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The January Effect on Oslo Stock Exchange

Navn: Halfdan Brynjulfsen

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The January Effect on Oslo Stock Exchange

Halfdan Brynjulfsen

Supervisor: Kjell Jørgensen

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Abstract

In this master thesis I study the phenomenon that is the January effect on Oslo Stock Exchange in the period 1980-2018. I do this by utilising OLS regression on both an equally weighted index and a value weighted index, estimating the return for each month. The results obtained in this paper provide evidence that the anomaly is present for the whole period. The effect is however not persistent over time, indicating that Oslo Stock Exchange has become more efficient over the years. The results also indicate that the size of the firm is relevant to how notable the effect is, supporting the well-established small firm effect.

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1 Introduction

The predictability of stock returns and the properties of the stock market has been extensively researched through the years(Gultekin & Gultekin, 1983). Calendar effects may be loosely defined as the tendency of financial asset returns to display systematic patterns at certain times of the day, week, month, or year (Brooks, 2008). The January effect and other stock market anomalies represent a challenge to the widely accepted efficient market hypothesis. This is because if it is possible to consistently achieve predictable abnormal returns in the month of January, markets would no longer follow a random walk and not be considered efficient. This paper can therefore provide relevant information for both academics and practitioners present at Oslo Stock Exchange trying to exploit even the smallest signs of inefficiency in the market. The effect has previously been proven by Gultekin and Gultekin (1983) to be present on Oslo Stock Exchange in the period 1959-1979. The aim of this thesis is to fill the research gap in the years after their paper. I have therefore chosen to use data starting in 1980 and ending in 2018. The first and foremost question in this paper is: Can abnormal returns be achieved in the month of January on Oslo Stock Exchange? After establishing that the effect really is there I will test if the effect has changed over the last 40 years. Finally I will check if the market capitalisation of companies is a relevant factor for the January effect.

This thesis does not conduct any research into possible explanations for the January effect nor does it take into account the transaction cost that would follow if one would try to build a trading strategy based on similar findings.

2 Literature Review

The January effect has been shown to exist both by academics and practitioners during the 20th century, with Wachtel (1942) one of the first to publish an academic paper about the topic. Prior to Wachtel's paper researchers believed that stock prices revealed no evidence of seasonal tendency (Wachtel, 1942). In fact Richard N. Owens and Charles O. Hardy stated that: "If a seasonal variation in stock prices did exist, general knowledge of its existence would put an end to it" (Owens & Hardy, 1925, p. 123).

Since Wachel's paper numerous researchers have published articles about the phenomenon and developed possible explanations for this anomaly. Kendall (1953) proved that the January effect is present in the U.K market, Officer (1975) gave evidence of a seasonal effect in Australia and Rozeff and Kinney (1976) proved that an equal-weighted index of NYSE prices also features the anomaly. Because Rozeff and Kinney used an equal-weighted index the small firms had a relative larger effect on the positive returns than they would have in a value-weighted index. This was further emphasised when Keim (1983), using monthly dummy variables, discovered that the high returns in January can be related to the exceptional high returns on small firm stocks, also known as small firm effect (Banz, 1981; Roll, 1981). Following these studies Gultekin and Gultekin (1983) studied the effect on international level and found that in the period 1959-1979 most of the industrialised countries such as: Denmark, Germany, Holland, Spain, USA and the U.K had the January effect.

More recently Mehdian and Mark (2002) examined the three market indices from 1964-1998: Dow Jones Composite, NYSE Composite and the SP500. They found evidence of a positive and significant January effect up until 1987. After that, January had a positive return, but it was not significant different from zero. In a paper analysing the last 300 years focusing on the U.K market Zhang and Jacobsen (2012) argue that any seasonality in market returns may only be in the eye of the behlder. They give evidence that most the months have either underperformed or outperformed in some periods throughout history. If you use a sample of 50 years almost every month has a glory period, but when extending the sample period to 100 years, conclusions are different. When testing the whole sample they do find positive significant seasonal anomalies, but in huge subsamples the effect may be reversed of what was found in the full sample.

Through the last 50 years many researchers have tried to give an explanation for the the January effect. The main explanations are: the year-end and tax-loss-selling hypothesis (Wachtel, 1942; Rozeff & Kinney Jr, 1976; Branch, 1977; Schultz, 1985); the window dressing hypothesis (Lakonishok & Smidt, 1988; Lakonishok, Shleifer, Thaler, & Vishny, 1991); turn-of-the-year 'liquidity' hypothesis (Ogden, 1990); accounting information hypothesis (Rozeff & Kinney Jr, 1976) and bid-ask spread (Keim, 1989).

3 Theory and methodology

3.1 Efficient Market Hypothesis

An efficient market is best explained by Fama(1970) where he state:

> A market in which prices always "fully reflect" available information is called "efficient" (Fama 1970. pp 383).

This hypothesis is considered as one of the cornerstones in modern finance, and has been developed from as early as 1900 when Louis Bachelier introduced "Théorie de la Spéculation", practically inventing mathematical finance (Davis & Etheridge, 2006). It means that as an investor it is impossible to achieve risk adjust excess returns, neither by technical or fundamental analysis. Thus all stocks trade at their fair value and investors can not buy an undervalued stock or sell an overvalued stock. Fama identified three sufficient conditions for a market to be efficient:

1. There are no transactions costs in trading securities
2. All available information is costlessly available to all market participant
3. All agree on the implications of current information for the current price and distributions of future prices of each security

3.2 Weak/semi-strong/strong efficiency

The concept of three levels of market efficiency was introduced by Harry Roberts (1967). The weak form, or random walk theory, was further made popular by Malkiel in his book *A Random Walk Down Wall Street*(1973). In the book he argues that looking at past returns of a stock is utterly meaningless. He states that a stocks price fully reflects all historical information, meaning that investors can not undertake an investment strategy based on a technical analysis, analysis based on historical prices, to achieve abnormal high returns. Simply put; the past price movements, trading volume or earnings data can not be used to predict the future price of a stock.

The semi-strong form asserts that stocks not only include all historical data(weak form efficiency), but also all relevant public information. Meaning that annual reports, announcements of stock splits and new security issue is immediately reflected in the stock price(Fama, 1970). If available to the public, information such as composition of balance sheet, patents, management, forecasted earnings and accounting practices will also be factored in to the price(Bodie, Kane, & Marcus, 2014). In the case of semi-strong efficiency neither a technical or fundamental analysis will yield a higher return. The only way to achieve higher returns and outperform the market is through the use of private information not known to the public(Rozeff & Zaman, 1988).

The last form of efficiency in a market is simply enough strong. In a strong efficient market it is assumed that all conceivable relevant information is known to *any* market participant about a company is fully reflected in market prices (Malkiel, 1989). This includes historical price movements (Weak form), public information(semi-strong form) and all private information, normally only available to insiders (Bodie et al., 2014). Here no one can through either technical analysis, fundamental analysis or through use of private information hope to achieve a higher yield since it is all included in the price, meaning there is perfect revelation of all private information in market pries.

3.3 The Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) was developed by Lindtner (1965), Sharpe (1964) and Mossin (1966) building on the theories on portfolio management by Markowitz (1952). CAPM provides an expected return when taking into account the risk of an asset.

$$E(r_i) = r_f + \beta_i[E(r_m) - r_f]$$

Where,

$E(r_i)$ = Return of an investment

r_f = Risk free rate

β_i = Beta of an Investment

$E(r_m)$ = Expected return of the market

The model has it flaws, and there is still debate over which extensions and assumptions are best when using the model. And even though it has failed many empirical tests over the years it is still at the center of the investment industry (Bodie et al., 2014). Below is an inexhaustible list of assumptions that must be for CAPM to hold.

- Investors are rational and mean variance optimised
- The planning horizon is a single period
- Investors have homogeneous expectations
- All assets are publicly held and traded on public exchanges, short positions are allowed and investors can borrow or lend at a common risk free rate
- All information is publicly available
- No taxes and no transaction cost.

3.4 Anomalies in the Market

Schwert (2003) defines anomalies as: ”Anomalies are empirical results that seem to be inconsistent with maintained theories of asset-pricing behaviour. They indicate either market inefficiency (profit opportunities) or inadequacies in the underlying asset-pricing model.” He further says that when an anomaly is documented and analysed in literature it will usually disappear. The reason for their disappearance is much debated, but two main explanations are that, either practitioners have implemented strategies to profit from said anomaly and in turn arbitrated the profit opportunity away, or the anomaly were only a statistical aberration.

Anomalies, both seasonal and non-seasonal can challenge the efficient market hypothesis, since they represent a possibility of predictable high returns. There are several anomalies that have been discovered, such as momentum effect, low price-to-book effect, day of the week effect, Halloween effect and the one this thesis is about, the January effect.

3.4.1 The January effect

The January effect suggests that it is possible to earn exceedingly high returns in the month of January compared to the rest of the year. It is considered one of the most consistent market anomalies and to this this day no one has given a conclusive solution to why such an effect exist. The effect was first observed by Wachtel (1942) when he examined the historical returns of the Dow Jones Industrial Average and NYSE. He found bullish tendencies from December to January in eleven of the fifteen years he analysed and the remaining four had insignificant bearish movement. More famously Rozeff and Kinney (1976) found that in an equally weighted index of New York Stock Exchange January achieved an average monthly return of 3.5% while the other months only managed an average return around 0.5% in the period of 1904-1974.

The most popular explanation for the January effect is the tax benefit theory. It was what Watchell (1942) thought was most likely and although they did not test for it, Rozeff and Kinney (1976) considered it as the most likely reason for so high return in January. Later several researchers, (Branch, 1977; S. L. Jones, Lee, &

Apenbrink, 1991; ?, ?; Roll, 1983; Schultz, 1985) to name a few, confirmed empirically what was first believed. Investors would when the end of the year approached sell losers in order to offset a capital gains tax liability. When the new year then came prices increase again as a lack of selling pressure and investors buying back the sold stocks. According to Roll (1983) this trading activity is more ..consistent.. for small firms since their high volatility caused higher short-term capital losses that investors would want to mitigate. In his paper Roll also show that large firms experience the tax-loss selling phenomenon, but it is more likely to be arbitraged away because transaction cost are lower and the trading volume is higher. However, when Gultekin and Gultekin (1983) examines the anomaly on international level they find evidence of a January effect in most of the countries using value wheighted indices, with the implication that the effect is not size related. Another, perhaps more interesting finding in Gultekin and Gultekin's paper is that the January effect is present in both U.K. and Australia even though their tax year starts in April and July respectively. Zhang and Jacobsen (2012) also found a January effect in the U.K spanning as far back as mid 19th century, long before capital gains tax had been instituted in 1965. This is in line with Jones, Pearce and Wilson (1987) who find a January effect in the U.S stock market prior to and after the introduction of income taxes, Kato and Schallheim (1985) who observe the January effect in Japan, a country with no capital gains or loss offsets exist, and Berges, McConnel and Schalarbum (1984) who found the effect in Canada before they introduced capital gains tax in 1972 . This evidence suggests that while taxes is an important factor for the January effect, they can not be the sole explanation.

Another possible reason for the January effect is window dressing. The prospect of was this first introduced by Haugen and Lakonishok (1988) and Ritter (1988) as the portfolio rebalancing hypothesis. They think that the high return in January can be explained by portfolio managers wish to appear better than they in reality are. The managers abruptly go from being net sellers in December to being net buyers in January, which Ritter (1988) strongly linked to the January effect. He also found that the January price rise for small stock was far higher than their price decline in December. In their paper Lakonshik et al. (1991) find evidence of overselling of poorly performing stocks by portfolio managers. This is especially the case when the end of the year is nearing because the managers know the sponsors is more likely to thoroughly investigate and evaluate the portfolio at that time. Porter, Powell and Weaver (1996) also found such an significant amount of portfolio rebalancing that the prices around turn-of-the-year concluding it would be a significant part of the January effect. This argument is further supported by Haug and Hirschey (2006) who found the effect to persist after the tax reform in 1986. They also argue that since many institutions still use January-December as reporting period, even though the new tax period being November-October, window dressing can be an explanation for the January effect for small-cap in the years after 1987.

Other explanations are the turn-of-the-year liquidity (Ogden, 1990), bid/ask spread (Keim, 1989) and seasonality related to CAPM (Tinic & West, 1984). In his paper Ogden argues that a surge in stock prices at the end of the year is due to the standardisation in the payments system in the United Sates. This is because investors receive substantial cash receipts at the end of the year resulting an increase in the demand for stocks. He further states that the effect will vary inversely with the stringency of monetary policy. Keim on the other hand argues that systematic trading patterns introduces bias into returns computed with closing transaction prices. This bias result in high returns on the last trading day of December and first day of January. This is because December closing prices tends to be recorded at bid and early January closing prices are recorded at ask. The effect is also stronger for lower priced stock since the bid/ask spread in percentage is larger for those stocks. While reevaluating CAPM investigating if risk premiums also featured seasonality, Tinic and West discovered that the observed return to riskier stocks occurs exclusively in January, while the return to riskier stocks where not higher in other months. Resulting in the rather surprising conclusion: CAPM is exclusively a January phenomenon.

3.5 Methodology

When conducting a quantitative analysis data collection is among the most important tasks at hand. Using the appropriate sample size, making the correct assumptions and the modelling of the data determines the validity of the research. The collection of data for this research endeavour has been conducted with careful consideration of time horizon, stock prices, market capitalisation, dividends and active trading days. The sample period is from 1980-2018 consisting of 39 years and 468 months. The data I have used is gathered with help from Bernt Arne Ødegaard from OBI, the data provider of Oslo Stock exchange. The returns data is calculated logarithmic and is based on daily observations of prices and volume of stocks listed on Oslo Stock Exchange, as well as dividends and adjustment factors necessary for calculating returns (Ødegaard, 2019). To analyse the data it is also necessary to remove some of the observations. First the stock has to be traded at a minimum of 20 trading days. Then I have eliminated the low value stocks, stock price below 10, because such stocks often have exaggerated returns. For the same reason i have also removed those stock with a total value of outstanding below 1 million. The data is gathered in one EW and one VW portfolio, and a decile portfolio based on their equity size for both the EW and VW indices, with the aforementioned filters.

Since the EW index consists of all the floating prices on Oslo Stock Exchange with equal weight, the small firms have a greater weight than their market value (Thaler, 1987). Consequently, if there is higher returns only on the EW index, it will be a small firm phenomenon. The VW index however is weighted according to the market capitalisation of each company, giving larger firms substantially greater weights. A significant higher return on the VW index indicates that the January effect is present in the whole market.

Table 1: Descriptive statistics: EW index, VW indicees and risk-free rate

	EW	**VW**	R_f
Mean	1.62 %	1.84 %	0.56 %
Std.div	5.34 %	6.02 %	0.39 %
Var	0.28 %	0.36 %	0.00 %
Min	-18.33 %	-23.79 %	0.05 %
Median	1.73 %	2.31 %	0.48 %
Max	19.06 %	19.72 %	2.07 %
Skewness	-0.245	-0.532	0.498
Kurtosis	4.624	4.761	2.295

Sample period: 1980 - 2018.

N = 468

Table 2: Correlation matrix: EW index, VW index and Risk-free rate

	EW	**VW**	R_f
EW	1	0.880	-0.032
VW	0.880	1	-0.014
RF	-0.032	-0.014	1

The goal of this analysis is to find out if there is a substantial January effect on the Norwegian stock exchange. To test this i will utilise the same model that Brooks and Persand (2001) did when testing for day-of-the-week effect in the Asian market, except for using five dummies for each day, i use twelve for each month. I have also included an autoregressive term in the regression to ameliorate the autocorrelation problem in the error term. The regression is as follows:

$$r_t = \beta_0 r_{t-1} + \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + ... + \beta_{12} D_{12t} + \epsilon_{it}$$

where, r_t denotes the return for the index in a month, r_{t-1} is the lagged return of the index, β_0 is the coefficient for the lagged returns. $D_1 - D_{12}$ is the dummy variable for each month, so D_1 = 1 for January and 0 otherwise, D_2 = 1 for February and 0 otherwise and so on, $\beta_1 - \beta_{12}$ can be interpreted as the average return for each month.

The F-Test is a joint test for the presence of at least one significant coefficient in a model so that H_0: β_0 = β_1 = .. = β_{12} = 0 and H_a: $\beta_i \neq 0$ for at least one $i \in$ (1, 12). Thus a significant F-Test indicates the presence of autoregressive- or month of the year effects.

Hypothesis 1: There is no excess return in the month of January on Oslo Stock Exchange within the sample period.
Hypothesis 2: The January effect do not diminish over time.
Hypothesis 3: The January effect is equally pronounced in firms with small market capitalisation and firms with large market capitalisation.

4 Data and Preliminary results

Following the methodology outlined in the last chapter i will here highlight and analyse the results obtained from the regressions on the entire index, subperiods and decile portfolios. To test the validity of the results from the regressions, the underlying assumptions for OLS will be tested with parametric tests. All the regression results is also presented with the robust standard errors.

By examining table 3 one can clearly see that on average the EW index have produced higher returns in January than any other month with a return of 5.21%. After January, April(3.26%) has the highest return followed by February (2.86%) and July (2.62%). Table 3 also shows that September (-0.78%) and June (-0.52%) are only months that have had a negative mean return since 1980. It is interesting to see that the majority of the returns is created in the first half of the year, where five out of six months have an average return of 1.54% or more. For the VW index April (4.34%) is the month with the highest return and while January comes in second with 3.56%. Noteworthy is also that July (3.11%) has third highest return followed by December (2.96%). Same as for the EW, September (-0.33%) and June (-0.16%) are the only months with negative return, and although smaller, the majority of the returns is created in the first half of the year. The preliminary results give a good indicator that the January effect is present at the Oslo stock exchange.

Table 3: Mean returns for EW and VW index

	EW	VW
January	5.21%	3.56%
February	2.86%	2.08%
March	2.08%	1.75%
April	3.26%	4.34%
May	1.54%	2.21%
June	-0.52%	-0.16%
July	2.62%	3.11%
August	0.10%	0.7%
September	-0.78%	-0.33%
October	0.76%	1.62%
November	0.31%	0.2%
December	2.01%	2.96%

One characteristic often found in markets where the January effect has been proven to be present, is that it has become less relevant or ceased to exist in recent years. To test if this is true in the Norwegian market i have split the data into groups with a ten year interval, the last subperiod is of course only eight years since the data only goes to 2018. In the last 40 years the Norwegian market has experienced several crisis that is important to have in mind. In the 1980's Oslo Stock Exchange experience an enormous growth in both the index and in trading volume (Exchange, 2019). This period of economic boom lasted from 1983 up until Tuesday 20. October 1987, the day after "Black Monday". Although the index managed to somewhat regain itself after crash in 1987, the banking crisis in the start of the 1990's saw the index drop significantly. The latter part of the decade was characterised by economic growth and low unemployment rates. Following the rise of the index in the 1990's, it had several short lasting drops in the end of the century and beginning of the 2000's. It started with the crisis in the Asian markets, followed by the dotcom bubble, 9/11 attacks, Enron scandal and reached its low point in 2003. It then experienced probably the longest and strongest rise in share prises culminating in the subprime crisis of 2008. Although it took some time to recover from the international crisis in 2008, the index has had a steady growth up until today, with only minor corrections. In figure 1 one can see the cumulative return on the Oslo Stock Exchange since 1980.

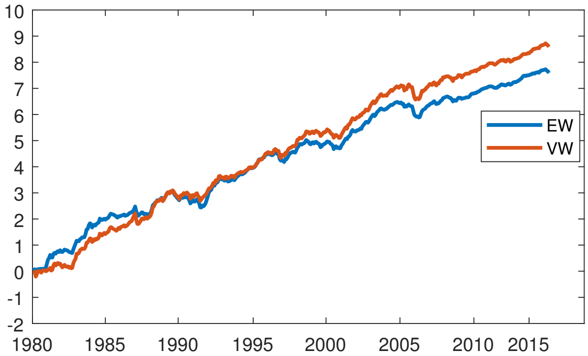

Figure 1: Cumulative return on Oslo Stock Exchange

5 Results and Discussion

With the methodology previously outlined the results from the regression is presented below. Table 4 demonstrates the results from the empirical testing of the entire sample of the EW and VW indices. The first two columns is the EW index while the last two represent the VW index. Because the model assumes homoscedasticity and no autocorrelation the Newey-West standard errors are also calculated in column two and four for both indices. The estimate does not change when using robust errors, but it is usually considered to make us more conservative to the possibility of rejecting H0 (Brooks, 2008). Due to the autoregressive term the model contains one less observation than the original data. As mentioned earlier the result also differ from those obtained in table 3 because of the autoregressive term, see the appendix for results without the lagged variable.

The first thing to notice is that both tests have a significant F-statistic meaning that the overall results are significant and at least one of the variables is different from zero. From the table one can see that January has a significant higher return than the rest of the months with a return of 4.7% within the 1% significance level. July and April also have positive significant results of 2.8% and 2.7% respectably at the 1% level. For the EW index the significance of each month is the same, but since the standard errors have changed, implying that the variance of the residuals is not constant or the covariance between the error terms over time is not zero or both, the possibility of heteroscedasticity or autocorrelation or both has to be taken into account.

Table 4: EW and VW indices - Regression with Non-robust and Robust std errors

	Plain	**Robust**	**Plain**	**Robust**
LagEW/VW	0.274***	0.274***	0.160***	0.160***
	(0.045)	(0.056)	(0.046)	(0.054)
January	0.047***	0.047***	0.031***	0.031***
	(0.008)	(0.010)	(0.010)	(0.012)
February	0.014*	0.014*	0.015	0.015*
	(0.008)	(0.008)	(0.010)	(0.009)
March	0.013	0.013*	0.014	0.014
	(0.008)	(0.007)	(0.009)	(0.010)
April	0.027***	0.027***	0.041***	0.041***
	(0.008)	(0.007)	(0.009)	(0.008)
May	0.006	0.006	0.015	0.015*
	(0.008)	(0,007)	(0.010)	(0.008)
June	-0.009	-0.009	-0.005	-0.005
	(0.008)	(0.007)	(0.009)	(0.008)
July	0.028***	0.028***	0.031***	0.031***
	(0.008)	(0.006)	(0.009)	(0.008)
August	-0.006	-0.006	0.002	0.002
	(0.008)	(0.008)	(0.0009)	(0.010)
September	-0.008	-0.008	-0.004	-0.004
	(0.008)	(0.008)	(0.009)	(0.01099
October	0.010	0.010	0.017*	0.017
	(0.008)	(0.010)	(0.009)	(0.0012)
November	0.001	0.001	-0.001	-0.001
	(0.008)	(0.007)	(0.009)	(0.008)
December	0.019**	0.019**	0.029***	0.029***
	(0.008)	(0.008)	(0.009)	(0.008)
Observations	467	467	467	467
R^2	0.1665	0.1665	0.0817	0.0817
Adjusted R^2	0.1445	0.1445	0.0574	0.0574
F statistic (df = 13;454)	10.836***	10.836***	6.637***	6.637***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

Unlike the EW index, the VW index has April as the highest performing month with a return of 4.1%. Then followed by January and July joint in second at 3.1%. They are together with December the only statistically significant months at the 1% level. It is also clear from the table that January has a lower coefficient than in the EW index. In the same procedure as for the EW index, the robust standard errors are calculated for the VW index. Although they are not very different from the plain standard errors, the assumption of homoscedasticity and no autocorrelation in the error terms can not be rejected. An example of a case where the change in standard errors give a different interpretation of a coefficient is the month of October in the VW index, where the coefficient is significant at the 10% level when using plain standard errors, but not when utilising robust standard errors. The same can be said for February and May, but then in reverse, i.e became significant after using robust standard errors. It will therefor be necessary to test the results for both. The autoregressive term is as expected also significant at 1% and has by far the highest coefficient. This indicates that last period returns has a high impact on the next and is as expected when finding a January effect. The results from table 4 give a good indication that the January effect is present on the Oslo Stock Exchange. The tests however also give a significant higher return in April, July and December.

5.1 Testing subperiods of EW and VW

To test if there has been a change in the January effect, the sample data has been split in the subperiods: 1980-1989, 1990-1999, 2000,20009 and 2010-2018. Table 5 below illustrates the results for the EW index with robust standard errors. Here it is clear that the January effect ceases to exist during the 2000's after being significant at the 1% level in the two first subperiods. In the first period January outperforms the other months by a substantial margin, having a return of over 10%. Along with July(1% level) and April(5% level) they are the only months with a statistical significant return. The second period sees the return in January drop substantially to 5.2%, but still remaining significant at the 1% level. Most of the other months remain non-significant except for July with a return of 3.1% on the 5% level, April with 2.7% return and May, June and December emerging with a return of 2.1%, -1.9% and 2.8% respectively, all with 10% significance level. During the period from 2000-2009 January no longer has a statistically significant return indicating that the effect no longer exist. The only months with significant returns this period is May, July and September all at the 10% level. The last period also show no sign of January effect, but February, April and July all have returns that are significant within the 1% level. The significance of the lagged variable is also clear from the table, and as expected when finding a January effect.

Table 5: EW index in subperiods - Regression with robust std errors

	80-89	**90-99**	**00-09**	**10-18**
Lag EW	0.267***	0.315***	0.326***	0.261**
	(0.1)	(0.096)	(0.085)	(0.123)
January	0.103***	0.052***	0.020	0.013
	(0.018)	(0.018)	(0.017)	(0.12)
February	0.003	0.016	0.015	0.020***
	(0.19)	(0.021)	(0.014)	(0.006)
March	0.026	0.020	0.000	0.003
	(0.017)	(0.013)	(0.013)	(0.008)
April	0.033**	0.027*	0.026	0.021***
	(0.013)	(0.015)	(0.017)	(0.007)
May	-0.014	0.021*	0.021*	-0.006
	(0.017)	(0.011)	(0.01)	(0.012)
June	-0.014	-0.019*	0.000	-0.008
	(0.016)	(0.011)	(0.015)	(0.006)
July	0.045***	0.031**	0.013*	0.021***
	(0.015)	(0.014)	(0.007)	(0.005)
August	0.006	-0.033	0.011	-0.011
	(0.009)	(0.025)	(0.011)	(0.008)
September	0.013	-0.016	-0.038*	0.012
	(0.014)	(0.013)	(0.022)	(0.009)
October	-0.006	0.021	0.015	0.013
	(0.025)	(0.018)	(0.021)	(0.013)
November	0.005	-0.013	0.014	-0.002
	(0.011)	(0.019)	(0.017)	(0.007)
December	0.017	0.028*	0.014	0.018
	(0.019)	(0.014)	(0.013)	(0.012)
Observations	119	120	120	108
R^2	0.2826	0.2592	0.1898	0.1918
Adjusted R^2	0.2014	0.1762	0.0989	0.0897
F statistic	4.8699***	3.6811***	2.5919***	2.9911***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

In the same way as for the EW index, the VW index indicate that there is a January effect in the two first subperiods, but not in the two last periods. The coefficient for January, although a bit lower than when testing the EW index, is still by far the highest and statistically significant at 1% in the first period. Following January, April (6.3%) and July (4.6%) is the only other significant coefficients at 1% and 5%

respectively. For the next period the return in January has in line with what was found in table 5 dropped some, to 5.2%, but still remain the highest and significant at 5%. April (3.4%) has as well seen a reduction in its statistical significance to 5%. July's (3.7%) significance is unchanged at 5% while December has a return of 4.2% and significance at 5% rounding off the millennium. From 2000 and onward January have neither the highest coefficient nor is it statistically significant. It is quite substantially outperformed by April(3.5%), December(3.4%) and May(3.3%) with significance level 10%, 1% and 5% respectively. In the last period January continues to be non-significant with a negative coefficient. July however returns as best performing month with a return of 3.4% at 1% level.

Table 6: VW index in subperiods - Regression with robust std errors

	80-89	**90-99**	**00-09**	**10-18**
Lag VW	0.217**	0.136	0.221	0.089
	(0.094)	(0.094)	(0.097)	(0.112)
January	0.083***	0.043**	0.000	-0.002
	(0.024)	(0.019)	(0.024)	(0.014)
February	-0.005	0.013	0.024	0.026***
	(0.017)	(0.02)	(0.018)	(0.009)
March	0.005	0.032*	0.009	0.010
	(0.024)	(0.019)	(0.017)	(0.01)
April	0.063***	0.034**	0.035*	0.029***
	(0.019)	(0.014)	(0.02)	(0.008)
May	-0.001	0.027**	0.033**	-0.003
	(0.019)	(0.014)	(0.015)	(0.016)
June	-0.005	-0.017	0.005	-0.006
	(0.02)	(0.014)	(0.019)	(0.01)
July	0.046**	0.037**	0.008	0.034***
	(0.02)	(0.015)	(0.012)	(0.01)
August	0.023	-0.025	0.018	-0.010
	(0.015)	(0.026)	(0.029)	(0.012)
September	0.009	-0.014	-0.032	0.018
	(0.018)	(0.015)	(0.029)	(0.012)
October	-0.006	0.028	0.017	0.030*
	(0.032)	(0.019)	(0.025)	(0.017)
November	-0.003	-0.009	0.012	-0.001
	(0.016)	(0.021)	(0.016)	(0.007)
December	0.020	0.042**	0.034***	0.019
	(0.018)	(0.017)	(0.011)	(0.014)
Observations	119	120	120	108
R^2	0.1811	0.168	0.1216	0.1525
Adjusted R^2	0.0884	0.0747	0.023	0.0454
F statistic	2.915***	2.5527***	1.8613**	2.3783***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

The previous results indicates that the January effect has been present at Oslo

Stock Exchange for the whole period, but when divided in subperiods based on time, the effect was no longer statistically significant after 1999. The effect has also been more prominent on the EW index than the VW index, indicating that the small firm effect is relevant. To better see if the effect is only related to small firms, or the whole market, the indices have been split based on their size. In table 7 the EW index is split into subgroups based on their market capitalisation starting with 1 being the smallest and 10 the largest. From the table it is possible to see that for the portfolio with the smallest companies, January outperforms the other months by a mile. With a statistically significant return on 10.2% January has more than three times the second best performing month, July, which only achieve 3%. Although the spread is smaller for the other portfolios, January is superior to the other months up until the 8th largest portfolio. In the 8th largest portfolio, December becomes the highest performing month, with July, April and February close following. Somewhat surprisingly all the months with a statistically relevant coefficient have seen an increase in their return from the 8th to the 9th portfolio. Even though July has seen a relative high increase in return becoming the best performing month, the spread between the months marginally decreased because January experienced an equal increase. It is clear from the table that the January effect is related to market capitalisation and the small firm effect is relevant. The effect starts out significant and large but decreases gradually as the size of the firms in the portfolios increases and towards the end it disappears, in the last portfolio January along with the F-statistic for entire model is not even statistically significant.

Table 7: EW indice in deciles - Regression with robust std errors

	1	2	3	4	5	6	7	8	9	10
Lag EW	0.210***	0.162***	0.084*	0.209***	0.191***	0.205***	0.193***	0.234***	0.150***	0.078*
	(0.066)	(0.054)	(0.059)	(0.052)	(0.065)	(0.054)	(0.059)	(0.054)	(0.062)	(0.06)
January	0.102***	0.062***	0.055***	0.055***	0.051***	0.047***	0.046***	0.022**	0.030***	0.017
	(0.015)	(0.01)	(0.012)	(0.012)	(0.013)	(0.014)	(0.011)	(0.012)	(0.012)	(0.013)
February	0.016*	0.045***	0.030***	0.010	0.029***	0.017*	0.014	0.013	0.012	0.007
	(0.009)	(0.013)	(0.011)	(0.01)	(0.014)	(0.01)	(0.01)	(0.009)	(0.008)	(0.008)
March	0.034**	0.006	0.023**	0.014	0.012	0.013	0.013	0.014	0.015	0.014
	(0.014)	(0.01)	(0.012)	(0.01)	(0.008)	(0.006)	(0.008)	(0.008)	(0.011)	(0.011)
April	0.029***	0.027***	0.030***	0.028***	0.027***	0.035***	0.026**	0.028***	0.032***	0.028**
	(0.009)	(0.011)	(0.009)	(0.009)	(0.009)	(0.011)	(0.009)	(0.009)	(0.011)	(0.01)
May	0.010	0.013	0.013	0.007	0.011	0.007	0.012	0.011	-0.001	0.014
	(0.011)	(0.008)	(0.008)	(0.007)	(0.008)	(0.007)	(0.009)	(0.01)	(0.009)	(0.01)
June	0.001	0.000	-0.009	-0.001	-0.007***	-0.009	-0.013	-0.015	-0.017	-0.011
	(0.007)	(0.008)	(0.01)	(0.01)	(0.009)	(0.009)	(0.008)	(0.009)	(0.01)	(0.008)
July	0.030***	0.035***	0.023**	0.019*	0.029	0.020	0.023**	0.030***	0.038***	0.030***
	(0.009)	(0.009)	(0.006)	(0.007)	(0.007)	(0.006)	(0.008)	(0.008)	(0.009)	(0.008)
August	0.004	0.009	0.002	-0.007	0.000	-0.010	-0.002	-0.013	-0.018	-0.002
	(0.007)	(0.01)	(0.008)	(0.01)	(0.009)	(0.011)	(0.011)	(0.011)	(0.013)	(0.012)
September	0.005	0.005	-0.008	-0.002	-0.011	-0.007	-0.018*	-0.019	-0.011	-0.012
	(0.008)	(0.009)	(0.009)	(0.009)	(0.01)	(0.011)	(0.01)	(0.011)	(0.014)	(0.013)
October	0.007	-0.003	0.002	0.019*	0.016	0.011	0.005	0.015	0.007	0.009
	(0.01)	(0.008)	(0.013)	(0.011)	(0.011)	(0.01)	(0.013)	(0.012)	(0.016)	(0.016)
November	0.011	0.017*	0.002	-0.009	-0.003	0.000	0.003	0.003	-0.007	0.001
	(0.01)	(0.01)	(0.009)	(0.012)	(0.01)	(0.008)	(0.01)	(0.01)	(0.01)	(0.01)
December	0.016**	-0.003	0.007	0.007	0.025**	0.028***	0.030***	0.032***	0.034***	0.017
	(0.008)	(0.011)	(0.01)	(0.011)	(0.008)	(0.01)	(0.015)	(0.01)	(0.011)	(0.008)
Observations	467	467	467	467	467	467	467	467	467	467
R^2	0.186	0.113	0.087	0.107	0.107	0.122	0.108	0.117	0.092	0.041
Adjusted R^2	0.164	0.090	0.063	0.083	0.084	0.099	0.085	0.094	0.068	0.016
F-statistic	7.9536***	4.4535***	3.3185***	4.1652***	4.1936***	4.8672***	4.2339***	4.6294***	3.534***	1.4859

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

Following the same procedure as for table 7, the VW index is split into ten portfolios and the results are displayed in table 8. The smallest portfolios for the VW index show the same pattern as the EW index, only with a bit higher returns overall. January 13.2% performs substantially better than the rest of the months in the smallest portfolio, approximately by as much as for the EW index. As expected the coefficients drop more uneven, due to the higher volatility in the index. January continues to be the best performing month up until the 9th portfolio, where December emerges as the month with the highest coefficient. More interesting is it that January remain statistically significant for all the portfolios. Given that April had so high returns in the preliminary results it is somewhat surprisingly that April has a higher coefficient than January in only the two largest portfolios.

Table 8: VW index in deciles - Regression with robust std errors

	1	2	3	4	5	6	7	8	9	10
Lag VW	0.188**	0.178***	0.100*	0.142***	0.185***	0.108*	0.208***	0.173***	0.121**	0.116**
	(0.095)	(0.059)	(0.058)	(0.053)	(0.056)	(0.06)	(0.056)	(0.061)	(0.056)	(0.056)
January	0.132***	0.073***	0.066***	0.072***	0.059***	0.069***	0.059***	0.038***	0.040***	0.026**
	(0.02)	(0.012)	(0.011)	(0.015)	(0.014)	(0.17)	(0.015)	(0.012)	(0.014)	(0.012)
February	0.037**	0.062***	0.043***	0.026**	0.030**	0.044**	0.022**	0.020**	0.026***	0.010
	(0.016)	(0.017)	(0.013)	(0.011)	(0.013)	(0.19)	(0.01)	(0.01)	(0.009)	(0.009)
March	0.037**	0.023**	0.029**	0.024**	0.016***	0.027***	0.025***	0.014*	0.020*	0.011
	(0.015)	(0.01)	(0.013)	(0.012)	(0.008)	(0.009)	(0.009)	(0.008)	(0.011)	(0.011)
April	0.040***	0.036**	0.029***	0.036***	0.039***	0.039***	0.035***	0.035***	0.042***	0.042***
	(0.012)	(0.014)	(0.009)	(0.011)	(0.01)	(0.01)	(0.013)	(0.009)	(0.011)	(0.009)
May	0.029*	0.022***	0.027***	0.022**	0.016*	0.011	0.018**	0.032**	0.006	0.016*
	(0.017)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.014)	(0.009)	(0.01)
June	0.007	0.009	-0.003	0.012	0.002	0.000	0.000	-0.007	-0.008	-0.005
	(0.009)	(0.01)	(0.011)	(0.013)	(0.009)	(0.1)	(0.01)	(0.01)	(0.01)	(0.009)
July	0.038***	0.044***	0.028***	0.023***	0.033***	0.031***	0.033***	0.030***	0.036***	0.030***
	(0.011)	(0.009)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)	(0.007)	(0.009)	(0.009)
August	0.029**	0.022*	0.012	0.004	0.006	0.017	-0.003	0.001	-0.008	0.005
	(0.014)	(0.011)	(0.009)	(0.01)	(0.01)	(0.013)	(0.012)	(0.011)	(0.011)	(0.01)
September	0.004	0.015	0.005	0.008	0.001	0.000	-0.010	-0.005	-0.003	-0.007
	(0.01)	(0.011)	(0.01)	(0.01)	(0.01)	(0.011)	(0.009)	(0.011)	(0.014)	(0.011)
October	0.022	0.006	0.024	0.022**	0.023**	0.031***	0.012	0.024*	0.010	0.015
	(0.014)	(0.008)	(0.017)	(0.011)	(0.011)	(0.012)	(0.012)	(0.013)	(0.015)	(0.013)
November	0.024	0.035***	0.015	0.002	0.010	0.013	0.017	0.015	-0.004	-0.003
	(0.022)	(0.013)	(0.014)	(0.012)	(0.014)	(0.008)	(0.01)	(0.01)	(0.009)	(0.01)
December	0.031*	0.008	0.022	0.025**	0.035***	0.038***	0.033***	0.033***	0.045***	0.021***
	(0.017)	(0.011)	(0.013)	(0.011)	(0.01)	(0.011)	(0.009)	(0.011)	(0.011)	(0.007)
Observations	467	467	467	467	467	467	467	467	467	467
R^2	0.1252	0.1044	0.0643	0.0823	0.0950	0.0749	0.1189	0.0768	0.0893	0.0593
Adjusted R^2	0.1020	0.0808	0.0396	0.0580	0.0711	0.0505	0.0956	0.0524	0.0652	0.0344
F statistic	12.1305***	12.6698***	7.362***	8.3841***	9.8849***	8.3494***	9.8706***	7.1306***	6.0814***	4.2635***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

5.2 Testing model specifications

For the results to be reliable, certain assumptions about the distribution of the data are required. If these assumptions are not met, the wrong conclusion could be made from the results. Since the results showed signs of heteroscedasticity and autocorrelation I have performed White's test for heteroscedasticity and BreuschGodfrey test for autocorrelation. If the residuals are heteroscedastic the coefficient is still unbiased and consistent, but the standard error may be wrong so any inferences made could be wrong. Autocorrelation in the residuals lead to the same problem as heteroscedasticity, standard errors could be wrong opening the possibility of making wrong inferences. A common way to handle both of these problems is by using robust standard errors, which I have already chosen to do. The following tables mimic the previous tables, and display the results from these tests. As seen in table 9 only the EW index faces problem with heteroscedasticity for the whole sample. In table 10 both indices have higher test-statistic than ideally, meaning the use of robust standard errors was absolutely necessary. In the appendix I have also included the test without the autoregressive term.

Table 9: Test statistic for White and BG test

	White	**BG**
EW	2.4105***	19.6705*
VW	1.5846*	14.8072
EW:80-89	1.3472	12.9343
EW:90-99	1.6436*	15.4587
EW:00-09	1.7096*	5.8729
EW:10-18	1.1487	4.6527
VW:80-89	0.9618	15.7546
VW:90-99	0.9306	9.7017
VW:00-09	1.7952*	4.0182
VW:10-18	0.9324	9.1132

$*p < 0.1; **p < 0.05; ***p < 0.01$. Reject H0 if test-stat>critical value

Critical value:

White: 1.5604;1.7735;2.2240 Full sample

White: 1.6086;1.8446;2.3569. Subsample

BG: 18.5493;21.0261;26.2170

Table 10: Test statistic for White and BG test

	White	BG
EW		
1	2.8416***	19.534*
2	1.3885	26.0915**
3	2.0492**	20.6814*
4	1.2636	22.2093**
5	2.2287***	21.4928**
6	2.4374***	23.9389**
7	0.9895	4.8585
8	1.7612*	7.3482
9	3.472***	25.6901**
10	2.5175***	15.3523
VW		
1	2.2417***	18.2518
2	3.0293***	23.0954**
3	1.6635*	16.0762
4	1.5324	22.2857**
5	1.376	23.6925**
6	1.2349	10.2554
7	2.1649**	12.0282
8	1.2245	15.2677
9	2.85***	20.8471*
10	1.3968	19.3168

$*p < 0.1; **p < 0.05; ***p < 0.01$. Reject H0 if test-stat>critical value

Critical value:

White: 1.5604;1.7735;2.2240

BG: 18.5493;21.0261;26.2170

5.3 Discussion

For most of the 20th century the efficient market hypothesis was more or less acknowledged by all (Malkiel, 2003), whether it be academics, scholars or market practitioners. It was believed that the markets where extremely efficient in reflecting the stock price, in turn making it impossible to earn higher returns over time than a randomly selected portfolio with the same risk. In somewhat contrast to this theory, the January effect is extensively researched around the globe and a favourite anomaly to highlight in economics and statistic textbooks. In the decades after Watchel (1942) published his findings empirical testing for the January effect became popular on many of the world's largest stock exchange. A number of researchers (Kendall & Hill, 1953; Officer, 1975; Rozeff & Kinney Jr, 1976; Keim, 1983) have found evidence confirming the presence of the January effect. For the Norwegian stock exchange however, Gultekin and Gultekin (1983) are the only ones to have published a scientific report proving the existence of the effect in Norway. Consistent with previous literature on international stock exchanges and Gulteking and Gultekin's study, there exist a January effect on the Oslo Stock Exchange for the whole sample. Although Keim (1983) showed evidence suggesting that 50% of the returns obtained in January came within the first five trading days on NYSE, this paper does not conduct any research to when in January the returns are produced on Oslo Stock Exchange. In spite of that, the results presented earlier suggest that it is possible to achieve abnormal returns in January and the initial hypothesis of no January effect should be rejected.

Since consistency is such an essential part, it is necessary to test if there has been changes in the effect. In many cases where such an anomaly as the January effect has been discovered, it often disappears either because practitioners try to exploit the possibility of excess return, it was never really there or some unknown explanation. Although most of the papers about the January effect previously mentioned on international level predates the sample period I use, many of them show the same pattern. The effect is substantial in the beginning of the testing period, but ceases to exist towards the end. The same pattern can to some extent be seen on Oslo Stock Exchange. In the first two subperiods, 1980-1999, the effects is there, before it disappears in the 2000's. This leads to a rejection of the null hypothesis that the

January effect has not changed over time. A possible explanation for this is that the Norwegian market has become more efficient over the years due to the increased analytic reporting (Jegadeesh, Kim, Krische, & Lee, 2004).

Many researchers have found evidence that the January effect is a small firm phenomenon (Keim, 1983; Lakonishok & Smidt, 1986; Haug & Hirschey, 2006). They all argue that the small firm effect discovered by Banz (1981) and Roll (1981) is very much related to the January effect. In his investigation of the small firm effect Keim discovered that half of the excess returns for small companies came in January giving strong evidence to the fact that the January effect is closely linked with the small firm effect. Lakonishok and Smidt did not find any sign of abnormal returns in January when they investigated the Dow Jones Industrial Average. Finally Haug and Hirschey conclude that 20 years later it continues to be a small firm phenomenon. In this thesis i find significant higher returns for both the EW index and the VW index. In fact, when splitting the indices into portfolios based on size, the coefficients for the VW index are all higher than for the EW index. This does not necessary mean that the two effects are not related. Because for both the indices, the by far highest return is achieved by the smallest portfolio. Although the VW index seem to go down and then up for every new portfolio, the trend is clearly downwards. The EW index follow a more strict downward trend indicating that size after all is more relevant in the EW index. In light of this the null hypothesis of equally pronounced effect is rejected.

6 Conclusion

The purpose of this thesis was to give light to the phenomenon of the January effect on the Oslo Stock Exchange. To test this I first form the null hypothesis that it is not possible to achieve abnormal returns in the month of January. The results found in this thesis is consistent with prevailing literature and economic theory. To do this I have tested an EW and a VW index of the listed stocks for the whole period and subsamples based on time and size of the stock. The tests show that for the whole period there exist a January effect. When testing if the effect disappears over time this study concludes that the effect is present from 1980-1999 and disappears after that. The results also show that the market capitalisation of a firm is an important factor for the January effect. Smaller firms achieve statistically significant higher returns whereas the largest portfolios fail to do so. I have also found significant high return on some other months which is also in line with some recent papers.

Something that should be done in the future is test the size portfolio with different time samples, and not just the whole sample as I have done here. It should also be tested if it is possible to build a trading strategy to profit from the anomaly, or if the transaction cost would eat up all the profits. To my knowledge it has also not been tested in the Norwegian market if the abnormal returns in January come as a result of private and institutional investors taking on more risk in the beginning of January.

In hindsight I believe it would have been easier and visually better to use one less dummy and include the intercept in the regression instead of twelve dummies and no intercept.

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A Appendix

Table A1: Test statistic for White and BG test

	White	BG
EW	1.1586	53.3998***
VW	1.2832	24.8536**
EW:80-89	0.7624	19.6276*
EW:90-99	1.4866	24.5327**
EW:00-09	1.3464	16.9916*
EW:10-18	1.171	10.1451
VW:80-89	0.8701	19.4441*
VW:90-99	0.9766	11.3857
VW:00-09	1.4429	9.4592
VW:10-18	1.0155	9.0453

$*p < 0.1; **p < 0.05; ***p < 0.01$. Crtical value:

White: 1.5847;1.8097;2.2868 Full sample

White: 1.6311;1.8784;2.4163. Subsample

BG: 18.5493;21.0261;26.2170

Table A2: Test statistic for White and BG test

	White	BG
EW		
1	1.2685	48.3787***
2	0.831	37.844***
3	1.2908	23.1305**
4	0.8861	56.7653***
5	1.1899	37.0777***
6	1.483	45.0437***
7	0.8914	21.9218**
8	1.2997	30.9593***
9	1.8952**	41.3213***
10	1.9309**	18.1427
VW		
1	0.7035	32.8565***
2	1.7206*	37.0729***
3	1.4465	20.5399*
4	1.2476	31.1137***
5	0.9543	38.3962***
6	1.1254	15.7441
7	1.3593	31.4546***
8	0.8284	28.2783***
9	2.3128***	24.9729**
10	1.0917	22.4497**

$*p < 0.1; **p < 0.05; ***p < 0.01$. Crtical value:

White: 1.5847;1.8097;2.2868

BG: 18.5493;21.0261;26.2170

Table A3: EW and VW indices - Regression with Non-robust and Robust std errors

	Plain	**Robust**	**Plain**	**Robust**
Janury	0.052***	0.052***	0.036***	0.036***
	(0.008)	(0.010)	(0.009)	(0.012)
Februay	0.029***	0.029***	0.021**	0.021***
	(0.008)	(0.008)	(0.009)	(0.008)
March	0.021***	0.021***	0.017*	0.017*
	(0.008)	(0.007)	(0.009)	(0.010)
April	0.033***	0.033	0.043***	0.043***
	(0.008)	(0.008)	(0.009)	(0.008)
May	0.015***	0.015**	0.022**	0.022***
	(0.008)	(0.007)	(0.009)	(0.008)
June	-0.005	-0.005	-0.002	-0.002
	(0.008)	(0.007)	(0.009)	(0.008)
July	0.026***	0.026***	0.031***	0.031***
	(0.008)	(0.006)	(0.009)	(0.008)
August	0.001	0.001	0.007	0.007
	(0.008)	(0.009)	(0.009)	(0.010)
September	-0.008	-0.008	-0.003	-0.003
	(0.008)	(0.009)	(0.009)	(0.010)
October	0.008	0.008	0.016*	0.016
	(0.008)	(0.010)	(0.009)	(0.012)
November	0.003	0.003	0.002	0.002
	(0.008)	(0.008)	(0.009)	(0.009)
December	0.020**	0.020**	0.030***	0.030***
	(0.008)	(0.008)	(0.009)	(0.008)
Observations	468	468	468	468
R^2	0.0984	0.0984	0.05771368	0.05771368
Adjusted R^2	0.0766	0.0766	0.03498309	0.03498309
F-statistic	8.0426***	8.0426***	6.0826***	6.0826***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

Table A4: EW index in subperiods - Regression with robust std errors

	80-89	**90-99**	**00-09**	**10-18**
January	0.098***	0.058***	0.028	0.021*
	(0.021)	(0.019)	(0.018)	(0.011)
February	0.029	0.035*	0.024*	0.026***
	(0.019)	(0.018)	(0.013)	(0.005)
March	0.034*	0.030**	0.008	0.010
	(0.019)	(0.015)	(0.011)	(0.007)
April	0.042***	0.036**	0.028*	0.023***
	(0.016)	(0.018)	(0.016)	(0.007)
May	-0.003	0.033***	0.030**	0.000
	(0.016)	(0.009)	(0.012)	(0.012)
June	-0.014	-0.009	0.010	-0.008
	(0.015)	(0.012)	(0.016)	(0.007)
July	0.041***	0.028*	0.016	0.019***
	(0.013)	(0.016)	(0.011)	(0.005)
August	0.017*	-0.024	0.016	-0.006
	(0.009)	(0.027)	(0.013)	(0.008)
September	0.017	-0.024*	-0.033	0.010
	(0.014)	(0.013)	(0.024)	(0.011)
October	-0.002	0.013	0.004	0.016
	(0.023)	(0.018)	(0.022)	(0.011)
November	0.004	-0.009	0.015	0.002
	(0.016)	(0.019)	(0.017)	(0.008)
December	0.018	0.025	0.019	0.019
	(0.019)	(0.015)	(0.014)	(0.013)
Observations	120	120	120	108
R^2	0.2125	0.17998	0.0905	0.1391
Adjusted R^2	0.1323	0.0965	-0.0021	0.0405
F-statistic	4.1077***	2.7662***	1.5425	2.5845***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

Table A5: VW index in subperiods - Regression with robust std errors

	80-89	90-99	00-09	10-18
January	0.079***	0.048**	0.011	0.001
	(0.025)	(0.019)	(0.024)	(0.012)
February	0.012	0.019	0.027	0.026***
	(0.016)	(0.017)	(0.017)	(0.009)
March	0.008	0.034*	0.015	0.012
	(0.027)	(0.018)	(0.015)	(0.008)
April	0.065***	0.039**	0.039*	0.030***
	(0.018)	(0.014)	(0.02)	(0.008)
May	0.014	0.032**	0.041**	-0.001
	(0.017)	(0.012)	(0.017)	(0.015)
June	-0.002	-0.012	0.014	-0.006
	(0.019)	(0.014)	(0.019)	(0.01)
July	0.045**	0.035**	0.011	0.033***
	(0.02)	(0.016)	(0.014)	(0.009)
August	0.033**	-0.020	0.020	-0.007
	(0.015)	(0.026)	(0.015)	(0.011)
September	0.016	-0.017	-0.028	0.017
	(0.017)	(0.015)	(0.029)	(0.013)
October	-0.002	0.026	0.011	0.031**
	(0.03)	(0.019)	(0.027)	(0.016)
November	-0.004	-0.005	0.015	0.002
	(0.019)	(0.02)	(0.017)	(0.007)
December	0.020	0.042**	0.037***	0.019
	(0.019)	(0.017)	(0.01)	(0.014)
Observations	120	120	120	108
R^2	0.1351	0.1529	0.0748	0.1460
Adjusted R^2	0.0470	0.0666	-0.0194	0.0482
F-statistic	2.5772***	2.5817***	1.4775	2.5235***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

Table A6: EW index in deciles - Regression with robust std errors

	1	2	3	4	5	6	7	8	9	10
January	0.107***	0.062***	0.054***	0.056***	0.055***	0.054***	0.052***	0.027***	0.034***	0.018***
	(0.014)	(0.010)	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.012)	(0.013)
February	0.039***	0.054***	0.034***	0.021**	0.040**	0.028***	0.024***	0.020**	0.017**	0.008**
	(0.011)	(0.013)	(0.011)	(0.011)	(0.016)	(0.010)	(0.009)	(0.009)	(0.007)	(0.008)
March	0.042***	0.015	0.026**	0.019*	0.019**	0.019***	0.018**	0.019**	0.017	0.015
	(0.014)	(0.011)	(0.012)	(0.011)	(0.008)	(0.006)	(0.008)	(0.008)	(0.011)	(0.011)
April	0.037***	0.030***	0.032***	0.032***	0.030***	0.039***	0.029***	0.032***	0.035***	0.029***
	(0.010)	(0.011)	(0.009)	(0.009)	(0.009)	(0.011)	(0.009)	(0.009)	(0.011)	(0.009)
May	0.018	0.018**	0.016**	0.014*	0.016**	0.015**	0.017**	0.019*	0.004	0.017*
	(0.011)	(0.009)	(0.008)	(0.007)	(0.008)	(0.007)	(0.008)	(0.011)	(0.008)	(0.010)
June	0.005	0.002	-0.008	0.002	-0.003	-0.006	-0.009	-0.011	-0.016	-0.009
	(0.007)	(0.008)	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)	(0.008)
July	0.031***	0.035***	0.022***	0.020***	0.028***	0.019***	0.022***	0.028***	0.036***	0.030***
	(0.009)	(0.009)	(0.006)	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.009)	(0.008)
August	0.011	0.014	0.004	-0.003	0.005	-0.006	0.002	-0.006	-0.013	0.000
	(0.008)	(0.010)	(0.008)	(0.010)	(0.010)	(0.011)	(0.012)	(0.012)	(0.013)	(0.012)
September	0.007	0.007	-0.008	-0.003	-0.010	-0.009	-0.017	-0.020*	-0.013	-0.012
	(0.008)	(0.009)	(0.009)	(0.010)	(0.010)	(0.011)	(0.011)	(0.012)	(0.014)	(0.013)
October	0.008	-0.002	0.001	0.019*	0.014	0.009	0.001	0.010	0.005	0.008
	(0.009)	(0.008)	(0.013)	(0.010)	(0.011)	(0.010)	(0.012)	(0.012)	(0.015)	(0.016)
November	0.013	0.016	0.002	-0.005	-0.001	0.002	0.003	0.006	-0.007	0.001
	(0.010)	(0.010)	(0.009)	(0.012)	(0.010)	(0.009)	(0.011)	(0.011)	(0.010)	(0.011)
December	0.019**	0.000	0.007	0.006	0.025***	0.028***	0.031**	0.033***	0.033***	0.017**
	(0.008)	(0.011)	(0.010)	(0.011)	(0.008)	(0.010)	(0.015)	(0.010)	(0.011)	(0.008)
Observations	468	468	468	468	468	468	468	468	468	468
R^2	0.1521	0.0898	0.0790	0.0643	0.0726	0.0851	0.0736	0.0638	0.0701	0.0348
Adjusted R^2	0.1316	0.0678	0.0568	0.0418	0.0503	0.0630	0.0512	0.0412	0.0477	0.0115
F-statistic	14.179***	8.0302***	5.6046***	4.721***	6.0198***	6.2425***	4.861***	4.1346***	3.7851***	2.2151**

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.

Table A7: VW index in deciles - Regression with robust std errors

	1	2	3	4	5	6	7	8	9	10
January	0.141***	0.075***	0.068***	0.074***	0.065***	0.073***	0.067	0.045**	0.041**	0.028**
	(0.019)	(0.013)	(0.011)	(0.015)	(0.013)	(0.016)	(0.014)	(0.012)	(0.014)	(0.012)
February	0.063**	0.076***	0.050***	0.037***	0.042***	0.052**	0.036***	0.028***	0.031***	0.013
	(0.025)	(0.017)	(0.013)	(0.011)	(0.013)	(0.022)	(0.010)	(0.009)	(0.008)	(0.008)
March	0.049***	0.036***	0.034***	0.029**	0.024***	0.033***	0.032***	0.019**	0.024**	0.012
	(0.014)	(0.012)	(0.013)	(0.012)	(0.008)	(0.008)	(0.009)	(0.008)	(0.011)	(0.011)
April	0.049***	0.042***	0.033***	0.040***	0.044***	0.042***	0.041***	0.039***	0.045***	0.043***
	(0.011)	(0.014)	(0.010)	(0.012)	(0.010)	(0.010)	(0.014)	(0.008)	(0.011)	(0.009)
May	0.039**	0.030**	0.031***	0.028***	0.024***	0.015*	0.026***	0.039**	0.011	0.021**
	(0.017)	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.016)	(0.009)	(0.009)
June	0.015*	0.014	0.000	0.016	0.006	0.001	0.006	0.000	-0.007	-0.002
	(0.008)	(0.010)	(0.011)	(0.013)	(0.009)	(0.011)	(0.010)	(0.010)	(0.010)	(0.009)
July	0.040***	0.047***	0.028***	0.025***	0.034***	0.031***	0.034***	0.030***	0.035***	0.030***
	(0.011)	(0.009)	(0.006)	(0.007)	(0.008)	(0.007)	(0.009)	(0.008)	(0.009)	(0.009)
August	0.036**	0.030***	0.015*	0.007	0.013	0.020	0.004	0.006	-0.003	0.008
	(0.014)	(0.011)	(0.009)	(0.010)	(0.011)	(0.013)	(0.012)	(0.012)	(0.011)	(0.010)
September	0.010	0.021*	0.007	0.009	0.003	0.003	-0.010	-0.004	-0.004	-0.006
	(0.011)	(0.012)	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.012)	(0.014)	(0.011)
October	0.024*	0.009	0.024	0.023**	0.023**	0.031***	0.010	0.024*	0.009	0.014
	(0.013)	(0.008)	(0.017)	(0.011)	(0.011)	(0.011)	(0.012)	(0.013)	(0.015)	(0.013)
November	0.028	0.036***	0.017	0.006	0.015	0.017**	0.019*	0.019*	-0.002	-0.001
	(0.022)	(0.013)	(0.014)	(0.012)	(0.013)	(0.008)	(0.011)	(0.010)	(0.010)	(0.010)
December	0.036**	0.015	0.023*	0.026**	0.038***	0.040***	0.037***	0.037***	0.045***	0.021***
	(0.016)	(0.011)	(0.014)	(0.011)	(0.011)	(0.011)	(0.009)	(0.011)	(0.011)	(0.007)
Observations	468	468	468	468	468	468	468	468	468	468
R^2	0.0970	0.0738	0.0547	0.0614	0.0618	0.0642	0.0797	0.0488	0.0713	0.0467
Adjusted R^2	0.0752	0.0514	0.0319	0.0387	0.0391	0.0416	0.0575	0.0259	0.0489	0.0237
F-statistic	11.6966***	12.0649***	7.5679***	8.0595***	9.0214***	8.5787***	8.6929***	6.4332***	5.6225***	4.0904***

$*p < 0.1; **p < 0.05; ***p < 0.01$. Standard errors in parenthesis.