ERASMUS UNIVERSITY ROTTERDAM
ERASMUS SCHOOL OF ECONOMICS
MSc Economics & Business
Master Specialisation Financial Economics

Stock Market Calendar Anomalies and Macroeconomic News Announcements

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Finish date: September 2010

PREFACE AND ACKNOWLEDGEMENTS

During the process of writing this thesis, I got support from many persons, who I am very grateful. First, I would like to thank Dr. Smant for supervising my thesis. At all times, he responded rapidly on the documents I sent him and his comments were always useful.

Next, I want to thank my former board mates of the Financial Study Association Rotterdam. They were always interested in my thesis progress and provided me with useful information and data for my thesis. Stefan, Geert, Robert, Anna, Willemijn and Marijn, thank you! I am also grateful to Koen for reading my thesis and suggesting some helpful corrections. Furthermore, I want to thank Mariëlle, Phebe, Pauline and Nienke, who were working on their thesis in the university library at the same time. We kept motivating each other during the writing process of our thesis, but also took time to relax during coffee breaks and lunches.

Last but not least, I want to thank my father for reading my whole thesis and advising various corrections and my mother for the mental support during the process of writing this thesis.

With the contribution of the above mentioned persons and the hard work by myself, this thesis is the result. I hope you will find this thesis interesting to read.

Rotterdam, August 2010

ABSTRACT

This thesis investigates, based on previous research, whether macroeconomic news announcements are an explanation for stock market calendar anomalies. By doing so, the influence of news announcements concerning several different macroeconomic variables in the U.S. and the U.K. on two stock market indices in both the U.S. and the U.K. is tested for the period January 1980 – July 2007. The four stock market calendar anomalies considered are the January effect, the day-of-the-week effect, the turn-of-the-month effect and the Halloween effect. The statistical significance of each stock market calendar anomaly when all trading days are considered is compared with the statistical significance of each stock market calendar anomaly when only nonannouncement days are considered. The results of this thesis show that macroeconomic news announcements have little to no influence on stock market calendar anomalies in the U.S. and the U.K.

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CHAPTER 1 Introduction

In finance, the Efficient Market Hypothesis (EMH) states that security prices on financial markets reflect all relevant information. On an efficient market there are no investment opportunities which can lead to abnormal returns. Abnormal returns are the differences between the actual and the expected returns of securities.

One of the violations of the EMH refers to stock market anomalies. A stock market anomaly is any event or time period that can be used to produce abnormal profits on stock markets. Stock market anomalies can be classified in different categories, like for example firm anomalies, accounting anomalies, event anomalies, weather anomalies and calendar anomalies. Calendar anomalies play a central role in this thesis. If a stock market anomaly depends solely on certain periods in a calendar year, it refers to a calendar anomaly. Stock market calendar anomalies are subject of a large amount of studies in the last decades. Innumerable researchers reported about different stock market calendar anomalies and tried to find explanations for them. Over the years this resulted in a large variety of explanations. A few years ago, Gerlach (2007) came up with an alternative explanation for stock market anomalies in the U.S. He stated that five of the six stock market calendar and weather anomalies are not present when only trading days are considered where no macroeconomic news was made public.. In his research he used eleven different macroeconomic announcements, such as the Gross Domestic Product (GDP), the Employment Report, the Consumer Price Index and Housing Starts. The anomalies that he focused on are the turn-of-the-month effect, the January effect, the fall effect, the lunar effect, the rain effect and the temperature effect.

Given that researchers have tried to find explanations for stock market anomalies for years and years, the findings of Gerlach (2007) are interesting. He is the first to report about the connection between macroeconomic news announcements and stock market anomalies. His conclusions are relevant to investigate further, because it can result in a new viewpoint regarding stock market anomalies. When both different datasets and possibly different methods are used to test the findings of Gerlach (2007), the findings can either be challenged or confirmed. Therefore, this thesis follows up on the research of Gerlach (2007) and further investigates the influence of macroeconomic news announcements on stock market returns and stock market calendar anomalies in particular. Consequently, the main research question in this thesis is:

Are stock market calendar anomalies still present when trading days on which macroeconomic announcements were made are not considered?

To find an answer to the main research question, four stock market calendar anomalies are considered, namely the January effect, the day-of-the-week effect, the turn-of-the-month effect and the Halloween effect. The January effect was first statistically examined by Rozeff and Kinney (1976) and refers to larger stock market returns in January compared to the remaining months of the year. Cross (1973) and French (1980) came with the first statistical study on the day-of-the-week effect / weekend effect by reporting higher Friday returns and lower Monday returns compared to the remaining days of the week. The turn-of-the-month effect refers to higher stock market returns on trading days surrounding the turn of the month compared to the remaining trading days of the month and was first statistically tested by Ariël (1987). The last stock market calendar anomaly captured in this thesis, the Halloween effect, refers to lower returns for the period May – October compared to the other half of the year and was statistically investigated by Bouman and Jacobsen (2002).

In this thesis, the impact of macroeconomic news announcements on stock market calendar anomalies is examined in two regions, the U.S. and the U.K. This thesis contributes to the existing literature by investigating the impact of macroeconomic news announcements on the day-of-the-week effect and the Halloween effect. Furthermore, the connection between macroeconomic news announcements and stock market calendar anomalies for the U.K. has not been subject of earlier research. For each of the four stock market calendar anomalies, the prior research is discussed with its main findings.

Dataset and methodology

In the U.S., stock market returns are used on the S&P500 and the CRSP equally weighted index for the period January 1980 – June 2007. A total set of twelve different macroeconomic news announcements is used for the U.S. For the U.K., the influence of eight different macroeconomic news announcements on the FTSE all share index and the FTSE small cap index is investigated for the period January 1986 – June 2007. For each trading day on each of the indices considered, the return is calculated, which is defined as the percentage difference between the closing price of the particular trading day and the closing price of the previous trading day. Subsequently, the presence of the four stock market anomalies on all trading days is investigated for each index by testing the statistical significance of the difference in mean percentage daily return between the 'calendar anomaly period' and the remaining trading days. Thereafter, this is done again for each of the four stock market anomalies, only now separately for announcement days (trading days on which at least one macroeconomic news announcement took place) and nonannouncement days (trading days where no macroeconomic news became public). The magnitude of the stock market calendar anomalies for nonannouncement days is then compared with the magnitude for the whole sample to answer the main research question.

The remaining chapters of this thesis deal with the following issues. In the second chapter, the theory concerning the efficient market hypothesis and stock market anomalies will be discussed. For four stock market calendar anomalies, namely the January effect, the day-of-the-week effect, the turn-of-the-month effect, and the Halloween effect, an overview is given of the most important literature concerned together with the main findings. At the end of chapter two, a few more recent articles concerning stock market calendar anomalies are described. Chapter three discusses the previous research which dealt with the relationship between macroeconomic news and stock market activity. The research of Gerlach (2007) concerning the relation between stock market calendar and weather anomalies is described as well in chapter three. Chapter four provides information about the dataset (stock market data and macroeconomic news announcements) and the statistical tests which are performed for this thesis. The results of these tests are presented and discussed in chapter five. Chapter six, the last chapter of this thesis, summarizes and concludes.

CHAPTER 2 Efficient Market Hypothesis and market anomalies

This chapter deals with the theory and literature related to the Efficient Market Hypothesis and stock market anomalies. First, a description is given of the three types of an efficient market. Further on, different kinds of stock market anomalies are discussed and examples are provided for each category. For the four calendar anomalies which play a central role in this thesis, an extensive overview is given of the literature concerned. This means that for the January effect, the day-of-the-week effect, the turn-of-the-month effect, and the Halloween effect, articles from the last decades are described, each with their own investigation and explanation of one ore more of these anomalies.

2.1 Efficient Market Hypothesis (EMH)

An information efficient market is a financial market where security prices reflect all relevant information. This means that the price of a security changes every time new information is released into the market, which could be every minute or even every second. The information for example can relate to earnings and dividend, private information, historical stock prices and macroeconomic data. There are three types of the efficient market hypothesis, namely the weak form, the semi-strong form and the strong form (Levy and Post 2005).

2.1.1 Weak form of the Efficient Market Hypothesis

The weak form of the EMH states that today's stock prices reflect all information about the historical prices of the stock. Within the weak form of the EMH, historical price information does not expose investment opportunities which lead to abnormal returns (the difference between the expected return and the actual return of a security), therefore making technical analysis unusable. When looking at historical series, the next outcome / return in a series is independent of earlier outcomes / returns (Levy and Post 2005). There are several studies which find evidence on the weak form of the EMH. One of the first was published by Fama (1965). He investigated whether information on past stock market returns can be used to predict future stock prices. After examining serial correlations and other statistical tools, he found no patterns in stock market returns. He concludes that his data support the random-walk theory and therefore chart-reading (technical analysis) is of no use to investors.

2.1.2 Semi-strong form of the Efficient Market Hypothesis

The semi-strong form of the EMH claims that stock prices reflect all relevant publicly available information. Among other things, publicly available information includes historical stock prices and all information concerning financial statements and accounting regulations. Within the semi-strong form of the EMH, investment strategies based on thoroughly studying publicly available information does not lead to earning abnormal returns, because the information will be reflected rapidly in prices once it becomes publicly available. This means that fundamental analyses are unusable, where information from financial statements (especially the price/earnings ratio and the market-to-book value ratio) is used to find investment opportunities (Levy and Post 2005). Among others, Fama *et al*. (1969) support the semi-strong form of the EMH. In their research, they examine the influence of stock splits on stock market returns. They conclude that the information of a stock split is reflected rapidly in the stock price, therefore making it impossible to gain abnormal returns.

2.1.3 Strong form of the Efficient Market Hypothesis

According to the strong form of the EMH, today's stock prices reflect all publicly and privately available information. In addition to historical price information and relevant publicly available information, private information is also captured in the strong form of the EMH, which is only known by a small group of persons (for example board members and private bankers). When the strong form of the EMH holds, no systematic excess returns could be earned by traders based on their information (Levy and Post 2005). There are a few articles which provide evidence on the strong form of the EMH. Henriksson (1984), for example, examined the performance of mutual fund managers. This investigation is a test for the strong form of the EMH, because many researchers assume that mutual fund managers have private information. Henriksson (1984) conducted parametric and non-parametric tests on the returns of 116 mutual funds for the period February 1968 - June 1980 and for two sub-periods within the total sample period. Despite a few exceptions, the mutual funds did not have significant positive estimates of market-timing ability. Therefore, he concluded that his results do not support the hypothesis that mutual funds managers are able to time the return on the market portfolio, thereby supporting the strong form of the EMH.

2.2 Market anomalies

A market anomaly is any event or time period that can be used to produce abnormal profits on stock markets. Stock market anomalies occur on multiple equities and stock market indices across the world. They do not correspond with existing equilibrium models, where risk is the only factor which is likely to cause possible variations in stock market excess returns. The occurrence of patterns in time series of stock market returns, independent of time-varying risk, would indicate that not all relevant information is captured in stock prices, which is inconsistent with the EMH. Stock market anomalies exist in every form of the EMH and can be classified in different categories, like for example firm anomalies, accounting anomalies, event anomalies, weather anomalies and calendar anomalies. (Levy and Post 2005) The first four categories will be discussed in this section, the majority of them on the basis of examples with relating literature.

Firm anomalies are a consequence of firm-specific characteristics (Levy and Post 2005). One well-known firm anomaly is the size effect, which states that returns on small firms are higher compared to returns on large firms, even after risk-adjustment. Banz (1981) discovered this size effect especially for the smallest firms in his sample based on total market value of NYSE stocks from 1936 - 1975. Keim (1983) presented the same conclusion for NYSE and AMEX firms in the period 1963 - 1979. The research of Banz (1981) and Keim (1983) in relation to the January effect, is discussed in a later section. Another firm anomaly is the effect that firms which are followed by only a few analysts earn higher returns. This effect is known as the neglected firm effect. Arbel, Carvell and Strebel (1983) looked at 510 firms from the NYSE, the AMEX and the over-the-counter markets and divided them into three groups of institutional holding (intensively held, moderately held and institutionally neglected) and three groups of size (small, medium and large). For the period 1971 - 1980 they found that the neglected firms earn significantly higher returns than firms intensively held by institutional investors for both the small and the medium size firms.

Accounting anomalies relate to stock price movements after the release of accounting information. An example of an accounting anomaly is the earnings momentum anomaly, which implies that firms with a rising growth rate of earnings are likely to have stocks that outperform the market. Another accounting anomaly is that if the market-to-book value (M/B) ratio is low, the stocks are likely to outperform the market. (Levy and Post 2005). This phenomenon is investigated by Fama and French (1992). They divide their total sample of stocks on the NYSE, AMEX and NASDAQ into ten groups based on M/B ratio and found that the group with the lowest M/B ratio had an average monthly return of 1.65%, while the group with the highest M/B ratio only had an average monthly return of 0.72%.

Event anomalies relate to price movements after an obvious event. This can be for example the announcement that a firm will be listed on a major stock exchange. After such an announcement, the price of the stock rises. The recommendation of an analyst is another example of an event anomaly. Depending on the type of recommendation, the stock price will rise or fall (Levy and Post 2005).

Weather anomalies relate to stock price changes during certain weather conditions. Yuan, Zheng and Zhu (2006), for example, find a relationship between stock returns and lunar cycles, looking at stock indices of 48 countries around the world for the period January 1973 to July 2001. Their conclusion is that stock returns are higher on days around a new moon compared to days around a full moon. Furthermore, they look at possible other explanations for this lunar effect, like macroeconomic announcements, trading volumes, return volatility and other anomalies, but none of them appear to be valid. Another investigation concerning weather anomalies comes from Saunders (1993). He explores whether the stock market returns on the Dow-Jones Industrial Average and NYSE / AMEX for the period 1927 – 1989 are affected by weather conditions. [1] His results suggest that the weather does have significant influence on the stock market returns. This is especially the case for

[1] Therefore, he uses data of temperature, relative humidity, precipitation, wind, sunshine and cloud cover.

100% cloudy days and for sunny days (with 0-20% clouds), where the mean return for the latter group differs most from the overall mean for all days. Saunders (1993) states that his results are robust to other anomalies like the January effect, the weekend effect and the size effect. Cao and Wei (2005) investigate the possible relationship between stock market returns and temperature. They test whether lower temperatures lead to higher stock market returns due to aggression and therefore risk-taking and higher temperatures lead to higher or lower returns depending whether aggression (which causes risk taking) or apathy (which causes risk-aversion) dictates. Returns on nine stock market indices around the world between 1962 and 2001 are used. Overall, Cao and Wei (2005) find that stock returns are significantly negatively correlated to temperature.

The four categories of stock market anomalies discussed above are not further captured in this research for several reasons. First, in general, there is considerably less research on these anomalies compared to calendar anomalies like the January effect, the day-of-the-week effect, turn-of-the-month effect and Halloween effect and the theoretical foundation for these anomalies is far from solid. Besides that, for some of the anomalies, like the weather anomalies, the data are more difficult to obtain and are beyond the scope of this thesis. Therefore, the research is restricted to calendar anomalies. The literature concerning these anomalies will be discussed in the next section.

2.3 Calendar anomalies

If a stock market anomaly depends solely on certain periods in a calendar year, it refers to a calendar anomaly. This section gives an overview of four calendar anomalies which are extensively discussed in the literature for the last decades, namely the January effect, the day-of-the-week effect, the turn-of-the-month effect and the Halloween effect.

2.3.1 January effect

The January effect is one of the most well-known anomalies. In 1976, Rozeff and Kinney reported seasonality in stock returns, using monthly rates of return of the New York Stock Exchange from 1904-1974. The seasonality that they found was mainly caused by large returns in January, compared to the remaining months of the year. In their research they focused on the existence of seasonality, they did not test possible explanations for it. Later on, others looked for possible explanations of the January effect. A selection of those articles is described in this section, categorized by their main explanation for the January effect.

The size effect

Banz (1981) discovered that risk-adjusted returns are higher for small firms than for large firms based on total market value by using return data from stocks on the NYSE from 1936 – 1975. By defining sub-periods of ten years, he found that this ‘size effect’ is not a linear function, so this does not mean that the returns increase when firm size decreases. Nevertheless, for the smallest firms in his sample, the effect is strongest. Keim (1983) also investigated the negative relation between firm size measured in total market value of equity and abnormal risk-adjusted returns. With data of firms on the NYSE and AMEX from 1963 – 1979, he defined different portfolios based on firm size and found that the smaller the firm size, the more excess return increased. Furthermore, his results showed that this effect is much stronger for January than for the remaining months of the year. In his further research, Keim (1983) found that approximately half of the size effect is caused by January returns and roughly a quarter is caused by the first five trading days of January. The findings of Banz (1981) and Keim (1983) suggest that the January effect found by Rozeff and Kinney (1976) should be more pronounced on small capitalization indices.

Tax loss selling hypothesis

Others attribute the January effect to the tax loss selling hypothesis. This hypothesis states that investors sell stocks at the end of the year for tax purposes, which leads to lower stock prices and thereby higher stock market returns in January. Reinganum (1983) used daily return data for all securities traded on the New York and American Stock Exchange from July 1962 – December 1980. He divided his sample in ten portfolios based on market capitalization, (price per share times the number of shares outstanding). Furthermore, he divided the securities into four categories of tax-loss selling measure, which is calculated by dividing the price of a security at the end of the year by the maximum price of that security. He stated that market capitalization tends to be correlated with potential tax-loss selling, with small firms being more suitable for tax loss selling. The exceptionally large returns that he discovered for the first few trading days of January support the tax-loss selling hypothesis. However, he stated that the January effect is only partly explained by tax-loss selling, because the January returns remained higher after controlling for it. This conclusion is also presented by Poterba and Weisbenner (2001). They divided their total sample period (1963 – 1999) into three sub-periods with different tax regimes regarding capital gains in order to test the impact of tax regimes on turn-of-the-year returns. Their results illustrate that the turn-of-the-year returns are linked to the tax regimes, thereby supporting the tax loss selling hypothesis. Gultekin and Gultekin (1983) searched for seasonality in stock returns by looking at monthly returns from 1959 – 1979 on stock market indices of seventeen countries across the world. By running the Kruskal and Wallis test, they found that for all months the hypothesis of equal means can be rejected at the ten percent significance level for twelve of the seventeen countries in their sample. For the U.S. they rejected the hypothesis for the equally-weighted index, although not for the value-weighted index. This indicates that the January effect is mainly caused by small firms. Moreover, Gultekin and Gultekin (1983) compared the mean return of the first month of the tax year with the mean return for the remaining months of the year. For all countries with a tax year starting in January, they found significant higher returns in January compared to the remaining months of the year, supporting the tax-loss selling hypothesis. For the U.K., where the tax year starts in April, three other months had higher returns than April. At last, for Australia, where the tax year starts in July, no significant difference was found.

In their examination of stock market anomalies in eighteen countries across the world, Agrawal and Tandon (1994) rejected the hypothesis of equal monthly returns at the ten percent level or less for ten countries. Furthermore, they found that the returns of January are large and positive in the majority of the countries and exceeding the mean return of December in fifteen countries. Agrawal and Tandon (1994) concluded that the January effect is not restricted to small firms, because they used value-weighted indices. They stated that their results support the tax-loss selling hypothesis for fifteen countries by looking at the last month for the tax year for each country.

In addition to the tax-loss selling hypothesis, Ritter (1988) presented the parking-the-proceeds hypothesis, which states that the January effect is caused by the buying and selling behaviour of *individual investors*. Individual investors tend to sell their securities at the end of the year to realize losses for tax purposes and 'park' these proceeds until January. During January these proceeds are reinvested, mainly in small firm stocks, which increase the prices of those securities. Ritter (1988) tested his parking-the-proceeds hypothesis by looking at the buy/sell ratio of individual investors at Merrill Lynch from 1970 – 1985 and found that there is net selling in December and net buying in January. These results support his parking-the-proceeds hypothesis.

In contrast with the studies described above which support the tax-loss selling hypothesis, Jones, Pearce and Wilson (1987) argued that the tax-loss selling cannot be the explanation for the January effect. In their research, they divided their total sample period on the Cowles index running from 1871 – 1938 into two sub-periods. One sub-period represented the period prior to the introduction of income taxes (1871 – 1917) and the other period started after income taxes were introduced. They found that the January effect is present in both sub-periods and does not become more pronounced when income taxes were introduced.

Difference in beta

Rogalski and Tinic (1986) concluded, by looking at stock returns of the NYSE and AMEX from 1963 - 1982, that a higher beta for stocks in January (especially for small-firms) explained a major part of the higher stock returns in January compared to the remaining months of the year.

Movements in bid-ask spread

According to Keim (1989), the January effect is partly attributable to systematic movements in the bid-ask spread at the turn of the year. Due to a selling pressure at the end of December, daily closing prices lie close to bid quotes, while a buying pressure at the beginning of January leads to daily closing prices which lie close to ask quotes. Because the bid-ask spreads can be large for small stocks, the bid-ask bounce tends to present a positive January return when such a return does not really exist.

Multiple explanations

Based on previous literature, Chen and Singal (2004) tested for the existence of four different explanations for the January effect, namely the tax-loss selling, window dressing, information and bid-ask spread. The window dressing hypothesis states that, just before the turn-of-the-year, institutional investors sell stocks which declined in price, to avoid revealing that they hold stocks which perform badly. For their research, they used daily stock returns on the NYSE, the AMEX and the NASDAQ for the months of January and December from 1993 – January 1999. Chen and Singal (2004) found, by comparing the stock returns of the last five trading days of December (excluding the last trading day) with the stock returns of the first five trading days of January, that the returns of the five-day period in January is positive and large and usually higher than the returns of the previous five-day period at the end of December. With respect to the tax-selling hypothesis they found that stocks with high potential for tax-loss selling yield lower returns in December than stocks with lower potential for tax-loss selling. Consequently, stocks with low potential for tax-loss selling yield lower returns in January than stocks with higher potential for tax-loss selling. With the argument that both the tax-loss selling hypothesis and window dressing as an explanation for the January effect have the same predictions related to returns, Chen and Singal (2004) evaluated returns for a June-July period in each year of their sample period as well. The majority of the companies listed on the stock market indices that Chen and Singal (2004) investigate (the NYSE, the AMEX and the NASDAQ) report semi-annually, hence they argued that possible differences in returns in the June-July period could then be attributed to window dressing. Nonetheless, they did not find similar results for the June-July period as they found for the December-January period. Therefore, they concluded that window dressing has little to no explanatory value with respect to the January effect. The third possible explanation that Chen and Singal (2004) discussed is the information hypothesis. Higher returns for the months of April, July and October (where accounting information is usually released) were not found. Lower trading volume in December (which may be the case when investors wait for new information in January) could not be found either. Consequently, they rejected the information hypothesis as an explanation for the January effect. Chen and Singal (2004) reported that the bid-ask spread is not likely to have a big influence on their results, because they use midpoint quotes. So their overall conclusion was that the tax-loss selling hypothesis must be the main cause of the January effect.

2.3.2 Day-of-the-week effect

The day-of-the-week effect comes down to the difference in returns between a particular trading day / a couple of trading days compared to the rest of the trading week. The weekend effect focuses on Monday and Friday returns, stating that Monday returns are low and negative and Friday returns are high compared to the remaining trading days of the week. Extensive research has been done to find explanations for this anomaly. This section gives an overview of the most important research that was made in the last few decades regarding the day-of-the week effect and the weekend effect.

Cross (1973) was one of the first to report differences in returns on Fridays and Mondays compared to the rest of the week. With daily return data from 1953 – 1970 on the S&P 500, he found a statistically significant difference between Friday and Monday returns for almost every year in the sample period in both mean returns and in percentage of time that the index rose on that day. Moreover, his results showed that Monday indices following a decline on Friday rose in approximately 24% of the cases, which is significantly different from the reaction of the remaining trading days of the week following a decline of the previous trading day. Subsequent to Roll (1973), French (1980) reported that Monday returns were negative and lower than returns for other days in the week, using daily returns from the S&P 500 composite portfolio for the period 1953 – 1977. In his research, he examined if this is the consequence of the weekend prior to each Monday or the consequence of every non-trading day (holiday). His results illustrated that the return on every weekday on its own (with the exception of Tuesday) is higher when the day follows a holiday compared to when the day follows a trading day. This is different for Tuesday, because Tuesday is the first trading day after the weekend when Monday is a holiday. Therefore, French (1980) concluded that the negative Monday returns are caused by a weekend effect.

Cross (1973) and French (1980) did not look for possible explanations for the weekend effect, although other authors did. Below a selection is given of the articles of those authors and their findings regarding the weekend effect.

Settlement period

By using mean returns and variances for the S&P 500 and the CRSP value- and equally-weighted portfolios from July 1962 – December 1978, Gibbons and Hess (1981) also found negative Monday returns, although no Monday effect in variances. Moreover, they searched for possible explanations for the Monday effect. The settlement period explains the more negative Monday returns before 1968 compared to the returns after 1968, because the settlement period was four business days before February 1968 and five business days after February. Nonetheless, it does not explain the negative Monday returns from February 1968 – December 1978. Apart from that, the settlement period is nowadays three business days for stocks.

Release of information

French and Roll (1986) investigated the return variances of weekdays, weekends, holidays and holiday weekends by means of daily returns on the New York and American Stock Exchanges from 1963 – 1982. They found that the returns are more volatile during exchange trading hours compared to non-trading hours. The three possible explanations that were given for this are that public information (which causes the volatility) is announced more frequently during business days (weekdays), private information probably influences prices more when the stock markets are open and the process of trading itself causes volatility. French and Roll (1986) concluded that their results showed that only a small part of the difference in variances between trading hours and non-trading hours is caused by mispricing occurring during trading. The reason for this mainly lies in the difference in quantity of information announced between trading hours and non-trading hours.

Internationally

Jaffe and Westerfield (1985) contributed to the literature by investigating the day-of-the-week effect internationally. In all countries in their research, namely the U.K., Japan, Canada and Australia, they found a day-of the-week effect with significant negative Monday returns and high Friday returns. Correlations tests suggest that there is a strong correlation between the returns of the four foreign countries and those of the U.S. Nonetheless, independent of the day-of-the-week effect in the U.S. Jaffe and Westerfield (1985) found a day-of-the-week effect in each of the four countries on their own. Similar to Gibbons and Hess (1981), they looked at settlement periods to explain the day-of-the-week effect. They only found little evidence for the higher Thursday and Friday returns in Australia, but for Canada, the U.K. and Japan the settlement period did not explain the day-of-the-week effect at all. In addition, Jaffe and Westerfield (1985) investigate the opportunity that measurement errors cause the day-of-the-week effect. They state that if Monday returns would be influenced by mainly negative random errors and Friday returns by mainly positive random errors, the correlation between Monday and Friday returns should be low. Nonetheless, they found a higher than average correlation between Monday and Friday returns and therefore conclude that measurement errors cannot explain the day-of-the-week effect.

In their exploration of different anomalies on stock market indices in eighteen countries across the world, Agrawal and Tandon (1994) captured the day-of-the week effect as well. They found negative returns on Mondays for thirteen countries (of which seven are statistically significant), but also negative returns on Tuesdays in twelve countries (of which eight are statistically significant). Furthermore, they found Tuesday returns to be lower compared to Monday returns in eight countries. Contrary to these negative Monday and Tuesday returns, they revealed positive Wednesday and Friday returns in the majority of the countries. After reporting the day by day returns, Agrawal and Tandon (1994) discussed possible explanations for the negative Tuesday returns. They stated that the time zone hypothesis (which argues that Tuesday returns are low in some countries due to time-differences that exceed twelve hours) can explain the negative Tuesday returns in three of the five countries, but cannot explain the negative Tuesday returns in European countries. Furthermore, the difference between trading days and non-trading days is not an explanation for the negative Tuesday returns. After running day-of-the-week correlation tests and regressions, the null hypothesis that day by day variances are dependent on the US can be rejected for the majority of the countries. Moreover, Agrawal and Tandon (1994) argued that the settlement procedure explains a part of the day-by-day differences (mainly the higher returns on Wednesday, Thursday and Friday) in returns, but cannot explain the negative Monday and Tuesday returns for most of the countries. Furthermore, they divided their total sample period into two sub-periods and found that in the seventies Monday returns are significantly negative in seven countries and Tuesday returns are significantly negative in nine countries, while in the eighties the Monday and Tuesday returns are not significantly negative in the majority of the countries. Finally, they found that Monday returns are negative in almost all countries if the market declined the previous week, but mainly positive when the market went up the previous week. However, this is not found for Tuesday returns.

2.3.3 Turn-of-the-month effect

The turn-of-the-month effect refers to higher stock market returns for the trading days surrounding the turn of the month compared to the remaining days of the month. In the past decades, many researchers discussed the turn-of-the-month effect, all with their own approach. This section gives an overview of those articles.

By looking at the stock returns of the CRSP value-weighted and equally-weighted index for the period 1963 – 1981, Ariël (1987) concluded that the mean cumulative return of the first half of trading months is significantly higher than the mean cumulative return of the second half of trading months. For this, he added the last trading day of the month to the first half of the following month. In the entire period he examined, the mean return of the first half of the month was positive and the mean return of the last half of the month was equal to zero. At the five percent significance level, he did not find unequal variances between the first half of trading months and the last half of trading months. This effect is not induced by outliers either. After reporting this effect, Ariël (1987) looked for possible causes of the difference in mean returns between the two periods. He reported that the effect is not caused by a concentration of dividend payments, holidays or weekends in the first or last half of the month. Furthermore, the effect still held after correcting for returns in January and therefore was not caused by the January effect. Moreover, the effect is not induced by a few months where the effect is strongest.

Examination of data

Lakonishok and Smidt (1988) argue that the definition of the first half of the month from Ariël (1987) is incorrect, because in their opinion it is a consequence of examination of the data. According to them, Ariël (1987) adds the last trading day to the first half of the following month, because the return on those days is high. Therefore, Lakonishok and Smidt (1988) define the first half of the month as the first until the fifteenth calendar day of the month and the last half of the month as the remaining days in the month. By looking at daily closing prices of the Dow Jones Industrial Average from 1897 – 1986, they did not reject the null hypothesis of equal returns of the first half and the last half of the month at the five percent significance level. Moreover, they investigated the difference between the two halves of each calendar month separately, but they only found significant differences for the first half of April and the last half of December. Their conclusion is that the effect that Ariël (1987) found is to some extent caused by the fact that he added the last trading day to the first half of the following month, and partly caused by the characteristics of the particular period that he investigated. Besides investigating the difference of returns between the two halves of the month, Lakonishok and Smidt (1988) also examined the returns of trading days around the turn of the month. They found a particularly high return of a period of four trading days, starting on the last trading day of the month and ending on the third day of the following month. The return of this period was statistically higher at the one percent significance level than the return for an average period of four trading days and was even higher than the average monthly return.

Turn-of-month liquidity hypothesis

A possible explanation for the turn-of-the-month effect comes from Ogden (1990). In his research he presented the turn-of-month liquidity hypothesis, which states that the payment system in the U.S., where the majority of cash flows takes place at the turn of each month, (partly) causes the turn-of-the-month effect. He tested his hypothesis by examining value-weighted and equally weighted daily stock index returns from the CRSP for the period January 1969 – December 1986. Similar to Lakonishok and Smidt (1988), he found higher stock market returns for the last trading day of the month and the first three trading days of the following month. Nonetheless, he argued that this cannot lead to higher profits for investors, because the higher returns did not exceed transaction costs that have to be paid.

Internationally

Cadsby and Ratner (1992) studied the turn-of-the-month effect globally, by means of daily stock returns of eleven stock market indices in ten different countries. They made use of the definition of the turn of the month as the last day and the first three trading days of the month, similar to Lakonishok and Smidt (1988). They found statistically significant differences in mean returns between the turn of month days and the remaining days of the month for seven out of eleven stock market indices, using a five percent significance level. Furthermore, they investigated whether the turn-of-the-month is a reflection of the turn-of-year effect or a consequence of window dressing at the end of each quarter by comparing the turn-of-the-month returns with the turn-of-year returns and the turn-of-quarter returns. However, they found that the turn-of-year and turn-of-quarter returns did not have substantial influence on the turn-of-the-month effect.

In reaction to the findings of Lakonishok and Smidt (1988), Agrawal and Tandon (1994) examined the turn-of-the-month effect in eighteen countries around the world, using daily stock indices returns for the period 1971 - 1987. For ten of these eighteen countries they also found a return of the four days around the turn-of-the-month that Lakonishok and Smidt (1988) used, which is significantly higher than the return of an average four day period. On top of that, for ten of the eighteen countries they discovered a high return for the last trading day of the month compared to the average return of a trading day, despite a very low variance of the last trading day in the majority of the countries.

2.3.4 Halloween effect

The Halloween effect refers to lower stock returns during the period May – October compared to the returns during November – April. It was first presented by Bouman and Jacobsen (2002). They concluded, using monthly stock returns of value-weighted market indices of 37 countries for the period January 1970 – August 1998, that the Halloween effect is present in 36 countries and is particularly economically significant in many European countries. After using the regression technique, Bouman and Jacobsen (2002) concluded that there is a statistically significant Halloween effect at the 10-percent level in 20 of the 37 countries. These results, they said, are also robust over time. Besides finding the Halloween effect in their sample, they looked for possible explanations for it. After running different tests, they rejected data mining, difference in risk, the January effect, differences in interest rates and trading volumes as possible explanations. Furthermore, they did not find any seasonal effect in the news which could explain the Halloween effect. While Bouman and Jacobsen (2002) did not find an explanation for the Halloween effect, other articles did present possible explanations. This section presents the research of Jacobsen and Visaltanachoti (2009) and Kamstra et al. (2003), which both put forward a possible alternative explanation for the Halloween effect. At the end of this section, the research of Maberly and Pierce (2004) is described, in which they question the existence of the Halloween effect.

Sector-specific Halloween effect

Jacobsen and Visaltanachoti (2009) investigated the possibility of the fall effect being sector-specific, by defining seventeen sector portfolios for the period July 1926 – December 2006. In all sectors, they found higher returns for the November – April period compared to the May - October period. In twelve sectors, the differences between summer and winter returns are statistically significant and in eight sectors the summer returns are lower than the Treasury bill rate in that same period. The sectors with the weakest Halloween effect are defensive consumer-oriented sectors, while production sectors and sectors related to raw materials have the strongest Halloween effect. After determining the liquidity for the summer and the winter periods by looking at trading volume and bid-ask spreads, which are not statistically different from each other, Jacobsen and Visaltanachoti (2009) stated that the Halloween effect is not caused by changes in liquidity. Finally they examined whether a sector rotation strategy leads to higher returns compared to the market as a whole, by setting up a portfolio of five consumer industries in the summer and holding a portfolio of five production industries in the winter. They found that the returns of this portfolio outperform the market in both the summer and the winter.

Seasonal effective disorder (SAD)

Kamstra et al. (2003) adopted an alternative explanation for the Halloween effect. They linked the Halloween effect to seasonal effective disorder (SAD). The SAD effect refers to the decreasing hours of daylight which makes investors depressed and therefore leads to higher risk aversion. By using four stock market indices in America and eight stock market indices across the world with different latitudes, they found that returns are lower during fall months and become relatively higher during winter months, when hours of daylight increase again.

Evidence against the Halloween effect

Maberly and Pierce (2004) present evidence against the Halloween effect found by Bouman and Jacobsen (2002). They argued that the Halloween effect is mainly caused by two outliers: the crash in world equity prices in October 1987 and the collapse of the hedge fund Long-Term Capital Management in August 1998. After correcting for those outliers, Maberly and Pierce (2004) concluded that the Halloween effect is not statistically significant anymore at a useful level. Furthermore, after correcting for the impact of January on the results, they concluded that the Halloween effect is even smaller. Besides looking at stock returns, Maberly and Pierce (2004) also tested for the existence of the Halloween effect in S&P 500 futures in the period April 1982 – April 2003. They did not find any significant Halloween effect in S&P 500 futures, even when the two earlier mentioned outliers are included in the sample. Finally, Maberly and Pierce (2004) compared the Buy and Hold strategy with two strategies based on the existence of a Halloween effect in S&P 500 futures (both long in S&P 500 futures for the period November – April and short or no positions in S&P 500 futures for the period May – October). They concluded that the Buy and Hold strategy performs better than the other two strategies until April 2000, except around October 1987 (due to the crash in world equity prices). After April 2000, when a bear market began, the other two strategies outperformed the Buy and Hold strategy, which Maberly and Pierce found quite logical, because those strategies had short positions or no positions at all from April – October.

2.4 Stock market anomalies nowadays

The previous sections illustrated that there are many studies which discussed different calendar anomalies. Most calendar anomalies were discovered decades ago and afterwards re-examined many times. The question arises whether or not these calendar anomalies still exist and if so, how strong they are. Kunkel et al. (2003) investigated, concerning the turn-of-the-month effect which was first discussed by Ariel (1987), if it is also present on 19 stock market indices across the world for the period 1988 – 2000. They found that it is present in 16 of the 19 countries and that on average 87% of the effect is caused by the 4-day period surrounding the turn-of-the-month. With respect to the January effect, which was first published by Rozeff and Kinney (1976), Moller and Zilca (2008) compared returns in January on the NYSE, the AMEX and the NASDAQ from 1965 – 1994 with a more recent period 1995 – 2004. For this last period, they found higher returns in the first half of the month and lower returns in the last part of the month. Nonetheless, the strength of the January effect is comparable for both periods, meaning that the January effect still exists.

One could question why market anomalies which have been present for decades do not disappear as investors are familiar with them. A possible reason is that the transaction costs are too high to profit from an anomaly, therefore making it impossible for investors to exploit the patterns. Another possible explanation is that the underlying market model has misspecifications. The majority of the tests of market efficiency are joint test, one for market efficiency and one for the underlying model which determines returns. If a model has misspecifications, this means that the expected return is incorrect and therefore conclusions about the existence and level of abnormal returns (market anomalies) could be wrong too. In other words, the market inefficiency (anomaly) that is found, does not have to exist after all, but is mainly caused by the lack of a powerful model to explain it.

Contrary to the conclusions of Kunkel et al. (2003) and Moller and Zilca (2008), there are authors who found that calendar anomalies decreased or even disappeared after they were first discovered. Schwert (2003), for example, dealt with this question by investigating, among other things, the turn-of-the-year effect (January effect) and the weekend effect. He concludes that both anomalies became less strong after they were first discovered, although he does not find evidence that they completely disappeared. Schwert (2003) brings forward the possibility that the anomalies did not exist at all and are more apparent and if they did exist, investors changed their behavior, making the market efficient again.

Marquering et al. (2006) also investigated whether or not anomalies still exist in the market and if so, to what degree. They used daily return data from the Dow Jones Industrial Average from 1960 – 2003 to check for the holiday, the weekend, the January, the turn-of-the-month and the size effect. By doing so, they compared the period prior to the first publication of the particular anomaly with the period after the first publication. Marquering et al. (2006) found that the weekend effect and the turn-of-the-month effect have weakened after its first discovery, but are still present. Furthermore, in their research, the January and holiday effect disappeared, while the size effect disappeared after its first discovery, but came back during the period 1999 – 2003.

As this section illustrates, the discussion about the existence of calendar anomalies continues after all these studies in the past decades. In the next chapter the influence of macroeconomic news announcements on stock market returns and stock market anomalies in particular will be discussed.

CHAPTER 3 Macroeconomic news and the stock market

This chapter deals with macroeconomic news announcements and their influence on stock market returns. In the first part of this chapter, an overview is given of different types of macroeconomic news announcements. Furthermore, previous literature which examined the relationship between macroeconomic announcements and stock market returns will be discussed. The second part of this chapter deals with the research of Gerlach (2007). He links stock market calendar and weather anomalies to macro economic news announcements.

3.1 Macroeconomic news announcements and stock market returns

Macroeconomic news announcements are recurrent economic and financial indicators which give information about the state of the economy. This information can relate to for example:

- Employment: Employment Report and Nonfarm Payrolls;
- Sales: Retail Sales, Lightweight Vehicle Sales;
- Production: GDP and Industrial Production;
- Prices: Consumer Price Index (CPI) and Producer Price Index (PPI);
- Housing: Housing Starts;
- Trade: Trade Balance.

Stock market returns are influenced by announcements on the above macroeconomic data. The macroeconomic news announcements that are used in this research will be discussed in more detail in the next chapter.

In the last few decades, there have been many studies examining the effect of macroeconomic announcements on stock market returns. Chen, Roll and Ross (1986) examine the relation between macroeconomic news and stock market returns by using returns on the equally and value weighted New York Stock Exchange for the period of January 1953 - November 1983. From the total set of macroeconomic variables that they use, the growth rate in industrial production and the changes in the risk premium and yield curve are highly significant in explaining expected stock returns, whereas the unanticipated and expected inflation (change in Consumer Price Index) is less significant. The overall conclusion of Chen, Roll and Ross (1986) is that stock market returns are influenced by macroeconomic variables and that the intensity of the influence corresponds with the total exposure to them.

State of the economy

McQueen and Roley (1993) investigate the impact of macroeconomic news announcements on stock market returns as well, thereby looking at the state of the economy. In doing so, they use daily stock market returns on the S&P 500 from 1977 – 1988 and data on macroeconomic announcements regarding industrial production, unemployment rate, nonfarm payroll employment, merchandise trade deficit, consumer price index, producer price index and M1. They define the economic activity as high, medium or low, which is based on the level of industrial production. Having tested the reaction of S&P 500 returns on macro-economic news announcements in the different states of the economy, McQueen and Roley (1993) conclude that the "market's response to macroeconomic news depends on the state of the economy". This is especially the case for higher than expected real activity, which leads to lower stock prices when there is high economic activity (a strong economy), but leads to higher stock prices when there is low economic activity (a weak economy). In their research, Boyd et al. (2005) also look at the state of the economy, although only investigating the influence of one macroeconomic announcement on the S&P 500, namely the unemployment rate. They thereby look at the reaction to the unexpected part of unemployment news and conclude that stock markets rise in response to bad employment news during expansions and drop in response to bad employment news during contractions. After presenting this conclusion, they search for an explanation by comparing the influence of two components of unemployment news on stock prices and risk-free government bonds, namely the equity risk premium and the expected future growth rate of dividends. They found that stock prices during expansions are most influenced by changes in the equity risk premium and stock prices during contractions are most influenced by changes in the expected future growth rate of dividends. Comparable research is conducted by Andersen et al. (2007), although using a substantially larger set of macroeconomic announcements. They look at the returns on the S&P 500, the FTSE 100 and the DJ Euro Stoxx 50 ten minutes before every macroeconomic announcement until one and a half hours after the announcement. This is done for the whole sample period (July 1988 – December 2002), but also for two sub-periods concerning expansion (July 1988 – February 28, 2001) and contraction (February 2001 – December 2002). Andersen et al. (2007) found, similar to Boyd et al. (2005), that bad macroeconomic news had a negative influence on stock markets during contractions, but a positive influence during expansions.

Flannery and Protopapadakis (2002) investigate the impact of 17 different macroeconomic announcements on daily stock returns of the value-weighted NYSE-AMEX-NASDAQ market index for the period 1980 – 1996. Besides looking at the influence of these macro-economic announcements on the level of the daily stock returns, they also capture the influence on the volatility of the returns. They find that, of the 17 macro-economic announcements, CPI and PPI only affect the market returns, while Balance of Trade, Employment and Housing Starts only affect the volatility of the returns.M1 affects both returns and volatility. Furthermore, Flannery and Protopapadakis (2002) investigate if their conclusions still hold after dividing the sample period into three sub-periods based on time and three sub-periods based on economic 'regimes' (by looking at the growth rate of Industrial Production, Unemployment Rate, Consumer Confidence and an index of Job Openings). Their conclusions turn out to be valid, even after the division mentioned above.

3.2 Macroeconomic news announcements and stock market anomalies

As described in chapter 2, multiple explanations for calendar anomalies have been put forward in previous research.

Gerlach (2007) comes with another explanation for calendar and weather anomalies. He links calendar and weather anomalies to the market response to macroeconomic news announcements. For his research, he uses daily returns on the CRSP equally weighted index of the NYSE / AMEX / NASDAQ and the S&P 500 index from 1980 – 2003. Furthermore, he makes use of the announcement dates of eleven news announcements, namely the Federal Reserve's Beige Book, Business Sales and Inventories, Consumer Price Index (CPI), Employment Report, Advance Durable Goods Shipments, Federal Open Market Committee announcements, (FOMC), Gross Domestic Product (GDP), Housing Starts, Industrial Production, Retail Sales and Lightweight Vehicle Sales. First, he presents the differences in mean daily return between the anomaly period and the remaining trading days for each of the six calendar and weather anomalies he considered. Appendix A shows table 2 of the research of Gerlach (2007), where these results are illustrated. The p-values for each anomaly demonstrate that each anomaly is statistically significant at the ten percent significance level or better. Further, Gerlach (2007) compares the mean daily return on days where at least one macroeconomic announcement was made (announcement day) with the mean daily return on days where no macroeconomic announcement took place (non announcement day). He finds that for both the S&P 500 and the CRSP index, the mean return on announcement days is significantly different from the mean return on nonannouncement days. Moreover, he demonstrates that the standard deviation is smaller on announcement days compared to nonannouncement days, therefore concluding that the higher return on announcement days is not caused by higher risk. After this, Gerlach (2007) investigates the influence of macroeconomic announcements on six calendar and weather anomalies, namely the turn of the month effect, the January effect, the fall effect, the lunar effect, the rainfall effect and the temperature effect. For the turn-of-the-month effect, the fall effect, the lunar effect, the rain effect and the temperature effect he finds that this is entirely caused by the significantly higher returns on announcements days. The January effect is the only anomaly that is still present when only nonannouncement days are used in the sample, but is less strong. Appendix A presents table 4 of the research of Gerlach (2007), which shows the statistical significance of the six stock market anomalies if only nonannouncement days are considered.

So the main finding of Gerlach (2007) is that five of the six anomalies do not occur when announcement days are left out. He concludes that the reaction of the market to macroeconomic announcements is the main source of calendar and weather anomalies. To corroborate this conclusion, he conducts several tests to exclude alternative explanations. A different sample of macroeconomic announcements is used, therefore testing for the possibility that the conclusion only holds for a particular set of announcements. Nevertheless, the main findings still hold for the different set of macroeconomic announcements, which contains Retail Sales, CPI, Employment Report, ISM survey and the Employment Cost Index. On top of that, the sample is divided into two sub-periods, namely 1980-1991 and 1992 – 2003. For both periods, the only significant anomaly is the January effect when controlled for macroeconomic announcements, which means that the possibility can be rejected that unusual returns in a particular period drive the conclusion. The last alternative explanation that is tested for, is the possibility that the market responds differently to macroeconomic news during periods of calendar anomalies (January, turn-of the-month and fall). The unexpected component of the market reaction to FOMC is used to determine the difference between the response of the market during calendar anomalies and the remaining of the year, but no significant differences are found.

This thesis is based on the article of Gerlach (2007). Comparable research will be conducted with respect to the influence of macroeconomic news announcements on stock market anomalies in the U.S. Furthermore, this will be repeated for the U.K. In the next chapter, the data and methodology used in this thesis will be described, making use of the data and methodology of Gerlach (2007).

CHAPTER 4 Data and methodology

This section describes the data and methodology which are used in this research. After a description of the stock market data, an overview is given of the macroeconomic announcement used. Thereafter, the descriptive statistics of the dataset will be provided. At the end of this chapter, the tests will be described which are performed to test for the stock market calendar anomalies.

4.1 Stock market data

With respect to the U.S., daily closing prices are used on two indices, similar to Gerlach (2007). The first index is the Standard & Poor's 500 (hereafter referred to as S&P 500) and the other index is the Center for Research in Security Prices (CRSP) equally weighted portfolio of the NYSE / AMEX and NASDAQ (hereafter referred to as CRSP EW). For both indices, daily closing prices from January 1st 1980 – June 30th 2007 are captured in the dataset. Both data series are obtained from Bloomberg. For the U.K. daily closing prices are used from two indices as well, namely the FTSE all share index and the FTSE small cap index. For both indices, daily closing prices are gathered from January 1st 1986 – June 30th 2007. Both data series are also obtained from Bloomberg.

4.2 Macroeconomic news announcements

For the U.S. a total set of 12 macroeconomic news announcements is used. Table 1 contains information concerning these macroeconomic announcements with their frequency, the institution which publishes it and the release time. For the U.K. eight macroeconomic news announcements are captured, which are the same as the announcements for the U.S. apart from Housing Starts, Beige Book, Business Sales & Inventories and Advance Durable Goods Shipments announcements. The macroeconomic announcements for the U.K. are lined up in table 2, including their frequency, the institution which publishes it and the release time. The information concerning the release times of the announcements for both the U.S and the U.K. are obtained from press releases on the official websites of the institutions which publish the announcements and from Flannery and Protopapadakis (2002). Moreover, weekly overviews of the coming announcements in the Wall Street Journal are used. These overviews are obtained from the Factiva database. An example of such a weekly overview can be found in Appendix B. Each of the announcements used for this thesis is described briefly.

Table 1		***Macroeconomic news announcements U.S.***	
Announcement	*Frequency of release*	*Released by*	*Release time*
Gross Domestic Product	quarterly	Bureau of Economic Analysis	10:00 am through 10/20/1983, 8:30 am thereafter
Monetary Policy events	not fixed	Federal Open Market Committee Board of Governors	no fixed time through 12/20/1994, 2:15 p.m. thereafter
Consumer Price Index	monthly	Bureau of Labor Statistics	9:00 a.m. through 03/23/1982, 8:30 a.m. thereafter
Producer Price Index	monthly	Bureau of Labor Statistics	9:00 a.m. through 03/12/1982, 8:30 a.m. thereafter
Industrial Production	monthly	Federal Reserve Board	9:30 a.m. through 10/16/1985 9:15 a.m. thereafter
Retail Sales	monthly	U.S. Census Bureau	4.00 p.m. through 01/13/1981, 2:30 p.m. through 11/10/1983, 8:30 a.m. thereafter
Employment Report	monthly	Bureau of Labor Statistics	9:00 a.m. through 03/05/1982 8:30 a.m. thereafter
Trade Balance	monthly	U.S. Census Bureau	2:30 p.m. through 11/29/1983, 9:30 a.m. on 12/29/1983 8:30 a.m. thereafter
Housing Starts	monthly	U.S. Census Bureau	2:30 p.m. through 11/17/1983, 9:30 a.m. on 12/20/1983, 8:30 a.m. thereafter
Beige Book	eight times per year	Federal Reserve Board	2:15 p.m.
Durable Goods	monthly	U.S. Census Bureau	2:30 p.m. through 11/22/1983, 8:30 a.m. thereafter
Inventories	monthly	U.S. Census Bureau	10:00 a.m. through 12/13/1996, 8:30 a.m. thereafter

Table 2		***Macroeconomic news announcements U.K.***	
Announcement	*Frequency of release*	*Released by*	*Release time*
Gross Domestic Product	quarterly	Office for National Statistics	11:30 a.m. through 07/23/1993, 9:30 a.m. thereafter
Monetary Policy events	not fixed	Bank of England	no fixed time through 05/06/1997, 12:00 p.m. thereafter
Consumer Price Index	monthly	Office for National Statistics	11:30 a.m. through 08/18/1993, 9:30 a.m. thereafter
Producer Price Index	monthly	Office for National Statistics	11:30 a.m. through 08/09/1993, 9:30 a.m. thereafter
Industrial Production	monthly	Office for National Statistics	11:30 a.m. through 08/12/1993, 9:30 a.m. thereafter
Retail Sales	monthly	Office for National Statistics	11:30 a.m. through 08/18/1993, 9:30 a.m. thereafter
Employment Report	monthly	Office for National Statistics	11:30 a.m. through 08/12/1993, 9:30 a.m. thereafter
Trade Balance	monthly	Office for National Statistics	11:30 a.m. through 08/20/1993, 9:30 a.m. thereafter

Gross Domestic Product (GDP) is the total value of goods and services produced in a country. In the U.S., three estimates of the GDP are released for each quarter. Those estimates were referred to as preliminary, 1st revision and 2nd revision until June 1988 and preliminary, revised and final estimates as from July 1988. For the U.K., until March 1993, two estimates of quarterly GDP were published. Thereafter, three estimates were made public, similar to the U.S. For this thesis, releases are used of the preliminary estimate of GDP. For the U.S., **Monetary Policy events** refer to announcements on the federal funds rate (the interest rate that banks charge each other for loans) and the discount rate (the interest rate charged to depository institutions for loans from the Federal Reserve). For the U.K., monetary policy events refer to announcements on the official bank rate, which is the interest rate that the Bank of England charges banks for lending. The **Consumer Price Index (CPI)** represents the change in the prices paid by urban consumers for a representative basket of goods and services.[2] This percentage change in prices can be seen as an estimation of inflation and is therefore closely watched. The **Producer Price Index (PPI)** indicates the level of selling prices which producers charge for goods and services. If producers have to deal with higher costs, they will pass this through in prices of goods and services. Therefore, the PPI gives early information on possible inflation. The macroeconomic announcement on **Industrial Production** is an index representing the output in the industrial sector. **Retail Sales** represent the total sales of goods by all retail organizations. The **Employment Report** provides information on the unemployment rate which is the percentage of people that are unemployed. The macroeconomic announcement on **Housing Starts** represents the total number of houses on which construction was started. The total number is divided into single-family units and multifamily units. **Trade Balance** is the difference between the monetary value of imports and exports of a country. A trade surplus indicates higher exports than imports, while a trade deficit indicates the opposite. The **Beige Book**, also known as the Summary of Commentary on Current Economic Conditions, is released eight times a year. Each time, the Federal Reserve Bank of one of the twelve districts makes a summary of the information provided by each district on its own and releases the Beige Book. The reports produced by the Federal Reserve Bank of each district contains information on current economic conditions gathered from Bank and Branch directors and interviews with key business contacts, economists, market experts and other sources.[3] The macroeconomic number on **Advance Durable Goods Shipments** stands for the total shipments, new orders and unfilled orders related to for example all types of equipment. An increasing number on advance durable goods shipments could lead to rising production and employment, while a decrease could lead to the opposite effect on production and employment. **Business Sales and Inventories** represents the monetary value of the total sales and inventories for the manufacturing, wholesale, and retail sectors. The number on business sales and inventories gives an indication of the level of

[2] This information is obtained from www.bls.gov, the official website of the Bureau of Labor Statistics.
[3] This information is obtained from www.federalreserve.gov, the official website of the Federal Reserve Board.

consumer spending in the economy. Increasing inventories could mean decreasing of consumer spending and decreasing inventories could mean increased consumer spending.

For the U.S., the database used for this thesis contains release dates for the macroeconomic announcements described above for the period January 1st 1980 until June 30th 2007. For the U.K., release dates are captured from January 1st 1985 until June 30th 2007.

4.3 Analyses

At first, for the four indices used in this research, the daily percentage return of each trading day in the sample is calculated. This is done by using the formula,

$$R_i = \left(\left(\frac{V_t}{V_{t-1}} \right) - 1 \right) \times 100\% \tag{1}$$

where V_t is the value of the index at day *t*. For this value the closing price of the index is used. Using these daily mean returns, the average return for each index is calculated. Furthermore, the mean daily return for each macroeconomic announcement is computed, which thus represents the mean daily return on the day that each particular macroeconomic announcement takes place. Besides the mean daily return, the standard deviation of the returns is calculated. Table 3 presents the descriptive statistics with the number of macroeconomic announcements, the mean daily returns for each index and each macroeconomic announcement and the standard deviation of the daily returns.

Table 3: **Descriptive Statistics**

Announcement	*number of releases*		*Mean % daily return*				*Standard Deviation*			
	U.S.	*U.K.*	*U.S.*		*U.K.*		*U.S.*		*U.K.*	
			S&P 500	*CRSP EW*	*FTSE all-share*	*FTSE small cap*	*S&P 500*	*CRSP EW*	*FTSE all-share*	*FTSE small cap*
All	3463	1809	0.0435	0.0926	0.0341	0.0306	1.0226	0.7250	0.9478	0.6171
Gross Domestic Product	110	85	0.0618	0.1307	-0.0553	-0.0032	0.9677	0.6209	0.9053	0.5198
Monetary Policy events	165	178	0.2369	0.1749	-0.0637	0.0204	1.1615	0.8495	1.1361	0.8713
Consumer Price Index	330	258	0.0665	0.0776	0.1380	0.0474	0.9977	0.6971	0.9406	0.6067
Producer Price Index	330	258	0.0600	0.1524	-0.0645	0.0267	1.1472	0.7273	0.8782	0.6025
Industrial Production	330	258	0.0489	0.0694	0.0029	-0.0032	1.0437	0.7527	0.8982	0.7837
Retail Sales	330	258	0.0522	0.1106	0.0311	0.0212	1.0423	0.6906	0.8953	0.8295
Employment Report	330	257	0.0321	0.1859	0.0786	0.0929	1.1169	0.7359	0.9332	0.6389
Trade Balance	329	257	-0.0437	0.0284	0.0057	-0.0355	1.0327	0.7381	0.8148	0.5762
Housing Starts	329	-	0.1063	0.0648	-	-	1.0522	0.8617	-	-
Beige Book	223	-	0.1059	0.1406	-	-	0.8213	0.6094	-	-
Durable Goods	327	-	0.0983	0.1258	-	-	0.9036	0.6330	-	-
Inventories	330	-	0.1058	0.1004	-	-	1.1226	0.7856	-	-

4.3.1 Methodology tests

For each of the four stock market calendar anomalies, the existence of the effect is first investigated for the total sample. This means that the mean daily return is calculated for the period where the anomaly should be present. This mean is then compared with the mean daily return of the remaining period of the year. Two tailed t-tests are computed to test the significance of the differences in means. A t-test is a parametric statistic. Parametric statistics are based on the assumption that the data come from a probability distribution and makes assumptions about the parameters of that distribution. In this thesis, it is assumed that the data on stock market returns are drawn from a normal distribution. This assumption is similar to, among others, French (1980). By means of this assumption, it is possible to use the t-test, a parametric test.. An alternative would be to use non-parametric tests, which do not make assumptions about the model structure a priori, but determine the model structure from the data. Rozeff and Kinney (1976) for example used, among other statistical tests, the Kruskal-Wallis test to test the hypothesis that all populations from which their samples are determined all have the same population distribution. The Kruskal-Wallis test can determine whether the population distributions are identical, without assuming them to have a normal distribution. Therefore it can solve kurtosis, but it cannot solve skewness. Another alternative would be the use of regression dummies. A regression dummy takes on the value of 1 if a certain effect is present and takes on the value of 0 if it is absent. For example, the effect of each trading day of the week on the stock market index return can be determined by using regression dummies for each day of the week.

Nonetheless, this thesis uses t-tests to obtain the results as is done by Gerlach (2007). For the January effect, the mean daily return of all trading days in January is compared with the mean daily return for the remaining months of the year. For the day-of-the-week effect / weekend effect the mean daily returns from all days of the week are compared with the mean daily return for the rest of the week, with a special focus on Monday and Friday returns. Now remember that the weekend effect states that Monday returns tend to be lower and Friday returns tend to be higher than mean daily returns for the rest of the week. For the turn-of-the-month effect the mean daily return is determined for the four day period around the turn-of-the-month, starting with the last trading day of the month and ending on the third trading day of the following month. This period is chosen, because it is widely used in previous research, for example Lakonishok and Smidt (1988), Ogden (1990) and Agrawal and Tandon (1994). Finally, to test for the Halloween effect, the mean daily return of the months November until April is compared with the mean daily return from April until October. The choice of this period to test for the Halloween effect is equal to, among others, Bouman and Jacobsen (2002) and Jacobsen and Visaltanachoti (2009).

After testing the presence of the stock market calendar anomalies on all trading days, the mean daily returns are computed separately for announcement days and non announcement days. For the anomaly periods and for the remaining trading days, a t-test is again computed to test the significance of the differences between the mean daily returns on announcement days and non announcement days.

Finally, the presence of the stock market anomalies is calculated one more time, only now for non announcement days only. This is done to test whether or not the outcome of macroeconomic news can be an explanation for one or more of the anomalies. In the next chapter, the results of the tests described above will be presented and discussed.

CHAPTER 5 Results

This section gives an overview of the results of this thesis. Each of the four parts in this section deals with one of the four calendar anomalies under investigation. Sequentially, the results are presented for the January effect, the day-of-the-week effect, the turn-of-the-month effect and the Halloween effect. The results of the tests on the existence of each particular anomaly for all trading days on every index are discussed first. Thereafter, the calculated mean daily returns are given subdivided into announcement days and non announcement days.

5.1 January effect

Table 4 presents the mean daily return for every month of the year on all four indices considered in this thesis, including the number of days. The mean daily return of each month is compared with the mean daily return of the remaining months of the year, for which a t-test is computed. The p-value represents the outcome of each t-test.

Table 4:		*January effect*								
		U.S.					*U.K.*			
		S&P 500		*CRSP EW*			*FTSE all-share*		*FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
January	585	0.0848	0.3078	0.2867	0.0000	466	0.0598	0.5411	0.1566	0.0000
All other months	6354	0.0397		0.0746		4965	0.0317		0.0188	
February	537	0.0137	0.4818	0.1071	0.6290	443	0.0747	0.3473	0.1165	0.0023
All other months	6402	0.0460		0.0914		4988	0.0305		0.0230	
March	614	0.0299	0.7295	0.0650	0.3228	478	0.0369	0.9455	0.0296	0.9674
All other months	6325	0.0449		0.0953		4953	0.0338		0.0307	
April	577	0.0686	0.5384	0.0981	0.8494	436	0.0824	0.2669	0.0943	0.0247
All other months	6362	0.0413		0.0921		4995	0.0299		0.0251	
May	592	0.0669	0.5605	0.1287	0.2055	445	0.0312	0.9459	0.0654	0.2157
All other months	6347	0.0414		0.0893		4986	0.0344		0.0275	
June	599	0.0276	0.6890	0.0680	0.3840	470	-0.0101	0.2901	-0.0255	0.0390
All other months	6340	0.0450		0.0950		4961	0.0383		0.0360	
July	571	0.0183	0.5388	0.0224	0.0157	464	0.0319	0.9576	-0.0286	0.0306
All other months	6368	0.0458		0.0989		4967	0.0343		0.0362	
August	597	0.0086	0.3829	0.0459	0.0996	444	-0.0035	0.3838	-0.0060	0.1913
All other months	6342	0.0468		0.0970		4987	0.0374		0.0339	
September	548	-0.0467	0.0313	0.0052	0.0033	451	-0.0619	0.0247	-0.0993	0.0000
All other months	6391	0.0513		0.1001		4980	0.0428		0.0424	
October	597	0.0715	0.4850	0.0438	0.0854	464	0.0090	0.5510	-0.0464	0.0049
All other months	6342	0.0409		0.0972		4967	0.0364		0.0378	
November	550	0.0999	0.1782	0.1420	0.0959	450	0.0410	0.8718	0.0330	0.9335
All other months	6389	0.0387		0.0884		4981	0.0335		0.0304	
December	572	0.0759	0.4289	0.0978	0.8595	420	0.0978	0.8595	0.0878	0.0481
All other months	6367	0.0406		0.0922		5011	0.0922		0.0258	

For the U.S., as can be seen from table 4, the mean daily return for January for the S&P 500 is 0.0848%. Although this is (with the exception of November) the highest mean daily return for any month on the S&P 500, it is not significantly different from the mean daily return of all other months at any useful significance level (p-value of 0.3078). This is not surprising, because the January effect is characteristic for smaller firms (among others Banz 1981 and Keim 1983). Table 1 confirms this with a mean daily return for January on the CRSP EW of 0.2867% (against 0.0746% for the remaining months of the year), by far the largest return for any month on the CRSP EW. The difference of this return with the mean daily return of the remaining months of the year is furthermore significant at the 1% significance level with a p-value of 0.0000. These results are practically the same as the findings of Gerlach (2007), who reports a mean daily return for January on the CRSP EW index of 0.30% and 0.08% for the remaining months of the year (see table 2 in Appendix A).

Table 4 also presents the results for the U.K. For the FTSE all share index, January is the month with the highest mean daily return apart from February, April and December. Nevertheless, the difference between the 0.0598% mean daily return for January and the 0.0317% mean daily return for the remaining months of the year is not significant at all with a p-value of 0.5411. Again, this is no surprise , because the January effect is particularly characteristic for small firms. This can also be concluded from the outcomes in table 4 for the FTSE small cap index. Although the mean daily returns for January, February, September and October are all significantly different from the mean returns for the remaining months of the year at the 1% significance level, January is by far the month with the highest mean daily return with 0.1566%.

At last, table 4 illustrates a remarkable low mean daily return for September on all four indices. This mean daily return is significantly different from the mean daily return for the remaining months at the 1% significance level for CRSP EW and FTSE small cap index and at the 5% significance level for the S&P 500 and the FTSE all share index, but will not be further investigated in this thesis.

The conclusion from table 4 is that the January effect is present and highly significant at the 1% significance level for the CRSP EW index in the U.S. and for the FTSE small cap index in the U.K. For the S&P 500 index in the U.S. and the FTSE all share index in the U.K., the January effect is not present.

After this discovery of the January effect on the CRSP EW index and the FTSE small cap index on all trading days in the sample period, the returns for January compared to the remaining months of the year were calculated for announcement days and non announcements days separately. A trading day is classified as announcement day if at least one announcement took place on that particular day. Part A of table 5 presents the results of those calculations. For the CRSP EW index, the mean daily return for January on announcements days (0.2735%) is slightly lower than the mean daily return for January on non announcement days (0.2974%), but the difference is not significant at all (p-value 0.6976). For the remaining months of the year, the mean daily return is 0.0975% on announcement days and 0.0608% on non announcement days. The difference between those means is nearly significant at the 5% significance level with a p-value of 0.0502. For the FTSE small cap index the mean daily return for January (0.1114%) on announcement days is also lower than on non announcements days (0.1765%), but the difference is not significant at any useful significance level with a p-value of 0.1898. For the remaining months of the year the difference is very small (0.0277% for announcement days and 0.0152% for non announcement days) and therefore not significant at all.

Table 5:	***January effect on ann. days and on nonann. days***					
	Part A. Announcements days versus nonannouncement days					
		U.S. CRSP EW			*U.K. FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*
January						
Announcements days	230	0.2735	0.6976	142	0.1114	0.1898
Nonannouncement days	355	0.2974		324	0.1765	
All other months						
Announcements days	2395	0.0975	0.0502	1450	0.0277	0.5233
Nonannouncement days	3959	0.0608		3515	0.0152	
	Part B. Nonannouncement days					
		U.S. CRSP EW			*U.K. FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*
January	355	0.2974	0.0000	324	0.1765	0.0000
All other months	3959	0.0608		3515	0.0152	

Part B of table 5 contains the results of a t-test for the difference in mean daily returns between non announcement days for January and non announcement days for the rest of the year. This is done to test whether the January effect is still present if all announcement days are left out of the sample. As can be seen in part B of table 5, the January effect is still highly significant for both the CRSP EW index and the FTSE small cap index with p-values of 0.0000. For both the indices it even became slightly more significant. Gerlach (2007) also reported a January effect for the CRSP EW index which is still highly significant for nonannouncement days only, as his results in table 4 of his research illustrate (Appendix A).

5.2 Day-of-the-week effect

In table 6, the results are presented of the investigation of the presence of the day-of-the-week effect on all four indices considered. The day-of-the-week effect or weekend effect states that the mean daily return on Monday is significantly lower and the mean daily return on Friday is significantly higher compared to the remaining days of the week.

For the U.S. table 6 tells us for the S&P 500 that Monday is the day with the lowest mean daily return. Nevertheless, none of the days of the week has a significantly different mean return compared to the remaining days of the week. Regarding the U.S., the opposite counts for the CRSP EW index, where every day of the week has a mean daily return which is significantly different from the mean daily return for the remaining days of the week at the 1% significance level. Clearly visible, however, is that Monday is by far the least performing day of the week with a largely negative mean daily return of -0.0787%. Furthermore, Friday is by far the day of the week with the highest mean daily return of 0.2325%.

The results for the U.K. are also presented in table 6. For both the FTSE all share index and the FTSE small cap index, Monday is the day with the lowest mean daily return and Friday the day with the highest mean daily return. The Friday mean return of the FTSE all share index is significantly different from the remaining days of the week at the 5% significance level with a p-value of 0.0305. The Monday mean return is significantly different from the remaining days of the week at the 5% significance level as well with a p-value of 0.0231. For the FTSE small cap index, the mean return for Monday is also significantly different from the remaining days of the week at the 5% level with a p-value of 0.0293, while the Friday mean return is even significantly different from the remaining days of the week at the 1% level with a p-value of 0.0084.

Table 6:		*Day-of-the-week effect*								
		U.S.					*U.K.*			
		S&P 500		*CRSP EW*			*FTSE all-share*		*FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
Monday	1317	0.0102	0.1881	-0.0787	0.0000	1011	-0.0270	0.0231	-0.0075	0.0293
All other days	5622	0.0514		0.1328		4420	0.0481		0.0394	
Tuesday	1421	0.0623	0.4387	0.0212	0.0000	1106	0.0303	0.8812	-0.0017	0.0508
All other days	5518	0.0387		0.1110		4325	0.0351		0.0389	
Wednesday	1422	0.0881	0.0653	0.1391	0.0067	1113	0.0284	0.8226	0.0209	0.5541
All other days	5517	0.0321		0.0807		4318	0.0356		0.0331	
Thursday	1395	0.0174	0.2860	0.1410	0.0053	1112	0.0447	0.6760	0.0640	0.0424
All other days	5544	0.0501		0.0804		4319	0.0314		0.0221	
Friday	1384	0.0366	0.7780	0.2325	0.0000	1089	0.0897	0.0305	0.0747	0.0084
All other days	5555	0.0453		0.0578		4342	0.0202		0.0196	

The conclusion that can be drawn from table 6 is that the day-of-the-week effect / weekend effect is present on the CRSP EW index in the U.S. and the FTSE small cap index and FTSE all share index in the U.K. although for the last index less pronounced.

For the indices on which the day-of-the-week effect is found, the mean returns for Monday and Friday are investigated again, only now separately for announcement days and for non announcement days. Part A of table 7 presents the results for the three indices. The Monday mean return is less negative on the CRSP EW index on non announcement days compared to announcement days (-0.0663% against -0.1877%), but the difference is not significant on at least the 5% significance level with a p-value of 0.1077. For the FTSE-all share index the Monday mean return for non announcement days is higher than on announcement days as well, but the difference is not significant either (p-value 0.1328). For the FTSE small cap index, the Monday mean return between announcement days and non announcement days does not differ much. Regarding Friday returns, the difference between announcement and non announcement days is significant at the 1% significance level for the CRSP EW index, with 0.1952% for announcement days and 0.2925% for non announcement days. For both the indices for the U.K., the mean daily returns on Friday do not differ much between announcement days and non announcement days.

Table 7: ***Day-of-the-week effect on ann. days and on nonann. days***

Part A. Announcements days versus nonannouncement days								
	U.S.			*U.K.*				
	CRSP EW			*FTSE all-share*			*FTSE small cap*	
Day	*n*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
Monday								
Announcements days	135	-0,1877	0,1077	347	-0,0966	0,1328	-0,0043	0,9250
Nonannouncement days	1182	-0,0663		664	0,0094		-0,0091	
All other days								
Announcements days	2490	0,1292	0,7287	1245	0,0635	0,4835	0,0461	0,6272
Nonannouncement days	3132	0,1356		3175	0,0420		0,0367	
Friday								
Announcements days	853	0,1952	0,0086	219	0,1084	0,7272	0,0784	0,9127
Nonannouncement days	531	0,2925		870	0,0849		0,0738	
All other days								
Announcements days	1772	0,0733	0,2819	1373	0,0159	0,8421	0,0282	0,5420
Nonannouncement days	3783	0,0505		2969	0,0221		0,0156	
Part B. Non announcement days								
	U.S.			*U.K.*				
	CRSP EW			*FTSE all-share*			*FTSE small cap*	
Day	*n*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
Monday	1182	-0,0663	0,0000	664	0,0094	0,4263	0,0089	0,0736
All other days	3132	0,1356		3175	0,0420		0,0367	
Friday	531	0,2925	0,0000	870	0,0849	0,0899	0,0738	0,0120
All other days	3783	0,0505		2969	0,0221		0,0156	

In part B of table 7 a t-test is conducted for the difference in mean daily returns on non announcement days for Monday and Friday and on non announcement days for the remaining days of the week. By doing so, the day-of-the-week effect / weekend effect is tested by only including non announcement days. Part B of table 7 tells us that the day-of-the-week effect / weekend effect is still highly significant on the CRSP EW with p-values of 0,0000. Comparing to the results in table 6, the effect became even more pronounced when looking at Friday returns. For the U.K., the results are different form the U.S. While the day-of-the-week effect was significant for Monday returns on the FTSE all share index with all trading days included, it is not significant anymore when only non announcement days are considered. With all trading days considered, the day-of-the-week effect was significant on at least the 5% significance level, while it is only significant for Friday returns on the FTSE small cap index when only non announcement days are included (p-value 0.0120).

The conclusion from table 9 is that, when only non announcement days are considered, the day-of-the-week effect is still present in the U.S. on the CRSP EW index, while in the U.K. the day-of-the-week effect is not present anymore on the FTSE all share index and became less pronounced on the FTSE small cap index.

5.3 Turn-of-the-month effect

The turn-of-the-month effect states that the mean daily return for the days surrounding the turn of the month is significantly higher compared to the remaining days of the month. To test for the turn-of-the-month effect, the mean daily returns are calculated for the period starting with the last trading day of the month and ending with the third trading day of the following month. The mean daily return for this turn-of-the-month period is thereafter compared with the mean daily return for the remaining days of the month. The results of these tests are presented in table 8. For all four indices, the mean daily return for the turn-of-the-month period is higher than the mean daily return for the remaining days of the month. Moreover, these differences are for every index highly significant at the 1% significance level. This implies that there is a turn-of-the-month effect for all four indices investigated. Gerlach (2007) reported a turn-of-the-month effect for the S&P500 index which is significant at the ten percent significance level (with a p-value of 0.09) when all trading days are considered. Appendix A contains table 2 of the research of Gerlach (2007), which illustrates this result.

Table 8: ***Turn-of-the-month effect***

	U.S.					U.K.				
		S&P500		CRSP EW			FTSE All-Share		FTSE small cap	
Part of the month	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
Last day and first 3 days	1320	0.1204	0.0024	0.2198	0.0000	1031	0.1242	0.0007	0.0873	0.0010
All other days	5619	0.0255		0.0627		4400	0.0130		0.0174	

After finding the turn-of-the-month effect by using all trading days, the mean daily returns are calculated again by dividing the trading days into announcement days and non announcement days. Part A of table 9 provides information on the outcomes. For both indices in the U.S., the mean daily return for the turn-of-the-month period is clearly higher for announcement days when compared to non announcement days. It is remarkable that the opposite pertains for the U.K., where for both indices the mean daily return for the turn-of-the-month period is lower on announcement days than on non announcement days. Nevertheless, none of the differences are significant on at least the 5% significance level. For the remaining days of the month, the mean daily return is higher on announcement days for all four indices considered, although the difference with non announcement days is only significant at the 1% significance level for the CRSP EW index with a p-value of 0.0051.

Table 9:		*Turn-of-the-month effect on ann. days and on nonann. days*								
		Part A. Announcements days versus nonannouncement days								
		U.S.					*U.K.*			
		S&P 500		*CRSP EW*			*FTSE All-Share*		*FTSE small cap*	
Part of the month	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
Last day and first 3 days										
Announcements days	248	0.1900	0.2218	0.2932	0.0838	51	0.0045	0.3367	-0.0445	0.0861
Nonannouncement days	1072	0.1043		0.2029		980	0.1304		0.0941	
All other days										
Announcements days	2376	0.0547	0.0682	0.0941	0.0051	1541	0.0294	0.4022	0.0378	0.1140
Nonannouncement days	3243	0.0041		0.0398		2859	0.0041		0.0064	
		Part B. Nonannouncement days								
		U.S.					*U.K.*			
		S&P 500		*CRSP EW*			*FTSE All-Share*		*FTSE small cap*	
Part of the month		*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*		*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
Last day and first 3 days	1072	0.1043	0.0059	0.2029	0.0000	980	0.1304	0.0004	0.0941	0.0001
All other days	3243	0.0041		0.0398		2859	0.0041		0.0064	

To test whether or not the turn-of-the-month effect is still present on the indices when only non announcement days are considered, for each index a t-test is conducted on the difference between the mean daily return for the turn-of-the-month period and the mean daily return for the remaining days of the month. Part B of table 9 contains the outcomes of these t-tests. For all four indices, the turn-of-the-month effect is still highly significant at the 1% significance level with p-values smaller than 0.01. The effect became slightly less significant for the S&P 500 and almost unchanged for the CRSP EW, whereas the significance increased in the U.K. for both indices. In contrast, Gerlach (2007) illustrates in table 4 of his research that the turn-of-the-month effect is not significant anymore for the S&P500 index when only nonannouncement days are considered (see Appendix A).

5.4 Halloween effect

The Halloween effect states that the mean daily return for the months November – April is lower compared to the mean daily return for the remaining months of the year. To test for this effect, the mean daily returns for both periods are calculated for each index and the results are presented in table 10. For the S&P500, the mean daily return is 0.0253% for the period November – April against 0.0621% mean daily return for the remaining months of the year. Nonetheless the difference is not statistically significant. For the other index considered in the U.S., as well as for both indices in the U.K., the difference in mean daily returns between the two periods is highly significant at the 1% significance level.. The conclusion concerning table 10 is therefore that the Halloween effect is present on the CRSP EW index in the U.S. and on both the FTSE all share index and FTSE small cap index in the U.K.

Table 10:							*Halloween effect*			
	U.S.					*U.K.*				
		S&P 500		*CRSP EW*			*FTSE All-Share*		*FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
November - April	3504	0.0253	0.1345	0.0531	0.0000	2738	-0.0005	0.0067	-0.0238	0.0000
All other months	3435	0.0621		0.1329		2693	0.0693		0.0860	

For the indices on which the Halloween effect is found, the mean daily returns for the November – April period and the remaining months of the year are computed again, only now separately for announcement days and non announcement days. Part A of table 11 tells us that the difference between announcement days and non announcements days is only significant at the 5% significance level for the November – April period on the CRSP EW index. For the remaining months on the CRSP EW index and for both periods on the two indices for the U.K., the differences in mean daily returns between announcement and non announcements days are small and insignificant.

Table 11:					***Halloween effect on ann. days and on nonann. days***			
				Part A. Announcements days versus nonannouncement days				
	U.S.			*U.K.*				
	CRSP EW				*FTSE all-share*		*FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
November - April								
Announcements days	1320	0.0947	0.0108	793	-0.0083	0.7988	-0.0316	0.6996
Nonannouncement days	2184	0.0280		1945	0.0027		-0.0206	
All other months								
Announcements days	1305	0.1313	0.9128	799	0.0652	0.8756	0.1014	0.3427
Nonannouncement days	2130	0.1339		1894	0.0710		0.0795	
				Part B. Nonannouncement days				
	U.S.			*U.K.*				
	CRSP EW				*FTSE all-share*		*FTSE small cap*	
Month	*n*	*Mean % daily return*	*p-value*	*n*	*Mean % daily return*	*p-value*	*Mean % daily return*	*p-value*
November - April	2184	0.0280	0.0000	1945	0.0027	0.0276	-0.0206	0.0000
All other months	2130	0.1339		1894	0.0710		0.0795	

In compliance with the other calendar anomalies, the Halloween effect is investigated again by using only the non announcement days. The results in Part B of table 11 indicate that the Halloween effect is still highly significant at the 1% level for the CRSP EW index in the U.S. and the FTSE small cap index in the U.K. On the CRSP EW the effect became even slightly stronger compared to table 11, while the effect for the FTSE small cap index practically remained the same. For the FTSE all share index the Halloween effect became less significant compared to table 13 and is now only significant at the 5% significance level.

CHAPTER 6 Conclusion

This thesis investigates the influence of macroeconomic news announcements on stock market returns and stock market calendar anomalies in particular. Stock market calendar anomalies relate to patterns in stock market returns within a calendar year. They indicate that not all relevant information is captured in stock prices, which is inconsistent with the EMH. Previous literature concerning four different stock market calendar anomalies is discussed in the first part of this thesis. For the January effect, which was first reported by Rozeff and Kinney (1976), the main explanations are described. Banz (1981) and Keim (1983) found that the January effect is particularly pronounced within small capitalization firms. Others, like Reinganum (1983), Gultekin and Gultekin (1983), Poterba and Weisbenner (2001) attribute the January effect to the tax loss selling hypothesis. This hypothesis states that investors sell stocks at the end of the year for tax purposes, which leads to lower stock prices and thereby higher stock market returns in January. A coherent explanation for this comes from Ritter (1988), who introduces the parking-the-proceeds hypothesis. This hypothesis claims that the January effect is caused by the buying and selling behaviour of individual investors. Alternative explanations come from Rogalski and Tinic (1986), who assume that a higher beta for stocks in January (especially for small firms) explains the higher returns and from Keim (1989), who states that the January effect is partially attributable to systematic movements in the bid-ask spread at the turn of the year.

Ariël (1987) was the first author who came forward with the turn-of-the-month effect. Lakonishok and Smidt (1988) investigated the turn-of-the-month period further and found a particularly high return for a four-day period surrounding the turn-of-the-month starting with the last trading day of the month and ending with the third trading day of the following month.. Ogden (1990) introduced the turn-of-month liquidity hypothesis, which claims that the payment system (partly) causes the turn-of-the-month effect, because the majority of the cash flows takes place at the end of each month. Cadsby and Ratner (1991) explored the possibility that the turn-of-the-month effect is a reflection of the turn-of-the-year effect or a consequence of window dressing at the end of each quarter. Nonetheless, they did not find evidence that either of them has substantial influence on the turn-of-the-month effect.

The weekend effect, which refers to higher stock market returns on Friday and lower stock market returns on Monday compared to the remaining days of the week, was first reported by Cross (1973). A few years later, French (1980) presented similar results. Possible explanations for the weekend effect came from Gibbons and Hess (1981), Jaffe and Westerfield (1985), French and Roll (1986), and Agrawal and Tandon (1994). Gibbons and Hess (1981) state that the settlement period explains the lower stock market returns on Monday before February 1968, because the settlement period was four business days before February 1968 and five business days after February 1968. Nonetheless, the settlement period does not explain the more negative stock market returns on

Monday after February 1968. In contrast, Jaffe and Westerfield (1985) found very little evidence on the settlement period being an explanation for the weekend effect. In their research, they explore the possibility of measurement errors as a cause of the weekend effect, but the results on the correlation between Monday and Friday returns reject this possibility. French and Roll (1986) survey returns on weekdays, weekend days, holidays and holiday weekends and relate differences in stock market returns for each particular day to the release of public and private information. Agrawal and Tandon (1994) investigated the stock market returns for each trading day separately and found low Monday and Tuesday returns and high Wednesday and Friday returns on many of the 18 indices of different countries in their research. For the low Tuesday returns they try to find explanations. They present the time zone hypothesis, which states that Tuesday returns are low in some countries due to time-differences that exceed twelve hours, as a possible explanation for some of the countries with low Tuesday returns. Nonetheless, the time zone hypothesis cannot explain the low Tuesday returns in European countries. Furthermore, Agrawal and Tandon (1994) found that the settlement period can explain part of the day-by-day differences, but mainly for Wednesday, Thursday and Friday returns, but not for the low Monday and Tuesday returns.

The Halloween effect, which refers to lower stock prices during the period May – October compared to the returns during November – April, was first presented by Bouman and Jacobsen (2002). A few years later, Jacobsen and Visaltanachoti (2009) investigated whether this Halloween effect is sector-specific. They found that the Halloween effect is strongest for production sectors and sectors related to raw materials, while it is weakest for defensive consumer-oriented sectors. Moreover, they found that a sector rotation strategy leads to higher returns compared to the market as a whole throughout the entire year.

Besides the previous research on stock market calendar anomalies, this thesis also describes articles related to the influence of macroeconomic news on stock market returns. Chen, Roll and Ross (1986) came to the conclusion that from their total set of macroeconomic variables, the growth rate in industrial production and the change in the risk premium and yield curve are highly significant in explaining expected stock returns. McQueen and Roley (1993), Boyd et al (2005) and Andersen et al. (2007) investigated the influence of macroeconomic news on stock market returns, thereby looking at the state of the economy. McQueen and Roley (1993) concluded that the market's response to macroeconomic news depends on the state of the economy. This is especially the case for higher than expected real activity, which leads to lower stock prices when there is high economic activity (a strong economy), but leads to higher stock prices when there is low economic activity (a weak economy). Boyd et al. (2005) investigated the influence of unemployment rate announcements and concluded that stock markets rise in response to bad employment news during expansions and drop in response to bad employment news during contractions. The explanation that was given for these findings is that stock prices are most influenced by changes in the equity risk premium during expansions and most influenced by changes in expected future growth rate of dividends during contractions. Andersen et al. (2007) investigated the influence of a large set of macroeconomic variables by looking at the stock market returns ten minutes before until half an hour after every macroeconomic announcements. They also found that bad macroeconomic news has a negative influence on stock markets during contractions, but a positive influence during expansions. Flannery and Protopapadakis (2002) tested the impact of 17 different macroeconomic announcements on stock market returns and the volatility of the returns. They find that CPI and PPI announcements only affect the market returns, while Balance of Trade, Employment and Housing Starts only affect the volatility of the returns.M1 affects both returns and volatility. These results still hold after dividing the sample period into three sub-periods based on time and three sub-periods based on economic 'regimes'.

After the discussion on the previous literature concerning stock market calendar anomalies and the influence of macroeconomic news on stock market returns, this thesis tests the influence of macroeconomic news announcements on stock market returns and stock market calendar anomalies in particular for the U.S. and the U.K. For the U.S., daily closing prices are used of the S&P500 index and the CRSP EW index from January 1st 1980 – June 30th 2007. For the U.K. daily closing prices are used of the FTSE all share index and the FTSE small cap index from January 1st 1986 – June 30th 2007. Furthermore, with respect to the U.S., the announcement dates are used regarding GDP, Monetary Policy events, CPI, PPI, Industrial Production, Retail Sales, Employment Report, Trade Balance, Housing Starts, Beige Book, Durable Goods Shipments and Business Sales & Inventories. For the U.K., the announcement dates of the same macroeconomic variables are used, with the exception of Beige Book, Housing Starts, Advance Durable Goods Shipments and Business Sales & Inventories.

The presence of each stock market calendar anomaly is first tested for all trading days and subsequently for non announcement days only. The results demonstrate that the January effect is present and highly significant on the CRSP EW index for the U.S. (which is in line with the results of Gerlach 2007) and on the FTSE small cap index in the U.K when all trading days are considered. When only nonannouncements days are considered, the January effect stays highly significant on both indices and becomes even slightly more significant. Gerlach (2007) also reported a January effect on the CRSP EW index which is still highly significant when only nonannouncement days are considered. For all trading days, the day-of-the-week effect / weekend effect is present on the CRSP EW index in the U.S. and the FTSE small cap index and FTSE all share index in the U.K. although for the last index less pronounced. When announcement days are left out, the day-of-the-week effect is still highly significant for the CRSP EW index, while in the U.K. it is not present anymore on the FTSE all share index and became less pronounced on the FTSE small cap index. The turn-of-the-month effect is present and significant at the 1% significance level for all four indices captured in this thesis when all trading days are considered. For nonannouncements days, the turn-of-the-month effect is still significant at the 1% significance level for all four indices. These results are in contrast with the research of Gerlach (2007), who reported that the turn-of-the-month effect is not significant anymore on the S&P500 index when only nonannouncement days are considered. A possible explanation for this relates to the definition of the turn-of-the-month period. Gerlach (2007) defines the turn-of-the-month period as the period starting with the last trading day of the month end ending on the eight trading day of the following month. This thesis uses the last four trading days of the month and the first four trading days of the following month as the turn-of-the-month period, based on previous literature. This difference in the definition of the turn-of-the-month period could be an explanation for the difference in results for the turn-of-the-month effect. The last anomaly investigated in this thesis, the Halloween effect, is present and significant at the 1% significance level on the CRSP EW index for the U.S. and on both the FTSE all share index and the FTSE small cap index for the U.K. when all trading days are considered. On non announcement days only, the Halloween effect is still present for these three indices, although for the FTSE all share index at the 5% significance level with a p-value of 0.0276.

The main research question of this thesis is:
Are stock market calendar anomalies still present when trading days on which macroeconomic announcements were made are not considered?

Supported by the above findings, the answer to the main research question is that the January effect, the turn-of-the-month effect and the Halloween effect are still present when announcement days are not considered. The significance of the January effect and the turn-of-the-month effect is practically the same for non announcement days and for all trading days, while the Halloween effect decreased in significance for the FTSE all share index. For the day-of-the-week effect / weekend effect the results are different. This anomaly is less pronounced for the FTSE small cap index on non announcement days only and no longer significant at any useful significance level for the FTSE all share index. With respect to the dataset used in this thesis, the conclusion might be that macroeconomic news announcements have little to no influence on stock market calendar anomalies in the U.S. and the U.K.

6.2 Suggestions for further research

This thesis used the dates of macroeconomic announcements. To expand this research, expectations of these macroeconomic variables could also be included. When expectations are included, a distinction can be made between positive and negative macroeconomic news. Consequently, the influence of macroeconomic announcements on stock market calendar anomalies can be investigated separately for positive macroeconomic news announcements and for negative macroeconomic news announcements.

Another suggestion for further research is to make adjustments to the methodology and dataset used in this thesis. With respect to the methodology, this thesis made the assumption that stock market returns are normally distributed. Succeeding research could for example use statistical tests to examine first whether the stock market returns are indeed normally distributed. This might influence further methodology and consequently the main results of the research, because non-parametric tests has to be performed when stock market returns turn out not to be normally distributed. In general, many different statistical tests can be performed, which can influence the main results.

Regarding the dataset, the sample period can be corrected for certain periods which can be classified as outliers. This was for example done by Maberly and Pierce (2004), discussed earlier in this thesis. They argue that the Halloween effect is mainly caused by two outliers: the crash in world equity prices in October 1987 and the collapse of the hedge fund Long-Term Capital Management in August 1998. Again, such adjustments could of course influence the main results in this thesis.

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APPENDIX A Main results Gerlach (2007)

TABLE 2. Calendar and Weather Anomalies from 1980 to 2003.

Anomaly	Mean Daily Return	*n*	*t*-stat (*p*-value)
Turn of the month			
Turn of the month	.0007	2,591	1.69
All other days	.0002	3,467	(.09)
January			
January	.0030	505	6.77
All other months	.0008	5,553	(.00)
Fall			
Fall days	.0009	1,528	2.01
All other days	.0003	4,530	(.04)
Lunar			
Full moon	.0015	208	2.12
Last quarter	−.0006	209	(.03)
Rainfall			
Rain	−.0007	476	2.39
No rain	.0005	3,165	(.02)
Temperature			
Moderate	.0010	740	1.90
Extreme	−.0003	321	(.06)

TABLE 4. Calendar and Weather Anomalies on Trading Days with No Macroeconomic Announcements from 1980 to 2003.

Anomaly	Mean Daily Return	*t*-stat (p-value)
Turn of the month		
Turn of the month	.0004	1.26
All other days	.0000	(.21)
January		
January	.0026	4.60
All other months	.0007	(.00)
Fall		
Fall	.0007	1.53
All other days	.0001	(.13)
Lunar		
Full moon	.0010	1.22
Last quarter	−.0004	(.22)
Rainfall		
Rain	−.0005	1.45
No rain	.0004	(.15)
Temperature		
Moderate	.0005	.53
Extreme	.0000	(.60)

APPENDIX B Example weekly overview announcements

[Table]
May 22, 2000

THOMSON
PERIOD SCHEDULED PREVIOUS GLOBAL
INDICATOR COVERED RELEASE ACTUAL FORECAST
GDP (prelim.) 1st. qtr. Thursday + 5.4% + 5.2%

Chain wghtd 1st. qtr. Thursday + 2.6% + 2.7%
price index

Initial week to Thursday 276,000 280,000
jobless claims May 20

Existing home April Thursday 4.83 mil. 4.90 mil.
sales

Durable April Friday + 2.6% - 0.5%
goods

Personal April Friday +0.7% +0.6%
income

Personal April Friday + 0.5% + 0.4%
consumption

Source: Thomson Global Markets

APPENDIX C Abbreviations

AMEX	American Stock Exchange
CRSP	Center for Research in Security Prices
CPI	Consumer Price Index
DJ	Dow Jones
EMH	Efficient Market Hypothesis
EW	Equally weighted
FOMC	Federal Open Market Committee
FTSE	Financial Times Stock Exchange
GDP	Gross Domestic Product
ISM	Institute for Supply Management
M/B	Market-to-book value
NASDAQ	National Association of Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
PPI	Producer Price Index
SAD	Seasonal effective disorder
S&P	Standard & Poor’s
U.S.	United States
U.K.	United Kingdom