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# The market reaction to national football match outcomes

## An event study of Oslo Stock Exchange

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# Abstract

In late 2020, an average of every 6th Norwegian watched the qualifying game between Norway and Serbia in the Nations League (Teigen, 2020). We therefore chose the Norwegian national team for our study, as the residents seem to have found a new hope for advancement in these tournaments in recent years. We conduct an event study where we adapt the ordinary least squares method to analyze if, and how, financial markets are affected by football matches played by the Norwegian national team. We analyze the daily returns of the two stock indices from 1983 to 2020 with the purpose of investigating potential abnormal returns after a win, loss or draw by the Norwegian national team. We find that a loss is followed by a negative abnormal return of -0.363%. Draws are also followed by negative abnormal return, although not statistically significant. We also find that only losses provide statistically significant abnormal returns for the entire sample, which provides evidence that the effect of a football match is different for a win and a loss. For our smaller sample of 1990-2000 only wins provide statistically significant abnormal returns of 0.361%, meaning the size of the Norwegian audience is related to the magnitude and significance of the effect of the match on the Oslo Stock Exchange main market index the next day. We conclude that a match played by the Norwegian national team has an effect on the main market index on Oslo Stock Exchange, which is stronger when Norwegian audiences are larger, and different for a win and a loss.

# 1 Introduction

During the 1994 FIFA World Cup an astounding 49.5% of the Norwegian population watched the football match against Mexico (NRK, 2008). During the period 1990-2000 the interest for the Norwegian national team rose and the team participated in several international tournaments such as the World Cup and the European Championship. During the decade that followed the interest for national football amongst the population fell and the team could not perform on the same level as the previous decade. Then again, in the late 2010's new players evolved and today the Norwegian national team once again consists of several players from the best international leagues. The main inspiration for this thesis is the article "Sports Sentiment and Stock Returns" by Edmans, Garcia and Norli (2007), in which they analyses the effects of sport sentiment on several stock exchange markets. In our thesis, we investigate if some of these finding could be observed on a single market for a single sport, specifically football.

We apply theories from both behavioral and economical science to investigate how financial markets react to sport results, and integrate well-known financial theories and discuss several empirical studies conducted on the topic of behavioral finance. The analysis in this thesis is divided into two major different analyses. One where the only variables are return on Oslo Stock Exchange and one in which we control for S&P 500 and include an estimation window for each match. All work is done with the purpose of answering our main research question which is; does the result of a Norwegian national team football match affect the Norwegian stock market index?

Daily data from the main market index on Oslo Stock Exchange (OSEBX), as well as the Standard & Poor's 500 index (S&P500), from 1983-2020 are merged with the match-data from the same period, formatted and treated to then be analyzed and tested. Financial data from the OSEBX are retrieved using Yahoo Finance, data from the S&P500 are retrieved from Macrotrends, and the match-data are retrieved from The Football Association of Norway (NFF). When determining the sample size of this thesis we excluded friendship-matches and other matches that tend to not have a significant size audience and therefore possibly not have an effect on the stock market.

This thesis applies the ordinary least squares method (OLS), with the market model as a basis, to the data in order to study the effects of a football match played by the Norwegian national team on the OSEBX. We carry out several other tests in order to further support our method such as t-tests, a GARCH (Generalized autoregressive conditional heteroscedasticity) and ARCH (Autoregressive conditional heteroscedasticity), as well as utilizing methodology related to event studies.

We find evidence of an effect from a loss of the Norwegian national team on OSEBX when controlled for S&P500, more specifically a negative abnormal return of -0.363% when controlling for the S&P500 and excluding the estimation window. We also see tendencies outside of this finding, such as a negative abnormal returns after a draw, but these tendencies cannot be concluded on due to the absence of statistical significance. We also find evidence of an effect from a win of the Norwegian national team on OSEBX when controlled for S&P500, with a positive abnormal return of 0.361% when controlling for the S&P500 and including the estimation window. This is found in the period 1990 to 2000, when TV-ratings and –audiences were at its highest.

Both of these statistical significant findings support a rejection of our second hypothesis, stating that the effect of a match played by the Norwegian national team on the OSEBX is indifferent for a win and a loss. Our first finding results in a rejection of our first hypothesis, which states that there is no relation between the main market index on Oslo Stock Exchange and football matches played by the Norwegian national team. Our second finding leads to a rejection our third hypothesis which states that there is no relation between the size of the Norwegian audience of a match and the magnitude of the effect of a match played by the Norwegian national team on the OSEBX. We conclude that a match played by the Norwegian national team has an effect on the main market index at Oslo Stock Exchange, which is stronger when Norwegian audiences are larger, and different for a win and a loss.

Edmans, Garcia and Norli (2007) report findings of statistical significant abnormal returns for international matches of several sports, also including football, on the respective nation's main stock index. Our thesis contributes to this research through our selection of one country, both for the national team and national index, and performing a thorough analysis of said country. The Norwegian team is also rarely qualified for the international competitions, thus adding a new aspect to the research done by Edmans, Garcia and Norli (2007), by investigating these potential effects from a dataset consisting of mainly qualification games. Seeing how the European Championship only has 24 nations competing, and the World Cup only 32, our research yields findings that applies for many nations that do not partake in these tournaments, and are not included in the research done by Edmans, Garcia and Norli (2007). Arkes, Herren and Isen (1988) find that sales of Ohio State lottery tickets go up in the following days after a win by the Ohio State University (OSU) football team, and links this to mood as a an susceptible variable. Our thesis contributes to this research by further investigating external forces and events that affect mood to a measurable extent. Further, we conduct an analysis of a relatively small sample of matches, and might be excluding factors that have an explanatory power to support or reject the hypothesis that sport sentiment is a factor in investor mood and behavioral finance as a whole, thus contributing to the field of research.

In chapter 2 we present literature related to the research done in our thesis, and formalize our hypotheses. In chapter 3 we present the methodology used both in the treatment, as well as the analysis of our data. Chapter 4 aims to present the data as a whole, before any formatting and merging is done. In chapter 5 we present our analysis, as well as the discussion of our findings in light of the hypotheses. Our conclusion is found in chapter 6, and references in chapter 7.

# 2 Related literature and hypothesis development

Fama (1970) reviews the theoretical and empirical research and develops the theory of efficient markets (EMH). The theory is based on the degrees of efficient markets which is dependent on how much information that is available to the investor, and the hypothesis states that all share prices reflect all information. According to the EMH all assets trade at their fair value and, should the EMH hold, there will be no opportunity for assets to be over- or undervalued. Due to this assumption, it is practically impossible to beat, or outperform, the equity market due to the value of assets always being fair and including all available information.

Therefore, there exists a grouping of EMH, specifying and defining the wording “all available information”, to allow the fact that investors in the real world actually can outperform the equity market with the correct timing and research. The three forms of efficient markets are weak, semi-strong and strong, depending on the amount of information available to the participants. The weak form of market efficiency states that all historical data is incorporated into today's prices. Semi-strong form includes all public data, and the strong form reflects all public and private information.

Contrasting to the theory of efficient markets where all financial practitioners act rationally, behavioral finance deals with the study of psychological effects on investors. By including the emotional component to standard economic models one would typically discover findings that deviate from neoclassical economics. Daniel et al. (1998) argue that the momentum effect exists, connecting the momentum effect to behavioral finance with the argumentation that all investors are irrational. Hence, the existence of the momentum effect and EMH simultaneously is a paradox.  Kahneman and Tversky (1974) investigates the field of human decision making and what human brains have a tendency to do when put under pressure, uncertainty or complexity. Through experiments they find that when making challenging decisions humans tend to make predictable errors. These errors stem from heuristics and biases which are mental shortcuts that ease the cognitive load of making a decision. Heuristics allow humans to make assumptions and shortcuts in order to make often correct and usefully automatic decisions. Evolutionary forces have probably passed on the most useful heuristics owing to the fact that heuristics from survivors are better than from forfeiters.

As stated by Kahneman and Tversky (1974) there are three heuristics employed in making judgements under uncertainty, which are representativeness, availability and adjustments from an anchor. Representativeness bias occurs when the confusion of similarity of objects or events regarding the probability of an outcome seeing that humans tend to assume that two independent objects or events are more closely correlated than they actually are. The availability bias refers to a heuristic tendency to judge an event by the ease with which examples of the event can be retrieved from your memory or constructed anew. The third heuristic, anchoring bias, refers to when an individual depends too heavily on an initial piece of information offered and uses this point as an anchor for future comparison. This number or information is arbitrary and all future estimates that are discussed in relation to the anchor are therefore biased to the initial value of it.

Kahneman and Tversky (1979) develop and first describe the prospect theory. The theory is based upon the choices of individuals in situations with uncertainty and how gains and losses are perceived in comparison to each other. The phenomenon of loss aversion is described by Kahneman and Tversky with the words “losses loom larger than gains”. The theory states that investors tend to be twice as affected by a loss than by a win of corresponding size. This means that the reference point of a potential win or loss is crucial to how the utility is perceived. This phenomenon is based upon that humans tend to overweigh small probabilities, which makes the curve steeper in losses and flatter gains relative to the reference point.

Stock market traders are often divided into two types, arbitrageurs and noise traders. Arbitrageurs or rational speculators are investors who form fully rational expectations about security returns and base their decisions on information and knowledge. The other type, noise traders, are investors who base their decisions on other factors such as trends in the market, other investors trading patterns and therefore act irrational to the market. This irrationality makes their actions hard to predict because they are not based on fundamental risk. This creates what Shleifer and Summers (1990) define as noise trader risk.

The first group of investors tend to take advantage of this risk created by the noise traders. By investing on the mispricing of the noise trader risk they create a systematic risk on the market which is then borne by all investors. Such a risk is a direct contradiction to the EMH and deter arbitrageurs to aggressively bet against noise traders. A model created by De Long, Shleifer, Summers & Waldmann (1990) sheds light on the abnormalities associated with this

phenomenon. Arbitrageurs tend to bear a significant load of the risk originating from noise traders because they do not always have the means to take advantage of mispricing or that their time horizon does not match up with the noise traders. These factors affect the arbitrageurs and thus allow noise traders to earn a higher expected return than the rational investors.
There are many biases that could affect the preferences of investors. One of the more well-known biases is confirmation bias, which Nickerson (1998) defines as the seeking or interpreting of evidence in ways that are partial to existing beliefs, expectations, or a hypothesis in hand. This phenomenon is the tendency to seek confirmation of a hypothesis and by doing so more easily fail to notice contradictions to it. In certain cases, confirmation bias is unavoidable, such as with attorneys and debaters who will present evidence and arguments for a single side of a case and to defend their position.

## 2.1 Empirical Literature

There are numerous empirical studies that reveal evidence contradicting the EMH. These concepts are often grounded in market anomalies, a state in which the outcome predicted by a model, given a set of assumptions, does not match the actual results. First, we include some well-known anomalies observable in the market. Second, we present some empirical findings where a mood variable is present. Lastly, we present some empirical findings regarding this papers thesis, sport sentiment and particularly football results and stock results.

### 2.1.1 The Monday Effect

Despite the efficient markets theory there is a large body of literature regarding the day of the week effect or the weekend effect. This is a phenomenon where in most studies it is found that the average return on Mondays is significantly smaller than the other days. French (1980) finds by analyzing daily returns from the S&P500 from 1953-1977 that the expected return on Mondays on average is negative and positive for the other four days of the trading week. Similar results are reported from Gibbons and Hess (1981) and Smirlock and Starks (1986). Other studies indicate a similar effect, but on different days of the week. Jaffe and Westerfield (1985) finds a weekend effect in several countries, but in the Australian and Japanese markets the lowest mean return on the stock markets are on Tuesdays rather than Mondays.

Explanations to this phenomenon are many and one important hypothesis is that an investor’s mood goes from optimistic on a Friday and fades throughout the weekend. Another hypothesis is that companies tend to release bad news on Fridays. Still, Damodaran (1989) argues that only a small portion of the weekend effect could be explained by bad news on a Friday.

### 2.1.2 The January Effect

The January Effect, first discovered by investment banker Sidney B. Wachtel in 1942, is a tendency of an increase in stock prices at the beginning of a new year, and particularly January. There are a couple of explanations to understanding this phenomenon such as tax benefits from selling stocks in December and buying them in January. End-of-year bonuses combined with holidays such as Christmas and New Year's Eve tend to encourage investments in January. According to Chen and Singal (2004), there is evidence of such an effect on the U.S equity markets and some stocks experience large mean returns in January.

This effect is a contradiction to the EMH, where no such effects should exist. Because of this effect rational investors should tend to invest in December and sell in January to make a profit. These actions would then cancel out the effect over time. In the 80 years since the first documentation of this effect it is still observable on the market, and one could therefore argue that the EMH is incorrect, and investors are irrational.

### 2.1.3 The Momentum Effect

The momentum effect describes the tendency for already rising assets to rise further, and already falling assets to fall further. This effect is a paradox when EMH is taken into consideration, as EMH states that no previous pricing of an asset has any effect on future pricing, and as such should not be able to predict future pricing. Essentially, the momentum effect should not exist, even though Jagadessh and Titman (1993) argue for the existence of such an effect.

### 2.1.4 The Home Bias Puzzle

The home bias puzzle essentially consists of two different theories. The first one is called the home bias puzzle, which consists of consumers tending to over consume domestically produced goods rather than imported goods and is regarded as a macroeconomic phenomenon. The second one is called the equity home bias puzzle and concerns the fact that investors tend to be overly confident in their abilities to outperform their domestic equity market rather than foreign equity markets. This leads to a disproportional diversification, which means that a much larger share of investors equity is held in domestic equity markets than what the theory of diversification would suggest is reasonable for diversifying the investor's risk (French and Poterba, 1991). To illustrate as such, they present a statistic of equity portfolios held by Japanese investors where 98% of said portfolios are held domestically. For the U.S and Britain the equivalent statistics are 94% and 82%, respectively.

French and Poterba (1991) present two different classes of explanations for the home bias investment in domestic equity markets puzzle, with the first being institutional factors, as a sub-category of rational behavior. Investors may experience limitations when it comes to holding foreign assets or have their returns from foreign investments reduced due to institutional factors, although such constraints are hard to identify and prove. Tax burdens are very similar domestically and internationally for most investors but could possibly hinder an investment-opportunity. Transaction cost may be lower in more liquid markets, such as the New York Stock Exchange (NYSE), but this would give the investors incentive to trade on the NYSE instead of their home equity market and does not support the theory of home bias.
The second class of explanations for the skewed diversification bases itself on investor behavior and particularly the expected returns of different groups of investors. Which is proven by Shiller et al. (1991) to vary systematically.

Arkes, Herren and Isen (1988) find that sales of Ohio State lottery tickets go up in the following days after a win by the Ohio State University (OSU) football team. The contrary is also true, and the authors are under the opinion that the population of Ohio are in a better mood following a win rather than a defeat, of the OSU football team, as present or former inhabitants of the state. The article clearly states the existence of a connection between mood as an affectable variable and the change in willingness to take on risk. The mood of the Ohio state inhabitants after a win of the OSU football team influences them to believe that their luck will continue, much like the momentum theory, and statistically increases the risk-taking behavior even when the chances of winning the bet does not increase.

Shiller et al. (1991) studies speculative behavior in the stock markets in the United States and Japan, in regard to the home bias puzzle. They find that a group of investors from the U.S. reports an expected return of -0.3 percent and -9.1 percent on the Dow Jones Industrial Average and the Nikkei respectively, over the next 12 months. The group of Japanese investors has an expected return of 12.6 percent and 9.8 percent on the Dow Jones Industrial Average and the Nikkei respectively, over the same time period. The Japanese investors were more optimistic than the U.S investors, but more optimistic in the Tokyo market than the U.S market, further supporting the home bias puzzle.

### 2.1.5 Weather as a Mood Variable

Saunders (1993) first documents the sunlight effect by testing the hypothesis that stock prices from exchanges in New York City are not systematically affected by local weather. Saunders concludes that the effect of investor psychology on asset pricing is supported by the weather in New York City having a history of significant correlation with major stock indexes. The connection between weather and mood is also indicated and experimented on in extensive literature, further supporting what Saunders (1993) calls "the establishment of casual direction between a temporal, economically insignificant, local mood influence and asset pricing".

### 2.1.6 Sport Sentiment

Carrol et. al (2002) show that admissions for cardiac arrest went up by 25% in the three following days after England lost to Argentina in the World Cup on penalty shootouts on 30th of June 1998. They record 55 more admissions than expected during the 3 day period starting the same day as the match in question, and ending two days after. No other diagnoses experienced excess admissions, nor did this occur on the days of other World Cup matches played by England, and the effect was the same when excluding the day of the penalty shootout match versus Argentina from the period treated as the exposed condition. The evidence presented in the article proves a clear effect of the penalty shootout in the game in question on people's health, and further underlines the effect such events have on human psychology and physiology. The article is a fundamental part of the theoretical groundwork for Edmans et al (2007), and also supporting the claims made by Edmans, Garcia and Norli (2007) of mood being affected by results of international football matches.

In their paper, Edmans, Garcia and Norli (2007) investigate the effect of football matches and the impact these may have on investor mood and therefore investor behavior. By using a cross-section of 39 countries and a total of 1162 matches they investigate the stock market's reaction to sudden changes in investor mood. The time period between January 1973 and December 2004 includes matches from the World Cup and other continental cups. By utilizing an ordinary least squares (OLS) model and controlling for other effects such as the Monday effect. To model stock return volatility, the authors use a generalized autoregressive conditional heteroscedastic (GARCH) model. This model is being used to control for periods of high volatility, the magnitude of which the standard errors would be biased downward. The volatility of the error term is therefore modeled using GARCH to address the issue occurring when modeling the stock returns. They also include results from other sports such as cricket, basketball and rugby, but the findings where these sports were considered are relatively smaller in magnitude than football but still statistically and economically significant.

Ashton, Gerrard and Hudson (2003) studies the effect of results of football matches played by the English national team on the returns on the Financial Times Stock Exchange (FTSE) 100 index. With a period from January of 1985 to July 2002, they define the importance of the matches played by the national team, such as finals in international tournaments being more important than friendly matches. Using a binomial test and a regression estimated with a generalized method of moments estimator, they test whether the expected return on the next trading day is greater or less than the unconditional mean return after a winning or losing game. They do this through a consideration of the proportion of returns after a particular game outcome that exceed the unconditional mean return. The indication, based on the results, is that good (bad) results in the football matches are followed by good (bad) market returns, more so in the important games such as qualifying matches or finals in World Cups and European Championships rather than friendly matches.

Scholtens and Peenstra (2009) analyses the effect of football matches on stock market returns. Their study includes both results of matches where football clubs listed on a stock exchange play such as the Champions League, Europa League and other international competitions, and matches played in the national leagues. The study includes 1274 matches where 235 of said matches are part of a European competition, and the rest are played in the national leagues.

In the international competitions a win is seen to result in an increase of the market of listed football clubs the following trading day by 0.36 percent, and a draw or loss resulting in a decrease of 1.10 and 1.41 percent respectively and is statistically significant at the 1%-confidence level. National league matches are seen to have the same trend, although an expected win results in a larger abnormal positive return than an unexpected win, where the difference between national league matches and international matches is not statistically significant. The study shows that the stock market reacts abnormally positive to a win, and abnormally negative to a loss, with the reaction to a loss being of larger magnitude. Effects of football matches are stronger in the international competitions than in the national league games.

## 2.2 Research Questions

The purpose of this thesis is to understand if, and how big a possible effect of, football matches can influence investor behavior to a degree that it could be measured and somewhat predicted. The main research question is therefore if the result of a Norwegian national team football match affects the Norwegian stock market index. Based on the assumption that the market is efficient and that investors are rational (Fama, 1970) we formalize our first hypothesis as:

Hypothesis 1: There is no relation between the main market index on the Oslo Stock Exchange and results of the Norwegian national team over the period 1983 to 2020.

Based on the assumption that loss aversion exists, which means that losses are perceived as more negative than a gain of equal size would be perceived as positive (Kahneman and Tversky, 1974), we formalize our second hypothesis as:

Hypothesis 2: The effect of a football match played by the Norwegian national football team on the Oslo Stock Exchange main market index is indifferent for a win and a loss over the period 1983 to 2020.

Based on the theory of sports sentiment and the relation between mood of a population and stock returns (Edmans, Garcia and Norli, 2007) we formalize our third hypothesis as:

Hypothesis 3: There is no relation between the size of the Norwegian audience of a match played by the Norwegian national team and the magnitude of the effect of a football match on the Oslo Stock Exchange main market index.

Table 1. Variables included in this analysis.

*Note:* The table displays the variables included in the analysis with adherent measures such as number of observations, mean of sample, standard deviation, and minimum and maximum values.

| **Variable** | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| OSEBX | 9650 | 1144.457 | 825.5982 | 138.34 | 3974.54 |
| S&P 500 | 9650 | 292.3718 | 259.7853 | 14.837 | 1064.91 |

Table 2. Dummy variables included in this analysis.

*Note:* The table displays the dummy variables included in the analysis, and which variables the dummy variables are derived from.

| **Dummy variables for match result** | | **Dummy variables for match type** | |
|---|---|---|---|
| **Type** | Obs. | **Type** | Obs. |
| Win | 90 | European Championship Qualification | 92 |
| Loss | 67 | European Championship | 3 |
| Draw | 61 | Nations League | 13 |
| | | Olympic Games Qualification | 17 |
| | | Olympic Games | 3 |
| | | World Championship Qualification | 83 |
| | | World Championship | 7 |

# 3 Methodology

The purpose of this chapter is to present the methodology of this thesis. Inspired by Edmans, Garcia and Norli (2007) we adapt the ordinary least squares method to analyze how football matches affect the financial markets, more specifically how the results of football matches played by the Norwegian national team affect the Oslo Stock Exchange main market index (OSEBX). By utilizing this method, we analyze the daily returns on the two stock indices OSEBX and the S&P 500 for reference, with the purpose of discovering any potential abnormal returns when comparing daily returns and returns after a match played by the Norwegian national team. The S&P 500 or Standard and Poor's 500 is a stock market index of 500 of the largest companies listed on stock exchanges in the United Stated. This index is used to control for events that could also affect OSEBX and at the same time is not likely to be affected by the football matches used in this analysis.

## 3.1 Statistical Methodology

To measure the effect of the results of football matches on the stock market returns we must choose the dummy-variables that best capture the effect. It has to be clear that the variable affects the mood of the population in question and there can be no doubt regarding the direction of the affected mood, meaning it must be clear if the mood of the population gets better or worse when the football team in question wins or loses. The variable must also affect a big enough portion of the population to assume that enough investors are affected, and the effect we are seeking to measure must be the same for, and affect, the entire population, at the same time (Norli, 2006). In our thesis we use the result of a selection of football matches of the Norwegian national team as our dummy variables.

## 3.2 The Market Model

The aim of this section is to establish a model for establishing normal prices of securities to consequently calculate the abnormal returns. We use the market model first described by Sharpe (1964). The capital asset pricing model (CAPM) is a pricing model developed to better understand the connection between risk and return. Given a systematic risk, the CAPM can be used to understand the differences in return.

To better understand the fundamentals of this model we will first present and derive the market model based on the capital asset pricing model which is given by equation 1 (Strøm, 2017, s. 189):

(1) $$E(r_i) = r_f - (E(r_m) - r_f)\beta_i$$

Where $E(r_i)$ is the expected value of actual return, $r_f$ is the risk-free return, $E(r_m)$ is the expected market return and $\beta_i$ is the systematic risk. The market premium is the equivalent of the market return minus the risk-free return. This is measured as additional return based on the investors' expectations by the risk taken.
The CAPM written as a regression in equation 2 (Strøm, 2017, s. 199):

(2) $$(r_i - r_f) = \alpha_i + \beta_i(r_m - r_f) + \varepsilon_i$$

To obtain the market model we exclude the risk-free rate as this rate often is relatively low and has a low variance which allows for equation 3 (Strøm, 2017, s. 199):

(3) $$r_i = \alpha_i + \beta_i r_m + \varepsilon_i$$

Where $\varepsilon_i$ is a residual of the unexplained variance in actual return $r_i$ and $\alpha_i$ is a constant that accounts for mispricing in the market. If the expected value of $\alpha_i$=0 one can claim according to CAPM that there is no mispricing in the market. An $\alpha_i$ of zero is in other words an indication that the expected return does not have an excess return greater than the return exceeded in the difference between the risk-free rent and the systematic risk. The regression beta $\beta_i$ is the slope of the regression and is a representation of how sensitive the dependent variable $r_i$ is to change the market.

According to CAPM all systematic risk is included in $\beta_i$. To account for other influences, a number of factors are added as an alternative or addition to the CAPM. By including more factors, the CAPM is said to expand and include other risk factors than simply "the market" as a risk factor. Reasoned in the limits of this thesis we will not include other factors as we do not collect data for other factors. The two additional factors developed by Fama & French (1993) are presented in a series of articles (Fama & French, 1993; Fama & French, 1995; Fama & French, 1998). This model, known as the three-factor model is frequently used in event studies.

These two additional factors are size risk and value risk in addition to the established market risk.

## 3.3 Event Study

To test the relation between stock market returns and football matches we have conducted an event study. An event study is an empirical analysis to inspect the potential effect of an event on stock results and the basis of an event study is to measure how the market reacts in the absence of an event to then compare the results to when the event occurred (Campbell, Lo and MacKinlay, 1997). The EMH states that the market prices should adjust after the impact of an event immediately and stock results are therefore a direct indicator of the market's reaction to an event.

Bowman (1983) defines the procedure of an event study as:

1. *Identify the event of interest*
2. *Model the security price reaction*
3. *Estimate the excess returns*
4. *Organize and group the excess returns*
5. *Analyze the returns*

The first step of an event study is to identify the event and event date. Our event of interest is a type of event, and therefore several events, which is any qualifying match or playoff match for the Norway national football team in the FIFA world cup, UEFA European Championships, Olympic Games and any match played in Nations League. The sample consists of matches played from 1980 until 2020. During this time period, Norway participated twice in the FIFA World Cup, in 1994 and 1998 respectively, once in the Olympic Games in 1984 and once in the UEFA European Championship in 2000.

Identifying the timeline defines the event window, which can be long-term or short-term windows. A number of studies with short-term windows are conducted such as 2-day or 3-day. The windows are defined according to the event date. In this study we include a 2-day (0,1) event window for each football match, where the event takes place on day 0 and we measure the effect between day 0 and the next trading day (day 1).

In addition to the event window, we must set an estimation window for calculating the expected returns if no events occur. The estimation window apparent for us in our case is, as used by Scholtens and Peenstra (2009) and Brown and Warner (1980), 250 days prior to our event window. This is due to the general assumption of 250 trading days per year. The estimation window and event window does not overlap for each individual match, but it would be difficult to not include previous matches that might affect the estimation window due to the frequency of the games. Therefore, is the estimation window set at 250 days.

To estimate the impact of football wins and losses on the stock market index while also including dummy variables for days of the week, we estimate this model on day $i$ from a regression similar to the one presented in Edmans, Norli and Garcia (2007)

(4) $$R_t = \gamma 0_i + \gamma_1 R_{t-1} + \gamma_2 R_{mt-1} + \gamma_3 R_{mt} + \gamma_4 R_{mt+1} + \gamma_5 D_t + \varepsilon_i$$

Where $R_t$ is the daily NOK return on OSEBX on day $t$, $R_{mt}$ is the continuous compounded return on the S&P500 index in U.S. dollars, $D_t$ is a dummy variable for Mondays through Sunday. The lagged order index return $\gamma_1 R_{t-1}$ is included to control for first-order serial correlation. The US-market $R_{mt}$ index is included to control for world events. Considering this reaction could be leading or lagging the OSEBX index and there is a 6-hour time difference between the indexes we chose to include both $R_{mt-1}$ and $R_{mt+1}$ to control for this correlation. $\varepsilon_i$ is the residuals and we can measure the effect of the results of the football matches from the regression model (Edmans, Norli and Garcia, 2007):

(5) $$\varepsilon_i = \beta_0 + \beta_W W_t + \beta_L W_t + u_t$$

where $W_t = \{W_{1t,} W_{2t}, \dots,\}$ is a dummy for win in the different subgroups, $L_t = \{L_{1t,} L_{2t}, \dots,\}$ is a dummy for loss for the same set of subgroups and $u_t$ is a residual.

A problematic feature of this model could be the assumption of constant volatility. Figure 5 is a graphical example of the volatility of OSEBX in the time period. This substantiates the fact that the volatility in price series shifts over time. These changes tend to cluster over periods and can be controlled for by implementing the GARCH model. The Generalized AutoRegressive

Conditional Heteroskedasticity (GARCH) model developed by Engle (1982) and generalized by Bollerslev (1986) accounts for the fact that the volatility in time period *t* is dependent on the volatility in the previous period, *t-1*. The GARCH model is (Stock & Watson, 2015, p.712)

(6) $$\sigma_t^2 = \lambda_0 + \lambda_1 \varepsilon_{t-1}^2 + \lambda_2 \sigma_{t-1}^2$$

Where $\sigma_t^2$ is the variance on day *t* and is dependent on its own lags $\lambda_2 \sigma_{t-1}^2$and the lags of the squared error $\lambda_1 \varepsilon_{t-1}^2$.

To measure the effect of the football matches on stock prices we first measure the daily return of an index on the trading day following the game. The index returns are calculated by the rate of return:

(7) $$R = \frac{V_i - V_j}{V_j}$$

Where $R$ is return and $V_i$ and $V_j$ are index prices on day *i* and *j*. The rate of return for example when an index jumps from 400 NOK on day *j* to 500 NOK on day *i* the return would be (500-400)/400)=0.25 or 25%.

To estimate the excess returns, hereby referred to as abnormal returns (AR), we subtract the expected return of the index which can be controlled for another index from the observed return the day following match. (Strøm, 2017, s. 59):

(8) $$AR_{i,t} = r_{i,t} - (\alpha + \beta r_{m,t})$$

By summarizing the abnormal returns over a time period one obtain the cumulative abnormal returns (CAR) (Strøm, 2017, s. 59):

(9) $$CAR = \sum_{t=L}^{H} [r - (\alpha + \beta_i r_m)]$$

Where $L$ is the first notation of abnormal returns and $H$ is the last. The $\alpha$ and $\beta$ is used as parameters calculated before the event in the estimation window and both are calculated from the daily return on OSEBX and S&P 500. Both Scholtens and Peenstra (2009) and Brown and

Warner (1985) use an estimation window of 250 trading days, which is also used in this analysis.

For each game in our sample we collect the daily returns of the stock index in Norway, OSEBX, and the S&P 500. The S&P 500 index returns are collected to be used as a reference to adjust for international events that may have a significant impact on the return of the OSEBX. The returns of both of these indexes are then compared with each other in the same time span, to see if the return of the OSEBX is statistically higher (lower) than that of the S&P 500 after a victory (loss) for the Norwegian national team. In this section we will explain our methods of testing said statistical difference.

As a method of regressing the data we use an ordinary least squares regression (OLS) with the returns of the OSEBX noted as y with dummy variables for victory, loss and draw. This is done to test the relationship between football results and stock market returns, and further analyze the significance of the relationship. A simplification of the model is conducted when including a dummy for draw instead of excluding draw.

Seeing that this research is a time series regression, stationarity is required. Consequently, an Augmented Dickey Fuller test is conducted (Dickey & Fuller, 1981). The test has a null hypothesis that a unit root is present in a time series sample. The alternative hypothesis is therefore that a unit root is not present, and the time series is for that reason stationary.

# 4 Data

This section aims to present our work with the data used in this thesis. Firstly, we present our selection criteria and the reasoning behind the criteria set for the data. Secondly, we present the collection method used to extract the data, with respect to data validity. Third, we present the data as a whole, for the purpose of displaying the data unedited.

## 4.1 Sample Selection

When selecting the games to include in our study we include specific assumptions; the games must be part of international competitions such as the Nations League, the World Cup, the European Championship or the Olympic Games, either qualifying games for or playoff games in, the respective competitions. This assumption is made to be sure that games of less importance, such as international friendlies, are left out, assuming the importance of the games will make a difference when testing our hypothesis as stated by Ashton, Gerrard and Hudson (2003). A potential downside of this assumption is that the Norwegian national team rarely makes it through to the playoff stages of most international competitions, making our analysis heavily reliant on qualification games. Also, by excluding international friendlies, we risk excluding matches where Norway is more expected to win, as they in these matches often face competition that are not eligible for qualification in certain championships, due to lower ranking, bad results or geographical location.

The matches selected for this thesis all conform to one specific criteria; the match must be directly linked to the potential qualification for the World Cup, the European Championship or the Olympic Games. With that, matches played in the Nations League are also eligible for selection as the last 4 spots in the European Championship are filled by the 4 nations that win both of their finals against other group-winners in the same league after finishing at the top of their respective group. This is all done after the ordinary qualification for the European Championship, and the matches played in the Nations League are therefore directly linked with qualification for the European Championship.

The selection of index returns for our analysis were reliant on us choosing the data that would provide the most accurate results. We therefore follow the work of previous studies of similar nature, such as Edmans, Garcia and Norli (2007), Scholtens and Peenstra (2009) and more, and include the returns of the Norwegian stock index, OSEBX, for the first trading day following the matches played by the Norwegian national team. The very same data is extracted for the S&P 500 index to be used as a reference and to control for international effects that may affect the returns of the OSEBX.

## 4.2 Data Collection

The returns of OSEBX and S&P 500 are collected using Thomson Reuters Eikon by Refinitiv, which is a financial tool with a vast historical archive. However, to obtain daily returns of said stock indices from 1983 we utilized the database of Yahoo Finance and Macrotrends respectively, as Thomson Reuters Eikon only could supply daily returns of OSEBX and S&P 500 from 2001 up till 2021. The data obtained from Yahoo Finance and Macrotrends are deficient compared to data collected from Thomson Reuters Eikon, as the older data is not as detailed. This means that from 2001 to date the data contained the open, close, high, low and adjusted values of the stock indices per day. From 1983 to 2001 we could only obtain the daily close value of both stock indices, and we therefore simplify the data of Thomson Reuters Eikon by using the close value of yesterday as the open value of today, and so forth, for all our data.

The data of the Norwegian national team are collected through The Football Association of Norway (Norges Fotballforbund, NFF). The data were downloaded in full, meaning all matches recorded of the nation’s team since 1908 until today were included. We then narrowed our data to include all matches played from 1983 until today, excluding international friendlies and non-qualifying and -playoff games.

## 4.3 Data description

In this section we will present the different data and samples of our thesis. Collected from NFF´s official archive, the matches in question adhere to different stages of different international competitions. Table 3 shows the distribution of matches across the different stages of the international competitions, including results of these matches.

Table 3. Distribution of matches on tournament and -stage, by result.

*Note:* The table illustrates all 218 games played by the Norwegian national team in the period of 1983-2020 included in our dataset, distributed on tournament and match result. This does not include matches that are not directly linked to an international competition, such as international friendly matches or training matches. The qualification games are extracted from the main body of games in the respective tournament as they are not technically a part of the tournament. The tournaments include both group stage matches and playoff matches.

| **Match type** | **Win** | **Loss** | **Draw** | **Total** |
|---|---|---|---|---|
| European Championship Qualification | 45 | 27 | 20 | 92 |
| European Championship | 1 | 1 | 1 | 3 |
| Nations League | 8 | 4 | 1 | 13 |
| Olympic Games Qualification | 1 | 5 | 11 | 17 |
| Olympic Games | 1 | 1 | 1 | 3 |
| World Cup Qualification | 32 | 27 | 24 | 83 |
| World Cup | 2 | 2 | 3 | 7 |
| Total | 90 | 67 | 61 | 218 |

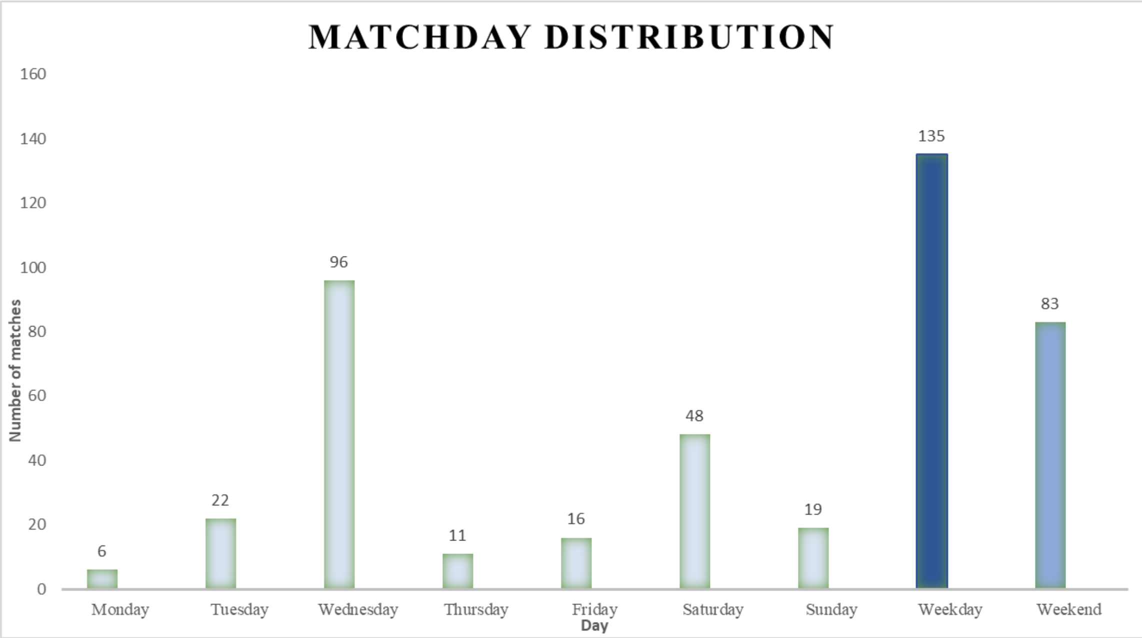
In total we include 218 games played by the Norwegian national team, where 90 of said games are victories, 67 are losses and 61 are draws. The matches included are from the start of the 1983 calendar year to the end of the 2020 calendar year. From Table 3 we can see that in these years the teams most entered competition stage is the European Championship, with 92 qualification games, followed by 83 World Cup qualification games. Only 13 Nations League games are recorded as this is a newer competition format which had its start in late 2018. The nation's football team rarely go through to the playoffs, as seen by the total number of playoff games across all competitions of 13, where 7 of these games are World Cup playoff games and the last 6 games are evenly distributed on the European Championship and the Olympic Games.

Table 4. Distribution of matches on weekdays, by result.

*Note:* The table illustrates all 218 games played by the Norwegian national team in the period of 1983-2020 included in our dataset, distributed on weekday and match result. This does not include matches that are not directly linked to an international competition, such as international friendly matches or training matches. Weekday includes all seven days of the week, hereby also the weekend.

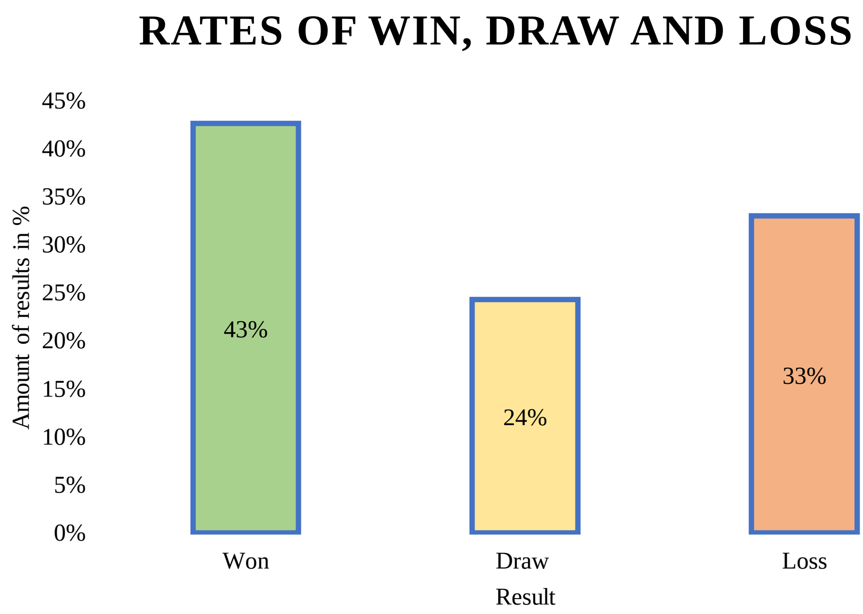
| **Day** | **Win** | **Loss** | **Draw** | **Total** |
|---|---:|---:|---:|---:|
| Monday | 5 | 1 | 0 | 6 |
| Tuesday | 9 | 5 | 8 | 22 |
| Wednesday | 36 | 29 | 31 | 96 |
| Thursday | 6 | 4 | 1 | 11 |
| Friday | 7 | 4 | 5 | 16 |
| Saturday | 17 | 18 | 13 | 48 |
| Sunday | 10 | 6 | 3 | 19 |
| Total | 90 | 67 | 61 | 218 |

In our dataset the days of the week are included as dummy variables. The games are distributed across all days of the week, where the highest frequency of games is on Wednesday and Saturday with 96 and 48 games played, respectively, as seen in Figure 1 and Table 4. In our chosen period, the team statistically performs best on Mondays with a loss rate of 16.7% and a win rate of 83%. Table 4 displays that matches played on Saturdays are more likely to end in a loss or a draw with 37.5% and 27.08% of matches ending with such a result, respectively. With Wednesday being the most frequent match day, one could expect the chance of a win to be 37.5% on this day, or approximately one victory in every three games. As draws go, the team performs well on Mondays with 0% draws and has the most draws on Wednesdays with 31 matches resulting as such. The total rates of wins, draws and losses are 41%, 28% and 31% respectively, as shown in Figure 2.




*Note:* Figure 1 illustrates the distribution of matches across the different days of the week for the 1983-2020 period. This does not include matches that are not directly linked to an international competition, such as international friendly matches or training matches. Figure 1 also illustrates the distribution of matches when separating weekend days from weekdays.

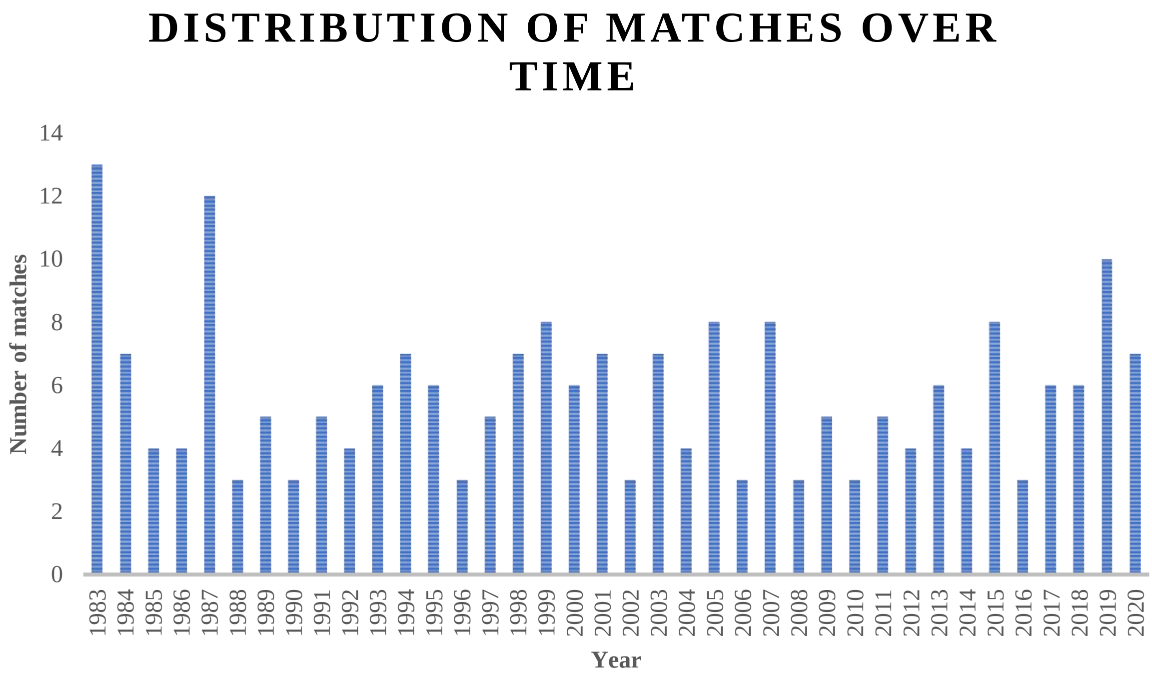
Figure 1. Distribution of matches across the different days of the week for the 1983-2020 period.




*Note:* Figure 2 illustrates the results of the 218 matches played by the Norwegian national team between 1983 and 2020, as a percentage of all games. This does not include matches that are not directly linked to an international competition, such as international friendly matches or training matches.

Figure 2: Amount of wins, draws and losses of 218 matches as percentages, from the period 1983-2020.

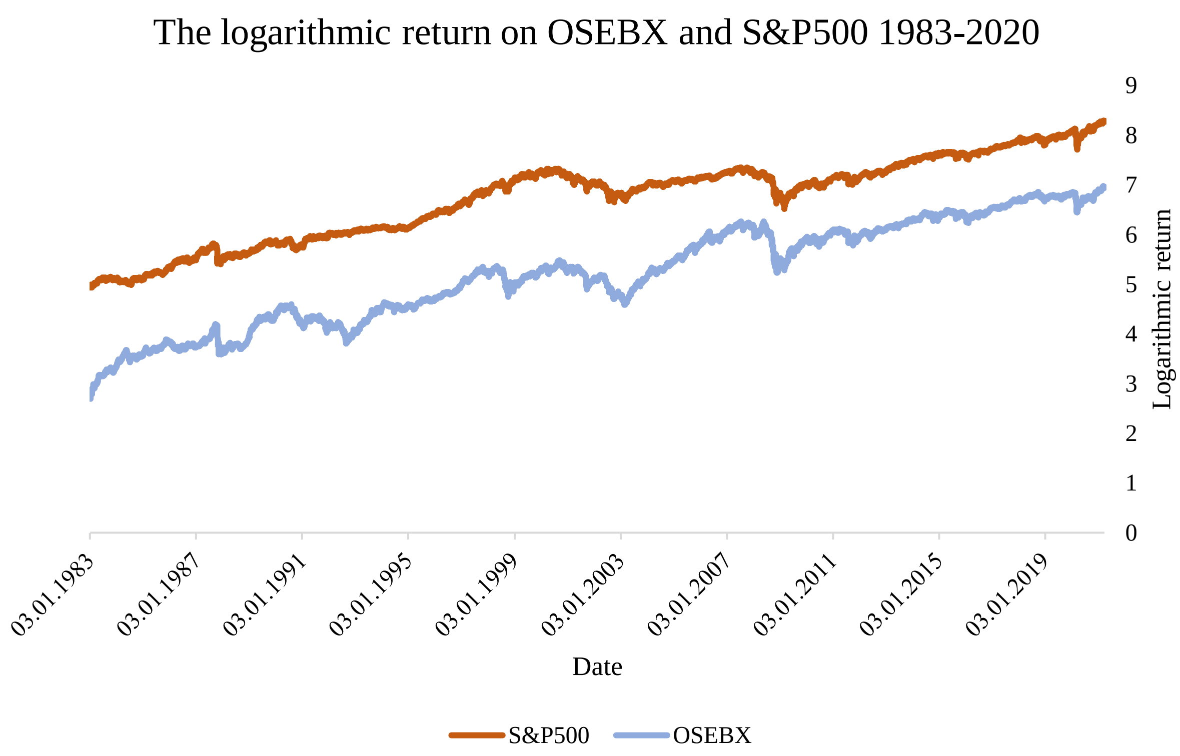
Figure 3 displays the number of matches per year in our dataset for the period of 1983-2020. The obvious outliers are 1983 and 1987 with 13 and 12 matches respectively. The difference between so-called successful years and not so successful years are apparent with the worst years, so to speak, having only 3 games, and the best having 13 games. On average, the Norwegian national team plays 5,737 games per year. Interestingly there are only two periods where the team has played more than the average number of games for four consecutive years. The first period is from 1998 to 2001 where the team played one of their most iconic games against Brazil in Marseille and won with a late penalty. The second period is from 2017 to 2020 and might come as a surprise to most people as the team has had relatively low success internationally, although the start of Nations League in late 2018 could have contributed to more matches being included in the sample. Even so, the team is full of exciting young players who are international stars in club football, and it seems to help the team reach important games such as qualifications and playoffs.




*Note:* Figure 3 displays the distribution of games played by the Norwegian national team per calendar year, in the period 1983-2020. This does not include matches that are not directly linked to an international competition, such as international friendly matches or training matches.

Figure 3. Distribution of matches in the sample per year in the period 1983-2020.

The financial data consisting of the returns, or close values, of the OSEBX is merged with the match data using Stata. We assume that the closing value of yesterday is equal to the open value of today, and that this is true for the entire dataset and therefore the entire period. In addition to the financial data for the OSEBX, daily data from the S&P500 index are imported and merged to be used as a reference for which we can control for international events that may play a role in the development of the value of the OSEBX. Average returns and other calculations for this second index are not presented unless the information is vital to our research questions, as this mainly acts as a reference index.

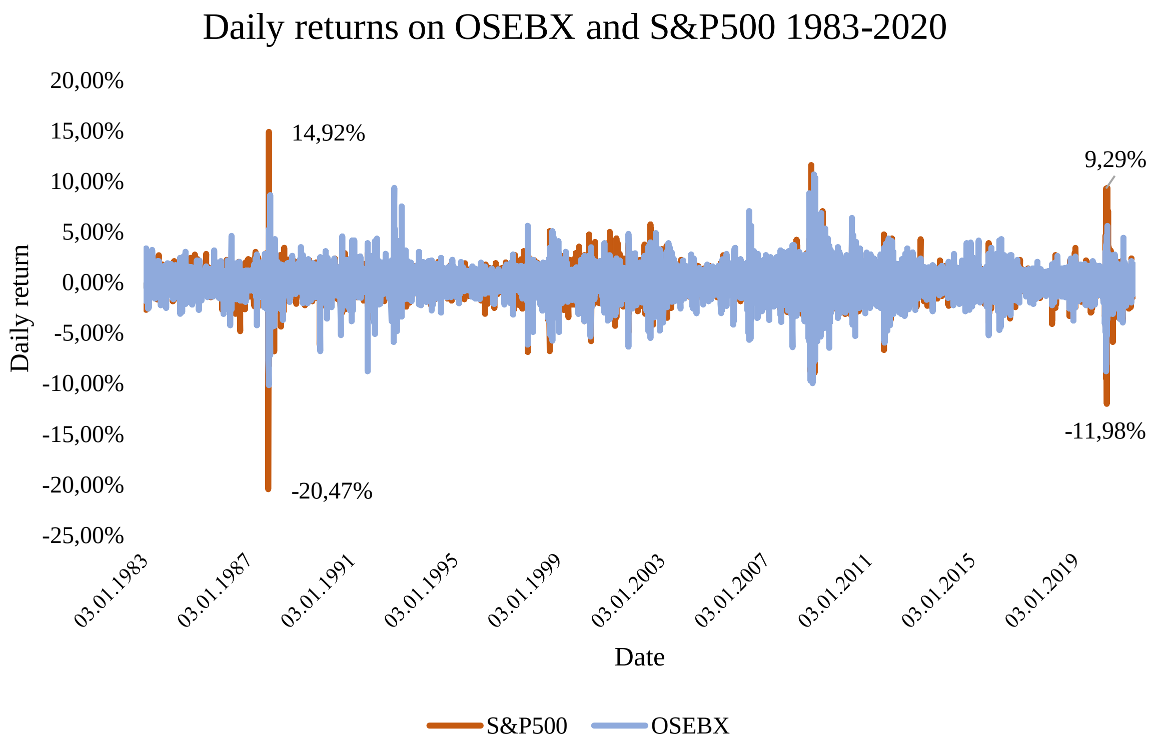



*Note:* Figure 4 illustrates the daily returns on OSEBX and S&P500 from January 1983 to December 2020 as logarithmic returns for the purposes of comparison. The data of the two indices are retrieved from Yahoo Finance and Macrotrends respectively.

Figure 4. Logarithmic return on OSEBX and S&P500 from January 1983 to December 2020.

By transforming the returns to logarithmic we can observe the relative returns on S&P500 and OSEBX because the indices are traded in their local currencies. As seen in Figure 4, the indexes show signs of being positively correlated. This is as expected, seeing how many indexes will react similarly to the same news and information.

As seen in Figure 5 the daily returns on both OSEBX and S&P500 fluctuates similarly, hinting towards a positive correlation between the two. Fjesme (2016) and Fjesme (2019) show that the Oslo Stock Exchange is similar to other comparable stock exchanges. There are periods of two events that cause outliers in the dataset. The first occurred on what is now known as Black Monday which was an event that occurred on October 19th, 1987, on which the Dow Jones Industrial Average almost dropped 22% (Roll, 1987). The market crash had no one explanation, more so a combination of events including the digitalization of stock trading. On March 12th, 2020, the World Health Organization (WHO) declared the COVID-19 virus a global pandemic, which resulted in a worldwide market decline (Kluge, 2020). On the S&P500 this resulted in a return of -11.98% the following Monday on March 16th 2020.




*Note:* Figure 5 displays the daily returns on OSEBX and S&P500 from January 1983-December 2020 as overlapping variables with a centered x-axis. The data of the two indices are retrieved from Yahoo Finance and Macrotrends respectively.

Figure 5. Daily return on OSEBX and S&P500 in the period January 1983 to December 2020.

# 5 Empirical results

In this section we present the results from the analysis. First, we present the findings relating to hypothesis 1. Second, we present the finding relating to hypothesis 2, and conclude the chapter with the findings relating to hypothesis 3. Throughout the analysis we apply a 5% significance level.

Hypothesis 1: There is no relation between the main market index on the Oslo Stock Exchange and results of the Norwegian national team over the period 1983 to 2020.

Through our processing of the data, we calculate and extract the average return on the following trading days after a match, and further split this into several subcategories based on the results of the match preceding these trading days. Preliminary average returns after a win, loss or draw are seen in Table 5, and show a positive tendency in all three cases. This is as expected, due to the fact that no extensive and exploratory calculations and estimations have yet been done. The average return after draws is relatively greater than average return after a win or loss, and even outperforms the average return for the entire dataset. By including all matches that qualify for our sample and not just for example losing matches, we aim to avoid confirmation bias defined by Nickerson (1998). If the sample were to only contain losing matches we could possibly be biased to finding other results and thereby confirm a hypothesis that in reality would not be accurate. A positive average return after all results hints towards no relation between the matches and the OSEBX, although the calculations producing the contents of Table 7 are simplistic and might not reflect all information of the dataset, and therefore does not provide any conclusive evidence. However, these results are in compliance with the efficient market hypothesis presented by Fama (1970), which states that all share prices reflect all information available. Due to the number of matches played on the weekend being relatively great with 135 matches, the question of the Monday effect described by French (1980) arises. We do not believe that the effect of the matches played on the weekend are affected by the Monday effect, and therefore do not adjust for this effect in our analysis. The matches in our dataset are clustered, meaning they often come in bulks with beaks in between. Therefore we do not adjust our analysis to control for the momentum effect described by Jagadessh and Titman (1993).

In total there are 9650 days in our dataset, with equally as many close values, where 218 of these days are defined as the following trading day after a match. The OSEBX index yields an average daily return, which is estimated as a percentage of change rather than in actual value changed and is displayed in Table 5. Average daily return for the period from 1983 to 2020, including all matches, is 0.04233%. Excluding all days but the following trading day after a match yields an average return of 0.02437%. As of these results, one might jump to the conclusion that losses affect the mood of the population more than victories do, seeing how the first trading day after a match has a lower mean than the mean of the full dataset, even with more victories than losses. This may support a rejection of our second hypothesis which states that there is no difference in effect on the OSEBX by a win and a loss. However, due to the simplicity of these calculations, we do not have sufficient evidence to make claims about this potential difference.

Table 5. Daily return on OSEBX in the period 1983-2020.

*Note:* The table displays the variable daily return on OSEBX in the top row and the variable return following any match at the lower row. The sample period is 1983-2020. Also displayed in the table are number of observations, mean of total observations, mean of observation relating to result, standard deviation, and minimum and maximum returns. Mean return, standard deviation, minimum and maximum are displayed as rate of return.

**Daily return on OSEBX 1983 – 2020**

| | **Obs.** | **Mean** | **Std. dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Total return | 9650 | 0.0004233 | 0.012945 | -0.1018146 | 0.1067051 |
| Return following a match | 218 | 0.0002437 | 0.014437 | -0.0794534 | 0.0604291 |

Table 6. Return on OSEBX in the period 1983-2020.

*Note:* The table displays the variable return on OSEBX for all days in the dataset at the top row, and the return following each possible outcome of a match played by the Norwegian national team below as separate variables. The sample period is 1983-2020. Also displayed in the table are number of observations, mean of total observations, mean of observation relating to result, standard deviation, and minimum and maximum returns.

**Return on OSEBX 1983 - 2020 following a match by result**

| | **Obs.** | **Mean** | **Std. dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Total return | 9650 | 0.0004233 | 0.0129458 | -0.1018146 | 0.1067051 |
| Return following a win | 90 | 0.0000418 | 0.0129594 | -0.0448446 | 0.0509318 |
| Return following a loss | 67 | 0.0000636 | 0.0168021 | 0.0794534 | 0.0378792 |
| Return following a draw | 61 | 0.0007394 | 0.0139211 | -0.028219 | 0.0604291 |

Table 7. Effects of a match on OSEBX.

*Note:* Table 7 displays a regression of OSEBX with dummy variables for win, loss and draw, excluding the estimation window. The sample period is 1983-2020. The constant represents the return on OSEBX when no match is played the day before.

**Effects of a match on OSEBX**

| | **OSEBX** |
|---|---|
| Win | -0.00049 |
| | (0.00137) |
| Loss | -0.00047 |
| | (0.00159) |
| Draw | 0.00021 |
| | (0.00166) |
| Constant | 0.000532*** |
| | (0.00013) |
| | |
| N | 9 650 |
| R-squared | 0,000 |

Standard error in parentheses

* p<0.05, **p<0.01, ***p<0.001

The simplest model examines the effect of a match result on the return on OSEBX the following day. The regression consists of dummy variables for each result. Table 7 summarizes this model. As one might not would expect, a win results in a negative effect of -0.049%. A loss has a negative effect of -0.047%, which is expected. A draw causes an effect of 0.021%, which is smaller in magnitude than both win and loss. Neither of these results are statistically significant, which in turn supports our hypothesis that there is no relation between the main market index on Oslo Stock Exchange and matches played by the Norwegian national team.

To test the return of the OSEBX index on the return following a match we conduct t-tests for all match results. The results of these tests are presented in Table 8.

Table 8. Sample T-test on return the day following a match, by result.

*Note:* Table 8 displays the variables the total return and a given match results return in the same row, over three different rows. The sample period is 1983-2020. Also displayed in the table are number of observations, mean of total observations, mean of observation relating to result, difference, standard error, t-value as p-value. Mean total is calculated as the total return minus the return of the result in the same row.

**T-test of return following a match with result**

| | **Obs.** | **Mean Total** | **Mean Result** | **Dif.** | **St. Err** | **t** | **p-value** |
|---|---|---|---|---|---|---|---|
| Return total and win | 90 | 0.0004269 | 0.0000418 | 0.0003851 | 0.0013763 | 0.2798 | 0.7803 |
| Return total and loss | 67 | 0.0004258 | 0.0000636 | 0.0003622 | 0.0020595 | 0.1759 | 0.8609 |
| Return total and draw | 61 | 0.0004213 | 0.0007394 | -0.0003182 | 0.0017903 | -0.1777 | 0.8595 |

The Mean Total in Table 8 is different for each match result because the tests were performed separately and consequently the sample to test against differs from result due to the different amount of observations in the sample for each result. OSEBX seems to perform better after a drawn game by the Norwegian national team, although this result is not statistically significant. Due to the high p-value of the test, we have insufficient evidence to claim that the return of the OSEBX is different from zero the first trading day following a match, independent of the result, as of this T-test.

Table 9. Dickey Fuller test on OSEBX with and without trend.

*Note.* Table 9 displays the results of a Dickey Fuller test, with and without a trend, on the OSEBX. The sample period is 1983-2020. Measures included in the table are the coefficient, p-value and critical values for the 1%, 5%, and 10% level.

| | **Coefficient** | **p-value** | **1% critical value** | **5% critical value** | **10% critical value** |
|---|---|---|---|---|---|
| Z(t) without trend | 1.587 | 0.9978 | -3.43 | -2.86 | -2.57 |
| Z(t) with trend | -0.776 | 0.9677 | -3.96 | -3.41 | -3.12 |
| | | | | | |
| L1 without trend | 0.0003432 | 0.113 | | | |
| L1 with trend | -0.0004074 | 0.438 | | | |
| Trend | 0.0001685 | 0.395 | | | |
| N | 7557 | | | | |

Seeing that this research is a time series regression, stationarity is required. To test for this the Augmented Dickey Fuller is displayed in Table 9. The test is conducted both with and without a trend. The test statistic values of 1.587 and -0.776 are both greater than critical value (5%) and both are not statistically significant which means that the time-series is non-stationary. Due to limitations of this thesis we choose not to transform the data to make the data more stationary. This can lead to bias in the analysis.

Table 10. GARCH [1,1] on daily closing values OSEBX.

*Note:* The table display the ARCH (Autoregressive conditional heteroscedasticity) and the GARCH (Generalized autoregressive conditional heteroscedasticity) results as different variables, with the variable C being the intercept. The sample period is 1983-2020. Measures included in the table are the coefficient, standard error, z-statistic and p-value.

**GARCH(1,1) on OSEBX**

| Variable | **Coef.** | **St. Err.** | **Z-stat** | **P-value** |
|---|---|---|---|---|
| C | -0.00000204 | -0.00000281 | -0.72000 | 0.4690 |
| ARCH(1) | 0.266877 | 0.0129461 | 20.58 | 0.0000 |
| GARCH(1) | 0.7203651 | 0.012461 | 26.94 | 0.0000 |

The GARCH (Generalized AutoRegressive Conditional Heteroskedasticity) models volatility clustering. The three variables listed in Table 10 from the GARCH (1, 1) results are C, which is the intercept, ARCH(1), which is the first lag of the squared return and GARCH(1), which is the first lag of the conditional variance. The ARCH represents how volatility reacts to new information and GARCH represents the persistence of the volatility ARCH. The total sum of the coefficients sum up to a number smaller than 1, which is necessary to have a mean reverting variance process. Both the ARCH(1) and the GARCH(1) are statistically significant.

Table 11. Average return on OSEBX, by tournament.

*Note:* The table displays the average return on OSEBX following a match, sorted by tournament and tournament-stage. The sample period is 1983-2020. Total return includes all days in the dataset. Also displayed in the table are number of observations, mean of total observations, mean of observation relating to result, standard error, and minimum and maximum returns.

**Average return on OSEBX between 1983 – 2020 following a match by tournament and -stage**

| | **Observation** | **Mean** | **Std. dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Total return | 9650 | 0.0004 | 0.0129 | -0.1018 | 0.1067 |
| European Championship Qualification | 92 | 0.0002 | 0.0146 | -0.0597 | 0.0509 |
| European Championship Group stage/Playoff | 3 | 0.0034 | 0.0036 | -0.0007 | 0.0058 |
| Nations League | 13 | -0.0040 | 0.0122 | -0.0278 | 0.0190 |
| Olympic Games Qualification | 17 | 0.0048 | 0.0149 | -0.0282 | 0.0284 |
| Olympic Games Group stage/Playoff | 3 | 0.0088 | 0.0192 | -0.0072 | 0.0301 |
| World Cup Qualification | 83 | -0.0004 | 0.0147 | -0.0795 | 0.0604 |
| World Cup Group stage/Playoff | 7 | 0.0001 | 0.0140 | -0.0300 | 0.0116 |

As seen in Table 11, the maximum return on OSEBX the day following a World Cup Qualification match is the day following the match that occurred on Saturday October 10$^{th}$, 2008 when playing a draw against Scotland with a return of 6.04%. The largest negative effect appears after a World Cup Group stage/Playoff with a return of -7.95%. All match types yield a mean positive effect except Nations League and World Cup Group stage/Playoff. The effects of Olympic Games Group stage/Playoff yield the largest mean with 0.88% respectively.

By including estimation windows of 250 days for each match and setting the event window to [0,1] we analyze the effects on OSEBX controlled for the change on S&P 500.

Table 12. Sum of regression of the won matches in the period 1983-2020.

*Note:* The table displays the sum of regression of winning matches, including an estimation window and controlled for S&P500. The sample period is 1983-2020. Variables included in the table are alphas, betas, average abnormal return (AAR), standard deviation of AAR (S_AAR), t-values of AAR (t_AAR), cumulative average abnormal returns (CAAR), with associated standard deviation (S_CAAR) and t-values (t_CAAR). Variables as Significant AAR and Significant CAAR are coded to be 1 if the result is significant. Measures included in the variable are number of observations, mean, standard deviation, and minimum and maximum values.

**Sum of regression with an estimation window and controlled for S&P500 for winning matches**

| Variable | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Alphas | 90 | 0.0002 | 0.0009 | -0.0022 | 0.0023 |
| Betas | 90 | 0.4044 | 0.2272 | -0.0529 | 1.0052 |
| AAR | 90 | -0.0010 | 0.0000 | -0.0010 | -0.0010 |
| S_AAR | 90 | 0.0113 | 0.0024 | 0.0089 | 0.0137 |
| t_AAR | 90 | -1.4122 | 0.2696 | -1.6811 | -1.1433 |
| Significant AAR | 0 | | | | |
| CAAR | 90 | -0.0021 | 0.0000 | -0.0021 | -0.0021 |
| S_CAAR | 90 | 0.0325 | 0.0000 | 0.0325 | 0.0325 |
| t_CAAR | 90 | -0.9404 | 0.0000 | -0.9404 | -0.9404 |
| Significant CAAR | 0 | | | | |

The results in Table 12 is a summary of the 90 regressions done with an estimation window for each match. The alpha is the regression constant and has a value of 0.0002.

The AAR which is the average abnormal return is calculated by summarizing the return on OSEBX controlled for both the constant and the return on S&P500. The weight of S&P500 is determined by the beta which is 0.4044. A high positive beta indicates that the return on OSEBX and S&P500 are positively correlated. The average abnormal returns (AAR) is surprisingly is a negative value of -0.1% and is not significant for this sum of regressions when conducting a t-test. The cumulative average abnormal returns is negative -0.21%, which is a greater value than the AAR, but nor this is significant for the sum of regressions when conducting a t-test.

Table 13. Sum of regression of the lost matches in the period 1983-2020.

*Note:* The table displays the sum of regression of lost matches, including an estimation window and controlled for S&P500. The sample period is 1983-2020. Variables included in the table are alphas, betas, average abnormal return (AAR), standard deviation of AAR (S_AAR), t-values of AAR (t_AAR), cumulative average abnormal returns (CAAR), with associated standard deviation (S_CAAR) and t-values (t_CAAR). Variables as Significant AAR and Significant CAAR are coded to be 1 if the result is significant. Measures included in the variable are number of observations, mean, standard deviation, and minimum and maximum values.

**Sum of regression with an estimation window and controlled for S&P500 for losing matches**

| Variable | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Alphas | 67 | 0.0005 | 0.0009 | -0.0016 | 0.0023 |
| Betas | 67 | 0.3811 | 0.2914 | -0.0554 | 1.0067 |
| AAR | 67 | -0.0020 | 0.0006 | -0.0026 | -0.0015 |
| S_AAR | 67 | 0.0139 | 0.0036 | 0.0104 | 0.0175 |
| t_AAR | 67 | -1.3537 | 0.6757 | -2.0268 | -0.6805 |
| Significant AAR | 0 | | | | |
| CAAR | 67 | -0.0040 | | | |
| S_CAAR | 67 | 0.0635 | | | |
| t_CAAR | 67 | -0.5188 | | | |
| Significant CAAR | 0 | | | | |

The results of the sum of regressions for the 67 losing matches are shown in Table 13. The alpha, which is the constant has a higher absolute value of 0.0005 than for winning matches when the alpha was 0.0002. The beta on the other hand is smaller, which can indicate a smaller correlation between OSEBX and S&P 500 in the sample. The AAR has a negative value of -0.2% which is expected for losing matches. Edmans, Garcia and Norli (2007) report similar findings in their study. Nor this AAR is significant for the sample. The CAAR, which has a value of negative -0.4%, is as the AAR greater in value than the sample of winning matches. This CAAR is not significant. Rational investors which are informed could be aware of the effect of loss found by and noise traders as defined by Summers & Waldmann (1990). This could lead to the effect on the stock market caused by irrational investors to be eliminated by rational investors.

Table 14. Sum of regression of the drawn matches in the period 1983-2020.

*Note:* The table displays the sum of regression of drawn matches, including an estimation window and controlled for S&P500. The sample period is 1983-2020. Variables included in the table are alphas, betas, average abnormal return (AAR), standard deviation of AAR (S_AAR), t-values of AAR (t_AAR), cumulative average abnormal returns (CAAR), with associated standard deviation (S_CAAR) and t-values (t_CAAR). Variables as Significant AAR and Significant CAAR are coded to be 1 if the result is significant. Measures included in the variable are number of observations, mean, standard deviation, and minimum and maximum values.

**Sum of regression with an estimation window and controlled for S&P500 for drawn matches**

| Variable | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Alphas | 61 | 0.0007 | 0.0014 | -0.0021 | 0.0053 |
| Betas | 61 | 0.2399 | 0.2613 | -0.1350 | 0.9703 |
| AAR | 61 | -0.0019 | 0.0004 | -0.0022 | -0.0015 |
| S_AAR | 61 | 0.0096 | 0.0010 | 0.0085 | 0.0106 |
| t_AAR | 61 | -1.5607 | 0.4811 | -2.0398 | -1.0815 |
| Significant AAR | 0 | | | | |
| CAAR | 61 | -0.0037 | | | |
| S_CAAR | 61 | 0.0578 | | | |
| t_CAAR | 61 | -0.5006 | | | |
| Significant CAAR | 0 | | | | |

The effect of a drawn match is shown in the sum of regressions in Table 14. The sample is the smallest one with 61 matches and has an alpha of 0.0007. The beta is also the smallest of the three regression results shown in Table 12, 13 and 14 with a value of 0.2399. The AAR and CAAR are -0.19% and -0.37% respectively while neither is statistically significant when conducting t-tests. This does not provide evidence to reject our first hypothesis of no relation between a match played by the Norwegian national team and the main market index on Oslo Stock Exchange.

Table 15. Effects of a match on OSEBX, controlled for S&P500.

*Note:* The table displays the results of a regression of OSEBX with dummy variables for win, loss and draw, controlled for S&P500. The sample period is 1983-2020. The regression excludes the estimation window. The daily returns of the two indices are retrieved from Yahoo Finance and Macrotrends respectively. The constant represents the return on OSEBX when no match is played the day before.

**Effects of a match on OSEBX controlled for S&P500**

| | **OSEBX - S&P500** |
|---|---|
| Win | -0.00092 |
| | (0.00147) |
| Loss | -0.00363* |
| | (0.0017) |
| Draw | -0.00216 |
| | (0.0018) |
| Constant | 0.00016 |
| | (0.00014) |
| | |
| N | 9 650 |
| R-squared | 0.0007 |

Standard error in parentheses

* p<0.05, **p<0.01, ***p<0.001

To control for other factors, we subtracted the return from S&P500 from OSEBX to better isolate the events. The result from this model is summarized in Table 15. The effects of win, loss and draw are -0.092%, -0.363% and -0.216% respectively. It is worth noting that the calculations are done with no consideration to the estimation window. The only effect that is statistically significant is the effect of a loss, which is significant at the 5% significance level. The effect is in compliance with the theory of loss aversion by Kahneman and Tversky (1974) stating that a loss is experienced as more negative than a win is experienced positive. Shleifer and Summers' (1990) theory of noise traders also fit the results, as a rational investor would not let a football match result affect the investments on the stock markets, whereas noise traders who does not act rational, might would. We reject hypothesis 1 on the basis that lost games affect the main market index on Oslo Stock Exchange negatively by an abnormal return of -0.363%, which is statistically significant.

Hypothesis 2: The effect of a football match played by the Norwegian national team on the Oslo Stock Exchange main market index is indifferent for a win and a loss over the period 1983 to 2020.

Due to similarities of the output used to test hypothesis 1 and 2, as well as not wanting to duplicate tables for the sake of presentation, we will refer to previously presented tables in this section.

From Table 12 and Table 13 we see that a win is observed to have an average abnormal return (AAR) of -0.1%, whereas a loss is seen to have an average abnormal return (AAR) of the double, -0.2%. The beta of winning matches is 0.4044, which in turn implies a relatively positive correlation between the OSEBX and the S&P500. For losing matches the beta is a bit smaller at 0.3811, which can be caused by several factors such as international events not controlled for in this study, or local events in the U.S. which does not affect OSEBX to the same degree. This clearly emerges as an ongoing trend, even though we do not possess statistical significance to draw a conclusion from these results. A draw has an average abnormal return of -0.19%, which is almost as big of an effect as a loss, although more stable of a reaction when inspecting minimum values.

As of the results for trading days following a win, loss and draw as per Table 15, a win yields an abnormal return -0.092%. This is not as expected for a win, but the result is not statistically significant at the 5%-level. A loss yields an abnormal return of -0.363%, which is as expected, and is significant at the 5%-level. The results of Table 15 are valid for the entire sample of 1983-2020, and as such we reject hypothesis 2 which states that there is not a difference in the effect of a win and loss of the Norwegian national team on the OSEBX.

Hypothesis 3: There is no relation between the size of the Norwegian audience of a match played by the Norwegian national team and the magnitude of the effect of a football match on the Oslo Stock Exchange main market index.

To examine if the effect were greater in the nineties, we conduct an analysis excluding the data that does not fall in this time period. Table 16 summarizes the match types that were played during this period. All the matches played in the World Cup and European Championship from the original sample from 1983-2021 were played in the period 1990-2000.

Table 16. Return on OSEBX between 1990 and 2000, by tournament.

*Note:* Table 16 displays the return on OSEBX following a match, sorted by both tournament and tournament stage as separate variables. The sample period is 1990-2000. Total return includes all days in the chosen period. Also displayed in the table are number of observations, mean of total observations, mean of observation relating to result, standard error, and minimum and maximum returns.

**Return on OSEBX 1990-2000 following a match by tournament and stage**

| | **Obs.** | **Mean** | **Std. dev.** | **Min** | **Max** |
|---|---|---|---|---|---|
| Total return | 2790 | 0.0004 | 0.0116 | -0.0880 | 0.0935 |
| European Championship Qualification | 29 | 0.0051 | 0.0128 | -0.0178 | 0.0509 |
| European Championship Group stage/Playoff | 3 | 0.0034 | 0.0036 | -0.0007 | 0.0058 |
| World Cup Qualification | 21 | -0.0006 | 0.0083 | -0.0216 | 0.0201 |
| World Cup Group stage/Playoff | 7 | 0.0001 | 0.0140 | -0.0300 | 0.0116 |

As seen in Table 16, three of four match types yields a mean positive return with the World Cup Qualification being the exception with a negative mean. The highest observation was made following a World Cup Qualification with a return of 2.01%.

Table 17. Summaries of return 1990-2000.

*Note:* The table displays the summary of abnormal return for each possible match outcome. The sample period is 1990-2000. Measures included in the table are mean of total observations and observations relating to result, standard deviation and minimum and maximum abnormal returns.

| **Result** | **Mean** | **Std. Dev.** | **Min** | **Max** |
|---|---|---|---|---|
| Total | -0.0011 | 0.0137 | -0.1011 | 0.0489 |
| Win | -0.0005 | 0.0123 | -0.0447 | 0.0489 |
| Loss | -0.0015 | 0.0175 | -0.1011 | 0.0259 |
| Draw | -0.0015 | 0.0106 | 0.0106 | 0.0257 |

Abnormal returns for the following trading days after a win has a mean of -0.05% with a standard deviation of 0.0123. Interestingly, the span of the abnormal returns after a win ranges from 4.47% to 4.89%, which in turn sees the possibility of the abnormal return being relatively volatile, as confirmed in Table 10. The minimum value of 4.47% partly represents either the lack of effect a win of the Norwegian national team, or the fact that other events with a greater effect on the stock market occurred in the same period as the match in question that we have not been able to control for. Potential external events are hard to take into account both as the nature of multiple events can differ profoundly, as well as the possibility of the event not having an effect on the reference index included. However, we note that even if the team wins a match it is not equal to a positive abnormal return the next day per these calculations, seen from both the average abnormal return and the fact that such a negative result the following day can occur.

For the first trading day after matches that resulted in a loss we see an average abnormal return -0.15% with a slightly larger standard deviation than after a win of 0.0175. The span of the abnormal returns after a loss is equal to approximately 12.7%, with a minimum value of greater magnitude than the maximum value of a winning matches abnormal returns. The implications that follow when the index reacts the opposite way of what is expected, according to our hypothesis, is that abnormal returns are not as extreme as when this occurs after a win. One possible interpretation of this phenomenon in this case is that a loss has a greater effect on the OSEBX and that the index therefore will not increase as much after a loss as it possibly could decrease after a win. Potentially, this could be seen as an example of the mood of the population being affected negatively to an extent that is greater or more lasting than a positive mood change. Another possible interpretation is that a larger amount of other significant events have happened surrounding matches that are won, and thus creating implications for the OSEBX, and the mood of the population, that are stronger in effect than what the match is.

Trading days after a draw produce a very similar average abnormal return as the loss matches did, with a value of -0.15%. However, these returns also have the lowest standard deviation of the three, implying that the returns are rather stable. Further evidence of such is found in the span of the total abnormal returns, which spans from -10.11% to 4.89%. Less volatile abnormal returns indicate a more stable reaction to the results from the market and the population in question. A possible interpretation of these results is that a draw is as negatively impacting on the mood of the population as a loss, and a more stable impact at that, but possibly not as cemented as the impact of a loss is. This last claim is made on the basis that a loss has greater effect in the aspect that the abnormal returns are greater after a loss than after a draw.

Table 18. T-test of return following a match 1990-2000.

*Note:* The table displays the results of a t-test with unequal variances of return following a match with unique results and total. The sample period is 1990-2000. Also displayed in the Table are number of observations, mean of total observations, mean of observation relating to result, difference, standard error, t-value as p-value.

**T-test with unequal variances of return following a match sorted by result 1990-2000**

| | Obs. | Mean Total | Mean Result | Dif. | St. Err | t | p-value |
|---|---|---|---|---|---|---|---|
| Return total and win | 34 | 0.0003562 | 0.0039695 | -0.0036133 | 0.000219 | -1.807 | 0.0797 |
| Return total and loss | 10 | 0.0003903 | 0.0031683 | -0.002778 | 0.000219 | -0.7747 | 0.4582 |
| Return total and draw | 16 | 0.0004097 | -0.0012416 | 0.0016513 | 0.000219 | 0.6115 | 0.5499 |

Table 18 shows a comparison of the t-test from the selection of matches from 1990-2000. The test is conducted to test if the return after each result can be said to be statistically different from zero. OSEBX seems to perform better after a won game by the Norwegian national team, although this Figure is not statistically significant. Due to the p-value of the test not being below 0.05, we have insufficient evidence to claim that the return of the OSEBX is different from zero the first trading day following a match, independent of the result, as of this T-test.

Table 19. Winning match against Brazil in the 1998 World Cup.

*Note:* The table displays the number of viewers on NRK, both as a numeric value and percentage of the total population, result of the match, goals for Norway and goals against Norway as summary statistics. The sample period is 1998. The variable OSEBX is the return on the OSEBX the following day. The number of viewers adapted from https://www.nrk.no/norge/50-pa-topp-i-norsk-tv-historie-1.5808512. Copyright 2008 by NRK. The population adapted from https://www.ssb.no/befolkning/faktaside/befolkningen Copyright 2020 by SSB.

**Winning match against Brazil in the World Cup on the 23rd of June 1998**

| Date | OSEBX | Viewers on NRK | In % of population | Result | Goals Norway | Goals Brazil |
|---|---|---|---|---|---|---|
| 23.06.1998 | 0.01057 | 1 622 000 | 36,7 % | Win | 2 | 1 |

Perhaps the most memorable match, against Brazil, was played on June 23rd, 1998, as seen in Table 19. The return on OSEBX the following day on June 24th was 0.0157 or 1.57% with the average return from 1990-2000 was as seen in Table 17 at 0.04%.

Table 20. Winning match against Mexico in the 1994 World Cup.

*Note:* The table displays the number of viewers on NRK, both as a numeric value and percentage of the total population, result of the match, goals for Norway and goals against Norway as summary statistics. The sample period is 1994. The variable OSEBX is the return on the OSEBX the following day. The number of viewers adapted from https://www.nrk.no/norge/50-pa-topp-i-norsk-tv-historie-1.5808512. Copyright 2008 by NRK. The population adapted from https://www.ssb.no/befolkning/faktaside/befolkningen. Copyright 2020 by SSB.

**Winning match against Mexico in the World Cup on the 19th of June 1994**

| Date | OSEBX | Viewers on NRK | In % of population | Result | Goals Norway | Goals Mexico |
|---|---|---|---|---|---|---|
| 19.06.1994 | -0.03002 | 2 139 000 | 49,5 % | Win | 1 | 0 |

Table 20 illustrates the most watched television broadcast per 2008 on NRK played on the 19th of June 1994. The match was the first playoff match against Mexico in the 1994 World Cup in USA. 49.5% of the Norwegian population watched the game which ended in a 1-0 victory to Norway. The return on OSEBX the following day was -3%.

By the results of Table 20, we can see that a win with many Norwegians as audience is not equal to a positive abnormal return the following day when isolating single games, even though Table 16 supports this. As of these findings we cannot reject hypothesis 3 which states that the size of the Norwegian audience is not related to the magnitude of effect of a match played by the Norwegian national team on the OSEBX. We therefore perform a regression on the entire sample of matches in the period 1990-2000 in Table 21.

Table 21. Returns on OSEBX between 1990 and 2000.

*Note:* The table displays a regression of OSEBX, with dummy variables for win, loss and draw. The sample period is 1990-2000. The constant represents the return on OSEBX when no match is played the day before.

**Regression of OSEBX on match results 1990-2000**

| | **OSEBX** |
|---|---|
| Win | 0.00361* |
| | (-0.00199) |
| Loss | 0.0028 |
| | (-0.00366) |
| Draw | -0.0016 |
| | (-0.0029) |
| Constant | 0.0004 |
| | (-0.000221) |
| | |
| N | 2 790 |
| R-squared | 0.001 |

Standard error in parentheses

* p<0.05, **p<0.01, ***p<0.001

Table 21 displays the regression results in the period 1990-2000 by match result, where we find the abnormal return after a win to be statistically significant at the 5%-level with a return of 0.361%. This is as expected due to the trend seen in Table 18, where the return after a win was just outside the 5% significance level when conducting a t-test.

We draw the conclusion that the number of Norwegians as audience does have an effect, due to the fact that abnormal returns after a win in the entire dataset from 1983 to 2020 are not statistically significant, and the period 1990-2000 is statistically significant with a greater number of Norwegians as audience. We therefore reject hypothesis 3. This result also provides evidence to reject hypothesis 1 and partially reject hypothesis 2.

# 6 Conclusion

The objective of this thesis is to examine the relation between match outcomes of the Norwegian National Team and the return on Oslo Stock Exchange the following trading day. Due to an increased popularity of watching football matches in the 1990's, we also investigate this sample separately which an emphasis on two matches. In this conclusion we will present our main conclusion and limitation of out thesis. Lastly, we will give our recommendation for future research.

The analysis in this thesis is divided into two major different analyses. One where the only variables are return on Oslo Stock Exchange, and one in which we control for S&P 500 and include an estimation window for each match.

We report that a win results in a positive abnormal return of 0.361% on trading days following a win in the sample period 1990-2000. In this sample, the effect of a win is greater than both a loss and a draw. A possible explanation to these results could be that the sample in this period consists of wins twice the amount of losses and draws combined. However, the finding provides evidence sufficient to support a rejection of all of our hypotheses. When including both S&P 500 and the estimation window, we report an abnormal return of -0.10%, -0.20% and -0.19% on the trading days following a win, loss and draw, respectively. None of these values are statistically significant, although we see a clear tendency when regressing the effect of a loss, which is quite stable and prolonged. When excluding the estimation window we see that the effects of win, loss and draw are -0.092%, -0.363% and -0.216% respectively. As a result of this regression, the abnormal returns on OSEBX after a loss is statistically significant at the 5%-level, when still controlling for the S&P500, and also support the rejection of our three hypotheses.

We conclude that a match played by the Norwegian national team has an effect on the main market index on Oslo Stock Exchange, which is stronger when Norwegian audiences are larger, and different for a win and a loss.

Compared to previous research, which is often conducted for several sports in a greater sample of countries, we analyze the effects of the most widespread sport in the world on a single stock exchange. Our contribution to existing literature by reporting these results could be that either the sample was too small or other factors should be included to support the hypothesis that sport sentiment is an actual factor in behavioral finance and investor mood. In addition to this, the European Championship only has 24 nations competing, and the World Cup 32, so that our findings apply for many nations that only partake in the qualification rounds of these tournaments and are not included in the research of Edmans, Garcia and Norli (2007), due to the likeness of Oslo Stock Exchange and other national stock indices (Fjesme, 2016, 2019).

The relation between investor mood and financial markets is a subject of great debate and complexity and numerous variables could be included to better grasp the phenomenon.
Future research could examine the impact of winning and losing in comparison with the expected outcome using betting odds, which could yield more meaningful results. Furthermore, it could be interesting to conduct an empirical analysis of national football matches effect on other financial instruments using a different methodology. We would also recommend collecting data on the number of viewers for all matches to further better the model testing the impact of audiences, as this may lead to more statistical significant results.

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