6.06714	0.604	0.5460
## i_cattransportation:y_cat2012	6.48318	6.33884	1.023	0.3065
## i_catConstruction:y_cat2013	1.79071	8.01410	0.223	0.8232
## i_catfinance:y_cat2013	0.65181	6.25258	0.104	0.9170
## i_catmanufacture:y_cat2013	0.45806	5.88820	0.078	0.9380
## i_catmining:y_cat2013	-1.60093	6.52155	-0.245	0.8061
## i_catretail:y_cat2013	0.81900	6.85462	0.119	0.9049
## i_catservices:y_cat2013	-3.26017	6.01902	-0.542	0.5881
## i_cattransportation:y_cat2013	-2.55581	6.37545	-0.401	0.6885

## i_catConstruction:y_cat2014	-3.17451	10.43656	-0.304	0.7610
## i_catfinance:y_cat2014	-3.42100	9.22897	-0.371	0.7109
## i_catmanufacture:y_cat2014	-3.55909	8.27793	-0.430	0.6673
## i_catmining:y_cat2014	4.07523	8.92824	0.456	0.6481
## i_catservices:y_cat2014	-6.74536	8.37966	-0.805	0.4209
## i_cattransportation:y_cat2014	0.95725	8.95123	0.107	0.9148
## i_catConstruction:y_cat2015	4.60499	9.16631	0.502	0.6154
## i_catfinance:y_cat2015	4.81868	7.66136	0.629	0.5294
## i_catmanufacture:y_cat2015	1.28147	6.53120	0.196	0.8445
## i_catmining:y_cat2015	4.93216	7.84768	0.628	0.5297
## i_catretail:y_cat2015	6.43216	7.15971	0.898	0.3691
## i_catservices:y_cat2015	0.27456	6.63280	0.041	0.9670
## i_catConstruction:y_cat2016	2.72358	8.82840	0.309	0.7577
## i_catfinance:y_cat2016	-1.50421	8.17515	-0.184	0.8540
## i_catmanufacture:y_cat2016	-0.93119	7.95764	-0.117	0.9069
## i_catmining:y_cat2016	-1.52373	8.15777	-0.187	0.8518
## i_catretail:y_cat2016	-0.05695	8.55286	-0.007	0.9947
## i_catservices:y_cat2016	-2.31932	8.06785	-0.287	0.7738
## i_cattransportation:y_cat2016	-3.21389	8.27735	-0.388	0.6978
## i_catwholesale:y_cat2016	1.14208	9.55544	0.120	0.9049
## i_catConstruction:y_cat2017	7.85738	7.19588	1.092	0.2750
## i_catfinance:y_cat2017	4.30419	6.10997	0.704	0.4812
## i_catmanufacture:y_cat2017	5.04963	5.78574	0.873	0.3829
## i_catmining:y_cat2017	4.58796	6.20556	0.739	0.4598

```

## i_catretail:y_cat2017      2.88833    6.37298    0.453    0.6504
## i_catservices:y_cat2017    4.88720    5.86040    0.834    0.4044
## i_cattransportation:y_cat2017 3.37588    6.19156    0.545    0.5856
## i_catConstruction:y_cat2018  1.32573    8.82492    0.150    0.8806
## i_catfinance:y_cat2018     2.40747    7.96986    0.302    0.7626
## i_catmanufacture:y_cat2018  1.61978    7.71383    0.210    0.8337
## i_catmining:y_cat2018     -1.45605    7.97777   -0.183    0.8552
## i_catretail:y_cat2018     5.43481    8.42968    0.645    0.5192
## i_catservices:y_cat2018    1.22722    7.76434    0.158    0.8744
## i_cattransportation:y_cat2018 3.48280    8.01946    0.434    0.6641
## i_catwholesale:y_cat2018    5.48233    9.52066    0.576    0.5648
## i_catfinance:y_cat2019     0.35301    6.59793    0.054    0.9573
## i_catmanufacture:y_cat2019  0.70399    6.26478    0.112    0.9105
## i_catmining:y_cat2019     -4.19588    7.10315   -0.591    0.5548
## i_catretail:y_cat2019     0.71729    7.28423    0.098    0.9216
## i_catservices:y_cat2019    -1.66621    6.27732   -0.265    0.7907
## i_cattransportation:y_cat2019 -1.57789    6.74468   -0.234    0.8150

##
## Diagnostic tests:
##              df1  df2  statistic  p-value
## Weak instruments      2 2741    17.159 3.93e-08 ***
## Wu-Hausman           1 2741     5.139 0.0235 *
## Sargan                1  NA     0.181 0.6702
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5.419 on 2742 degrees of freedom
## Multiple R-Squared:  -0.05326,    Adjusted R-squared:  -0.1086
## Wald test: 1.542 on 144 and 2742 DF,  p-value: 5.576e-05

```



```

iv_mode3<-ivreg(CAR22~`firm size`+leverage+`Tobin's q`+`free cash flow`
+ preMTR+ deal_size + hostile + high_tech + diversifyin
g + public_target + private_target + all_cash_deal + stock_deal+cross_b
order+ i_cat * y_cat+`Prev ESG Score.x`|`firm size`+leverage+`Tobin's q
`+`free cash flow`
+ preMTR+ deal_size + hostile + high_tech + diversifyin
g + public_target + private_target + all_cash_deal + stock_deal+cross_b
order+ i_cat * y_cat + `blue state (dummy) old` + `religion rank (2)`,
data = data1)

```

```
summary(iv_mode3, diagnostics = TRUE)
```

```

##
## Call:
## ivreg(formula = CAR22 ~ `firm size` + leverage + `Tobin's q` +
##   `free cash flow` + preMTR + deal_size + hostile + high_tech +
##   diversifying + public_target + private_target + all_cash_deal +
##   stock_deal + cross_border + i_cat * y_cat + `Prev ESG Score.x` |
##
##   `firm size` + leverage + `Tobin's q` + `free cash flow` +
##   preMTR + deal_size + hostile + high_tech + diversifying +
##   public_target + private_target + all_cash_deal + stock_deal
##
##   cross_border + i_cat * y_cat + `blue state (dummy) old` +
##   `religion rank (2)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -43.82059  -3.03308   0.06552   2.94230  82.45334
##
## Coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -4.34667     6.61943  -0.657  0.51146
## `firm size`      1.42545     0.62054   2.297  0.02169
## *
## leverage       -0.23041     1.25455  -0.184  0.85430
##
## `Tobin's q`    -0.51082     0.16737  -3.052  0.00229
## **
## `free cash flow`
##              3.55550     1.46106   2.434  0.01502
## *
## preMTR         -2.02938     0.50180  -4.044 5.39e-05
## ***
## deal_size      1.89706     0.40839   4.645 3.56e-06
## ***

```

## hostile	-4.81170	4.59101	-1.048	0.29470
## high_tech	0.78579	0.38484	2.042	0.04126
* ## diversifying	-0.10677	0.26734	-0.399	0.68965
## public_target	-1.85336	0.36643	-5.058	4.52e-07
*** ## private_target	-0.30320	0.26683	-1.136	0.25593
## all_cash_deal	-0.61167	0.38941	-1.571	0.11635
## stock_deal	-1.03396	0.52870	-1.956	0.05061
. ## cross_border	0.78935	0.29564	2.670	0.00763
** ## i_catConstruction	-6.43849	7.50322	-0.858	0.39091
## i_catfinance	-3.04749	6.53738	-0.466	0.64114
## i_catmanufacture	-0.58468	6.11938	-0.096	0.92389
## i_catmining	-1.01834	6.39230	-0.159	0.87344
## i_catretail	-1.97998	6.64877	-0.298	0.76588
## i_catservices	-0.71754	6.20317	-0.116	0.90792
## i_cattransportation	-2.09610	6.54565	-0.320	0.74882
## i_catwholesale	-5.09672	8.73750	-0.583	0.55973
## y_cat2004	-0.58661	6.78531	-0.086	0.93111
## y_cat2005	1.90488	7.45519	0.256	0.79835
## y_cat2006	0.05327	6.65359	0.008	0.99361
## y_cat2007	2.54949	6.80332	0.375	0.70788
## y_cat2008	-0.03950	7.46479	-0.005	0.99578
## y_cat2009	-0.49391	8.60183	-0.057	0.95422
## y_cat2010	-0.21144	8.60409	-0.025	0.98040
## y_cat2011	5.30846	7.18769	0.739	0.46024

## y_cat2012	-0.53953	6.74182	-0.080	0.93622
## y_cat2013	6.86990	6.63712	1.035	0.30073
## y_cat2014	9.80166	9.25834	1.059	0.28984
## y_cat2015	2.84374	7.16542	0.397	0.69149
## y_cat2016	6.21763	9.09821	0.683	0.49442
## y_cat2017	0.59455	6.57463	0.090	0.92795
## y_cat2018	2.16785	8.63868	0.251	0.80187
## y_cat2019	4.30309	7.16368	0.601	0.54810
## `Prev ESG Score.x` **	-0.19224	0.07140	-2.692	0.00714
## i_catfinance:y_cat2004	1.38648	7.47599	0.185	0.85288
## i_catmanufacture:y_cat2004	0.55081	6.87552	0.080	0.93615
## i_catmining:y_cat2004	-1.61001	7.22450	-0.223	0.82367
## i_catretail:y_cat2004	-1.32879	8.23327	-0.161	0.87180
## i_catservices:y_cat2004	-1.06425	6.98908	-0.152	0.87898
## i_cattransportation:y_cat2004	-2.42044	7.59086	-0.319	0.74986
## i_catfinance:y_cat2005	-0.39939	7.87923	-0.051	0.95958
## i_catmanufacture:y_cat2005	-2.64977	7.54747	-0.351	0.72555
## i_catmining:y_cat2005	-3.23422	7.91216	-0.409	0.68274
## i_catretail:y_cat2005	1.10355	8.54322	0.129	0.89723
## i_catservices:y_cat2005	-1.69147	7.60714	-0.222	0.82406
## i_cattransportation:y_cat2005	-2.82836	8.17123	-0.346	0.72927
## i_catwholesale:y_cat2005	1.07266	11.35218	0.094	0.92473
## i_catfinance:y_cat2006	-0.20201	8.23703	-0.025	0.98044
## i_catmanufacture:y_cat2006	1.56527	6.80472	0.230	0.81809

## i_catmining:y_cat2006	-6.36695	8.31775	-0.765	0.44406
## i_catservices:y_cat2006	0.36889	6.94484	0.053	0.95764
## i_cattransportation:y_cat2006	-5.78044	8.28442	-0.698	0.48539
## i_catfinance:y_cat2007	-1.72021	7.30767	-0.235	0.81392
## i_catmanufacture:y_cat2007	-2.18845	6.88483	-0.318	0.75061
## i_catmining:y_cat2007	-1.41292	7.24657	-0.195	0.84542
## i_catretail:y_cat2007	2.67133	8.51454	0.314	0.75374
## i_catservices:y_cat2007	-3.74067	6.99179	-0.535	0.59269
## i_cattransportation:y_cat2007	-3.84628	7.75186	-0.496	0.61981
## i_catConstruction:y_cat2008	21.31479	9.63342	2.213	0.02701
* ## i_catfinance:y_cat2008	7.96730	8.38553	0.950	0.34213
## i_catmanufacture:y_cat2008	-0.58244	7.53922	-0.077	0.93843
## i_catmining:y_cat2008	-2.77739	7.92049	-0.351	0.72587
## i_catretail:y_cat2008	5.24507	8.35977	0.627	0.53044
## i_catservices:y_cat2008	0.60335	7.60507	0.079	0.93677
## i_cattransportation:y_cat2008	1.45506	7.97463	0.182	0.85523
## i_catmanufacture:y_cat2009	3.40305	8.72941	0.390	0.69669
## i_catmining:y_cat2009	3.77704	10.68734	0.353	0.72381
## i_catretail:y_cat2009	8.46312	10.97330	0.771	0.44063
## i_catservices:y_cat2009	1.43629	8.80568	0.163	0.87044
## i_cattransportation:y_cat2009	5.81941	9.73504	0.598	0.55004
## i_catConstruction:y_cat2010	3.11361	10.29180	0.303	0.76227
## i_catfinance:y_cat2010	3.18518	9.15765	0.348	0.72800
## i_catmanufacture:y_cat2010	2.40290	8.75723	0.274	0.78381

## i_catmining:y_cat2010	-0.26137	9.02426	-0.029	0.97690
## i_catretail:y_cat2010	7.07360	9.92257	0.713	0.47598
## i_catservices:y_cat2010	2.49170	8.84041	0.282	0.77808
## i_cattransportation:y_cat2010	2.22137	9.17328	0.242	0.80868
## i_catwholesale:y_cat2010	6.02731	11.11872	0.542	0.58780
## i_catfinance:y_cat2011	-11.09645	7.85584	-1.413	0.15791
## i_catmanufacture:y_cat2011	-3.60916	7.21660	-0.500	0.61703
## i_catmining:y_cat2011	0.74936	8.43771	0.089	0.92924
## i_catretail:y_cat2011	1.46280	9.66214	0.151	0.87967
## i_catservices:y_cat2011	-3.98662	7.43606	-0.536	0.59192
## i_cattransportation:y_cat2011	-8.25055	8.26093	-0.999	0.31801
## i_catConstruction:y_cat2012	-7.46145	9.95197	-0.750	0.45347
## i_catfinance:y_cat2012	4.69276	6.97062	0.673	0.50086
## i_catmanufacture:y_cat2012	4.13140	6.58869	0.627	0.53068
## i_catmining:y_cat2012	-3.51187	7.05782	-0.498	0.61882
## i_catretail:y_cat2012	4.84137	7.37786	0.656	0.51175
## i_catservices:y_cat2012	1.79889	6.77997	0.265	0.79078
## i_cattransportation:y_cat2012	4.16727	7.08359	0.588	0.55638
## i_catConstruction:y_cat2013	-4.04642	8.95568	-0.452	0.65143
## i_catfinance:y_cat2013	-2.61982	6.98720	-0.375	0.70773
## i_catmanufacture:y_cat2013	-3.50448	6.58000	-0.533	0.59436
## i_catmining:y_cat2013	-6.10941	7.28777	-0.838	0.40193
## i_catretail:y_cat2013	-1.32691	7.65997	-0.173	0.86249
## i_catservices:y_cat2013	-5.92756	6.72620	-0.881	0.37825

## i_cattransportation:y_cat2013	-6.44770	7.12450	-0.905	0.36554
## i_catConstruction:y_cat2014	-4.15023	11.66276	-0.356	0.72198
## i_catfinance:y_cat2014	-9.90502	10.31329	-0.960	0.33693
## i_catmanufacture:y_cat2014	-7.04459	9.25051	-0.762	0.44640
## i_catmining:y_cat2014	-1.70448	9.97722	-0.171	0.86436
## i_catservices:y_cat2014	-10.90472	9.36418	-1.165	0.24432
## i_cattransportation:y_cat2014	-2.07168	10.00291	-0.207	0.83594
## i_catConstruction:y_cat2015	-2.51144	10.24326	-0.245	0.80634
## i_catfinance:y_cat2015	0.69132	8.56149	0.081	0.93565
## i_catmanufacture:y_cat2015	-2.74682	7.29855	-0.376	0.70669
## i_catmining:y_cat2015	-0.87241	8.76971	-0.099	0.92076
## i_catretail:y_cat2015	5.72678	8.00091	0.716	0.47420
## i_catservices:y_cat2015	-1.42149	7.41209	-0.192	0.84793
## i_catConstruction:y_cat2016	2.57144	9.86564	0.261	0.79438
## i_catfinance:y_cat2016	-3.36317	9.13565	-0.368	0.71280
## i_catmanufacture:y_cat2016	-3.63627	8.89258	-0.409	0.68264
## i_catmining:y_cat2016	-3.08762	9.11623	-0.339	0.73487
## i_catretail:y_cat2016	1.09252	9.55774	0.114	0.90900
## i_catservices:y_cat2016	-4.27252	9.01574	-0.474	0.63561
## i_cattransportation:y_cat2016	-5.83212	9.24985	-0.631	0.52841
## i_catwholesale:y_cat2016	3.84273	10.67811	0.360	0.71897
## i_catConstruction:y_cat2017	7.18776	8.04133	0.894	0.37148
## i_catfinance:y_cat2017	2.39731	6.82783	0.351	0.72553
## i_catmanufacture:y_cat2017	2.30793	6.46551	0.357	0.72115

```

## i_catmining:y_cat2017      1.11060    6.93466    0.160    0.87277
## i_catretail:y_cat2017     1.22629    7.12175    0.172    0.86330
## i_catservices:y_cat2017   3.93581    6.54894    0.601    0.54790
## i_cattransportation:y_cat2017 0.18491    6.91900    0.027    0.97868
## i_catConstruction:y_cat2018  1.29862    9.86176    0.132    0.89524
## i_catfinance:y_cat2018    1.60787    8.90624    0.181    0.85675
## i_catmanufacture:y_cat2018  0.05837    8.62012    0.007    0.99460
## i_catmining:y_cat2018    -2.22104    8.91508   -0.249    0.80328
## i_catretail:y_cat2018     1.37815    9.42009    0.146    0.88370
## i_catservices:y_cat2018    0.48456    8.67658    0.056    0.95547
## i_cattransportation:y_cat2018  2.82532    8.96167    0.315    0.75258
## i_catwholesale:y_cat2018    7.94478   10.63924    0.747    0.45528
## i_catfinance:y_cat2019   -0.94326    7.37312   -0.128    0.89821
## i_catmanufacture:y_cat2019  -1.80313    7.00083   -0.258    0.79677
## i_catmining:y_cat2019    -0.14027    7.93770   -0.018    0.98590
## i_catretail:y_cat2019     0.56394    8.14006    0.069    0.94477
## i_catservices:y_cat2019   -2.06001    7.01485   -0.294    0.76904
## i_cattransportation:y_cat2019 -3.21255    7.53712   -0.426    0.66997

##
## Diagnostic tests:
##              df1  df2  statistic  p-value
## Weak instruments    2 2741    17.159 3.93e-08 ***
## Wu-Hausman         1 2741     7.845 0.00513 **
## Sargan              1  NA     0.017 0.89720
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.055 on 2742 degrees of freedom
## Multiple R-Squared:  -0.1021, Adjusted R-squared:  -0.1599
## Wald test: 1.803 on 144 and 2742 DF,  p-value: 3.954e-08

```

```

iv_mode4<-ivreg(CAR55~`firm size`+leverage+`Tobin's q`+`free cash flow`
+ preMTR+ deal_size + hostile + high_tech + diversifyin
g + public_target + private_target + all_cash_deal + stock_deal+ cross_
border+i_cat * y_cat+`Prev ESG Score.x`|`firm size`+leverage+`Tobin's q
`+`free cash flow`
+ preMTR+ deal_size + hostile + high_tech + diversifyin
g + public_target + private_target + all_cash_deal + stock_deal+ cross_
border+i_cat * y_cat + `blue state (dummy) old` + `religion rank (2)`,
data = data1)

```

```
summary(iv_mode4, diagnostics = TRUE)
```

```

##
## Call:
## ivreg(formula = CAR55 ~ `firm size` + leverage + `Tobin's q` +
## `free cash flow` + preMTR + deal_size + hostile + high_tech +
## diversifying + public_target + private_target + all_cash_deal +
## stock_deal + cross_border + i_cat * y_cat + `Prev ESG Score.x` |
## `firm size` + leverage + `Tobin's q` + `free cash flow` +
## preMTR + deal_size + hostile + high_tech + diversifying +
## public_target + private_target + all_cash_deal + stock_deal
## +
## cross_border + i_cat * y_cat + `blue state (dummy) old` +
## `religion rank (2)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.805e+01 -3.788e+00 -3.686e-13  3.750e+00  9.019e+01
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    -8.14520     8.02044  -1.016  0.309931
## `firm size`     1.59824     0.75187   2.126  0.033619
## *
## leverage        0.81575     1.52008   0.537  0.591554
##
## `Tobin's q`    -0.52202     0.20279  -2.574  0.010100
## *
## `free cash flow`  5.26973     1.77029   2.977  0.002939
## **
## preMTR         -5.33643     0.60800  -8.777 < 2e-16
## ***
## deal_size       1.60054     0.49483   3.235  0.001233
## **

```


## hostile	-7.02764	5.56270	-1.263	0.206570
## high_tech	0.85265	0.46630	1.829	0.067573
·				
## diversifying	-0.01096	0.32393	-0.034	0.973020
## public_target	-1.72433	0.44399	-3.884	0.000105

## private_target	-0.23807	0.32330	-0.736	0.461573
## all_cash_deal	-0.70877	0.47183	-1.502	0.133163
## stock_deal	-0.94270	0.64060	-1.472	0.141247
## cross_border	0.73357	0.35821	2.048	0.040670
*				
## i_catConstruction	-7.62666	9.09128	-0.839	0.401599
## i_catfinance	-1.30554	7.92102	-0.165	0.869098
## i_catmanufacture	3.04346	7.41455	0.410	0.681492
## i_catmining	2.28398	7.74523	0.295	0.768101
## i_catretail	0.67625	8.05598	0.084	0.933108
## i_catservices	2.63646	7.51607	0.351	0.725783
## i_cattransportation	1.06386	7.93104	0.134	0.893302
## i_catwholesale	-0.83170	10.58679	-0.079	0.937388
## y_cat2004	-1.86397	8.22143	-0.227	0.820657
## y_cat2005	3.30723	9.03309	0.366	0.714301
## y_cat2006	-1.44676	8.06182	-0.179	0.857591
## y_cat2007	1.03234	8.24325	0.125	0.900347
## y_cat2008	-1.94579	9.04471	-0.215	0.829682
## y_cat2009	-3.89960	10.42240	-0.374	0.708318
## y_cat2010	3.80434	10.42514	0.365	0.715199
## y_cat2011	3.89628	8.70897	0.447	0.654631

## y_cat2012	-0.62665	8.16872	-0.077	0.938858
## y_cat2013	6.42670	8.04187	0.799	0.424270
## y_cat2014	10.21157	11.21787	0.910	0.362747
## y_cat2015	1.71560	8.68198	0.198	0.843369
## y_cat2016	12.58087	11.02385	1.141	0.253869
## y_cat2017	-0.97968	7.96615	-0.123	0.902132
## y_cat2018	4.68898	10.46706	0.448	0.654207
## y_cat2019	7.46021	8.67987	0.859	0.390149
## `Prev ESG Score.x` *	-0.22137	0.08651	-2.559	0.010555
## i_catfinance:y_cat2004	2.54946	9.05828	0.281	0.778386
## i_catmanufacture:y_cat2004	1.05352	8.33072	0.126	0.899376
## i_catmining:y_cat2004	-3.76380	8.75356	-0.430	0.667249
## i_catretail:y_cat2004	2.69814	9.97585	0.270	0.786821
## i_catservices:y_cat2004	-0.53264	8.46832	-0.063	0.949852
## i_cattransportation:y_cat2004	-1.17086	9.19746	-0.127	0.898710
## i_catfinance:y_cat2005	-1.17714	9.54687	-0.123	0.901878
## i_catmanufacture:y_cat2005	-4.12019	9.14489	-0.451	0.652353
## i_catmining:y_cat2005	-3.92420	9.58677	-0.409	0.682326
## i_catretail:y_cat2005	2.10253	10.35139	0.203	0.839060
## i_catservices:y_cat2005	-3.37294	9.21720	-0.366	0.714438
## i_cattransportation:y_cat2005	-5.43993	9.90068	-0.549	0.582741
## i_catwholesale:y_cat2005	-2.66560	13.75487	-0.194	0.846352
## i_catfinance:y_cat2006	5.32288	9.98040	0.533	0.593846
## i_catmanufacture:y_cat2006	2.97617	8.24495	0.361	0.718150

## i_catmining:y_cat2006	-11.66740	10.07820	-1.158	0.247093
## i_catservices:y_cat2006	2.32948	8.41472	0.277	0.781928
## i_cattransportation:y_cat2006	-4.87948	10.03782	-0.486	0.626928
## i_catfinance:y_cat2007	-0.30123	8.85435	-0.034	0.972863
## i_catmanufacture:y_cat2007	-1.44011	8.34201	-0.173	0.862952
## i_catmining:y_cat2007	0.60451	8.78031	0.069	0.945115
## i_catretail:y_cat2007	4.85147	10.31664	0.470	0.638209
## i_catservices:y_cat2007	-1.62527	8.47160	-0.192	0.847875
## i_cattransportation:y_cat2007	-3.21803	9.39254	-0.343	0.731914
## i_catConstruction:y_cat2008	33.06051	11.67234	2.832	0.004654
**				
## i_catfinance:y_cat2008	13.67835	10.16033	1.346	0.178333
## i_catmanufacture:y_cat2008	0.37757	9.13490	0.041	0.967033
## i_catmining:y_cat2008	-0.01070	9.59686	-0.001	0.999111
## i_catretail:y_cat2008	12.77184	10.12912	1.261	0.207451
## i_catservices:y_cat2008	3.30848	9.21469	0.359	0.719590
## i_cattransportation:y_cat2008	2.36719	9.66247	0.245	0.806484
## i_catmanufacture:y_cat2009	5.25336	10.57699	0.497	0.619456
## i_catmining:y_cat2009	6.44781	12.94932	0.498	0.618576
## i_catretail:y_cat2009	28.75512	13.29581	2.163	0.030649
*				
## i_catservices:y_cat2009	6.02239	10.66940	0.564	0.572491
## i_cattransportation:y_cat2009	9.78779	11.79547	0.830	0.406728
## i_catConstruction:y_cat2010	6.07341	12.47007	0.487	0.626270
## i_catfinance:y_cat2010	1.60621	11.09586	0.145	0.884913
## i_catmanufacture:y_cat2010	-2.10351	10.61070	-0.198	0.842868

## i_catmining:y_cat2010	-2.19327	10.93425	-0.201	0.841036
## i_catretail:y_cat2010	4.55654	12.02269	0.379	0.704721
## i_catservices:y_cat2010	-2.48753	10.71148	-0.232	0.816376
## i_cattransportation:y_cat2010	-2.91481	11.11480	-0.262	0.793152
## i_catwholesale:y_cat2010	1.90487	13.47200	0.141	0.887568
## i_catfinance:y_cat2011	-7.79036	9.51853	-0.818	0.413176
## i_catmanufacture:y_cat2011	-3.66811	8.74400	-0.420	0.674883
## i_catmining:y_cat2011	-0.87636	10.22355	-0.086	0.931696
## i_catretail:y_cat2011	7.83721	11.70713	0.669	0.503272
## i_catservices:y_cat2011	-1.32170	9.00990	-0.147	0.883384
## i_cattransportation:y_cat2011	-10.71606	10.00935	-1.071	0.284441
## i_catConstruction:y_cat2012	7.07522	12.05831	0.587	0.557419
## i_catfinance:y_cat2012	6.20779	8.44596	0.735	0.462401
## i_catmanufacture:y_cat2012	3.71531	7.98318	0.465	0.641688
## i_catmining:y_cat2012	-4.90684	8.55160	-0.574	0.566156
## i_catretail:y_cat2012	6.13645	8.93938	0.686	0.492487
## i_catservices:y_cat2012	2.16726	8.21495	0.264	0.791939
## i_cattransportation:y_cat2012	4.95737	8.58283	0.578	0.563588
## i_catConstruction:y_cat2013	0.80570	10.85116	0.074	0.940817
## i_catfinance:y_cat2013	-1.01451	8.46604	-0.120	0.904624
## i_catmanufacture:y_cat2013	-3.47846	7.97266	-0.436	0.662654
## i_catmining:y_cat2013	-7.50717	8.83023	-0.850	0.395307
## i_catretail:y_cat2013	1.24322	9.28120	0.134	0.893452
## i_catservices:y_cat2013	-6.50700	8.14980	-0.798	0.424693

## i_cattransportation:y_cat2013	-4.61573	8.63240	-0.535	0.592902
## i_catConstruction:y_cat2014	-3.11027	14.13118	-0.220	0.825810
## i_catfinance:y_cat2014	-8.78631	12.49610	-0.703	0.482038
## i_catmanufacture:y_cat2014	-9.32246	11.20838	-0.832	0.405628
## i_catmining:y_cat2014	2.44882	12.08890	0.203	0.839488
## i_catservices:y_cat2014	-10.15263	11.34612	-0.895	0.370967
## i_cattransportation:y_cat2014	-2.21539	12.12003	-0.183	0.854978
## i_catConstruction:y_cat2015	-4.34588	12.41125	-0.350	0.726248
## i_catfinance:y_cat2015	3.96661	10.37353	0.382	0.702210
## i_catmanufacture:y_cat2015	-2.60756	8.84329	-0.295	0.768121
## i_catmining:y_cat2015	13.53177	10.62582	1.273	0.202956
## i_catretail:y_cat2015	8.18584	9.69430	0.844	0.398521
## i_catservices:y_cat2015	-1.36674	8.98086	-0.152	0.879053
## i_catConstruction:y_cat2016	2.27677	11.95371	0.190	0.848958
## i_catfinance:y_cat2016	-7.67648	11.06921	-0.693	0.488056
## i_catmanufacture:y_cat2016	-9.91242	10.77470	-0.920	0.357668
## i_catmining:y_cat2016	-9.22768	11.04568	-0.835	0.403559
## i_catretail:y_cat2016	-5.68509	11.58064	-0.491	0.623527
## i_catservices:y_cat2016	-10.73739	10.92392	-0.983	0.325731
## i_cattransportation:y_cat2016	-13.61560	11.20759	-1.215	0.224526
## i_catwholesale:y_cat2016	-2.92776	12.93813	-0.226	0.820994
## i_catConstruction:y_cat2017	15.19710	9.74328	1.560	0.118934
## i_catfinance:y_cat2017	5.28633	8.27294	0.639	0.522883
## i_catmanufacture:y_cat2017	3.68903	7.83394	0.471	0.637747

```

## i_catmining:y_cat2017      2.98555      8.40238      0.355 0.722376
## i_catretail:y_cat2017      5.20926      8.62907      0.604 0.546101
## i_catservices:y_cat2017    5.79322      7.93502      0.730 0.465402
## i_cattransportation:y_cat2017 2.44022      8.38341      0.291 0.771014
## i_catConstruction:y_cat2018 5.56469     11.94900      0.466 0.641465
## i_catfinance:y_cat2018    -0.29790     10.79125     -0.028 0.977979
## i_catmanufacture:y_cat2018 -3.28250     10.44458     -0.314 0.753334
## i_catmining:y_cat2018     -7.46657     10.80196     -0.691 0.489484
## i_catretail:y_cat2018      1.77260     11.41385      0.155 0.876594
## i_catservices:y_cat2018    -1.57479     10.51298     -0.150 0.880937
## i_cattransportation:y_cat2018 0.09540     10.85841      0.009 0.992990
## i_catwholesale:y_cat2018    6.57959     12.89104      0.510 0.609812
## i_catfinance:y_cat2019    -3.15427      8.93364     -0.353 0.724057
## i_catmanufacture:y_cat2019 -5.97007      8.48256     -0.704 0.481614
## i_catmining:y_cat2019     -7.92260      9.61772     -0.824 0.410153
## i_catretail:y_cat2019      0.85343      9.86290      0.087 0.931052
## i_catservices:y_cat2019    -4.71447      8.49954     -0.555 0.579163
## i_cattransportation:y_cat2019 -7.63204      9.13235     -0.836 0.403388

##
## Diagnostic tests:
##              df1  df2  statistic  p-value
## Weak instruments      2 2741    17.159 3.93e-08 ***
## Wu-Hausman           1 2741     5.842 0.0157 *
## Sargan                1  NA     2.029 0.1543
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 7.337 on 2742 degrees of freedom
## Multiple R-Squared: -0.0258, Adjusted R-squared: -0.07967
## Wald test: 2.267 on 144 and 2742 DF, p-value: 6.035e-15

```

long_term

Min&Qi

2023-06-13

```
###Long term ESG effect ANALYSIS
```

```
###input data
```

```
library(readxl)
```

```
## Warning: 程辑包 'readxl' 是用 R 版本 4.1.3 来建造的
```

```
library(lmtest)
```

```
## 载入需要的程辑包: zoo
```

```
##
```

```
## 载入程辑包: 'zoo'
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
##      as.Date, as.Date.numeric
```

```
library(sandwich)
```

```
## Warning: 程辑包 'sandwich' 是用 R 版本 4.1.3 来建造的
```

```
library(car)
```

```
## Warning: 程辑包 'car' 是用 R 版本 4.1.3 来建造的
```

```
## 载入需要的程辑包: carData
```

```
FF_12 <- read_excel("data/FF-12.xlsx")
```

```
## New names:
```

```
## * `` -> `...8`
```

```
## * `` -> `...9`
```

```
## * `` -> `...10`
```

```
## * `` -> `...11`
```

```
## * `` -> `...12`
```

```
## * `` -> `...13`
```

```
## * `` -> `...14`
```

```
## * `` -> `...16`
```

```
## * `` -> `...17`
```

```
## * `` -> `...18`
```

```
## * `` -> `...19`
```

```
## * `` -> `...20`  
## * `` -> `...21`  
## * `` -> `...22`  
## * `` -> `...24`  
## * `` -> `...25`  
## * `` -> `...26`  
## * `` -> `...27`  
## * `` -> `...28`  
## * `` -> `...29`  
## * `` -> `...30`  
## * `` -> `...32`
```

```
FF_24 <- read_excel("data/FF-24.xlsx")
```

```
## New names:
```

```
## * `` -> `...8`  
## * `` -> `...9`  
## * `` -> `...10`  
## * `` -> `...11`  
## * `` -> `...12`  
## * `` -> `...13`  
## * `` -> `...14`  
## * `` -> `...16`  
## * `` -> `...17`  
## * `` -> `...18`  
## * `` -> `...19`  
## * `` -> `...20`  
## * `` -> `...21`  
## * `` -> `...22`  
## * `` -> `...24`  
## * `` -> `...25`  
## * `` -> `...26`  
## * `` -> `...27`  
## * `` -> `...28`  
## * `` -> `...29`  
## * `` -> `...30`  
## * `` -> `...31`  
## * `` -> `...33`
```

```
FF_36 <- read_excel("data/FF-36.xlsx")
```

```
## New names:
```

```
## * `` -> `...8`  
## * `` -> `...9`  
## * `` -> `...10`  
## * `` -> `...11`  
## * `` -> `...12`  
## * `` -> `...13`  
## * `` -> `...14`  
## * `` -> `...15`  
## * `` -> `...17`
```



```

## * `` -> `...18`
## * `` -> `...19`
## * `` -> `...20`
## * `` -> `...21`
## * `` -> `...22`
## * `` -> `...23`
## * `` -> `...24`
## * `` -> `...26`
## * `` -> `...27`
## * `` -> `...28`
## * `` -> `...29`
## * `` -> `...30`
## * `` -> `...31`
## * `` -> `...32`
## * `` -> `...34`

##rename
data1<-FF_12
data2<-FF_24
data3<-FF_36

##full sample after one year
reg1<-lm(`Excess return of acquirer portfolio (%)`~`MKTRF (%)`+`SMB (%)`
+`HML (%)`+`UMD (%)`,data=data1)
summary(reg1)

##
## Call:
## lm(formula = `Excess return of acquirer portfolio (%)` ~ `MKTRF (%)`
+
##   `SMB (%)` + `HML (%)` + `UMD (%)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.4112 -0.8293 -0.0285  0.8766  6.8365
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.05213    0.10845  -0.481   0.631
## `MKTRF (%)`  1.04042    0.02867  36.293 < 2e-16 ***
## `SMB (%)`    0.31927    0.04882   6.539 4.58e-10 ***
## `HML (%)`   -0.04834    0.04391  -1.101   0.272
## `UMD (%)`   -0.12377    0.02747  -4.506 1.10e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.545 on 211 degrees of freedom
## Multiple R-squared:  0.9149, Adjusted R-squared:  0.9132
## F-statistic: 566.8 on 4 and 211 DF, p-value: < 2.2e-16

```

##heteroskedasticity test and heteroskedasticity adjusted

```
bptest(reg1)
```

```
##
## studentized Breusch-Pagan test
##
## data: reg1
## BP = 28.444, df = 4, p-value = 1.014e-05
```

##solve heteroskedasticity problem

```
coeftest(reg1, vcov = vcovHC(reg1, type="HC3"))
```

```
##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.052129  0.110023  -0.4738  0.636131
## `MKTRF (%)`  1.040421  0.044885  23.1795 < 2.2e-16 ***
## `SMB (%)`    0.319274  0.048745   6.5498 4.322e-10 ***
## `HML (%)`   -0.048337  0.110445  -0.4377  0.662084
## `UMD (%)`   -0.123774  0.044606  -2.7749  0.006018 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

##multicollinearity problem

```
vif(reg1)
```

```
## `MKTRF (%)`  `SMB (%)`  `HML (%)`  `UMD (%)`
##    1.365306    1.198435    1.252015    1.347153
```

##full sample after two year

```
reg2<-lm(`Excess return of acquirer portfolio (%)`~`MKTRF (%)`+`SMB (%)`
+`HML (%)`+`UMD (%)`,data=data2)
```

```
summary(reg2)
```

```
##
## Call:
## lm(formula = `Excess return of acquirer portfolio (%)` ~ `MKTRF (%)`
+
##   `SMB (%)` + `HML (%)` + `UMD (%)`, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -7.0291 -0.7585 -0.0776  0.7432  6.4246
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.017375  0.099495   0.175   0.862
## `MKTRF (%)`  1.064436  0.026201  40.626 < 2e-16 ***
## `SMB (%)`    0.350141  0.043456   8.057 4.69e-14 ***
## `HML (%)`   -0.003744  0.037982  -0.099   0.922
```

```

## `UMD (%)`   -0.155156   0.025431  -6.101 4.61e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.458 on 223 degrees of freedom
## Multiple R-squared:  0.9274, Adjusted R-squared:  0.9261
## F-statistic: 711.8 on 4 and 223 DF,  p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg2)

##
## studentized Breusch-Pagan test
##
## data:  reg2
## BP = 9.1759, df = 4, p-value = 0.05685

##solve heteroskedasticity problem
coeftest(reg2, vcov = vcovHC(reg1, type="HC3"))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.0173755  0.1100228  0.1579 0.8746578
## `MKTRF (%)`  1.0644356  0.0448853 23.7146 < 2.2e-16 ***
## `SMB (%)`    0.3501407  0.0487453  7.1831 1.009e-11 ***
## `HML (%)`   -0.0037441  0.1104452 -0.0339 0.9729874
## `UMD (%)`   -0.1551561  0.0446055 -3.4784 0.0006064 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##multicollinearity problem
vif(reg2)

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##   1.313601    1.158761    1.237548    1.343644

##full sample after three year
reg3<-lm(`Excess return of acquirer portfolio (%)`~`MKTRF (%)`+`SMB (%)`
+`HML (%)`+`UMD (%)`,data=data3)
summary(reg3)

##
## Call:
## lm(formula = `Excess return of acquirer portfolio (%)` ~ `MKTRF (%)`
+
##   `SMB (%)` + `HML (%)` + `UMD (%)`, data = data3)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.9456 -0.7018 -0.0600  0.7397  5.0244

```

```

##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.06380    0.09347   0.683   0.4955
## `MKTRF (%)`  1.02435    0.02372  43.187 < 2e-16 ***
## `SMB (%)`    0.39192    0.04078   9.611 < 2e-16 ***
## `HML (%)`    0.05377    0.03219   1.671  0.0961 .
## `UMD (%)`   -0.14823    0.02397  -6.184 2.74e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.419 on 235 degrees of freedom
## Multiple R-squared:  0.9327, Adjusted R-squared:  0.9315
## F-statistic: 813.8 on 4 and 235 DF,  p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg3)

##
## studentized Breusch-Pagan test
##
## data:  reg3
## BP = 3.7844, df = 4, p-value = 0.436

##multicollinearity problem
vif(reg3)

## `MKTRF (%)`  `SMB (%)`  `HML (%)`  `UMD (%)`
##  1.298118    1.141151    1.148356    1.294206

##sample with high ESG after one year
reg4<-lm(`Excess return of high ESG acquirer portfolio`~`MKTRF (%)`+`SMB (%)`+`HML (%)`+`UMD (%)`,data=data1)
summary(reg4)

##
## Call:
## lm(formula = `Excess return of high ESG acquirer portfolio` ~
##      `MKTRF (%)` + `SMB (%)` + `HML (%)` + `UMD (%)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.5497 -0.8556 -0.0661  0.7303  5.3688
##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.01833    0.11026   0.166   0.868
## `MKTRF (%)`  1.02697    0.02902  35.391 < 2e-16 ***
## `SMB (%)`    0.23446    0.04939   4.747 3.83e-06 ***
## `HML (%)`   -0.02105    0.04436  -0.474  0.636
## `UMD (%)`   -0.11723    0.02773  -4.228 3.53e-05 ***

```

```

## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.559 on 208 degrees of freedom
## (因为不存在, 3 个观察量被删除了)
## Multiple R-squared:  0.9093, Adjusted R-squared:  0.9075
## F-statistic: 521.2 on 4 and 208 DF,  p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg4)

##
## studentized Breusch-Pagan test
##
## data:  reg4
## BP = 28.058, df = 4, p-value = 1.214e-05

##solve heteroskedasticity problem
coeftest(reg4, vcov = vcovHC(reg4, type="HC3"))

##
## t test of coefficients:
##
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.018331   0.114359   0.1603 0.8728078
## `MKTRF (%)`  1.026969   0.042903  23.9373 < 2.2e-16 ***
## `SMB (%)`    0.234464   0.049042   4.7808  3.3e-06 ***
## `HML (%)`   -0.021047   0.110491  -0.1905 0.8491157
## `UMD (%)`   -0.117234   0.034641  -3.3843 0.0008529 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##multicollinearity problem
vif(reg4)

## `MKTRF (%)`  `SMB (%)`  `HML (%)`  `UMD (%)`
##    1.366569    1.201440    1.250820    1.345446

##subsample with high ESG after two years
reg5<-lm(`Excess return of high ESG acquirer portfolio`~`MKTRF (%)`+`SMB (%)`+`HML (%)`+`UMD (%)`,data=data2)
summary(reg5)

##
## Call:
## lm(formula = `Excess return of high ESG acquirer portfolio` ~
##     `MKTRF (%)` + `SMB (%)` + `HML (%)` + `UMD (%)`, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -5.6395 -0.7522 -0.1042  0.7337  4.9942

```

```

##
## Coefficients:
##           Estimate Std. Error t value Pr(>|t|)
## (Intercept) 0.083204  0.092851  0.896    0.371
## `MKTRF (%)` 1.031690  0.024341 42.385 < 2e-16 ***
## `SMB (%)`   0.226346  0.040340  5.611 6.01e-08 ***
## `HML (%)`  -0.001401  0.035222  -0.040  0.968
## `UMD (%)`  -0.125292  0.023560  -5.318 2.58e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.351 on 220 degrees of freedom
## (因为不存在, 3个观察量被删除了)
## Multiple R-squared:  0.9291, Adjusted R-squared:  0.9278
## F-statistic: 720.8 on 4 and 220 DF,  p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg5)

##
## studentized Breusch-Pagan test
##
## data:  reg5
## BP = 15.322, df = 4, p-value = 0.004078

##solve heteroskedasticity problem
coeftest(reg5, vcov = vcovHC(reg5, type="HC3"))

##
## t test of coefficients:
##
##           Estimate Std. Error t value  Pr(>|t|)
## (Intercept) 0.0832042  0.1019392  0.8162    0.4153
## `MKTRF (%)` 1.0316900  0.0313239 32.9362 < 2.2e-16 ***
## `SMB (%)`   0.2263463  0.0404600  5.5943 6.543e-08 ***
## `HML (%)`  -0.0014012  0.0688998  -0.0203  0.9838
## `UMD (%)`  -0.1252921  0.0313995  -3.9903 8.990e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##multicollinearity problem
vif(reg5)

## `MKTRF (%)`  `SMB (%)`  `HML (%)`  `UMD (%)`
##    1.314444    1.161254    1.236396    1.341962

##subsample with high EGS after three years
reg6<-lm(`Excess return of high ESG acquirer portfolio`~`MKTRF (%)`+`SMB (%)`+`HML (%)`+`UMD (%)`,data=data3)
summary(reg6)

```

```

##
## Call:
## lm(formula = `Excess return of high ESG acquirer portfolio` ~
##     `MKTRF (%)` + `SMB (%)` + `HML (%)` + `UMD (%)`, data = data3)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.7042 -0.7866 -0.0426  0.7471  4.2295
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.16187    0.08860   1.827  0.06897 .
## `MKTRF (%)`  0.99702    0.02238  44.555 < 2e-16 ***
## `SMB (%)`    0.25354    0.03845   6.594 2.86e-10 ***
## `HML (%)`    0.08233    0.03033   2.715 0.00713 **
## `UMD (%)`   -0.12083    0.02256  -5.356 2.05e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.336 on 232 degrees of freedom
## (因为不存在, 3个观察量被删除了)
## Multiple R-squared:  0.9331, Adjusted R-squared:  0.9319
## F-statistic: 808.8 on 4 and 232 DF,  p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg6)

##
## studentized Breusch-Pagan test
##
## data:  reg6
## BP = 11.082, df = 4, p-value = 0.02566

##solve heteroskedasticity problem
coeftest(reg6, vcov = vcovHC(reg6, type="HC3"))

##
## t test of coefficients:
##
##              Estimate Std. Error t value  Pr(>|t|)
## (Intercept)  0.161873    0.099579  1.6256   0.1054
## `MKTRF (%)`  0.997018    0.031147 32.0105 < 2.2e-16 ***
## `SMB (%)`    0.253538    0.040833  6.2091 2.435e-09 ***
## `HML (%)`    0.082329    0.054303  1.5161  0.1309
## `UMD (%)`   -0.120830    0.028795 -4.1962 3.868e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##multicollinearity problem
vif(reg6)

```

```

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##    1.298846    1.143019    1.147323    1.292882

##subsample with low ESG after one year
reg7<-lm(`Excess return of low ESG acquirer portfolio`~`MKTRF (%)`+`SMB
  (%)`+`HML (%)`+`UMD (%)`,data=data1)
summary(reg7)

##
## Call:
## lm(formula = `Excess return of low ESG acquirer portfolio` ~
##     `MKTRF (%)` + `SMB (%)` + `HML (%)` + `UMD (%)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.5062 -1.2016  0.0175  1.1621  7.3829
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.14301    0.13920  -1.027   0.3054
## `MKTRF (%)`  1.05047    0.03680  28.547 < 2e-16 ***
## `SMB (%)`    0.42777    0.06267   6.826 9.14e-11 ***
## `HML (%)`   -0.09657    0.05637  -1.713  0.0881 .
## `UMD (%)`   -0.14442    0.03526  -4.096 6.00e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.983 on 211 degrees of freedom
## Multiple R-squared:  0.8752, Adjusted R-squared:  0.8729
## F-statistic: 370.1 on 4 and 211 DF,  p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg7)

##
## studentized Breusch-Pagan test
##
## data:  reg7
## BP = 36.014, df = 4, p-value = 2.874e-07

##solve heteroskedasticity problem
coeftest(reg7, vcov = vcovHC(reg7, type="HC3"))

##
## t test of coefficients:
##
##              Estimate Std. Error t value  Pr(>|t|)
## (Intercept) -0.143008    0.136222  -1.0498   0.29500
## `MKTRF (%)`  1.050469    0.054428  19.3003 < 2.2e-16 ***
## `SMB (%)`    0.427769    0.069859   6.1233 4.416e-09 ***
## `HML (%)`   -0.096567    0.121030  -0.7979  0.42584

```



```

## `UMD (%)`   -0.144424   0.070307 -2.0542   0.04119 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

###multicollinearity problem
vif(reg7)

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##   1.365306   1.198435   1.252015   1.347153

###subsample with low ESG after two years
reg8<-lm(`Excess return of low ESG acquirer portfolio`~`MKTRF (%)`+`SMB
  (%)`+`HML (%)`+`UMD (%)`,data=data2)
summary(reg8)

##
## Call:
## lm(formula = `Excess return of low ESG acquirer portfolio` ~
##   `MKTRF (%)` + `SMB (%)` + `HML (%)` + `UMD (%)`, data = data2)
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -9.0478 -1.0847  0.0971  1.0265  7.6345
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.05629   0.12596  -0.447   0.655
## `MKTRF (%)`  1.09406   0.03317  32.983 < 2e-16 ***
## `SMB (%)`    0.47472   0.05502   8.629 1.18e-15 ***
## `HML (%)`   -0.01522   0.04809  -0.316  0.752
## `UMD (%)`   -0.18604   0.03220  -5.778 2.52e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.846 on 223 degrees of freedom
## Multiple R-squared:  0.9003, Adjusted R-squared:  0.8985
## F-statistic: 503.4 on 4 and 223 DF,  p-value: < 2.2e-16

###heteroskedasticity test and heteroskedasticity adjusted
bptest(reg8)

##
## studentized Breusch-Pagan test
##
## data:  reg8
## BP = 6.4301, df = 4, p-value = 0.1692

###multicollinearity problem
vif(reg8)

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##   1.313601   1.158761   1.237548   1.343644

```

```

##subsample with low EGS after three years
reg9<-lm(`Excess return of low ESG acquirer portfolio`~`MKTRF (%)`+`SMB (%)`+`HML (%)`+`UMD (%)`,data=data3)
summary(reg9)

##
## Call:
## lm(formula = `Excess return of low ESG acquirer portfolio` ~
##      `MKTRF (%)` + `SMB (%)` + `HML (%)` + `UMD (%)`, data = data3)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -8.0266 -0.9594  0.0123  0.9005  5.9001
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -0.01688    0.11649  -0.145    0.885
## `MKTRF (%)`   1.05590    0.02956  35.719 < 2e-16 ***
## `SMB (%)`     0.52881    0.05082  10.405 < 2e-16 ***
## `HML (%)`     0.02998    0.04012   0.747    0.456
## `UMD (%)`    -0.17055    0.02987  -5.710 3.4e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.768 on 235 degrees of freedom
## Multiple R-squared:  0.91, Adjusted R-squared:  0.9084
## F-statistic: 593.7 on 4 and 235 DF, p-value: < 2.2e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg9)

##
## studentized Breusch-Pagan test
##
## data:  reg9
## BP = 1.1498, df = 4, p-value = 0.8863

##multicollinearity problem
vif(reg9)

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##      1.298118    1.141151    1.148356    1.294206

##subsample with zero cost portfolio after one year
reg10<-lm(`Excess return of zero-cost portfolio`~`MKTRF (%)`+`SMB (%)`+
`HML (%)`+`UMD (%)`,data=data1)
summary(reg10)

##
## Call:
## lm(formula = `Excess return of zero-cost portfolio` ~ `MKTRF (%)` +

```

```

##      `SMB (%)` + `HML (%)` + `UMD (%)`, data = data1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -6.6620 -0.9718 -0.0511  0.8856  8.6591
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.14532    0.13061   1.113  0.26715
## `MKTRF (%)` -0.02468    0.03437  -0.718  0.47365
## `SMB (%)`    -0.19321    0.05850  -3.302  0.00113 **
## `HML (%)`    0.08057    0.05255   1.533  0.12675
## `UMD (%)`    0.02690    0.03285   0.819  0.41379
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.847 on 208 degrees of freedom
## (因为不存在, 3 个观察量被删除了)
## Multiple R-squared:  0.07816,    Adjusted R-squared:  0.06043
## F-statistic: 4.409 on 4 and 208 DF,  p-value: 0.001926

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg10)

##
## studentized Breusch-Pagan test
##
## data:  reg10
## BP = 24.646, df = 4, p-value = 5.926e-05

##solve heteroskedasticity problem
coeftest(reg10, vcov = vcovHC(reg10, type="HC3"))

##
## t test of coefficients:
##
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.145316    0.119337   1.2177 0.224722
## `MKTRF (%)` -0.024675    0.040120  -0.6150 0.539206
## `SMB (%)`    -0.193206    0.069579  -2.7768 0.005991 **
## `HML (%)`    0.080568    0.053235   1.5135 0.131682
## `UMD (%)`    0.026896    0.056249   0.4782 0.633032
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##multicollinearity problem
vif(reg10)

## `MKTRF (%)`    `SMB (%)`    `HML (%)`    `UMD (%)`
##      1.366569      1.201440      1.250820      1.345446

```

```

##subsample with zero cost portfolioafter two years
reg11<-lm(`Excess return of zero-cost portfolio`~`MKTRF (%)`+`SMB (%)`+
`HML (%)`+`UMD (%)`,data=data2)
summary(reg11)

##
## Call:
## lm(formula = `Excess return of zero-cost portfolio` ~ `MKTRF (%)` +
##   `SMB (%)` + `HML (%)` + `UMD (%)`, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -4.5933 -0.7835  0.0082  0.7008  6.0870
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.12522    0.10073   1.243   0.2151
## `MKTRF (%)` -0.06353    0.02641  -2.406   0.0170 *
## `SMB (%)`   -0.24827    0.04376  -5.673 4.38e-08 ***
## `HML (%)`   0.01810    0.03821   0.474   0.6362
## `UMD (%)`   0.06046    0.02556   2.366   0.0189 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.465 on 220 degrees of freedom
## (因为不存在, 3 个观察量被删除了)
## Multiple R-squared:  0.249, Adjusted R-squared:  0.2353
## F-statistic: 18.23 on 4 and 220 DF, p-value: 5.949e-13

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg11)

##
## studentized Breusch-Pagan test
##
## data:  reg11
## BP = 3.4853, df = 4, p-value = 0.4801

##multicollinearity problem
vif(reg11)

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##      1.314444      1.161254      1.236396      1.341962

##subsample with zero cost portfolio after three years
reg12<-lm(`Excess return of zero-cost portfolio`~`MKTRF (%)`+`SMB (%)`+
`HML (%)`+`UMD (%)`,data=data3)
summary(reg12)

##
## Call:

```

```

## lm(formula = `Excess return of zero-cost portfolio` ~ `MKTRF (%)` +
##   `SMB (%)` + `HML (%)` + `UMD (%)`, data = data3)
##
## Residuals:
##   Min       1Q   Median       3Q      Max
## -4.1969 -0.8362 -0.1285  0.7687  6.2699
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  0.16337    0.09153   1.785   0.0756 .
## `MKTRF (%)` -0.05971    0.02312  -2.583   0.0104 *
## `SMB (%)`   -0.27520    0.03972  -6.928 4.18e-11 ***
## `HML (%)`   0.05595    0.03133   1.786   0.0755 .
## `UMD (%)`   0.04929    0.02331   2.114   0.0355 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.38 on 232 degrees of freedom
##   (因为不存在, 3个观察量被删除了)
## Multiple R-squared:  0.2835, Adjusted R-squared:  0.2712
## F-statistic: 22.95 on 4 and 232 DF,  p-value: 5.416e-16

##heteroskedasticity test and heteroskedasticity adjusted
bptest(reg12)

##
## studentized Breusch-Pagan test
##
## data:  reg12
## BP = 4.5484, df = 4, p-value = 0.3369

##multicollinearity problem
vif(reg12)

## `MKTRF (%)`   `SMB (%)`   `HML (%)`   `UMD (%)`
##   1.298846    1.143019    1.147323    1.292882

```

data description

Min&Qi

2023-06-14

```
##data description
##clear data
rm(list=ls())

##input data
library(readr)
final_deal <- read_csv("data/final_deal.csv")

## New names:
## Rows: 2887 Columns: 37
## -- Column specification
## ----- Delimiter:
## ", " chr
## (4): Target 6-digit CUSIP, event_date, Acquiror 6-digit CUSIP, Date
Eff... dbl
## (33): ...1, Acquiror PERMNO, preMTR, CAR11, CAR22, CAR55, Acquiror G
VKEY...
## i Use `spec()` to retrieve the full column specification for this da
ta. i
## Specify the column types or set `show_col_types = FALSE` to quiet th
is message.
## * `` -> `...1`

data1<-final_deal
data1<-data1[,-1]
final_deal_withportfolio <- read_csv("data/final_deal_withportfolio.csv
")

## New names:
## Rows: 290 Columns: 48
## -- Column specification
## ----- Delimiter:
## ", " chr
## (5): Target 6-digit CUSIP, Acquiror 6-digit CUSIP, Target GVKEY, Acq
ui... dbl
## (42): ...1, Target PERMNO, preMKT_target, BKV_assets_target, MKTV_eq
uit... date
## (1): event_date
## i Use `spec()` to retrieve the full column specification for this da
ta. i
## Specify the column types or set `show_col_types = FALSE` to quiet th
is message.
## * `` -> `...1`
```

```

data2<-final_deal_withportfolio
data2<-data2[,-1]

##add package for following use
library(readr)
library(car)

## Warning:  程辑包 'car'是用 R 版本 4.1.3 来建造的

## 载入需要的程辑包: carData

library(lmtest)

## 载入需要的程辑包: zoo
##
## 载入程辑包: 'zoo'
##
## The following objects are masked from 'package:base':
##
##   as.Date, as.Date.numeric

library(sandwich)

## Warning:  程辑包 'sandwich'是用 R 版本 4.1.3 来建造的

library(lubridate)

##
## 载入程辑包: 'lubridate'
##
## The following objects are masked from 'package:base':
##
##   date, intersect, setdiff, union

library(robustbase)

## Warning:  程辑包 'robustbase'是用 R 版本 4.1.3 来建造的

##transfer CAR and portfolio CAR into % format
data1$CAR11<-data1$CAR11*100
data1$CAR22<-data1$CAR22*100
data1$CAR55<-data1$CAR55*100

data2$portfolio_CAR11<-data2$portfolio_CAR11*100
data2$portfolio_CAR22<-data2$portfolio_CAR22*100
data2$portfolio_CAR55<-data2$portfolio_CAR55*100

##change the value of firm size
data1$`firm size`<-log(data1$MKTV_equity)
data2$`firm size acquiror`<-log(data2$MKTV_equity_acquiror)
data2$`firm size target`<-log(data2$MKTV_equity_target)

```

```
## extract year
```

```
data1$year<-year(data1$event_date)
```

```
data2$year<-year(data2$event_date)
```

```
##assign company into different type according industry number
```

```
data1$indu_type<-ifelse(data1$a_industry<10&data1$a_industry>=0,"agriculture",ifelse(data1$a_industry>=10&data1$a_industry<=17,"mining&construction",ifelse(data1$a_industry>=20&data1$a_industry<=39,"manufacture",ifelse(data1$a_industry>=40&data1$a_industry<=49,"transportation",ifelse(data1$a_industry>=50&data1$a_industry<=59,"wholesale",ifelse(data1$a_industry>=60&data1$a_industry<=67,"finance","services")))))
```

```
data2$indu_type<-ifelse(data2$a_industry<10&data2$a_industry>=0,"agriculture",ifelse(data2$a_industry>=10&data2$a_industry<=17,"mining&construction",ifelse(data2$a_industry>=20&data2$a_industry<=39,"manufacture",ifelse(data2$a_industry>=40&data2$a_industry<=49,"transportation",ifelse(data2$a_industry>=50&data2$a_industry<=59,"wholesale",ifelse(data2$a_industry>=60&data2$a_industry<=67,"finance","services")))))
```

```
##table 1 (summary the characteristic of fixed effects in the simple CAR deals)
```

```
table1<- addmargins(table(data1$year,data1$indu_type))
```

```
table1<- as.data.frame.array(table1)
```

```
print(table1)
```

```
##      agriculture finance manufacture mining&construction services
## 2003           1         7           71           12           28
## 2004           0         8           91           15           26
## 2005           2        23          106           14           32
## 2006           0         2           23            2           14
## 2007           0        17           85           14           28
## 2008           0         4           58           17           28
## 2009           0         0           18            1           14
## 2010           1        28          111           15           29
## 2011           0         5           33            2            8
## 2012           0        39          126           12           30
## 2013           0        27           74            8           31
## 2014           0         2           19            3           10
## 2015           0         2           26            3            9
## 2016           1        50          150           30           48
## 2017           0       118          161           18           72
## 2018           1        98          174           25          100
## 2019           0        17           28            3           44
## Sum           6       447          1354          194          551
##      transportation wholesale Sum
## 2003           7           6  132
## 2004           6           7  153
## 2005           6           6  189
```



```

## 2006          2          5  48
## 2007          5          6 155
## 2008         12          7 126
## 2009          3          2  38
## 2010         15          8 207
## 2011          3          4  55
## 2012         16         15 238
## 2013         11         11 162
## 2014          2          1  37
## 2015          0          8  48
## 2016         20         19 318
## 2017         27         27 423
## 2018         33         21 452
## 2019          7          7 106
## Sum         175        160 2887

```

##table 2 (summary the characteristic of the fixed effects in portfolio CAR deals)

```

table2<- addmargins(table(data2$year,data2$indu_type))
table2<- as.data.frame.array(table2)
print(table2)

```

```

##      finance manufacture mining&construction services transportation
##      wholesale
## 2003      0          0          0          1          0
##      0
## 2004      2          5          0          1          0
##      1
## 2005      2         13          4          4          1
##      0
## 2006      0          4          0          1          0
##      0
## 2007      3         14          0          8          1
##      3
## 2008      0         10          0          3          2
##      2
## 2009      0          1          0          0          0
##      1
## 2010      0          2          0          2          0
##      0
## 2011      0          9          2          1          4
##      0
## 2012      2         14          2          4          0
##      3
## 2013      1          8          1          6          1
##      2
## 2014      1          2          0          2          1
##      0
## 2015      0          4          0          2          0
##      1

```

```

## 2016      4      23      1      10      3
##      0
## 2017      2      17      2      5      2
##      0
## 2018      3      18      6      8      11
##      2
## 2019      0      4      2      3      0
##      0
## Sum      20     148     20     61     26
##      15
##      Sum
## 2003      1
## 2004      9
## 2005     24
## 2006      5
## 2007     29
## 2008     17
## 2009      2
## 2010      4
## 2011     16
## 2012     25
## 2013     19
## 2014      6
## 2015      7
## 2016     41
## 2017     28
## 2018     48
## 2019      9
## Sum     290

```

##summary of the mean value of ESG for different industries in different years for simple CAR

```

table3 <- aggregate(data1$`Prev ESG Score.x` ~ year + indu_type, data =
  data1, FUN = mean)
print(table3)

```

```

##      year      indu_type data1$`Prev ESG Score.x`
## 1  2003  agriculture  31.85369
## 2  2005  agriculture  46.90794
## 3  2010  agriculture  16.59137
## 4  2016  agriculture  86.31290
## 5  2018  agriculture  24.65794
## 6  2003      finance  24.29802
## 7  2004      finance  27.23035
## 8  2005      finance  29.61604
## 9  2006      finance  20.49095
## 10 2007      finance  32.48298
## 11 2008      finance  52.82070
## 12 2010      finance  36.15962
## 13 2011      finance  35.05312

```

## 14	2012	finance	39.87985
## 15	2013	finance	44.91071
## 16	2014	finance	28.89040
## 17	2015	finance	33.49081
## 18	2016	finance	31.53979
## 19	2017	finance	30.75880
## 20	2018	finance	33.95220
## 21	2019	finance	32.35309
## 22	2003	manufacture	32.47603
## 23	2004	manufacture	32.60043
## 24	2005	manufacture	35.23376
## 25	2006	manufacture	45.72281
## 26	2007	manufacture	37.34367
## 27	2008	manufacture	39.81353
## 28	2009	manufacture	47.56542
## 29	2010	manufacture	45.21752
## 30	2011	manufacture	37.48889
## 31	2012	manufacture	49.01993
## 32	2013	manufacture	47.02549
## 33	2014	manufacture	36.37372
## 34	2015	manufacture	35.19762
## 35	2016	manufacture	43.30992
## 36	2017	manufacture	42.54421
## 37	2018	manufacture	44.91790
## 38	2019	manufacture	34.37733
## 39	2003	mining&construction	19.36889
## 40	2004	mining&construction	27.72182
## 41	2005	mining&construction	24.74110
## 42	2006	mining&construction	12.66003
## 43	2007	mining&construction	37.04301
## 44	2008	mining&construction	27.89755
## 45	2009	mining&construction	25.08877
## 46	2010	mining&construction	28.62833
## 47	2011	mining&construction	52.63782
## 48	2012	mining&construction	46.67880
## 49	2013	mining&construction	27.87604
## 50	2014	mining&construction	36.59931
## 51	2015	mining&construction	55.66640
## 52	2016	mining&construction	35.73238
## 53	2017	mining&construction	37.64307
## 54	2018	mining&construction	31.28959
## 55	2019	mining&construction	29.98471
## 56	2003	services	24.43388
## 57	2004	services	24.90177
## 58	2005	services	31.95399
## 59	2006	services	32.02854
## 60	2007	services	34.51619
## 61	2008	services	41.57969
## 62	2009	services	38.62386
## 63	2010	services	38.61610

## 64	2011	services	44.27597
## 65	2012	services	39.65635
## 66	2013	services	38.36847
## 67	2014	services	38.64635
## 68	2015	services	41.09667
## 69	2016	services	35.99895
## 70	2017	services	35.32112
## 71	2018	services	38.56093
## 72	2019	services	34.66174
## 73	2003	transportation	25.74809
## 74	2004	transportation	26.00603
## 75	2005	transportation	36.01428
## 76	2006	transportation	17.36853
## 77	2007	transportation	38.46798
## 78	2008	transportation	45.18087
## 79	2009	transportation	55.72668
## 80	2010	transportation	40.26206
## 81	2011	transportation	22.82074
## 82	2012	transportation	40.28464
## 83	2013	transportation	43.07715
## 84	2014	transportation	34.47532
## 85	2016	transportation	34.06553
## 86	2017	transportation	39.91408
## 87	2018	transportation	43.16090
## 88	2019	transportation	37.86384
## 89	2003	wholesale	28.91118
## 90	2004	wholesale	20.79500
## 91	2005	wholesale	25.11357
## 92	2006	wholesale	21.45129
## 93	2007	wholesale	28.11888
## 94	2008	wholesale	48.76714
## 95	2009	wholesale	28.27469
## 96	2010	wholesale	51.42058
## 97	2011	wholesale	43.44255
## 98	2012	wholesale	45.29911
## 99	2013	wholesale	42.98025
## 100	2014	wholesale	54.95245
## 101	2015	wholesale	52.02288
## 102	2016	wholesale	43.54045
## 103	2017	wholesale	41.13275
## 104	2018	wholesale	37.40031
## 105	2019	wholesale	39.18600

##summary of the mean value of ESG for different industries in different years for portfolio CAR

```
table4 <- aggregate(data2$`Prev ESG Score` ~ year + indu_type, data = data2, FUN = mean)
print(table4)
```

##	year	indu_type	data2\$`Prev ESG Score`
## 1	2004	finance	42.134608
## 2	2005	finance	18.774660
## 3	2007	finance	35.034587
## 4	2012	finance	63.650100
## 5	2013	finance	28.833408
## 6	2014	finance	31.731247
## 7	2016	finance	42.477291
## 8	2017	finance	40.104388
## 9	2018	finance	31.169975
## 10	2004	manufacture	23.767616
## 11	2005	manufacture	48.943531
## 12	2006	manufacture	14.733208
## 13	2007	manufacture	41.077931
## 14	2008	manufacture	43.814365
## 15	2009	manufacture	80.078957
## 16	2010	manufacture	23.746350
## 17	2011	manufacture	47.113338
## 18	2012	manufacture	50.954990
## 19	2013	manufacture	51.527364
## 20	2014	manufacture	42.968439
## 21	2015	manufacture	41.300045
## 22	2016	manufacture	45.779463
## 23	2017	manufacture	52.157408
## 24	2018	manufacture	50.365218
## 25	2019	manufacture	49.135434
## 26	2005	mining&construction	42.729068
## 27	2011	mining&construction	29.452786
## 28	2012	mining&construction	57.582000
## 29	2013	mining&construction	17.359745
## 30	2016	mining&construction	28.206275
## 31	2017	mining&construction	35.237166
## 32	2018	mining&construction	32.554973
## 33	2019	mining&construction	37.605266
## 34	2003	services	27.194441
## 35	2004	services	8.622742
## 36	2005	services	34.707627
## 37	2006	services	38.807712
## 38	2007	services	39.303233
## 39	2008	services	39.211325
## 40	2010	services	11.864007
## 41	2011	services	44.491083
## 42	2012	services	49.907390
## 43	2013	services	48.223597
## 44	2014	services	49.400410
## 45	2015	services	62.887577
## 46	2016	services	43.277509
## 47	2017	services	42.013638
## 48	2018	services	35.912651
## 49	2019	services	41.480371

```

## 50 2005      transportation      55.571210
## 51 2007      transportation      39.347167
## 52 2008      transportation      36.016725
## 53 2011      transportation      38.725145
## 54 2013      transportation      66.643189
## 55 2014      transportation      34.475317
## 56 2016      transportation      50.671820
## 57 2017      transportation      52.735424
## 58 2018      transportation      44.023347
## 59 2004              wholesale      21.600431
## 60 2007              wholesale      28.176939
## 61 2008              wholesale      71.624109
## 62 2009              wholesale      34.180511
## 63 2012              wholesale      69.787157
## 64 2013              wholesale      47.504061
## 65 2015              wholesale      44.268027
## 66 2018              wholesale      51.656302

```

##calcualte the mean value, median value of all the sample

```

data1$target_dummy <- ifelse(!is.na(data1$target_ESG) & data1$target_ESG != '0', 1, 0)
data2$target_dummy <- ifelse(!is.na(data2$target_ESG) & data2$target_ESG != '0', 1, 0)

```

```

a1<- colMeans(data1[c(4:7,10:16,18:24,27:31,33:35,36,39)],na.rm=TRUE)
a2<- colMeans(data2[c(7:13,17:23,27:33,36:47,50)],na.rm=TRUE)

```

```

b1<- colMedians(as.matrix(data1[c(4:7,10:16,18:24,27:31,33:35,36,39)]),na.rm=TRUE)
b2<- colMedians(as.matrix(data2[c(7:13,17:23,27:33,36:47,50)]),na.rm=TRUE)

```

##divide all samples into two groups.

```

data1$subsampl<-ifelse(data1$`Prev ESG Score.x`<median(data1$`Prev ESG Score.x`), 'B', 'A')
data2$subsampl<-ifelse(data2$`Prev ESG Score`<median(data2$`Prev ESG Score`), 'B', 'A')

```

```

data1A<-subset(data1,data1$subsampl=='A')
data1B<-subset(data1,data1$subsampl=='B')
data2A<-subset(data2,data2$subsampl=='A')
data2B<-subset(data2,data2$subsampl=='B')

```

##calculate the mean and median value of all the subsamples

```

c1<- colMeans(data1A[c(4:7,10:16,18:24,27:31,33:35,36,39)],na.rm=TRUE)
c2<- colMeans(data2A[c(7:13,17:23,27:33,36:47,50)],na.rm=TRUE)

d1<- colMedians(as.matrix(data1A[c(4:7,10:16,18:24,27:31,33:35,36,39)]))

```

```

,na.rm=TRUE)
d2<- colMedians(as.matrix(data2A[c(7:13,17:23,27:33,36:47,50)]),na.rm=T
RUE)

e1<- colMeans(data1B[c(4:7,10:16,18:24,27:31,33:35,36,39)],na.rm=TRUE)
e2<- colMeans(data2B[c(7:13,17:23,27:33,36:47,50)],na.rm=TRUE)

f1<- colMedians(as.matrix(data1B[c(4:7,10:16,18:24,27:31,33:35,36,39)]
),na.rm=TRUE)
f2<- colMedians(as.matrix(data2B[c(7:13,17:23,27:33,36:47,50)]),na.rm=T
RUE)

#difference in mean value and median value between sample A and sample
B
g1<-c1-e1
g2<-c2-e2

h1<-d1-f1
h2<-d2-f2

#put them in a table
table5<-cbind(a1,b1,c1,d1,e1,f1,g1,h1)
table5<- as.data.frame.array(table5)
colnames(table5)<-c("mean_total","median_total","mean_highESG","median_
highESG","mean_lowESG","median_lowESG","difference in mean","differnece
in median")
table5<-round(table5,digit=5)

table6<-cbind(a2,b2,c2,d2,e2,f2,g2,h2)
table6<- as.data.frame.array(table6)
colnames(table6)<-c("mean_total","median_total","mean_highESG","median_
highESG","mean_lowESG","median_lowESG","difference in mean","differnece
in median")
table5<-round(table6,digit=5)

##test difference significance in mean difference for the simple CAR de
al and portfolio deal

circle_function_mean <- function(groupA, groupB) {
  result <- t.test(groupA, groupB)
  p_value <- result$p.value
  return(p_value)
}

# Extract the columns from data1A and data1B
data1A_v<-data1A[c(4:7,10:16,18:24,27:31,33:35,36,39)]
data1B_v<-data1B[c(4:7,10:16,18:24,27:31,33:35,36,39)]

```

```

# Initialize lists for groups and p-values
groupA <- list()
groupB <- list()
p_value <- vector("numeric", length = 28)

# Perform t-tests for each pair of columns
for (i in 1:28) {
  groupA[[i]] <- data1A_v[, i]
  groupB[[i]] <- data1B_v[, i]
  p_value[[i]] <- circle_function_mean(groupA[[i]], groupB[[i]])
}

# Display the results about the significance of mean difference for the
  simple CAR deal
table7 <- data.frame(Column = paste0(colnames(data1A_v)[1:28]),
                     P_Value_mean = round(p_value, digit=
4))

# Extract the columns from data2A and data2B
data2A_v<-data2A[c(41:43,51)]
data2B_v<-data2B[c(41:43,51)]

# Initialize lists for groups and p-values
groupA <- list()
groupB <- list()
p_value <- vector("numeric", length = 3)

# Perform t-tests for each pair of columns
for (i in 1:3) {
  groupA[[i]] <- data2A_v[, i]
  groupB[[i]] <- data2B_v[, i]
  p_value[[i]] <- circle_function_mean(groupA[[i]], groupB[[i]])
}

# Display the results about the significance of mean difference for the
  portfolio CAR deal
table8 <- data.frame(Column = paste0(colnames(data2A_v)[1:3]),
                     P_Value_mean = round(p_value, digit=4))

##test significance for median difference
library(RVAideMemoire)

## Warning:  程辑包 'RVAideMemoire' 是用 R 版本 4.1.3 来建造的

```



```

## *** Package RVAideMemoire v 0.9-81-2 ***

data1_test<-data1[c(4:7,10:16,18:24,27:31,33:35,36,39,40)]

circle_function_median <- function(groupA) {
  result <- mood.medtest(groupA ~ data1_test$subsampl)
  p_value <- result$p.value
  return(p_value)
}

groupA <- list()
p_value <- vector("numeric", length = 28)

for (i in 1:28) {
  groupA[[i]] <- as.matrix(data1_test[, i])
  p_value[[i]] <- circle_function_median(groupA[[i]])
}

##display median difference signicance for simple CAR deal
table9 <- data.frame(Column = paste0(colnames(data1_test)[1:28]),
                    p_value_median = round(p_value,digit=4))

data2_test<-data2[c(7:13,17:23,27:33,36:47,50,51)]

circle_function_median <- function(groupA) {
  result <- mood.medtest(groupA ~ data2_test$subsampl)
  p_value <- result$p.value
  return(p_value)
}

groupA <- list()
p_value <- vector("numeric", length = 34)

for (i in 1:34) {
  groupA[[i]] <- as.matrix(data2_test[, i])
  p_value[[i]] <- circle_function_median(groupA[[i]])
}

##display median difference signicance for portfolio deal
table10 <- data.frame(Column = paste0(colnames(data1_test)[1:34]),
                    p_value_median = round(p_value,digit=4))

```