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SEASONAL ANOMALIES IN FINANCIAL MARKETS: THE APPEARANCE OF MONTHLY EFFECT AND DAY-OF-THE-WEEK EFFECT IN THE FINNISH STOCK MARKET

Graduation thesis

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ABSTRACT

Against the efficient market hypothesis, there are anomalies in financial markets, which might make it possible for investors to predict future stock prices. The aim of the research is to examine whether seasonal anomalies, monthly effects and day-of-the-week effects, have appeared in the Finnish stock market during the years 2003-2018. The linear regression model in Excel and in Gretl are used to examine the research question. The hypothesis is that the markets should be efficient, which means that seasonal anomalies should not appear in the markets. The main results indicate that the best-known anomalies have disappeared from the Finnish stock market, but instead the most negative stock returns appeared in June and the most positive in April. Among the weekdays, the most negative stock returns appeared on Fridays.

Keywords: Anomaly, Seasonal anomaly, Monthly effect, Day-of-the-week effect

INTRODUCTION

Efficient market hypothesis can be considered one of the most important theories in the field of finance. The theory states that stock prices fully reflect all the available information, and it is impossible for investors to predict future stock prices in order to gain excess returns. There are many different kinds of anomalies in financial markets, from which investors might benefit. Anomalies are evidences against the efficient market hypothesis. Over the last few decades, seasonal anomalies have been widely researched, especially the January effect and the day-of-the-week effect. January effect refers to the anomaly where average stock returns are higher in January than in other months of the year. The day-of-the-week effect refers to stock returns being lower in some days than others. Generally, the stock returns have been lowest on Mondays and highest on Fridays.

Because both of these anomalies have been widely researched, the results are divergent. Some studies have shown evidence that effects still occur and some state that the effects have weakened or even disappeared from the financial markets. Some studies have shown evidence that the January effect and day-of-the-week effect are more related to smaller companies.

Finnish stock markets are relatively small, which makes it interesting to examine whether January effect and day-of-the-week effect still appears in Finland. The effects are examined with the OMX Helsinki 25 index (OMXH25), which includes 25 most traded companies. The data is collected from the years 2003-2018. The objective of the research is to examine, with more recent data, whether January effect and day-of-the-week appear in the Finnish OMXH25 index.

Linear regression analysis with dummy-variables is used to empirically test the appearance of the effects. To conduct the analysis, Excel and Gretl are used. Regression analysis is made from the whole 15-year period. Also, 15 years are divided into three periods to examine whether the behaviour of stock returns has changed during these periods. The hypothesis is that markets are efficient and therefore these anomalies should not exist.

In the first chapter the following theories are introduced; perfectly competitive markets as theoretical market structure, efficient market hypothesis, and behavioural finance. These theories give a theoretical background for market anomalies. Also, January effect and day-of-the-week effect and previous findings from these effects are more widely discussed. The second part of the paper consists of data collection and research methods. Third and the last part of this paper includes the discussion of the regression analysis and results.

1. Theoretical background

1.1. Perfectly competitive markets

The model of perfectly competitive markets is very useful when studying financial markets. The model has three basic assumptions:

1) Price-taking
2) Product homogeneity
3) Free entry and exit

In perfectly competitive markets firms are price takers, which means that they take the market price as given. The decisions of individual firms have no impact on market price because each firm’s contribution to total market output is relatively small. The assumption of price-taking applies also to consumers. The contribution of each individual consumer on total industry output is relatively small, and individual consumers have no impact on market prices. “There are many independent firms and independent consumers in the market, all who believe – correctly – that their decisions will not affect prices”. (Pindyck, Rubinfeld 2018)

When the products of different companies in the market are perfect substitutes with one another, it means that the products are homogenous. Firms are not having the possibility to raise prices above their competitors without losing all of their business. The homogeneity of products ensures that there is a single market price. (Pindyck, Rubinfeld 2018)

The assumption of free entry and exit means that new companies can easily enter the industry without any special costs or exit if the business is not profitable. This assumption is important because it ensures that the competition is efficient. Companies can freely enter the industry where they see profit and also exit when they are generating losses. Consumers can change to a competitor if the current supplier raises prices. (Pindyck, Rubinfeld 2018)

According to Malkamäki and Martikainen (1990), when observing financial markets, the term perfect market is commonly used. In theory, financial markets are perfect when the following conditions occur:

1) Perfect competition occurs in the markets. All firms sell identical products and all firms are price-takers. In perfect competition, prices reflect demand and supply, and firms cannot earn excess profits. In the context of security markets, all individuals are trading at market prices.
2) Markets are frictionless; there are no taxes, transaction costs or restricting legislation.
3) Perfect information appears in the markets. Information is free and equally available to everyone.
4) Everyone operates rationally in the markets with the aim to maximize expected returns.

In reality, there are taxes and transaction costs in the markets. The information might not be free and getting the right information might take a lot of time (Knüpfer, Puttonen 2004). Even if all the conditions mentioned above are not fulfilled, the markets can still be efficient (Malkamäki, Martikainen 1990).

1.2. Efficient market hypothesis

Eugene Fama represented a theoretical concept about efficient markets in 1970. The theoretical concept about efficient markets, also known as an efficient market hypothesis (EMH), is one of the most used investment theories. Numerous financial theories are made based on the efficient market hypothesis. Efficient market hypothesis assumes that investors are always operating rationally in financial markets and that the security prices "fully reflect" all the available information about the market. The efficiency of markets means that with the all available information, it is impossible for investors to predict future stock prices. (Fama 1970)

Fama divided efficient market hypothesis into three variants

- Weak efficient market hypothesis
- Semi-strong efficient market hypothesis
- Strong efficient market hypothesis

According to the weak efficient market hypothesis, the stock prices are reflecting all the available information from history, such as the earlier evolution of the stock prices. This hypothesis states that it is impossible for investors to get excess returns. In the semi-strong efficient market hypothesis, in addition to historical information, stock prices are reflecting all the available public financial information. Annual financial reports and financial analysis reports are examples of public financial information. In semi-strong efficient markets, public information reflects to security prices. According to the strong efficient market hypothesis, the stock prices are reflecting all the available information, which includes historical, public and non-public information. In strong efficient market hypothesis, there is an assumption that all investors have, in addition to previously mentioned information, an access to unreleased or inside information. Inside information has a direct correlation with stock prices. Fama called inside information as monopolistic information. (Fama 1970)

Today, even if it cannot be ruled out entirely, no investor should have inside information. If there is a situation where an investor is having inside information, the usage of that information is not allowed. The restrictions about inside trading have changed a lot since Fama made his research about the topic in 1970. These three hypotheses are dependent on each other; if strong efficiency occurs, then also semi-strong efficiency must occur, if semi-strong efficiency occurs, then also weak efficiency must occur.

According to Mishkin (2016) “The term random walk describes the movements of a variable whose future values cannot be predicted (are random) because, given today’s value, the value of the variable is just as likely to fall as it is to rise”. An essential implication of the efficient market hypothesis is that the stock prices should follow a random walk where the main idea is that future changes in stock prices should, for all purposes be unpredictable. The future stock prices cannot be predicted based on past actions. The theory suggests that changes in the stock prices are independent of each other and have the same distribution. The evolution of investors tastes and the process of generating new information does not cause changes in return distributions. According to the random walk theory, all the changes in the stock prices are possible; the prices can increase, decrease or remain with the same probability. When the random walk theory occurs, financial markets can be considered as efficient. (Fama 1970)

According to Malkamäki and Martikainen (1990) in efficient markets, the best estimation of stock prices are the current stock prices. If over- or under-pricing of stocks occurs in the efficient markets, the prices tend to return to their normal level quickly, which is why investors cannot earn excess returns.

Financial markets are more efficient compared to many other markets such as markets for used cars. The reason for financial markets being so efficient is the efficiency and relatively easily accessible information. In addition, there are many different operators in the markets which increase the efficiency. Even if financial markets are considered relatively efficient, there are some factors which are causing inefficiency. The existence of anomalies in financial markets violates the efficient market hypothesis and are proof against efficient markets. (Knüpfer, Puttonen 2004)

Because equity prices do not remain random and the future values can be estimated, from the three forms of market efficiency, calendar effects are violating the weak form of efficiency. According to weak form of efficiency, stock prices are fully reflecting all past information. Still, seasonal anomalies make it possible to estimate future prices with past patterns and seasonalities.

1.3. Behavioural finance

Even if efficient market view can be considered as a benchmark against which market imperfections can be measured, behavioural finance questions the domination of the approach in academic teaching. Classical finance models fail to produce predictions that are even vaguely close to the real outcomes in financial markets (Montier 2002). Behavioural finance is often introduced in the context of efficient market hypothesis. The assumption in the efficient market hypothesis is, that only factor which drives investors is the profit maximization. This means that investors are operating rationally and aiming to maximize their expected rate of return. When investors get information concerning securities, they make a decision whether to buy, sell, issue or hold their securities based on their knowledge. The available information is directly related to the decisions of investors. Prices are composed according to the intersection of demand and supply curves. (Smith 2008)

It is earlier researched by psychologists that investors tend to be overconfident with their own judgements. Because investors tend to think that their own judgements are more relevant than others, they start to trade based on their own assumptions rather than based on pure facts (Mishkin 2016). Against the traditional exposition, investors might have other motives besides profit maximization. According to behavioural finance, cognitions and feelings of investors are affecting the way investors operate and think. Investors can, for example, try to avoid losses or be more willing to take risks. In this case, information processing is added in between the information and decision making (Smith 2008). As mentioned before, participants in the markets are expected to operate totally rationally. Still, people make irrational financial decisions, mostly based on their over-confidence or over-optimism. Behavioural finance tries to propose explanations for these irrational decisions. Behavioural finance supposes that markets are moved as much by psychological factors as by information from financial statements. (Montier 2002)

Some features of securities markets' behaviour are not well explained with the efficient market hypothesis, which is why behavioural finance also tries to find explanations to these features (Mishkin 2016). Behavioural finance as a concept would be an interesting way to approach anomalies in financial markets, but because the field of behavioural finance is quite young, most of the existing researches are made based on traditional finance theories.

1.4. Market anomalies

The word anomaly is defined as something different, abnormal, peculiar or not easily classified. A market anomaly, also knows as market inefficiency, is a situation where a security or a group of securities performs differently than expected in the efficient market hypothesis. Like mentioned in part 1.2, in efficient markets all the available information reflects directly to the security prices, which means that it should be impossible for investors to predict future returns. Anomalies are indicators of financial markets are operating inefficiently. Naik (2014) defined market anomalies as "Deviation from the presently accepted paradigm that is too widespread to be ignored, too systematic to be dismissed as random error and too fundamental to be accommodated by relaxing the normative system". There are many different kinds of anomalies in financial markets; some of them appear once and then disappears and some of them are appearing regularly and frequently. (Naik 2014).

As a research topic, anomalies are interesting for several reasons. Systematic risk, also known as market risk, is not the only factor affecting changes in stock prices. In addition, by utilizing anomalies it can be possible to create investment strategies, which can be beneficial to earn excess returns. Anomalies in financial markets can be divided into seasonal anomalies and to company-related fundamental anomalies.

The best-known company related fundamental anomalies are P/E-ratio effect and company size effect. According to company size effect stocks of smaller companies, taking the beta risk into consideration, generate higher returns than stocks of larger companies. Banz (1981) made research from The New York Stock Exchange (NYSE) stock returns from 40 years by dividing stocks to portfolios according to the size of the companies. The difference in stock returns between the stocks belonging to the smallest 20% and the largest 20% was approximately 19,8%. Benz considered this as an evidence against the capital asset pricing model (CAPM). CAPM is widely used in the field of finance and it measures the relationship between systematic risk and expected return for stocks. The size effect is not linear and in the market value and small firms are most affected by it (Banz 1979). The size effect is usually explained by the information hypothesis, the ownership structure of the company or by liquidity risk related to the stocks of smaller companies. Information hypothesis state that there is less information available from smaller companies, which leads researchers to analyse larger companies. Another explanation, the ownership structure of the company, means that the owners of smaller companies tend to be more interested to develop companies' operations than the leaders in larger companies. Developing of the operations can lead to stock returns to increase. (Malkamäki, Martikainen 1990)

Price/Earnings-ratio (P/E-ratio) measures the value of a company's current share price relative to its per-share earnings. P/E-ratio is one of the most used ratios when valuing the company's shares. It is observed that stocks of the companies with lower P/E-ratio have achieved higher returns than the same risk level stocks with higher P/E-ratio. It is also researched that there is a relation between size effect and P/E-ratio effect (Malkamäki, Martikainen 1990). The oldest significant findings of P/E-ratio anomaly were found in 1977 by Basu. Basu (1977) examined the anomaly in the years 1957-1971 and found out that companies with lower P/E-ratio had higher stock returns. The research gave evidence that companies with lower P/E-ratios had lower market value than companies with higher P/E-ratio. (Basu 1977)

In general, seasonal anomalies refer to stock returns being higher in the first half of the month than the second half, in other months than others, in other weekdays than others, before holidays and between Christmas and New Year. (Siegel 2014) The best known seasonal anomalies are the January effect and the day-of-the-week effect, which will be discussed in the chapters 1.4.1 and 1.4.2.

1.4.1. January effect and monthly effects

One of the first significant findings against the efficient market hypothesis was the January effect, which was discovered by Donald Keim in the early 1980s. From the seasonal anomalies, January effect is the most publicized (Siegel 2014). It is examined that in the financial markets stock returns are greater in January than in other months, especially smaller stocks tend to outperform. In this chapter, the most common factors behind January effect are explained.

The most researched reason for January effect is the tax-loss selling hypothesis. According to this hypothesis, investors tend to reduce their taxes by realizing losses at the end of the year, which causes depression in stock prices. After the year-end, stocks return to equilibrium levels, providing high returns in January. (Jones *et al.* 1987) According to Siegel (2014), there was no January effect before the introduction of income tax in 1913 in U.S. Siegel (2014) also points out that some countries do not have capital gain taxes and are still affected by January effect, for example Japan until 1989 and Canada until 1972. Most of the countries have tax year from January to December, but for example, in Australia, the tax year ends in June. Some of the researches state that even if some countries are not having the tax year similar to the calendar year, the January effect still occurs. This kind of findings indicates that the tax-loss hypothesis cannot be considered as the only factor behind the effect. (Jones *et al.* 1987)

Another explanation for January effect is the information hypothesis. Many companies have their fiscal year ending at the end of December. There can be uncertainty in the financial markets before the release of fiscal year end accounting information, causing depression in stock prices. When the information is published in January, the prices of stocks rise back to the equilibrium level. According to the information hypothesis, if the fiscal year ends in December, the stock returns should be lower in December than in January. In case of companies having fiscal year end in some other month than December, the stock returns of January should not differ significantly from the returns of other months.

Kim (2006) examined the information hypothesis as part of wide research. The sample consists of companies which have been listed in NYSE (The New York Stock Exchange) and AMEX (The American Stock Exchange) over the period 1972-2003. Kim divided companies to 12 groups according to the end of the fiscal year. The research resulted in only four of the 12 groups having lower returns in the fiscal year end month than in the next month, regardless of the size of the company. Also regardless of the month of fiscal year-end, stock returns were higher in January than in other months. The results of the research were incoherent with the information hypothesis.

Theory of portfolio rebalancing is also considered as an explanation for the January effect. According to portfolio rebalancing hypothesis, professional portfolio managers tend to change the composition of investments in a portfolio during the turn of the year. Haugen and Lakonishok (1988) in their research divided the theory into two parts; window dressing hypothesis and performance hedging hypothesis. According to window dressing hypothesis investors at the year-end sell the compositions which they estimate having the high risk. After the turn of the month investors might buy the compositions back, which causes the stock returns to increase in January. According to performance hedging hypothesis, investors are selling the compositions they estimate are not increasing their value in the future. After the turn of the month, investors buy new compositions to portfolios which causes stock prices to increase. Performance hedging can be considered as protection of stock returns, which is caused by the investors' willingness to maximize profits. The research of Haugen and Lakonishok (1988) states that the acts of portfolio managers might be the preliminary reason for January effect. Ten years after Haugen and Lakonishok research Lee, Porter and Weaver (1998) published research where they examined the behaviour of portfolio managers based on the research of Haugen and Lakonishok, with the aim to provide information whether window dressing hypothesis or performance hedging hypothesis is more related to January effect. As a result, research verified that the behaviour of portfolio managers explained the January effect, especially in the case of the stocks of smaller companies. In addition, the January effect is more caused by performance hedging related behaviour than by window dressing. (Lee *et. al.* 1998)

It is also examined that in the past, stocks underperformed during the summer months. This effect is called "Sell in May and Go Away", and it used to continue with "and come back on St. Leger's Day." This saying states that investors should divest their equity holdings in May and invest again on St. Leger's day, which is in mid-September. According to this effect, the stock returns should be lower from May to September compared to other months of the year. This effect is stated to be a result of the lower amount of market participants during warm summer months and summer holidays. (Bouman, Jacobsen 2002)

October effect, also known as Mark Twain effect, is also a well-known market anomaly. This anomaly states stock returns being lower during October compared to other months. The effect is stated to be driven by psychological reasons. Investors might feel nervous during October because dates for many historical market crashes have occurred during October, which might affect the behaviour of investors. (Balaban 1995)

There have been many anomalies in financial markets. Different anomalies have, or still do occur at different times among different stock markets. As Mark Twain wrote in the book Pudd'nhead Wilson in 1894, "October. This is one of the peculiarly dangerous months to speculate in stocks. The others are July, January, September, April, November, May, March, June, December, August, and February."

1.4.2 Day-of-the-week effect

Researches related to the day-of-the-week effect states that stock returns on certain days differ on average returns of other days. Assuming Monday being the first trading day of the week and Friday being the last, over the past 127 years, stock returns of Mondays have been significantly lower than other days, whereas the returns of Fridays have been the highest. The day-of-the-week effect is mainly attributable to the trading patterns of individual investors. According to this effect, it would be beneficial to sell stocks on Fridays and buy them on Mondays. The day-of-the-week effects are also called as Monday effect and Weekend effect. (Siegel 2014)

One possible reason for the Monday effect is the blue-Monday hypothesis. According to the hypothesis, investors are more pessimistic towards Mondays than to other days. This pessimistic attitude will result to decrease in investors willingness to buy or increase in their willingness to sell shares on Mondays (Gondhalekar and Mehdian 2003). The research of blue-Monday effect is challenging because pessimistic and optimistic attitudes depend on psychological factors. Another explanation for the Monday effect is an information release hypothesis. Usually, companies are publishing negative information at the end of the week to give investors two non-trading days to digest the information, which then depresses stock prices on Mondays. (Raj and Kumari 2006)

1.5 Previous studies

1.5.1 January effect and monthly effects

Before the concept of the efficient market hypothesis was represented, Owens and Hardy (in the early 1920s) stated that “Seasonal variations are impossible… If a seasonal variation in stock prices did exist, general knowledge of its existence would put an end to it.” After this, seasonal anomalies have been widely researched topics.

Keim (1983) and Reinganum (1983) both published their researches in the same publication of the Journal of Financial Economics. Both of these researches gave evidence that there is a significant relationship between the company size effect and January effect, which lead January effect to be considered to apply only to small companies. Keim (1983) researched the stability of company size effect using the data from NYSE and AMEX stocks from the years 1963-1979 and noticed that over 50% of the risk-adjusted excess stock returns of small firms concentrated to January. Keim also noticed that the January effect did strengthen between the years 1963-1979.

Technically January effect was considered to apply only on small firms until Kohers and Kohli (1991) made research which gave evidence that also large companies are affected by the effect. The research was made using the data from the years 1930-1988 from the S&P composite index, which consists of large firm securities. Research stated that apart from very few companies the stock returns in January were higher than in other months. According to researchers, this study is an evidence that the January effect appears regardless of the size of the company.

In 1983 Gultekin and Gultekin made remarkable research which gave an evidence that the January effect appears internationally, not only in the U.S. markets. This research tested the appearance of January effect in 17 developed countries: Australia, Sweden, Belgium, Canada, Spain, Holland, Denmark, France, Germany, Austria, Italy, Great Britain, Switzerland, Norway, Singapore, Japan and the United States. The indices used in the research were market adjusted and the time period was 1959-1979. The monthly seasonality of stock returns was noticed in 13 counties, of which 11 countries had fiscal year according to the calendar year. According to empirical results in these 13 countries, stock returns in January were significantly higher compared to other months. There is a possibility that the use of market adjusted indices did weaken the January effect because the weight of smaller companies is lower. This can be considered as an evidence that also internationally not only small companies are affected by the effect.

Berglund and Wahlroos were first to investigate January effect in the Finnish stock market with the data from Nasdaq Helsinki from the years 1970-1981. In their research, the January effect was noticed especially among smaller companies. The average stock returns in January were 2-6,5% higher than in other months, whereas stock returns for larger companies in January were 1,5-2,5% higher than in other months. The research gave evidence that, in addition to January, the higher stock returns appeared also in February. Even if the tax loss selling cannot wholly explain the January effect, also this research gave evidence that there is a relation. (Berglund and Wahlroos 1986)

After this, there have been many types of research made which have shown evidence of the appearance of the January effect in various countries. In addition, many types of research have stated that the effect has weakened or even disappeared from the markets.

1.5.2. Day-of-the-week effect

One of the most remarkable research on the day-of-the-week effect was made by French (1980). French examined S&P composite index daily stock returns between the years 1953-1977. Research evidenced that average daily returns over the whole time period were significantly negative on Mondays, whereas average daily returns were positive on all other days.

A couple of decades ago studies concerning anomalies in financial markets concentrated on the stock markets of the United States, which was also the case with day-of-the-week effect. Internationally, research results vary among countries. Jaffe and Westefield (1985) examined the appearance of the effect, in addition to the United States, in Japan, Great Britain, Canada and Australia stock markets, to find out whether the effect appears in other stock markets than just in the United States. Jaffe and Westerfield got evidence that there were systematic features in stock returns for different days in every country. In the United States, Great Britain and Canada daily returns were lowest on Mondays, whereas in Japan and Australia they were lowest on Tuesdays. Daily stock returns were highest on Wednesdays in the United States and on Tuesdays Great Britain. According to the research the daily stock returns of the United States and other countries were independent on each other, and there was no unequivocal explanation for these week-of-the-day effects.

Martikainen and Puttonen (1996) studied the day-of-the-week effect in the Finnish stock market. According to Martikainen and Puttonen (1996), the Monday effect in the small financial markets of Europe is not so distinct than for example in U.S. stock markets. Research states that from the years 1989-1990 in the Helsinki Stock Exchange, the most negative returns concentrated on Tuesdays instead of Mondays. The results of Tuesday effect are convergent with some other of the studies made in European stock markets.

Bayar and Kan (2002) studied the day-of-the-week effect in 19 different stock markets including Finland. Research concerned stock returns from the year 1993-1998. This research showed evidence that stock returns were lowest on Mondays and highest on Wednesdays. The results of Bayan and Kan research are in contradiction with the research from Martikainen and Puttonen (1996). This is an example of how results from the same market can differ significantly, usually because of the research method.

It is examined that among large companies, the day-of-the-week anomaly has not remained stable. The anomaly has developed in a way that the stock returns of Mondays did not differ from the returns of other days. After this, the returns of Mondays did even increase higher than the returns of other days. One explanation for the development is decreasing transaction costs, which enables rational investors to exploit arbitrages in the markets. This kind of development did not happen among the stocks of smaller companies. (Pettengil 2003)

Kohers et al. (2004) conducted research where the day-of-the-week effect was widely researched in 11 developed countries with large stock markets. The research covered data from 11 stock markets together with the Morgan Stanley Capital International (MSCI) World index from the years 1980-2002. According to the research day-of-the-week and Monday effect occurred in financial markets on the 1980s but from the 1990s the effect started to weaken. For example, in the stock market of Great Britain and the U.S. the effect did not appear in the years 1991-2002. According to Kohers et al. stated that one reason for the disappearance of day-of-the-week effect is the development of efficiency in stock markets.

One of the most significant recent studies on behalf of weakening day-of-the-week and month-of-the-year effect was made by Sighn in 2014. Sighn researched day-of-the-week effect and month-of-the-year in Brazil, Russia, India and China (BRIC-countries) with the data from years 2003-2013. Data was collected from the BOVESPA index, National Stock Exchange of India, MOSKOW Exchange and Shanghai Stock Exchange. The dummy regression model was used to examine the existence of the effects. According to this research, the day-of-the-week effect has disappeared from the markets in Brazil, Russia and India, and the most negative returns in the Chinese stock market were on Tuesday. No month-of-the-year anomalies were found in any of these countries, which indicates that the January effect has disappeared from the markets in BRIC-countries.

2. Methodology

2.1 Data collection

The Helsinki Stock Exchange, currently Nasdaq Helsinki is the only stock exchange in Finland. Companies in Nasdaq Helsinki are divided into three groups according to their market value, large-cap companies (over 1 billion €), mid-cap companies (over 150 million €) and small-cap companies (under 150 million €). OMX Helsinki 25 is a stock market index for Helsinki Stock Exchange. The index includes 25 most traded companies and the maximum weight for a single stock is limited to 10%. In this research, the data from 25 companies currently in OMX Helsinki is used. If some of these 25 companies have been listed later than 2003, the data is collected from the day of enlisting to the end of 2018. A list of companies can be viewed in Appendix 1.

Historical data is collected from the Nasdaq Nordic web page. The data includes daily and monthly stock prices, from which daily and monthly stock returns are calculated with a formula

$$r = \frac{p1}{p0} - 1 \quad (1)$$

where
r- stock return
p1- new stock price
p0- previous stock price

In the formula (1), p0 indicates previous stock price, in daily data previous day and in monthly data previous month.

Figure 1. represents historical average monthly stock prices in euros for OMX Helsinki 25 index from the years 2003-2018.

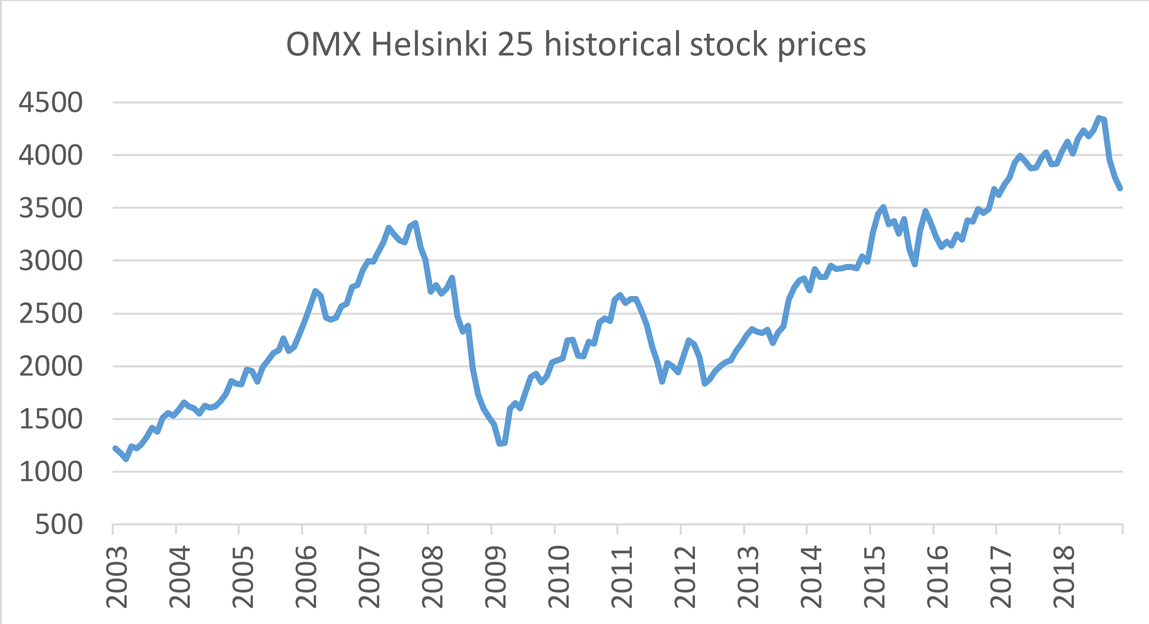

Figure 1. OMX Helsinki 25 historical stock prices

Source: Prepared by the author

From the year 2003 to 2018 OMX Helsinki 25 index value has increased from 1219,47 to 3685,16. Figure 1. illustrates that stock prices have been fluctuating and suffering from a couple of larger drops during the years. The index has been affected by the financial crisis of 2007-2008, Black Monday in 2011 and stock market selloff in 2015-2016. After these crises, the curve has managed to get upward sloping direction reaching as high as 4353,74 in 2018. The fluctuation and development of OMX Helsinki 25 have been similar to major world stock market indexes.

2.2 Research method

In this paper, a quantitative research method, regression analysis is used. Regression analysis is used to describe and evaluate the relationship between a given variable and one or more variables and to explain how the movements in one variable have an effect on another variable or variables (Brooks 2014). Linear regression is a lot used tool for forecasting and financial analysis. The reason why regression analysis is an excellent tool for analyzing seasonal effect is that stock returns are usually not normally distributed.

When conducting regression analysis with seasonal data, is advisable to add dummy variables in regression equations. Dummy variables are also called as qualitative variables because they are often used to represent numerically some qualitative data. It is important to take a so-called dummy variable trap into consideration to avoid perfect multicollinearity. To avoid perfect multicollinearity, one of the seasons needs to be left from analysis and used as a reference group. In the analysis, each dummy variable is compared with the reference group (Brooks 2014). In this paper, Wednesday and December are used as a reference group. Dummy variables are created in a way that in D1 for Monday, Mondays are marked with 1, other days with 0, in D2 for Tuesday, Tuesdays are marked with 1, other days with 0, et cetera.

In order to include the data from all 25 companies into the regression analysis, the data from 25 companies are stacked in a way that they form one long vertical dataset. Regression analyses are conducted in Excel and in Gretl. When conducting the regression analysis in Excel, the data of stock returns is placed to input Y range to represent the dependent variable. Seasonal data, in this case, dummy-variables, are placed to input X range to represent independent variables.

All in all, eight regression models were estimated. One with the whole 15-year period for the January effect and for the day-of-the-week effect. In addition, the data is divided into three periods; 2003-2008, 2009-2013 and 2014-2018, to analyze whether the effects have occurred in different forms in the separate periods.

In the regression tables, coefficients indicate the difference in stock returns compared to reference groups. P-values indicate the significance of the results. Usually, p-values between 0.05 and 0.01 can be considered as marginally significant and p-values less than 0.05 can be considered statistically significant, and there is an evidence against the null hypothesis. P-values less than 0.01 can be considered very significant. In order to confirm a specific seasonal effect, the t-tests with specific parameter values are conducted.

3. Empirical analysis

Regression analysis for January effect is made with monthly average returns of current OMX Helsinki 25 companies. Each dummy-variable represents one month on the table. To avoid perfect multicollinearity December is left out from the analysis. As December is used as a reference group, each coefficient represents the average deviation of each month from December.

Table 1. Regression analysis for monthly effects

	Coefficients	*Standard Error*	*P-value*
Intercept	0,0095	0,0050	0,0562
D_1	0,0044	0,0071	0,5355
D_2	0,0124	0,0071	0,0794
D_3	-0,0060	0,0071	0,3952
D_4	0,0215	0,0071	0,0024
D_5	-0,0098	0,0071	0,1653
D_6	-0,0247	0,0071	0,0005
D_7	0,0073	0,0071	0,2997
D_8	-0,0051	0,0071	0,4683
D_9	-0,0045	0,0071	0,5223
D_10	-0,0042	0,0071	0,5523
D_11	0,0006	0,0071	0,9351
N	4323		
Adj. R2	0,0110268		

Source: Prepared by the author

Table 1. represents the results of regression analysis which is made for monthly effects and includes all the data from 15 years. The results indicate that compared to December, the most positive returns occur on April (0,0215) and the most negative on June (-0,0247). According to the p-values, the result can be considered as significant. Also, the positive returns of February can be considered as weakly significant. This support the research made by Berglund and Wahlroos, which stated relatively positive stock returns appearing on February in the Finnish stock market. Compared to December, the returns of January are positive but the result is not statistically significant. By this statement, the January effect can be excluded. When examining the sell-in-May effect, the results indicate the stock returns from May to September being negative, except June, but results cannot be considered as significant, which means that sell-in-May effect can be

also excluded. The same thing concerns the stock returns of October, and it could be stated that the October effect has not appeared in the Finnish stock market during the years 2003-2018.

To analyse, whether the January effect or other monthly effects has appeared in Finnish stock markets in shorter periods of time, the data was divided into three parts. Table 2. represents the results of regression analysis from all three periods.

Table 2. Periodic regression analysis for monthly effects

	2003-2008			2009-2013			2014-2018		
	Coefficients	*St. Error*	*P-value*	*Coefficients*	*St. Error*	*P-value*	*Coefficients*	*St. Error*	*P-value*
Intercept	-0,0001	0,0084	0,9900	0,0371	0,0099	0,0002	-0,0064	0,0073	0,3834
D_1	-0,0060	0,0120	0,6163	0,0003	0,0140	0,9811	0,0180	0,0104	0,0839
D_2	0,0322	0,0120	0,0072	-0,0379	0,0140	0,0069	0,0398	0,0104	0,0001
D_3	-0,0015	0,0120	0,8977	-0,0293	0,0140	0,0368	0,0109	0,0104	0,2932
D_4	0,0123	0,0120	0,3061	0,0292	0,0140	0,0370	0,0230	0,0104	0,0269
D_5	0,0111	0,0119	0,3534	-0,0709	0,0140	0,4702	0,0264	0,0104	0,0111
D_6	-0,0133	0,0119	0,2673	-0,0568	0,0140	0,5302	-0,0065	0,0104	0,5343
D_7	0,0018	0,0119	0,8779	-0,0072	0,0140	0,6064	0,0264	0,0104	0,0112
D_8	0,0234	0,0119	0,0490	-0,0338	0,0140	0,0158	-0,0075	0,0104	0,4708
D_9	-0,0124	0,0119	0,2965	-0,0038	0,0140	0,7866	0,0026	0,0104	0,7985
D_10	-0,0056	0,0119	0,6354	-0,0136	0,0140	0,3312	0,0059	0,0104	0,5680
D_11	-0,0015	0,0118	0,8971	-0,0188	0,0140	0,1786	0,0209	0,0104	0,0439
N	1479			1380			1464		
Adj. R2	0,0196925			0,0503355			0,0221839		

Source: Prepared by the author

Regression analysis for period 1 shows that compared to December, the most positive stock returns appear in February (0,322) and the most negative in June (-0,0133). The result of positive returns in February can be considered significant, as well as the positive returns of August is statistically weakly significant. For period 2, compared to December, the most positive stock returns appear in April (0,0292) and the most negative in May (0,0709), but from this period, only the positive returns on April and negative returns of February, March and August can be considered statistically significant. For period 3, compared to December, the most positive returns appear in February (0,0398) and the most negative in August (-0,0075). In period 3, p-values indicate the positive stock returns of January, February, April, May and November to be statistically significant.

The results show that more months are statistically significant in the years between 2009-2018. According to these results, there are two significant months in period 1, four in period 2 and six in period 3. Even if the results can be considered as statistically significant the returns are not following any specific pattern.

To examine the day-of-the-week effect, the regression model is estimated with daily returns of current OMX Helsinki 25 companies. Each dummy-variable represents each day on the table. To avoid perfect multicollinearity Wednesday is left out from the analysis. As Wednesday is used as a reference group, each coefficient represents the average deviation of each day from Wednesday.

Table 3. Regression analysis for day-of-the-week effect

	Coefficients	*Standard Error*	*P-value*
Intercept	0,0014	0,0004	0,0004
D_1	0,0004	0,0005	0,4245
D_2	-0,0007	0,0005	0,1735
D_4	-0,0008	0,0005	0,1637
D_5	-0,0010	0,0005	0,0799
N	89605		
Adj. R2	0,0000603		

Source: Prepared by the author

Table 3. represents the results of regression analysis which is made to examine day-of-the-week effect in the Finnish stock market and includes the data from the whole 15-year period. According to the analysis, compared to Wednesday, the most positive returns appears on Mondays (0,0004), but this is not statistically different from zero. and the most negative on Fridays (-0,0010). Friday shows the modest day of the week effect which is statistically significant. According to this analysis, instead of Mondays, the most negative returns have appeared on Fridays.

For periodic regression analysis, the data is divided into three parts, to examine whether the day-of-the-week effect has occurred in different periods. Table 4. represents the results of regression analysis from all three periods.

Table 4. Periodic regression analysis for day-of-the-week-effect

	Period 1	Period 2	Period 3

	Coefficients	St. Error	P-value	Coefficients	St. Error	P-value	Coefficients	St. Error	P-value
Intercept	0,00045	0,00029	0,11955	0,00286	0,00115	0,01292	0,00091	0,00025	0,00034
D_1	0,00003	0,00041	0,95008	0,00230	0,00163	0,15969	-0,00089	0,00036	0,01387
D_2	-0,00020	0,00041	0,62630	-0,00145	0,00163	0,37325	-0,00063	0,00036	0,07965
D_4	-0,00145	0,00041	0,00038	0,00013	0,00164	0,93576	-0,00086	0,00036	0,01669
D_5	0,00052	0,00041	0,20169	-0,00296	0,00165	0,07231	-0,00064	0,00036	0,07946
N	31106			28089			30410		
Adj. R2	0,0007010			0,0002586			0,0001294		

Source: Prepared by the author

Regression analysis for period 1 indicates that compared to Wednesday, the most negative stock returns appears on Thursdays (-0,00145), the result is statistically significant. For period 2, compared to Wednesday, the most negative stock returns occur on Fridays (-0,00296), the result is weakly significant. For period 3, compared to Wednesday, all the returns are negative. The most significant negative returns appear on Mondays and Thursdays. Period 3 includes most of the significant results.

According to these analyses, contrary to expectations, monthly-effects and day-of-the-week effect have been more evident when examining the more recent data. The analyses of whole the 15-year period show that the most significant findings are that among months, the most negative stock returns appeared in June and the most positive in April. Among weekdays, the most negative stock returns appeared on Fridays. By these results, it can be stated that the January effect, October effect and sell-in-May effect have disappeared from the Finnish stock market. Analysis for monthly effects gives evidence that the stock returns tend to be higher during February, except in the period 2. This supports the research made by Berglund and Wahlroos (1986), which gave evidence that higher stock returns appear in February. Also, there is no Monday-effect, and the most negative returns have transferred from Mondays to Fridays.

SUMMARY

Seasonal anomalies were studied already 40 years ago. Anomalies have been, and still are, a lot spoken and researched topics among researchers and investors. Today, academic writings and researches give evidences that seasonal anomalies have weakened or even disappeared from the markets. In the theoretical part of this research, the theories which give theoretical background for market anomalies are introduced. The theoretical part also consists of previous studies, which represent how the effects have been discovered, and how they have changed during the years.

The purpose of the empirical testing was to find out whether these effects have occurred in the Finnish stock market during the years 2003-2018. According to empirical results, January effect and day-of-the-week effect have disappeared from the Finnish stock market. Regression analysis for January effect indicates that instead of January, the most positive returns appear in February. Regression analysis for the day-of-the-week effect resulted in not having any significant differences in stock returns on different days. There can be many factors behind the weakening or disappearance of seasonal effects, such as the experience of investors, information technology or the development of financial markets. These results support the hypothesis, that financial markets should be so developed and efficient that January effect and day-of-the-week effect should not appear anymore.

As mentioned, certain seasonal effects seem to have disappeared from the Finnish stock market. Still, there have been seasonal effects in the Finnish stock market during the years 2003-2018. The most significant findings of the regression analysis are the most negative stock returns on June and the most positive on April, as well as the most negative stock returns on Fridays. During the periods the effects have occurred but differently in different periods, without following any distinct pattern. Contrary to the hypothesis seasonal anomalies have appeared in the markets. Even if the seasonal effects have been widely researched in many different stock markets, researchers have not been able to find consensus whether the seasonal anomalies have appeared in every financial market. Also in spite or various researches, there doesn't seem to be any univocal explanation behind the seasonal anomalies. In addition, previous research result has been differing for the sake of different materials and research methods. Recent researches with more current materials and more reliable statistical methods, would be necessary in order to guarantee the results of the effect weakening or disappearing.

The data is collected from 25 companies currently on OMX Helsinki 25. As mentioned, the index includes 25 large-cap companies. This factor needs to be taken into consideration when observing the results, because according to some studies, the smaller companies are most affected by these effects.

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APPENDICES

Appendix 1.

AMEAS	AMER SPORTS OYJ
CGCBV	CARGOTEC OYJ
DNA	DNA OYJ
ELISA	ELISA OYJ
FORTUM	FORTUM OYJ
HUH1V	HUHTAMÄKI OYJ
KCR	KONECRANES OYJ
KESKOB	KESKO OYJ B
KNEBV	KONE OYJ
METSB	METSÄ BORD OYJ B
METSO	METSO OYJ
NDA FI	NORDEA BANK ABP
NESTE	NESTE OYJ
NOKIA	NOKIA OYJ
NRE1V	NOKIAN RENKAAT OYJ
ORNBV	ORION OYJ B
OTE1V	OUTOTEC OYJ
OUT1V	OUTOKUMPU OYJ
SAMPO	SAMPO OYJ A
STERV	STORA ENSO OYJ R
TELIA1	TELIA COMPANY
UPM	UPM-KYMMENE OYJ
VALMT	VALMET OYJ
WRT1V	WÄRTSILÄ OYJ ABP
YIT	YIT OYJ

Source: Prepared by the author