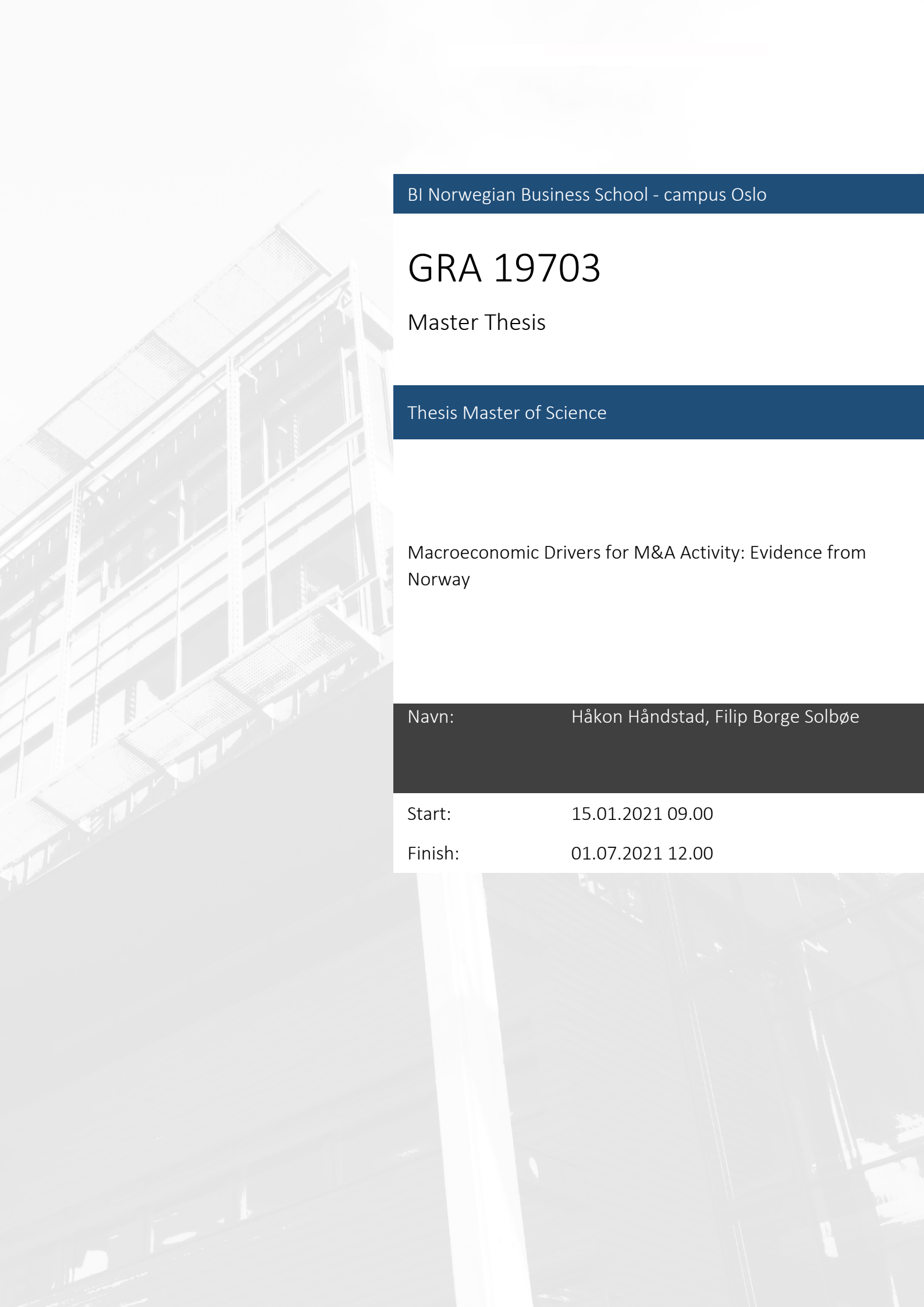

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Master Thesis

Thesis Master of Science

Macroeconomic Drivers for M&A Activity: Evidence from Norway

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Macroeconomic Drivers for M&A Activity: Evidence from Norway

Master Thesis

by

Håkon Håndstad and Filip Borge Solbøe

MSc in Business – Finance

Supervisor: Prof. Siv Staubo

Department of Finance, BI Norwegian Business School

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Abstract

This paper investigates whether certain quantitative macroeconomic factors are drivers for takeover activity in Norway, and if so, what effects these variables have on the number of takeovers. Three macroeconomic variables are studied: domestic stock market performance, domestic short-term interest rate, and gross domestic product. A multiple regression analysis is performed on quarterly data from Norway in the period 2008-2019. The results of the regression suggest that there exists a statistically significant positive relationship between the short-term interest rate and takeover activity. However, no significant relationship is found between M&A activity and the other regressors. A set of robustness regressions are performed, one where quarterly data is altered to yearly data, several where one or two independent variables are omitted, and two regressions where the data is split into two subsamples based on the time period. The robustness tests strengthen the results of the main regression.

Acknowledgments

We would like to thank our supervisor Siv Staubo, Professor of Finance at BI Norwegian Business School, for her helpful input, insight, and guidance throughout the whole thesis process.

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1.0 Introduction

The market for mergers and acquisitions is huge. Since 2000, the total value of announced transactions worldwide surpassed 57 trillion USD (IMAA, n.d.). Companies can either grow organically, by for example introducing new products, or they can grow inorganically through mergers and acquisitions (Baghai et al., 2007). There exists extensive research on what drives these transactions. Some papers relate takeover activity to business cycles of macroeconomic factors (Becketti, 1986; Gort, 1969; Golbe & White, 1993), while others find that industry-level and firm-specific factors affect the intensity of mergers (Mitchell & Mulherin, 1996; Andrade & Stafford, 2004; Harford & Li, 2007). However, little attention has been given to the drivers of M&A activity in smaller economies such as Norway.

This paper aims to investigate and contribute to the understanding of what drives M&A activity in Norway by studying the relation between certain quantitative macroeconomic variables and takeover activity. Due to the limited research on determinants for M&A activity in Norway, research on other geographical areas will make up the majority of the academic foundation of this paper. The existing research is focused on larger markets, like the U.S. market, and does not cover smaller economies to the same extent. Due to this fact, an examination of a smaller economy like Norway could prove interesting.

The paper has the following structure: First, a review and a discussion of the current literature on the takeover market, M&A activity, and determinants of merger activity is provided in section 2. The review is used to construct hypotheses in the same section. Furthermore, in section 3 the research model is presented along with the variables of interest and the data sources. Variables are selected based on the hypotheses, previous research, and the interrelations between the variables. Section 4 presents some descriptive statistics on the variables together with the empirical results from the regression and a subsequent discussion of the results. Additionally, robustness tests are provided to test the strength of the statistical model. Finally, section 5 concludes and summarizes the findings, and provides suggestions for further research.

2.0 Literature Review and Hypothesis Development

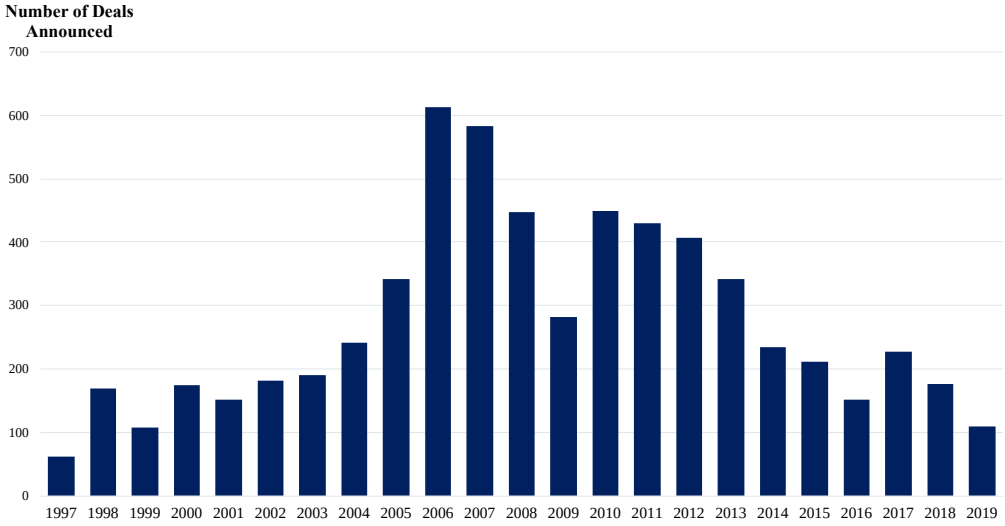
2.1 The Market for Mergers and Acquisitions

A *merger* can be defined as a transaction that consolidates two firms into one single entity, while an *acquisition* can be defined as the purchase of one firm by another individual or firm (Hirschleifer, 1995). These terms are referred to as either *takeovers* or *M&As*, which will be used interchangeably throughout this paper. Furthermore, the aforementioned transactions are both parts of the *takeover market* or the *market for corporate control* (Berk & DeMarzo, 2017).

A *takeover wave* reflects the wave pattern of the number and the total value of takeover deals over time (Martynova & Renneboog, 2008). Takeover activity tends to cluster and is characterized by peaks in the activity level, followed by periods of fewer transactions (Koller et al., 2015). There has developed a consensus in M&A literature that takeover activity occurs in waves. Martynova & Renneboog (2008) argue that this is a well-known phenomenon. Scherer and Ross (1990) describe merger activity as episodic marked by waves, and Blair et al. (1991) note different waves and point out the volatility of the patterns. However, Golbe & White (1993) found that the previous hypotheses had been accepted without any formal support. They performed a direct econometric test to the merger wave proposition on U.S. merger data, which proved that what people had the impression of, also was formally correct.

If the conclusion of the previously mentioned authors is cross-examined with the pattern of takeover activity in Norway from 1997 to 2019, as shown in *Figure 1*, it does resemble a wave-pattern with distinct peaks and valleys. The overall volatility of the data, which encompasses the whole market, can be an indicator that some macroeconomic forces may drive the level of mergers in Norway.

Figure 1. Number of Announced Takeovers in Norway 1997-2019



Notes: This figure shows a bar chart of the yearly number of announced takeovers in Norway in the period 1997-2019 (Zephyr, n.d.). These transactions concern takeovers where the acquirer has its primary address in Norway and the targets are both domestic and foreign.

2.2 Drivers for M&A Activity

The drivers, or determinants of takeover activity, can be divided into three groups of drivers based on the extent of their domain (Lukkarinen, 2011). *Macro-level* drivers, that affect M&As across all industries; *industry-level* drivers, that affect certain industries at a specific point in time; and *micro-level* drivers, company-specific drivers that only affect certain companies. This paper will focus on *quantitative macroeconomic determinants* and will thus give a more thorough discussion of this subject. In the following paragraphs, the current literature on the aforementioned levels of drivers is reviewed and discussed. The next section will cover the current literature on quantitative macroeconomic drivers, and the subsequent section will cover the development of the hypotheses of this paper.

Micro-level drivers for takeover activity, or simply *motives* for M&A activity, can be divided into two groups of motives; motives that aim to increase the value of the merging firms, and motives that aim to increase the wealth of the acquiring firm's manager, despite a deterioration in value for the firms (Motis, 2007). Starting with the first group of motives, Berk & DeMarzo (2017) note that the synergies that acquirers use the most to justify takeovers are economies of scale and scope; vertical integration; talent acquisition; monopoly gains; efficiency

gains; tax savings from operating losses; increased debt capacity due to diversification; and earnings growth. As for the second group of motives, it is related to agency problems. Harford & Li (2007) found that CEOs have a substantial incentive for acquiring another firm as their overall pay and wealth increase after the takeover, regardless of the outcome of the transaction. Furthermore, Roll (1986) presents the "hubris hypothesis" to explain takeovers, arguing that CEOs pursue takeovers that have a low chance of succeeding, due to overconfidence. Nguyen et al. (2012) found that 59% of M&As are related to agency motives and/or hubris.

Industry-level drivers affect takeovers in certain industries at a specific point in time. Potential industry-level determinants include deregulation, oil price shocks, foreign competition, and financial innovation (Martynova & Renneboog, 2008). Gort (1969) notes that the concentration of mergers varies across industries. Andrade & Stafford (2004), and Mitchell & Mulherin (1996) found that takeovers tend to cluster within industries as a result of industry shocks, leading to industry-specific takeover waves.

Macro-level, or macroeconomic, drivers for takeover activity can be grouped into *quantitative* determinants that can be quantitatively measured, and *qualitative* drivers. Harford (2005) found that industry shocks trigger takeover waves but are not sufficient to create a wave alone. There must be sufficient macro-level capital liquidity, for takeovers to cluster. This paper will focus on quantitative macroeconomic factors, but it is useful to provide a brief overview of some of the qualitative drivers as well. Qualitative factors can be a result of political decisions or technological development. Campa (2006) argues that economic policies towards increased globalization have led to and can continue to lead to an increase in restructuring activity. Furthermore, Jensen (1988) states that the relaxation of restrictions on mergers imposed by antitrust laws leads to the restructuring of companies in order to operate efficiently.

2.3 Quantitative Macroeconomic Drivers

Takeovers are closely related to macroeconomic factors (Yagil, 1996). There have been conducted a great deal of research into the topic of macroeconomic

variables' effect on takeover activity. The current literature contains different approaches and the studies examine various independent variables' effect on takeover activity. Becketti (1986) found that changes in macroeconomic variables account for about *one-third of the variation* in M&A activity. Several empirical studies have found a relationship between the cyclical patterns of M&A activity and macroeconomic variables. Gort (1969), and Golbe & White (1993) found that changes in capital market conditions and economic growth are positively correlated with takeover activity. Following, an overview of previous research on various macroeconomic variables is presented.

Stock market performance

Several empirical studies have found a relationship between the cyclical patterns of M&A activity and macroeconomic variables. Gort (1969), and Golbe & White (1993) found that changes in capital market conditions and economic growth are positively correlated with takeover activity. Choi & Jeon (2011) examined M&A activity in the US in the period 1980-2004 and found stock market performance to be one of the main macroeconomic forces driving takeover activity. Furthermore, according to Mitchell & Mulherin (1996), the most robust result from empirical studies related to macroeconomic variables as the source of takeover activity is that takeover activity is positively related to *overall stock performance* and vice versa. That is, an increase in stock prices means an increase in merger activity and vice versa. Weston (1953) was one of the first to report on this relationship. Subsequently, it was found to be true again by Melicher et al. (1983), and Benzing (1991). Shleifer & Vishny (2003) examined the relation between takeovers and stock market misevaluations and found that companies with overvalued equity might be able to grow and survive through acquisitions. Firms then have an incentive to raise their share price, implying that there is a positive relation between stock prices and takeovers.

Economic growth

Several research papers have studied the relationship between *economic growth* and takeover activity. Choi & Jeon (2011) concluded that GDP is one of the most relevant factors determining aggregate merger activity, alongside stock market performance and monetary policy. They argued that an expanding economy allows firms to have a more favorable environment to make M&A decisions. Gort

(1969), and Golbe & White (1993) found that there is a positive relationship between changes in economic growth and the intensity of takeovers. Economic growth in home countries of potential acquirers increases earnings and equity values, and hence the pool of capital available to fund takeovers (Glaister & Ahammad, 2008). Becketti (1986) on the other hand, discovered a negative relationship between economic growth and merger activity. His results suggest that increases in real gross national product precede declines in the number and value of mergers. Previous literature shows that there is not a universal agreement about the effect economic growth has on takeover activity. However, most research points in the direction of this relationship being positive.

Interest rate

An important factor that often determines the outcome of business investment decisions is the *level of interest rates*. Gardiner (2006) points out that M&As are often large transactions that usually require external funding. Reducing the cost of financing would increase the total value of the transaction, making the investment more attractive to the shareholders of the merging firms. Koller et al. (2015) point out the empirical result that low interest rates stimulate acquisitions, especially highly levered transactions. There have been several empirical studies on the interest rates' effect on takeover activity, in which the results have been mixed. Melicher et al. (1983) found a weak negative relationship, that was significant. Yagil (1996) discovered that the interest rate alongside the change in the investment level in the economy have significant explanatory power for variations in takeover activity, and he found that the effect of these variables on takeover frequency was positive. Becketti (1986) found a strong relationship between changes in interest rates and takeover activity, pointing out that changes in interest rates both affect the cost of mergers and the attractiveness of mergers by changing the return to lending cash instead of using the funds for acquisitions. The importance of the interest rate as a determinant of takeover activity is in previous research mostly acknowledged. However, researchers have reached different conclusions regarding the sign of the relationship between interest rates and takeover activity.

Unemployment

There has not been conducted as much research on the effect of the unemployment rate on takeover activity compared to other economic variables, but there are a few relevant findings. Mitchell & Mulherin (1996) researched how shocks within industries impact the level of takeover activity. In their research, they found that there was a significantly positive relationship between takeover activity and positive employment shocks. O'Shaughnessy & Flanagan (1998) researched the relationship between takeover activity and the announcement of layoffs. They found that takeover activity seems to correlate with the announcement of layoffs, with slight variations depending on the pre-merger relationship of the firms. Benzing (1991) diverges from the two previously mentioned research articles and found that the unemployment rate was an insignificant determinant of merger activity in her research.

Money supply

Money supply as a factor for takeover activity has been researched at different times by different contributors, with different outcomes. The money supply is a tool that can be used by central banks to influence inflation, and the effects of money supply will always be linked to inflation. Statistics Norway (2021) defines the most commonly used measures for money supply as; M1 (Narrow money) – the currency in circulation and transaction deposits; M2 (Intermediate money) – which is M1 plus deposits with a period of notice up to three months or an agreed-upon maturity up to two years. Becketti (1986) tested the effect of changes in the stock of money, as measured by M1, on the intensity of mergers, but found no evidence of any relation between the two variables. Resende (2008) found that, in addition to stock market returns and real output, the money supply was a driving factor for merger waves in the United Kingdom.

Inflation

Little attention has been given to inflation as a determinant of merger activity in prior research articles. In a working paper by Wilson & Vencatachellum (2016), the inflation rate was used as a measure for macroeconomic stability. They found that the inflation rate has a significantly negative impact on M&A activity and argue that high inflation discourages investment as it increases the cost of doing business. Inflation is also closely linked to other macroeconomic measures, such

as the stock market, economic growth, and money supply, which can be seen later in this paper.

2.4 Hypothesis Development

Taking the existing literature into account and looking at previous research on macroeconomic variables' effects on takeover activity, the hypotheses of the paper are formed. The thesis mainly follows the methods and empirical research of Yagil (1996) and will be grounded in his examination of the subject. This paper will expand slightly on the aforementioned model with the addition of domestic stock market performance. In addition, the thesis will utilize a wider view of the economy, examining the economic growth's effect on takeover activity. From this approach, the thesis hypotheses are formed. Research has mainly shown that an increase in stock market performance is positively related to increased takeover activity on international data. Thus, it is not unlikely that the same relationship exists for Norwegian data as well. Hence, the first hypothesis is developed:

Hypothesis 1:
Takeover activity in Norway is positively related to domestic stock market performance.

The research on the interest rate's effect on takeover activity has reached differing conclusions in prior research. The existing literature has explored different ways changes in the interest rate influence the level of takeovers. Yagil (1996) presents evidence that suggests there exists a positive relationship. However, Becketti (1986) presents a strong negative relationship between the interest rate level and takeover activity through a cost of financing factor and an alternative cash lending factor. The prior research on the relationship provides compelling evidence leading both directions. Although this paper follows Yagil (1996), the research is divided on the topic, and thus the second hypothesis is as follows:

Hypothesis 2:
Takeover activity in Norway is related to the domestic interest rate level.

The existing literature does not agree on the sign of the relationship between the frequency of takeovers and economic growth. However, the majority of the research points towards a positive relationship. Therefore, it is reasonable to believe that one can observe the same results when testing the theory on Norwegian data. Thus, the third hypothesis of the research paper is formed:

Hypothesis 3:
Takeover activity in Norway is positively related to domestic economic growth.

Consequently, the paper seeks to research three economic variables: *stock market performance*, *domestic interest rate level*, and *economic growth*. Scrutiny of the other economic variables omitted from our research, as well as insight into the paper's variables of interest, is discussed in section *3.2*. Melicher et al. (1983) did an inquiry into the relationship between the stock market and takeover activity where they found that changes in the stock market seem to have an effect on the level of takeovers with a lag of one quarter. It is reasonable to think that the other independent variables of interest may affect the takeover activity with lagged intervals. However, this paper does not try to assess if there is any lagged relationship between the variables i.e., any dynamic relationship, but seeks only to establish if there is a relationship between the independent variables and the dependent variable.

3.0 Methodology and Data

3.1 Dependent Variable

This thesis aims to investigate how macroeconomic variables drive takeover activity in Norway. In this paper, how the activity changes over time will be studied. Typically, M&A activity is measured in two different ways, either by the total number of takeovers or by the total value of the takeovers. In this thesis, the total *number of takeovers* will serve as the dependent variable, with the main reason being data size and accuracy. Becketti (1986) notes that data on the value of takeovers are less complete and less reliable than data on the number of takeovers. Furthermore, Town (1992) points out that it would be optimal to measure activity by the real value of the firms, but that using it as it is would result in a huge error due to a lot of deals not disclosing the deal information. Only 23% of the deals in the dataset used for this thesis have disclosed deal value. Using the number of deals as the measure for activity also removes the problem of mega deals with huge values. Applying the *natural logarithm* on the number of takeovers converts changes in the variable into percentage changes (Stock, 2020).

Data on the number of takeovers in Norway have been retrieved from *Zephyr*. This is a comprehensive database containing corporate deal information for research, provided by Bureau van Dijk, including M&As, IPOs, private equity-, and venture capital deals. The collected data consists of the quarterly number of takeovers from 2008-2019 and includes deals that have been confirmed, assumed to be confirmed, or announced. Due to limited access to data on decisions made before the announcement of takeovers, the *announcement dates* will be used as a proxy for the dates of the takeovers. Furthermore, the dataset consists of deals where the primary address of the acquirer is located in Norway, which means that it will cover both domestic and cross-border transactions. The complete search strategy in Zephyr can be found in *Appendix A*.

Table 1. Deal Statistics

	N	in % of total
Deals with known value	777	23%
Foreign target	823	24%
Domestic target	2616	76%
Mergers	87	3%
Sum takeovers	3439	100%

Notes: This table reports certain statistics on the number of deals collected from Zephyr in the period 2008-2019. N denotes the number of takeovers. Deals with known value indicate how many takeovers that have disclosed the deal value. Foreign (domestic) target indicates how many deals there are in the dataset in which the target company is foreign (domestic). Lastly, the number of mergers is reported – the remaining number of deals consist of acquisitions.

Given the aforementioned restrictions, the total number of deals equals 3,439, as can be seen in *Table 1*. About 77% of the transactions have missing deal values, and thus the number of takeovers will serve as a far better measure of activity than deal value. Furthermore, the number of takeovers that are mergers is quite small, about 3% of the total number of deals, the rest being acquisitions.

The data collected from Zephyr following the search strategy, as shown in *Appendix A*, contains *cross-border transactions*. One of the search criteria is that the primary address of the acquirer firm is located in Norway. However, there are no restrictions put on the primary address of the target firm. Hence, some of the takeovers have foreign target companies. Even though the aforementioned search criterion is used, some transactions are presented with another acquirer company code than Norway. After consulting with Zephyr customer service, the authors have found that this is because some companies make acquisitions through their foreign subsidiaries. Thus, because the subsidiaries' primary address is outside of Norway, the acquirer company code will reflect this. The dataset consists of both domestic and cross-border takeovers where the acquirer has the primary address in Norway, including acquisitions through foreign subsidiaries. A yearly overview of the data sample on takeovers can be seen in *Table 2* below.

Table 2. Overview of Cross-Border and Domestic Takeovers in Norway 2008-2019

	Norwegian Acquirer		**Norwegian Acquirer and Target**	
Year	N	in % of total	N	in % of total
2008	446	13.0%	369	10.7%
2009	277	8.1%	237	6.9%
2010	446	13.0%	378	11.0%
2011	428	12.4%	351	10.2%
2012	403	11.7%	324	9.4%
2013	339	9.9%	265	7.7%
2014	233	6.8%	167	4.9%
2015	210	6.1%	129	3.8%
2016	150	4.4%	90	2.6%
2017	224	6.5%	145	4.2%
2018	176	5.1%	110	3.2%
2019	107	3.1%	51	1.5%
Sum takeovers	3439	100%	2616	76.1%

Notes: This table reports an overview of the data sample on takeovers in Norway in the period 2008-2019 sorted by year. N denotes the number of takeovers. Percentages are based on the total number of takeovers when the acquirer is Norwegian, but the target can be either foreign or domestic. The second and third columns contain M&As in which the primary address of the acquirer is in Norway. The fourth and fifth columns contain M&As in which the primary address of both the acquirer and the target is in Norway.

3.2 Independent Variables

The independent variables consist of macroeconomic factors that have been chosen based on an examination of previous literature, as well as the correlation between these variables.

Several macroeconomic factors are closely related, and thus some may be correlated with one another. When two, or more of the independent variables, are highly correlated with one another, the regression may have a *multicollinearity* problem (Brooks, 2014). If this problem is present the individual variables will not be significant, and the individual coefficients will have high standard errors, despite a high R-squared. Hence, it is hard to identify which of the independent variables that explain a certain variation in the dependent variable. Brooks (2014) presents a simple method to detect multicollinearity, in which the correlation matrix of the independent variables is examined. If high correlations between the variables are observed, there could be a multicollinearity problem. A correlation matrix on the level of some macroeconomic variables is presented in *Table 3*.

Table 3. Correlation Matrix on Macroeconomic Variables

	OSEBX	*GDP*	*NIBOR*	*M2*	*10YB*	*LFS*	*CPI*
OSEBX	1						
GDP	0.920	1					
NIBOR	-0.588	-0.607	1				
M2	0.960	0.936	-0.714	1			
10YB	-0.736	-0.792	0.778	-0.859	1		
LFS	0.477	0.460	-0.748	0.587	-0.740	1	
CPI	0.954	0.912	-0.708	0.991	-0.832	0.608	1

Notes: This table reports the correlations between certain macroeconomic variables that are thought to influence the number of takeovers. The notation is as follows: OSEBX is the quarterly average value of the OSEBX index; GDP is the quarterly value of the Norwegian gross domestic product in market values; NIBOR is the nominal quarterly average 3-month NIBOR; M2 is the quarterly average of the monetary aggregate M2; 10YB is the effective quarterly average yield on 10-year Norwegian government bonds; LFS is the seasonally adjusted quarterly unemployment rate in Norway; CPI is the quarterly average Consumer Price Index in Norway. The data on all variables is from the period 2008-2019.

Yagil (1996) studied the effect of interest rate on Treasury Bills and the change in the total investment level in the economy on takeover activity. He found the interest rate to be statistically significant, while the statistical significance of the change investment level was found to be weaker. Thus, this paper focuses on *gross domestic product* (GDP) instead of investment level, as the authors believe this measure to be better suited for the model in the paper. First, there is extensive research on the topic. Choi & Jeon (2011) found GDP to be one of the most significant factors determining aggregate merger activity. Furthermore, using GDP as a determinant of the frequency of takeovers will indirectly include investment level. As GDP can be viewed as the sum of the money spent by actors in the economy, investment level will be included. This can be seen through an equation of domestic expenditure (CFI, n.d.), which consists of private consumption (C), total government expenditures (G), total investment (I), and net exports (NX).

$$GDP = C + G + I + NX$$

Table 3 reveals a high correlation between multiple variables. This is not unexpected as macroeconomic variables are closely linked together. Both *M2* and *CPI* are highly correlated with the majority of the other variables, and to avoid the problem of multicollinearity these will not be included in the model. Additionally,

there is limited research on M2. Becketti (1986) tested the effect of changes in the stock of money, as measured by M1, on the intensity of mergers, but found no evidence of any relation between the two variables. Furthermore, *unemployment* has also been given little attention in previous research and will be excluded from the model.

Mitchell & Mulherin (1996) found that the most robust result in an empirical study of macroeconomic variables as a source for takeover activity was a positive relationship between overall stock performance and takeover activity. Despite the high correlation with GDP, the *OSEBX* index will be included in the model, as it is believed to strongly influence the frequency of M&As. A *logarithmic transformation* will be applied to deal with the high correlation between these variables.

Since Yagil (1996) found interest rate to be strongly statistically significant, this paper will use the interest rate in the regression model. Both Becketti (1986) and Yagil (1996) used the interest rate on Treasury Bills in their empirical studies. That is, they used a short-term interest rate, which this paper also will employ. Hence, the model will use the 3-month NIBOR.

Domestic stock market performance

Domestic stock market performance is measured by tracking historical data from a Norwegian index, *Oslo Børs Benchmark Index (OSEBX)*. The data have been retrieved from the Oslo Stock Exchange (Oslo Børs, n.d.), which is the only Norwegian stock exchange. The exchange keeps track of all current and historical quotes from all listed companies and funds including OSEBX. This data does not cover prices on private companies, but it will serve as a good proxy for the overall domestic stock market performance. The dataset contains monthly index values that have been converted to average quarterly values to match the frequency of the dataset on the number of takeovers.

Short-term interest rate

The short-term interest rate is measured by tracking historical data from the 3-month interbank rates in Norway, the *Norwegian Interbank Offered Rate (NIBOR)*. The data consists of a merged dataset of monthly nominal interest rates

from *Norges Bank* (Norges Bank, n.d.), which provides observations from 1982 to 2013, and *Norske Finansielle Referanser* (NoRe, n.d.), which keeps data from 2011 to 2021. The monthly data for both sets of interest rates have been transformed into quarterly average figures.

Economic growth

Domestic economic growth is measured by tracking historical data of GDP from the national accounts of Norway. The dataset has been retrieved from *Statistics Norway* (Statistics Norway, n.d.-a), which has detailed data on all national accounts dating from 1978 to 2020. It is not uncommon for the national accounts to provide data for *Mainland Norway*, which includes all domestic production activity excluding exploration of oil and gas, pipeline- and ocean transport (Statistics Norway, 2014). This thesis, however, will employ total GDP, because the petroleum industry makes up such a high fraction of total GDP in Norway and is, therefore, an important factor for domestic economic growth.

An overview of both the dependent variable and the independent variables that will be used in the model in this paper is found in *Table 4*.

Table 4. Overview of Variables

	Proxy	Data
Dependent variable		
Norwegian takeover activity	Number of quarterly takeovers	Zephyr, (n.d.)
Independent variables		
Domestic stock market performance	Change in average quarterly OSEBX value	Oslo Børs (n.d.)
Short-term interest rate	Average quarterly 3-month NIBOR	Norges Bank (n.d.), NoRe (n.d.)
Economic growth	Change in quarterly GDP	Statistics Norway (n.d.-a)

Notes: This table gives an overview of the variables in the model used in this paper. The second column reports proxies that will be used to measure the effects of the variables. The last column reports data sources, which can be found in the bibliography. The data on all variables is from the period 2008-2019.

3.4 Methodology

In this paper, an empirical study is conducted, and a *multiple linear regression* model is applied. The time period researched will be ranging from the start of 2008 until the end of 2019. A multiple linear regression analysis allows one to measure the effect of each of the independent variables on the dependent variable, by holding the other variables constant (Brooks, 2014), and provides insight into the relationship between the variables. The general *multiple linear regression* model is given by:

$$y_t = \beta_1 + \beta_2 x_{2t} + \beta_3 x_{3t} + \cdots + \beta_k x_{kt} + u_t, \qquad t = 1,2, \dots, T$$

where $x_{2t}, x_{3t}, \dots, x_{kt}$ are a set of $k - 1$ explanatory independent variables which are believed to influence the dependent variable y_t; $\beta_1, \beta_2, \beta_3, \dots, \beta_k$ are the parameters which quantify the effect of each explanatory variable on y_t; and u_t is the error term (Brooks, 2014). The coefficients $\beta_1, \beta_2, \beta_3, \dots, \beta_k$ will be estimated using the *ordinary least squares* (OLS) method.

Following Yagil (1996), this paper will use a *log-log model*, in which both the dependent variable and the independent variables will have a ln-transformation (Stock, 2020). In a log-log model, a 1% change in the independent variable is associated with a β% change in the dependent variable, where β is the coefficient for the relevant regressor. The dependent variable will have a simple ln-transformation on the form $ln(x)$, where x denotes the quarterly number of takeovers. Furthermore, the independent variables will exploit the following result:

$$\ln(1 + x) \approx x \quad for \quad x \approx 0$$

where x denotes the independent variable. Thus, when the values of the independent variables are small, this ln-transformation is approximately equal to the original value of the variable.

Additionally, transforming the variables using logarithms will stabilize the variance, or reduce *heteroskedasticity* (Brooks, 2014). Heteroskedasticity is the

case in which the variance of the errors in the regression is not constant. In this case, the OLS estimators will not have the minimum variance among the class of unbiased estimators. Hence, using a ln-transformation will rescale the data to "pull in" extreme observations. Considering the thesis uses data from the financial crisis, this may well be an adequate solution. Thus, the following time-series regression equation is estimated:

$$ln(M_t) = \beta_0 + \beta_1\, ln(1 + \Delta GDP_t) + \beta_2\, ln(1 + NIBOR_t) + \beta_3 \ln(1 + \Delta OSEBX_t) + u_t$$

The abbreviations are as follows:

M_t	Number of quarterly takeovers
ΔGDP_t	Change in quarterly GDP
$NIBOR_t$	Average quarterly 3-month NIBOR
$\Delta OSEBX_t$	Change in the average quarterly level of OSEBX

Using standard academic software, the dependent variable is regressed on the independent variables according to the regression equation as presented above. The results of the multiple regression are presented and discussed in the next section.

4.0 Empirical Results

4.1 Descriptive Statistics

Table 5 below shows typical statistical properties of the ln-transformed variables used in the regression analysis. The table presents the number of observations, the mean and median values, the standard deviation of the variables, and the minimum and maximum values that the variables take. Additional graphs showing the variables plotted over time can be found in *Appendix B-E*. The sample period in our regression consists of 48 consecutive quarters ranging from Q1 2008 to Q4 2019. The variables containing changes in the variable ($\Delta OSEBX$ and ΔGDP) used 49 data points (including the datapoints from Q4 2007) to obtain the changes for 48 quarters. Therefore, there are 48 observations on each ln-transformed variable on which the regression runs on.

The change in OSEBX is by far the most volatile independent variable in the dataset. With a minimum of *-0.5263*, a maximum of *0.2160*, and a standard deviation of 11.06%, it reflects the precarious nature of the stock market. The movements are shown in *Appendix D*. The large bottom that occurs in the late quarters of 2008 is due to the financial crisis, which had devasting effects on the global stock market. The slightly positive mean and median values indicate a slightly positive long-run trend for the Norwegian stock market. Likewise, the change in GDP is relatively volatile, with a minimum of *-0.1156*, a maximum of *0.1054*, and a standard deviation of 4.72%. The GDP is estimated from market values and the relative changes in growth are dependent on short- and long-term policy decisions and other economic factors, which makes the relative changes inherently volatile. The relative movements are shown in *Appendix E*. Both the mean and median values are relatively close to zero. The mean value suggests a moderate long-run economic growth. The 3-month NIBOR has been moving downwards in the long run, with a small hike recently. The mean is higher than the median value, which suggests that there are, relatively speaking, more high observations than there are low ones. *Appendix F* contains a plotted graph showing the movement of the short-term interest rate over time. It shows how the interest rate has moved from the area around its max value in the dataset, towards the minimum value over time.

Table 5. Descriptive Statistics

	N	MEAN	MEDIAN	SDV	MIN	MAX
Dependent variable						
Ln(M)	48	4.1513	4.1109	0.5126	2.8904	5.2933
Independent variables						
Ln(1 + ΔGDP)	48	0.0077	-0.0044	0.0472	-0.1156	0.1054
Ln(1 + NIBOR)	48	0.0210	0.0173	0.0136	0.0081	0.0639
Ln(1 + ΔOSEBX)	48	0.0125	0.0280	0.1106	-0.5263	0.2160

Notes: This table reports typical descriptive statistics on the variables in the regression model. The notation is as follows: N is the number of observations for each variable; M is the quarterly number of takeovers; ΔOSEBX is the change in the average quarterly OSEBX index; NIBOR is the nominal average quarterly 3-month NIBOR; and ΔGDP is the change in the quarterly value of the Norwegian gross domestic product. The descriptive statistics are the mean value (MEAN); the median value (MEDIAN); the standard deviation (SDV); the minimum (MIN) and maximum (MAX) values. The data on all variables is from the period 2008-2019.

4.2 Regression Results

Table 6 presents the results of the multiple regression. It displays the results of running the independent variables $ln(1 + \Delta GDP)$, $ln(1 + NIBOR)$, and $ln(1 + \Delta OSEBX)$ on the dependent variable $ln(M)$. The regression returns an R-squared of *0.35*, which implies that the regressors explain 35% of the variation in the dependent variable. However, the R-squared increases whenever a regressor is added and can give an inflated view of how well the model fits (Stock, 2020). Looking at the *adjusted R-squared* is more reliable, which returns a rate of about 30%. A high figure does not necessarily mean that one uses the right set of regressors, nor does a low adjusted R-squared mean that you have an inappropriate set of regressors. It serves as a tool to analyze a regression's fit but should be weighted alongside data availability, economic theory, and the nature of the research question (Stock, 2020). In this case, the relatively low adjusted R-squared indicates that about *one-third of the variation* in the dependent variable is explained by the regressors. Although on a slightly different set of regressors, similar values of R-squared can also be found in Becketti (1986) and Yagil (1996).

The overall F-statistic of the model is *7.89* and its corresponding p-value equals *0.00025*, which implies that the joint hypotheses that all slope coefficients are

zero can be rejected at the 1% significance level. Hence, statistical evidence suggests that the independent variables influence the dependent variable. Now that the model is established to be statistically significant, the significance of each independent variable must be assessed.

Table 6. Results of Regression Analysis

Variable	Coefficient	t-statistic
Constant	**3.6198*** ** (0.1299)	27.864 (1.37e-29)
ln(1 + ΔGDP)	1.2131 (1.333)	0.9101 (0.3678)
ln(1 + NIBOR)	**24.32*** ** (5.2442)	4.6375 (3.16e-05)
ln(1 + ΔOSEBX)	0.8601 (0.6517)	1.3198 (0.1937)
R-Squared	0.35	
Adjusted R-Squared	0.306	
F-statistic	**7.89*** **	
p-value	(0.00025)	
N	48	

Notes: This table reports the results of the multiple regression using quarterly data from the period 2008-2019. The second column reports the coefficient estimates for the independent variables with their respective standard errors in parentheses. The third column reports the t-statistics for the independent variables with their respective p-values in parentheses. The lower part of the table reports the R-squared, the adjusted R-squared, the F-statistic and its corresponding p-value, and the number of observations (N) for the regression, respectively. ***, **, and * denotes statistical significance at the 1%, 5%, and 10% levels, respectively.

The results from the regression support the hypotheses of this paper. The relationship between takeover activity and economic growth was expected to be positive, which is confirmed by the regression analysis. The independent variable is, however, with a p-value of *0.3678,* not statistically significant at any of the commonly used levels of statistical significance; 1%, 5%, and 10%. The relationship between M&A activity and the domestic stock market performance was also expected to be positive, which the regression analysis confirms. The significance of the independent variable is higher than the one of the GDP growth, with a p-value of *0.1937*. Yet, it is not statistically significant on any of the

aforementioned significance levels. Consequently, neither of the two variables have any statistical significance in the model.

This paper did not hypothesize about the sign of the relationship between takeover activity and the 3-month NIBOR. The hypothesis was that there is a relationship, either positive or negative. The regression analysis found this to be true, which shows that there is a positive relationship between these variables. The interest rate has a p-value of *0.0000136*, thus being **significant** on the 1% level and the only statistically significant independent variable in the regression model.

The results from the regression analysis should be interpreted with caution. Some of the independent variables may be correlated, which is considered likely from an economic perspective since the variables are macroeconomic factors that affect one another. Thus, there might be a multicollinearity problem for these variables that can affect the precision of the coefficient estimates. *Table 7* gives an assessment of potential multicollinearity using the correlations between the explanatory variables, as well as the *variance inflation factor* (VIF) for each regressor. A VIF above 1 indicates that collinearity is present, and a VIF above 10 indicates so high collinearity that the standard error of the coefficient is excessively inflated and it is likely that the coefficient is not precisely estimated (Ferré, 2009).

Table 7. Multicollinearity between Independent Variables

	ln(1 + ΔGDP)	**ln(1 + NIBOR)**	**ln(1 + ΔOSEBX)**
ln(1 + ΔGDP)	1		
ln(1 + NIBOR)	-0.0233	1	
ln(1 + ΔOSEBX)	0.1349	-0.4870	1
VIF	1.0210	1.3141	1.3377

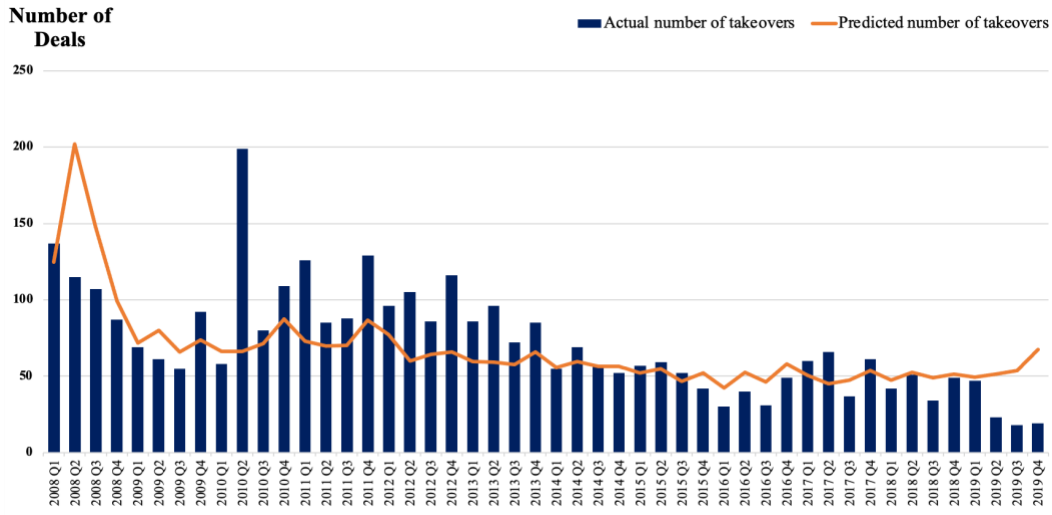
Notes: This table reports potential multicollinearity between the independent variables of the regression model. The upper part of the table is a correlation matrix that reports the correlations between each of the independent variables. The lower part of the table reports the variance inflation factor (VIF) for these variables. The data on all variables is from the period 2008-2019.

As *Table 7* shows, most of the variables have low correlations. However, there is a negative correlation between the change in the OSEBX index and the NIBOR that is relatively high. Thus, since the regressors are highly correlated, there might be a case of *near multicollinearity*. In this case, the regression may look "good" but the coefficients will have inflated standard errors and the individual variables are not significant (Brooks, 2014). Nonetheless, the VIF values are quite low for all of the regressors, which implies a low degree of multicollinearity.

4.3 Discussion of Regression Results

Applying the coefficient estimates from *Table 6* to the regression equation, a predicted model is created. Furthermore, if the exponential function is applied to the predicted dependent variable, the model can predict the number of takeovers. *Figure 2* shows a bar chart of the actual number of takeovers, as collected from Zephyr (n.d.), plotted against a line diagram of the number of takeovers as predicted by the model. The model seems to explain some of the variation in the number of takeovers, as indicated by the R-squared and the adjusted R-squared. However, in some periods, the model diverges more drastically from the real number of takeovers. E.g., the predicted number of takeovers in Q2 2008 is almost twice the actual number of takeovers. This is likely due to the effects of the financial crisis, for which the model gives a poor prediction.

Figure 2. Actual number of takeovers vs. predicted number of takeovers



Notes: This figure shows a bar chart of the actual quarterly number of takeovers in the period 2008-2019, as collected from Zephyr (n.d.), and a line diagram of the number of takeovers in the same period as predicted using the coefficients from the regression. For the coefficient estimates, see *Table 6*.

In the last section, the regression results revealed that both the economic growth and the stock market performance had a positive relation to takeover activity. These relations are both consistent with their respective hypotheses that indicate a positive relationship between each variable and the frequency of takeovers. However, both independent variables are not statistically significant, and this paper can therefore not draw a relation between these variables and the number of takeovers. This thesis used the domestic stock market performance, by looking at the main Norwegian stock market index, as a proxy for the general performance of firms in Norway. It means that the performance of listed companies is used to describe the sum of firms, which of course also include private firms. Therefore, observing only the performance of listed companies may fail to capture any trends in the business cycle of the majority of firms in Norway. The gross domestic product is the most direct measurement of economic growth available and should not harbor any underlying problems when including it in the model.

The short-term interest, on the other hand, is proven to be statically significant at all levels. This implies a strong relationship between the *3-month NIBOR* and M&A activity, and it indicates that the interest rate help explain some of the variation in the number of takeovers. As stated in the literature review, there are mixed results in the existing literature on this topic. On the one hand, Becketti (1986) found a strong negative relationship between the interest rate on 3-month Treasury Bills and the number of M&As. He argues that lower interest rates result in lower acquisition costs because less interest is paid, and that lower interest rates also decrease the return to lending cash instead of using it for acquisitions. On the other hand, Yagil (1996) found a strong positive relationship between the interest rate on Treasury Bills and the frequency of takeovers. The results of both the previously mentioned authors are statically significant.

A rationale for the positive relationship between interest rates and takeover activity may be found by examining the relationship between interest rates and stock prices. There is a significant negative relationship between interest rates and stock prices (Melicher et al., 1983). That is, if bond yields fall, stock prices will rise, and vice versa. Furthermore, Shleifer & Vishny (2003) argue that firms with undervalued, or relatively less overvalued, equity become takeover targets. Thus,

if interest rates are higher, stock prices will fall, and firms will have a lower valuation and therefore be more attractive to acquire. Consequently, higher interest rates will lead to increased takeover activity. The relationship also holds in the opposite direction: lower bond yields will lead to an increase in stock prices, and firms will have a higher valuation and therefore be less attractive to acquire. However, Shleifer & Vishny (2003) also argue that firms with overvalued equity might be able to grow and survive through acquisitions. Following this logic, a change in the interest rates could increase or decrease takeover activity, depending on how much the equity of each firm is affected by the prevailing interest rate.

Yagil (1996) tested the hypothesis that there exists a positive relationship between merger activity and the activity in the economy. To measure economic activity, he attempts to capture the impact of the two sectors of the economy – the financial and the real. Thus, the interest rate is used to capture the impact of the financial sector on merger activity. This suggests that higher interest rates indicate higher economic activity. When interest rates are higher, the expected return on investments also increases, and more investments are likely to be undertaken. Because acquisitions are investments for corporations, this implies that more acquisitions are likely to be undertaken as a result of higher interest rates.

4.4 Robustness Tests

In this section, a series of regressions are performed, to test whether the main results from the previous sections are robust. That is, more evidence is needed to establish statistical significance between the independent variables and the dependent variable. Depending on the results of the robustness tests, it will either solidify the results of the main multiple regression or expose potential problems with the model.

The first test consists of running the regression on yearly data, as opposed to the regression results in the previous section, which were based on quarterly data. This will show whether the results found in the quarterly regression will still hold in a regression with fewer observations. The second part consists of omitting one or multiple variables from the regression, to obtain insight into the dynamic of the

different independent variables' explanatory abilities on the dependent variable. In the third and last test, the dataset is split into two subsamples based on certain time periods. This will show what happens to the results when using a shorter timeframe, i.e., with fewer observations per regression.

Table 8. Results of Regression Analysis – Yearly Data

Variable	Coefficient	t-statistic
Constant	**4.7145***** (0.3095)	15.233 (3.42e-07)
ln(1 + ΔGDP)	2.5002 (3.9078)	0.6398 (0.5402)
ln(1 + NIBOR)	**39.603**** (15.961)	2.4813 (0.0380)
ln(1 + ΔOSEBX)	2.11 (1.321)	1.5973 (0.1489)
R-Squared	0.586	
Adjusted R-Squared	0.431	
F-statistic	3.77	
p-value	(0.0591)	
N	12	

Notes: This table reports the results of the multiple regression in the period 2008-2019 using yearly data. For further description, see *Table 6*.

As can be seen in *Table 8*, changing the frequency of the regression from quarterly to yearly produces somewhat similar results. According to the R-squared measures, the yearly model represents a better fit than the quarterly model, in which the adjusted R-squared increases from about 30% to about 43%. However, the statistical significance of the model drops notably, as the p-value is higher for the yearly model than for the quarterly model. The statistical significance of the individual coefficient estimates decreases for both GDP and NIBOR and increases slightly for OSEBX. Still, both GDP and OSEBX are not significant at any of the common significance levels. More importantly, NIBOR is still statistically significant, but only at the 5% level. Thus, the yearly regression indicates a *strong positive relationship* between the 3-month NIBOR and takeover activity, just as for the quarterly regression.

Table 9. Results of Regression Analysis - Omitting Variables

	ExNIBOR		ExOSEBX		ExGDP		regNIBOR	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Constant	**4.1473***** (0.0757)	54.771 (7.82e-43)	**3.6997***** (0.1159)	31.929 (1.47e-32)	**3.6232***** (0.1296)	27.955 (4.4e-30)	**3.7135***** (0.1155)	32.165 (3.52e-33)
ln(1 + ΔGDP)	1.516 (1.6064)	0.9438 (0.3503)	1.4621 (1.3304)	1.099 (0.2776)				
ln(1 + NIBOR)			**20.939***** (4.6136)	4.5387 (4.2e-05)	**24.554***** (5.2279)	4.6967 (2.51e-05)	**20.821***** (4.6227)	4.5041 (4.54e-05)
ln(1 + ΔOSEBX)	-0.6162 (0.6862)	-0.8905 (0.3739)			0.9441 (0.6439)	1.4661 (0.1496)		
R-Squared	0.0322		0.324		0.338		0.306	
Adjusted R-Squared	-0.0108		0.294		0.308		0.291	
F-statistic	0.748		**10.8*****		**11.5*****		**20.3*****	
p-value	(0.479)		(0.00015)		(9.42e-05)		(4.54e-05)	
N	48		48		48		48	

Notes: This table reports the results of a set of regressions on quarterly data in the period 2008-2019, in which one or multiple variables are omitted from the regression. ExNIBOR omit NIBOR, ExOSEBX omit OSEBX, ExGDP omit GDP, and regNIBOR omit both GDP and OSEBX. For further description, see *Table 6*.

Table 9 presents three multiple regressions on takeover activity where one variable has been omitted at a time, as well as a simple regression where only the NIBOR variable is regressed on the dependent variable. The results are striking. First, if NIBOR is omitted from the regression, it produces a model that is not statistically significant at any of the common levels. The model has a very poor fit with an adjusted R-squared that is negative. Furthermore, none of the independent variables are statistically significant at any of the aforementioned levels of significance.

When either GDP, OSEBX, or both variables are omitted from the regression, it produces models that are statistically significant at the 1% level. All models indicate that the regressors explain about one-third of the variation in takeover activity. Furthermore, both GDP and OSEBX are not statistically significant at any of the common levels for all models, while NIBOR is significant at the 1% level in every case. This solidifies the results from the main regression, as presented in *Table 6*.

Table 10. Split Sample Regressions

	2008-2013		2014-2019	
Variable	**Coefficient**	**t-statistic**	**Coefficient**	**t-statistic**
Constant	**4.3705***** (0.1611)	27.123 (3.01e-17)	**3.9725***** (0.3469)	11.45 (3.1e-10)
ln(1 + ΔGDP)	1.7342 (1.2587)	1.3778 (0.1835)	0.2371 (1.7516)	0.1354 (0.8937)
ln(1 + NIBOR)	5.0902 (5.0447)	1.009 (0.3250)	-18.538 (26.497)	-0.6996 (0.4922)
ln(1 + ΔOSEBX)	-0.1752 (0.5019)	-0.349 (0.7307)	1.1035 (1.7597)	0.6271 (0.5377)
R-Squared	0.163		0.0484	
Adjusted R-Squared	0.0377		-0.0943	
F-statistic	1.3		0.0339	
p-value	(0.302)		(0.797)	
N	24		24	

Notes: This table reports the results of two multiple regressions in the period 2008-2019 using quarterly data. The second and third columns concern the regression on data in the period 2008-2013, while the fourth and fifth columns concern the regression in the period 2014-2019. For further description, see *Table 6*.

Table 10 reports the results of two multiple regressions, in which the dataset is split into two subsamples, one for the period 2008-2013, and one for the period 2014-2019. As can be seen in *Figure 1*, the period 2008-2013 seems to exhibit a higher number of takeovers than 2014-2019. If the data is split into these periods, one may be able to further investigate the independent variables' effect on the takeover activity. As shown in the aforementioned table, the sign of the coefficient for the 3-month NIBOR is positive in the first period, and negative in the second. This may suggest that the effects of the short-term interest rate on M&A activity vary depending on the time period. However, these results are not significant on any of the commonly used significance levels, which is the case for all variables. Furthermore, neither of the periods are significant, as shown by low F-statistics. Neither of the models seem to present a good fit according to the R-squared measures.

Even though the two time periods have opposite signs for the NIBOR coefficient, no conclusions can be drawn as none of these are statistically significant. One explanation might be that 24 observations are not enough data and that there seems to be little variation in the number of takeovers. Alas, it could prove hard to find any significant relationship between the right-hand side variables and the dependent variable.

The main takeaway from the robustness tests performed above is that there is a significant positive relationship between NIBOR and the number of takeovers. While both GDP and OSEBX remain not statistically significant, NIBOR is statistically significant across the board.

5.0 Conclusions

5.1 Conclusion

This paper has studied the relationship between macroeconomic variables and aggregate takeover activity in Norway during the period from 2008 to 2019. There have been significant efforts to study various factors' effects on merger activity, on different levels – micro-level, industry-level, and macroeconomic. Most research has focused on the micro, or firm-specific, level since these transactions are firm-specific events. However, existing literature agrees that there exists a wave pattern for takeover activity. This suggests that some macroeconomic forces may drive this phenomenon. Thus, in this paper, the activity level is measured by the number of transactions, and the macroeconomic factors of interest are domestic stock market performance, economic growth, and the domestic level of interest rates.

There are three hypotheses postulated in this study. The first hypothesis is that there exists a positive relationship between M&A activity and domestic stock market performance. The second hypothesis states that merger activity is related to the domestic level of interest rates, while the third hypothesis states that there is a positive relationship between takeover activity and economic growth. Domestic stock market performance, economic growth, and the domestic level of interest rates in Norway are measured by the OSEBX index, GDP, and the 3-month NIBOR, respectively.

The main findings of this paper are summarized as follows. First, there exists a positive relation between takeover activity and two of the independent variables; the domestic stock market performance and economic growth. This is in line with the two relevant hypotheses. However, the results suggest that these variables are not significant, and therefore one cannot conclude that these variables affect merger activity. Furthermore, the findings suggest that there exists a positive relationship between the domestic level of interest rates and takeover activity. In contrast to the other variables, this is the only significant regressor. The results are confirmed and solidified through a series of robustness tests, in which the frequency of the data is altered from quarterly to yearly, as well as omitting one or

two of the independent variables. Additionally, the data was split into two subsamples to determine if any of the independent variables were significant for the two individual periods. However, none of the variables were statistically significant and thus did not provide any meaningful results.

According to the findings of this paper, the first hypothesis that merger activity is positively related to domestic stock market performance, and the third hypothesis that merger activity is positively related to gross domestic product do not hold since none of the relevant regressors are statistically significant different from zero. The second hypothesis that takeover activity is related to the domestic interest rate level does hold, since the results reveal that the relevant regressor is statistically significant different from zero across the board.

To conclude, the results suggest that the three regressors explain about *one-third of the variation* in takeover activity. The domestic short-term interest rate has a *statistically significant positive relationship* with takeover activity, while both the domestic stock market performance and the economic growth do not have any significant relationship with M&A activity.

5.2 Suggestions for Further Research

The paper sought to find out if there were any non-dynamic relationships between the macroeconomic independent variables and the dependent variable takeover activity. Hence, there has been no inquiry into any potential dynamic relationships between the regressors and the dependent variable. Previous research observed a lagged relationship between various macroeconomic variables and takeover activity on US data (Melicher et al., 1983; Becketti, 1986). They found that changes in stock prices and bond yields precede changes in merger activity. Furthermore, Becketti (1986) found that increases in real gross national product precede declines in the number and value of mergers. Future research could examine whether this dynamic relationship holds for data on the Norwegian economy.

Whilst this paper researched the effects of macroeconomic drivers of takeovers, there exist other types of drivers. On the one hand, there are industry-level drivers

that affect takeover activity. Andrade & Stafford (2004), and Mitchell & Mulherin (1996) found that mergers tend to cluster within industries as a result of industry shocks, leading to industry-specific merger waves. In the case of Norway, the oil- and gas industry has a huge impact on the domestic economy as a whole. Therefore, it is highly likely that there exist industry-level drivers that affect merger activity. On the other hand, there exist micro-level, or firm-specific, determinants of takeovers. Nguyen et al. (2012) found that about 60% of takeovers are related to agency motives and/or hubris. Including variables at multiple levels could very likely increase the fit of the model, explaining more of the variation in the dependent variable.

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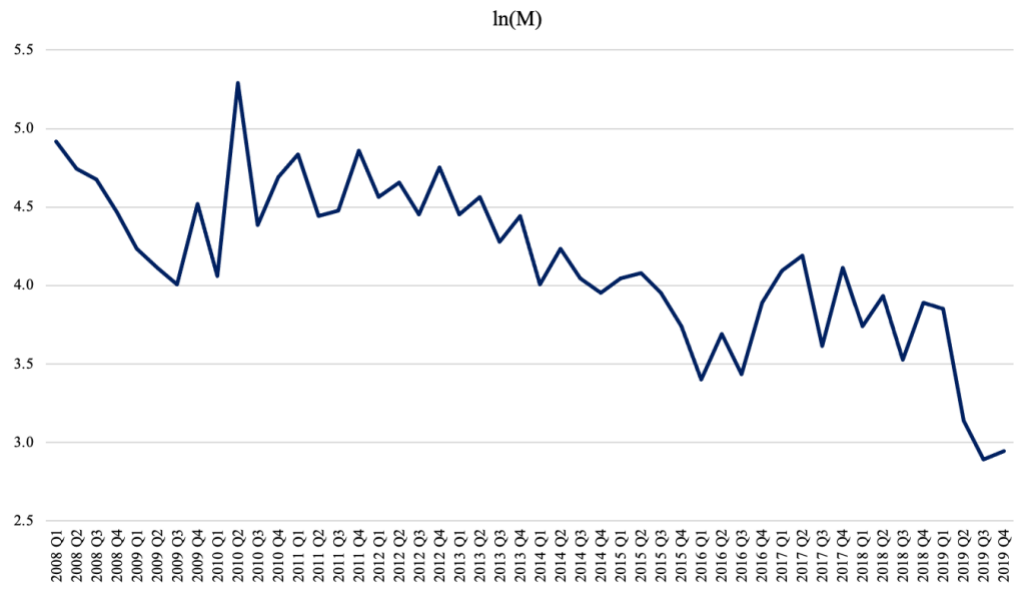
7.0 Appendix

7.1 Appendix A. Search Strategy in Zephyr

Product name	**Zephyr**		
Update number	**30**		
Software version	**30.0**		
Data update	**17/02/2021 (n° 30248871)**		
Username	**Nowegian Business School-10549**		
Export date	**18/02/2021**		
Cut off date	**31/03**		
		Step result	**Search result**
1.	**Company type: Company (Acquiror AND Target)**	**1,195,350**	**1,195,350**
2.	**Deal type: Acquisition, Merger**	**778,652**	**567,709**
3.	**Current deal status: Announced, Completed**	**1,905,696**	**509,730**
4.	**Time period: on and after 01/01/2008 and up to and including 31/12/2019 (completed-confirmed, completed-assumed, announced)**	**1,352,863**	**338,952**
5.	**Country (primary adresses): Norway (NO) (Acquiror)**	**19,632**	**3,952**
	Boolean search : 1 And 2 And 3 And 4 And 5		
		TOTAL	**3,952**

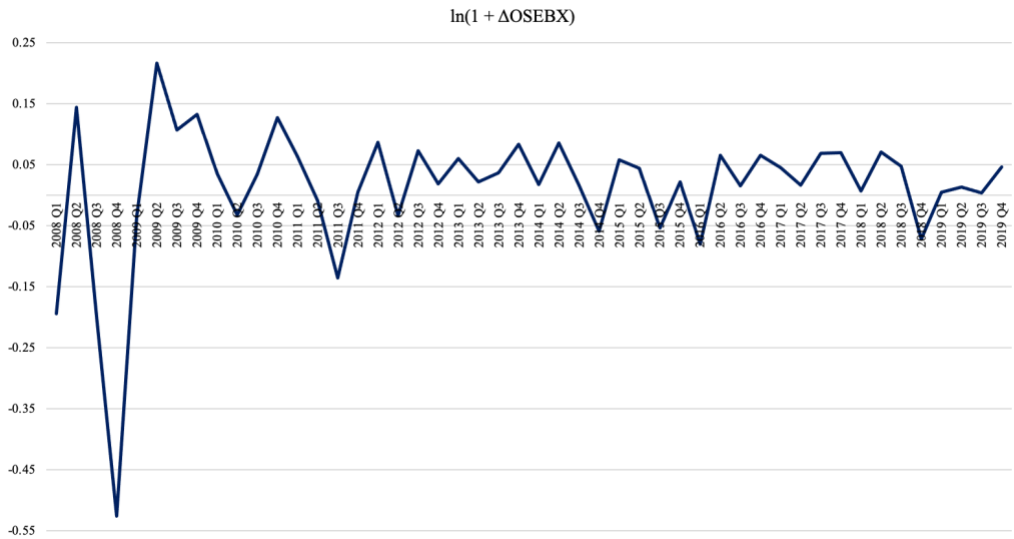
Notes: This table displays the search criteria used in Zephyr to retrieve data on the dependent variable. The criteria are specified in point 1-5.

7.2 Appendix B. ln of number of takeovers plotted over time



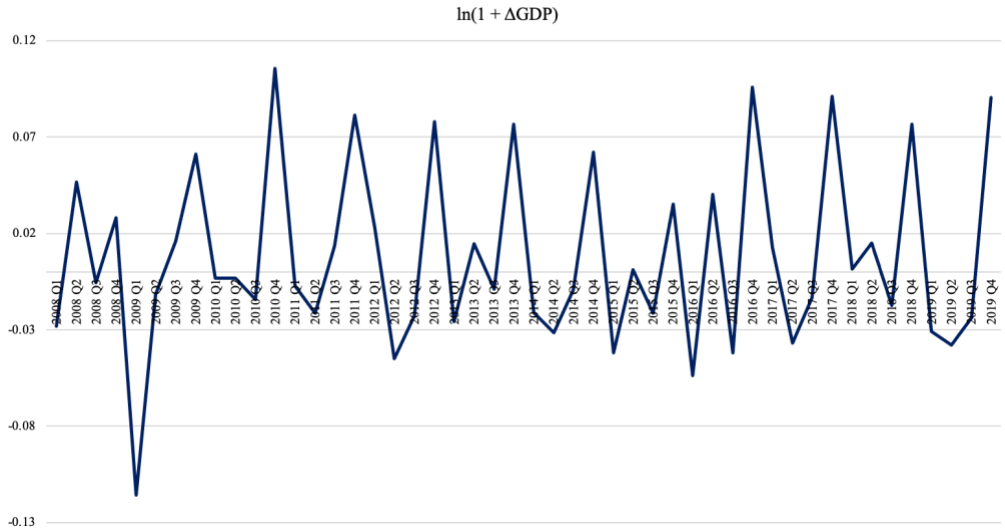
Notes: This figure shows a line diagram of the natural logarithm of the number of takeovers plotted over the period 2008-2019 with a quarterly frequency.

7.3 Appendix C. ln-transformation of OSEBX plotted over time



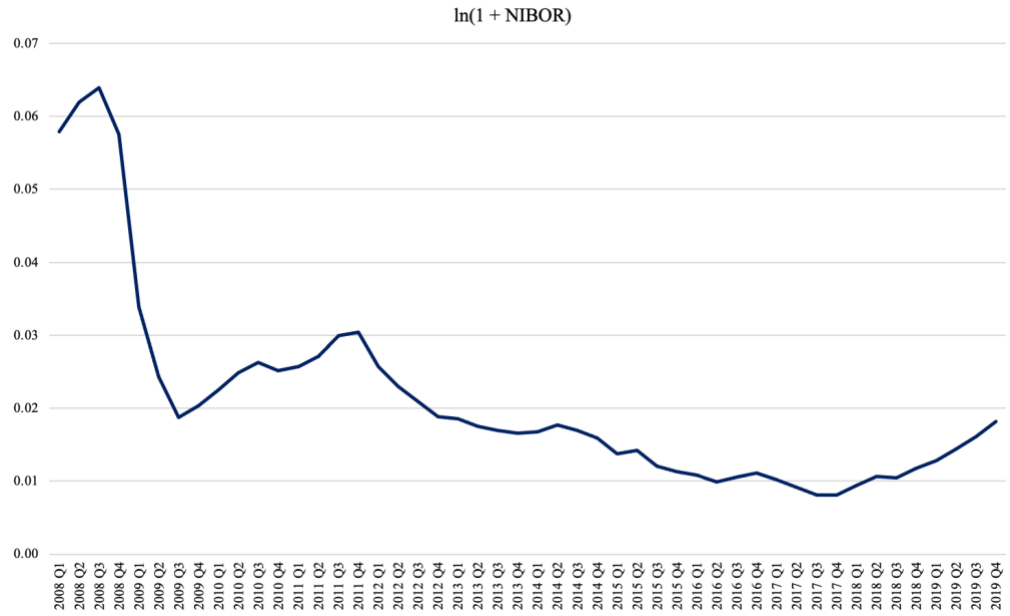
Notes: This figure shows a line diagram of the dependent variable ln(1 + ΔOSEBX) plotted over the period 2008-2019 with a quarterly frequency.

7.4 Appendix D. ln-transformation of GDP plotted over time



Notes: This figure shows a line diagram of the dependent variable ln(1 + ΔGDP) plotted over the period 2008-2019 with a quarterly frequency.

7.5 Appendix E. ln-transformation of NIBOR plotted over time



Notes: This figure shows a line diagram of the dependent variable ln(1 + NIBOR) plotted over the period 2008-2019 with a quarterly frequency.