



**LUT School of Business and Management**

Bachelor's thesis

Financial Management

**Performance of oversold stocks at the Helsinki Stock Exchange**

Ylimyytyjen osakkeiden suoriutuminen Helsingin pörssissä

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## TIIVISTELMÄ

|                             |   |
|-----------------------------|---|
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Tämän tutkielman tarkoituksena on selvittää, voidaanko osakemarkkinoilla saavuttaa lyhytaikaisesti ylituottoa luokittelemalla osakkeet ylimyytyihin ja yliostettuihin niiden suhteellisen vahvuuden indeksillä (RSI) ja jakamalla osakkeet niiden trendin perusteella. Tutkielma tehdään Helsingin pörssissä noteerattujen osakkeiden kanssa ja toteutetaan kvantitatiivisena portfolioanalyysinä hyödyntämällä Nasdaq tietokannasta 31.05.2019 – 28.06.2019 kerättyä aikasarjadataa. Kerättyä tietoa analysoidaan niiden tuottojen ja riskikorjattujen indikaattorien avulla.

Tutkielman tulokset osoittavat, että tarkastellulla aikavälillä osakkeiden luokittelu ylimyytyihin olisi johtanut markkinoita suurempiin tuottoihin. Yliostetuilla osakkeilla on sen sijaan markkinoita alhaisempi tuotto-odotus. Molemmat havainnot myötäilevät aikaisempia akateemisia tutkimustuloksia. Osakkeen trendi vaikuttaa sen kykyyn suoriutua epänormaaleista olosuhteista. Molemmissa tapauksissa, jos osakkeella oli nousujohteinen trendi ennen ylimyytyä/yliostettua tilaa, olivat sen tuotot suuremmat.

## ABSTRACT

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**Keywords:** Technical analysis, stock market, relative strength index, exponential moving average

The aim of this thesis is to find out whether abnormal returns can be gained within the stock market short-term, by categorizing the stocks to oversold/overbought conditions with a Relative strength index (RSI) and taking into account the short-term trend the stocks are experiencing. The research is conducted with stocks listed in the Helsinki stock exchange and carried out as a quantitative portfolio analysis, by utilizing a time series data collected from the Nasdaq databases between 31.05.2019 – 28.06.2019. The data is analyzed by the returns of the portfolio's as well as their risk adjusted indicators.

The results show that within the period reviewed, categorizing stocks to oversold conditions would have resulted in greater profits than the market. Overbought stocks instead have a lower expected return in comparison to the market. Both results are in line with previous academic hypothesis. The trend of the stock affects its performance to recover from severe conditions. In both cases if the stocks had an uptrend before an oversold/overbought condition its returns were greater.

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## **LIST OF SYMBOLS AND ABBREVIATIONS**

B&H= Buy and Hold strategy

CAPM = Capital Asset Pricing Model

EMA= Exponential moving average

EMH= Efficient market hypothesis

MA= Moving average

OMXHPI= OMX Helsinki primary index

PM= Performance measure

RSI= Relative strength index

SMA= Simple moving average

## 1. Introduction

The best way and the most consistent way to profit from the stock market has been discussed and debated since the dawn of the stock exchanges. Most of the modern investment strategies originated at the beginning of the 20<sup>th</sup> century, which include value investing, growth investing, quality investing and index investing. Based on historical evidence, we can already say that succeeding in the stock market does not require any of these strategies to begin with. If one knows how to diversify between a few shares or just buy the index, they will most likely achieve great profits from the natural growth of the economy.

However, there are always two good questions in the back of the mind of the typical investor: *Wouldn't it be nice to succeed a little bit better?* and *How do I beat the market?* These two questions have been forever tried to get answers to in the field of finance. Some will succeed, others are not even close, and because investing is not an exact science, there are plenty of answers. New ways to beat the market are being developed all the time, and why not? Beating the market bears fruitful rewards in money and satisfaction, and this research tries to find opportunities for this everlasting question one more time.

This work studies the performance of oversold stocks compared to overbought and normal circumstances. Short-term trend will be considered as a way to gain new understanding for the readjustment of overreacted prices. It deals with the possibility of utilizing stock momentum resulting from abnormal conditions to gain short-term profits. Criterion for this model is developed in this research, by classifying stocks by their relative strength index and exponential moving average. Stocks are categorized to oversold, normal and overbought levels. These are further specified to stocks that were up- or downtrending before the condition. Six different portfolios are constructed from these categories after the effect of trend is added. The main purpose is to find if there is a difference in performance between these categories. Portfolios are also evaluated with risk-adjusted return indicators, to gain comprehension for the best risk to return ratio. The research is set in a random marked circumstance, which represents normal market conditions.

## 1.1 Background

In the realm of financial academia, value and momentum investing seem to be the most studied and accepted investment strategies, which continue to hold appraisal and interest today (Beunza & Stark 2004). Value investing introduced by Graham and Dodd (1934) became known to the masses in the 80s when Warren Buffet became a popular billionaire. It has recently gained popularity also in Finland from books such as: *Vaurastu kuin Warren Buffett* (Hytinen 2014) and *Sijoita kuin guru* (Hämäläinen 2016). Unfortunately, due to the awareness and simplicity in use, value investing has many papers written about it already, and it is unnecessary to write the same conclusion again. One purpose of this study is to offer a new perspective and give concrete help in the viewpoint of a small individual investor.

Value investing and other long-term strategies are applicable when you control a fund worth 2 billion euros and have the need to grow it steadily within a couple of decades. For a small investor these popular strategies are not that feasible due to a slow compounding effect arising from the lack of capital. Fortunately, the small capital enables more possibilities in terms of liquidity, which allows getting in and out of trades very efficiently. If there was a short-term anomaly that could be used to gain minor profits within months, the capital could be compounded relatively swiftly. Luckily, technical analysis and the premise of active market timing seemed to be an applicable option. It was an interesting concept to be able to model the psychology of the market with technical indicators. The Relative Strength Index (RSI) became my favorite indicator due to its simplicity and effectiveness in use. The RSI is an oscillator that describes the momentum of a market (Wilder 1978, 63). Stocks within a certain range are considered oversold and they are bound to experience some momentum in their future.

However, it had one problem. You could comfortably say that oversold stocks would experience a bump in momentum, from which follows a short-term positive reaction (Chong & Ng 2008; Chiang et al. 2012). In fact, the RSI in conjunction with the other aforementioned strategies, were widely used and researched<sup>1</sup>. This conclusion led

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<sup>1</sup> You would essentially know the outcome of the study before even started to write it. It would be like watching *The Dark Knight* just to find out, that Batman has captured the Joker. All the excitement and interest would be gone.

to the idea of the inclusion of trend in conjunction with the RSI. This would make this simple study more unpredictable and the writing process fascinating. From there, the hypothesis of this thesis was formed as follows “the stock that has momentum and has been uptrending should definitely recover more swiftly from the oversold condition”. Maybe there would be no difference at all? There was no clear answer, and this made it easy to start writing this thesis.

The methodology for this work required an indicator to assess short-term trend. Moving averages (MA) are a popular and used technical analysis tool that could be used to forecast the volatility and trend of the stock market (Brock et al. 1992; McMillan et al. 2000). They also had plenty of research done on them throughout the years, so they were employed. Two exponential moving averages (EMA) would be used to display the 6-month trend of a stock and thus it could be observed if the past trend had any effect of a stock's ability to recover from the oversold condition. To the best of my knowledge, there are no previous trend adjusted studies done with the RSI in the Helsinki stock exchange. This exchange was also the perfect place to study this, due to its high volatility and low liquidity, which induce more severe stock price fluctuation. This primed the purpose for this research, because even though a bachelor's thesis is very limited, something new was found in this limited range to study. A clear objective for this research was also gained, which is outlined in the next chapter.

## **1.2 Research problem and objectives**

The primary objective of this research is to find out whether abnormal returns can be gained within the stock market short-term. Stocks will be categorized by their RSI to oversold/normal/overbought conditions based on their past performance. The occurring short-term trend will also be taken into account with the help of an EMA. Stocks will be categorized to six different portfolio's, which performance will be measured with risk-adjusted return indicators and compared to one another. With the use of these indicators it is also possible to observe the usability of technical analysis at the Helsinki Stock Exchange.

To reach the above stated objectives, the main research question was formulated as:



*“How will the stocks selected by their relative strength index perform compared to the stock market index”*

and for the validation of the results of the main question, three sub questions must be answered to:

*“How will the short-term trend of the stock affect its ability to react to an oversold/overbought condition”*

*“Is there a level of relative appreciation where the stocks perform consistently the best regardless of the short-term trend”*

*“Does the magnitude of the oversold/overbought condition affect a stock’s performance”*

After answering these questions, there should be a firm understanding of the profitability of using the RSI to categorize stocks and the performance of these stocks. Furthermore, there should be a comprehension about the effect of the stocks trend to these conditions.

### **1.3 Limitations**

The representative period for the research consists of 28-days. Although the period was chosen randomly, it may invoke the possibility of data-snooping, which would distort the results of the study. Also, the period’s ability to represent a random market conditions is limited. If this study results in positive findings, it would be important to confirm these findings in differing short-term periods tested throughout multiple years that include differing economic cycles, as well as positive, neutral and negative short-term conditions. This would improve the validity of the results immensely.

The findings are geographically limited to the stocks listed in the OMX Helsinki Price Index (OMXHPI). Technical trading strategies have differing results, regarding the size, time and place of the market. Results obtained in Helsinki are not validated in other exchanges and countries. The results of the study represent the market

conditions of the Helsinki stock exchange and the investor behavior, reactivity to macro economical events and the feedback of technical indicators may differ elsewhere. No transaction costs are taken into consideration which are known to reduce short-term profits (Park & Irwin 2007).

#### **1.4 Structure of the study**

The structure of the research contains five different main chapters. The purpose of this first chapter is to introduce the reader into the topic being discussed and establish the aim and background for the research. The second chapter is a theoretical frame for this study, in which relevant literature and previous research results are presented. There, we define technical analysis and the philosophic premises it is based on to necessitate further understanding of the principles used in this research. The third chapter consists of research data and the used methods to analyze the data and form the portfolios. The fifth chapter accommodates the results for the research, and the final chapter concludes the whole research, answers the research questions and makes suggestions for future efforts in this area.

## 2. Literature review

In this section, the commonly used terms for this subject, as well as the general framework for technical analysis, which is used in the criteria is defined. We present the emergence of these theories, go over their calculation and display their interpretation in use. We also go over former studies in the area of this research and with it, validate the use of these theories in this subject. Finally, we present the methods used to evaluate the performance of the portfolios.

### 2.1 Technical analysis

In his book, *Technical Analysis of the Futures Markets*, which is considered the bible of technical analysis, Murphy (1986, 1) defined the subject as such:

*“Technical analysis is the study of market action, primarily through the use of charts, for the forecasting of future market trends.”*

As Murphy states, the role of technical analysis is to identify market action beforehand, so that one can hold an investment position before the occurrence of a trend. It is seen as the opposite to fundamental analysis, which focuses on financial statements and public information for the determination of future price. Technical analysis on the other hand assumes that past prices and volume (market action) contain all the requisite information to conduct investment decisions. (Murphy 1986, 1-5)

The origin of technical analysis and the oldest technique used can be traced back to Charles H. Dow, the founder of the Wall Street journal and co-founder of Dow Jones Industrial Average Index. He published a series in the Wall Street Journal, where he used the behavior of the stock market to forecast future prices. These ideas were compiled to a theory in 1932 by Rhea (1932) in the book *Dow Theory*. The theory is a collection of six principles which illustrate stock market behavior. Although the theory is the oldest one in technical analysis, it is still widely popular and used even today (Amling 1978, 549).

Murphy (1986, 2-5) has defined three premises, which nearly follow the Dow-Theory and in which technical analysis is based on. Firstly, *Market Action Discounts*

*Everything*, which is a belief in that whatever can possibly affect the price (psychologically, politically or otherwise), is eventually reflected in the current price of the market. Secondly, *Price Move in Trends*, meaning that in the market a trend motion is more likely to continue than to reverse. Lastly, *History Repeats Itself*, meaning that patterns that have worked well in the past, will continue to work well in the future. Pring (1991) has asserted that in no doubt technical analysis can be applied forever, because with historical examples you can see that nothing in the last 100 years has changed and will not, because financial markets are a reflection of the human nature.

Technical analysis has been widely criticized for decades, and it hasn't been considered by academics as a form of research within financial theories. Traditionally technical forecasting methods have been seen useless, according to the efficient-market and random walk hypothesis (Schwager 1999, 1), which we discuss later. Despite this Park and Irwin (2007) found that from 95 modern studies, 56 found positive results regarding technical analysis, in which the technical tool used resulted in larger profits than a traditional buy and hold (B&H) strategy. Allen and Taylor (1992) found that from the chief foreign exchange dealers in London, 90 percent use technical analysis alongside fundamental analysis when doing forecasts for investment decisions. Billingsley and Change (1996) found that from the commodity trading advisors in the U.S. about 60% rely heavily on technical trading systems. These studies imply that technical analysis is popular among investment professionals although it has not got recognition in the academic circles.

Technical analysis and its trading rules have been found to be more profitable on smaller emerging markets (Gunasekarage & Power 2001; Ratner & Leal 1999). Pätäri and Vilska (2014) found that by using technical analysis tools in the Finnish stock market one can outperform corresponding B&H strategies. This points in the direction that technical analysis is still applicable at the Helsinki Stock Exchange and can be used to gain excess profit. The basic tools of technical analysis are charts, price patterns, volume, trendlines, moving averages and oscillators (Murphy 1999, 12). This research will focus on a relative strength index, which is an oscillator and an exponential moving average, to conduct its model. In the next chapter we will discuss these and their application in price prediction and trading, and no other tools of technical analysis are further discussed.

## 2.2 Relative Strength Index

The Relative Strength Index is a popular oscillator one used to describe the intensity of the stock market today. It was developed and published originally by Wilder Jr. (1978) in his book, *New Concepts in Technical Trading systems*. It is an indicator of momentum that predicts changes in the future trend of an instrument and measures the magnitude of changes done in the closing prices of this security (Wilder 1978, 63).

The RSI compares the securities positive price trends significance to its negative price development with a pattern ranging from 0 to 100. The conventional interpretation of the index is that when a specific security's value goes over 70, it is considered overbought or overvalued, and when it goes under 30 it instead treated as oversold or undervalued. After an overvaluation the security is primed for a reversal in price and for a pullback vice versa. A conventional way to depict the index is that the values of 60-80 are considered a sell signal and values of 20-40 as a buy signal. (Murphy 1986, 290-295)

In the calculation of the RSI a short (<14 days) or a long (>1 month) time period is used. With a longer time, interval more broad changes can be demonstrated, and the short period is more sensitive to minuscule price movements. A 6-day index is popular for intraday analysis and a 10-week model is the most popular to be used along with financial statements. Wilder himself recommends a 14-day time period, which is the most used duration and the one we will be using in this study. (Siegel et al. 2000, 236)

The mathematical value of the RSI is calculated in two steps:

$$RSI(n) = 100 - \left[ \frac{100}{1+RS} \right] \quad (1)$$

$$RS = \frac{\text{Average of } (n) \text{ day's closes up}}{\text{Average of } (n) \text{ day's closes down}} \quad (2)$$

Here the RSI represents the value of the index in an “n” number of periods. For calculating the RS from which the first equation can be calculated from, the (n) number of day's closing prices are needed. The closes up and closes down are summed up and divided by the (n). After the previous (n) days are obtained it is only necessary to use the previous average for the calculation of the next RSI.

## 2.2.1 Interpretation

In Figure 1, are the price changes of Uponor's stock in a 6 Month time period and below it the RSI indicator for it. From this figure we can look at the 5 different things this index indicates.



**Figure 1.** Uponor stock price movement and its RSI14 oscillator

- 1. Tops and Bottoms:** These are indicated when the value of the index goes either above 70 or below 30. It is usual that the index will bottom out before the actual security. This suggest that a reversal or a significant reaction is imminent. (Wilder 1978, 68) The bottom price of Uponor (in grey) was hit on the 10<sup>th</sup> of December which was forecasted by the RSI value going under 30 on the 7<sup>th</sup> day. The major top price of the 17<sup>th</sup> of April was predicted by the RSI value going over 70 on the 16<sup>th</sup> day. A considerable weakness of the index is that even if it indicates a sell signal the price may continue to rise higher, such as on the third of April (Pring 1991, 147).
- 2. Chart Formations:** The index will display technical analysis chart formations which may not be obvious from the corresponding chart formations. These can be such as pennants and triangles that indicate breakouts and buy and sell

points. In Uponor's RSI chart (in blue) there is a pennant is forming in February that is not noticeable on the price chart. A breakout of this triangle results in a prompt movement in price.

3. **Failure Swings:** Top failure swings above 70 and bottom failure swings below 30 are strong indications of price rehearsal (Wilder 1978, 70). This is demonstrated by Uponor (in black) when a top failure swing results in a considerable 12% price drop at the end of December.
4. **Support and Resistance:** Trend lines on the price chart usually show up as support lines on the RSI chart. This can be seen with Uponor (in brown) when the support line of the RSI confirms the rising trend of the price. After the support is broken, it implies a price rehearsal.
5. **Divergence:** Divergence between the price and the RSI is a strong indicator of a market turning point. When divergence appears, especially after a large directional move, it is an indication of a turnaround. It occurs when the RSI is increasing, and the price movement is either consolidating or decreasing (marked in green). It conversely emerges when the RSI is decreasing, and the price movement is consolidating or increasing. Divergence is considered the most indicative character of the index. (Wilder 1978, 68-70)

### 2.2.1 Studies on the performance of the RSI in the financial markets

The Relative Strength Index is one of the most studied indexes in short term price prediction. It has been applied to a myriad of markets and models with different outcomes. Typically, it is present in soft computing research as a part of a set of diverse calculations, that are used to forecast stock market indexes. (Rodríguez-González et al. 2011)

Arguably the most famous study done was by Chong and Ng (2008), where they studied the London Stock Exchange Index for a 60-year period and found that the RSI trading rules generated higher returns than a B&H strategy in most cases. This was later confirmed by Chiang and others (2012) where the RSI outperformed all other technical trading strategies as well as the B&H strategy. This is significant because they were taking transaction costs into account, which are known to diminish the potential excess earnings in technical analysis strategies (Park & Irwin 2007).

The profitability of RSI has been analyzed between the different market cycles. Sahin and Ozbayoglu (2014) pointed that the RSI works well when the market is trendless, but during bull and bear markets its performance degraded. However later Cohen and Cabiri (2015) showed that during a bear market the index performed the best but agreed upon it performing the worst during a bull market.

These studies were conducted on a securities market. Anderson and Li (2015) found that if the basic RSI trading rules were applied to the foreign exchange market it resulted in no trading profit, but instead a small loss. They reasoned this due to the index being so well known that no consistent profit opportunities no longer exist. This was elaborated on by Kamble (2018) when he presented that the short-term predicting accuracy of the RSI is still excellent but in order to gain correct long-term predictions, fundamental analysis had to be implemented into the model as well.

The public awareness of the index's profitability has led the researchers to apply it to more complex models with intention to gain exceptional profits. Rodríguez-González et al. (2011) applied a modified RSI to a price predicting neural network and found that individual stocks as well as a given market can be predicted. It has also been applied with positive results to support vector machines and genetic algorithms (Chiu & Chen 2009), rule-based fuzzy systems (Chang & Liu 2008) and time-series analysis with differing rough sets (Yao & Herbert 2009).

The rise in awareness of the RSI's trading rules has resulted in purposeful regulation of the index by top shareholders. Ni et al. (2019) found that major shareholders who are not directors may deliberately enhance the RSI so that the stock price would overreact due to the well-known buy signals.

Altogether it can be concluded that the RSI still shows great potential in today's stock market environment to forecast short-term price changes. It is especially potent on small exchanges such as the one in Helsinki, where the awareness of its utility isn't great. It is also a good fit in this research for the classification of stocks to different categories based on their past relative performance.



### 2.3 Exponential moving average

Moving averages (MA) are some of the simplest and most used technical analysis tools today due to their clarity and simplicity. They can be used to create transparent buy and sell signals and therefore make it easy to spot changes in trends and changes in direction. Moving averages are claimed to be able to explain many of the occurring phenomena on the market, such as temporary bubbles, sudden market crashes and price fluctuation. (Chiarella et al. 2006) There are many different versions of moving averages, but the one we will be focusing on this study is the exponential moving average (EMA), due to its greater weight on recent closing prices.

An exponential moving average is a type of a moving average that emphasizes recent data points of the securities price. This helps it react faster to changes in the market condition and thus reduces lag. It also contains all the historical information of a security unlike any other MA. Like all other moving averages buy and sell signals are given when the price of the instrument crosses the moving average or the moving average itself changes direction. (Boboc & Dinică 2013)

Traders use several different EMA durations for different purposes. The 12 and 26-day EMAs are the most used and insightful to determine buy and sell points. They are also used to generate other indicators such as the moving average convergence divergence. 50 and 200-day EMAs are used for long-term trend prediction. A stock price crossing the 200-day EMA line is a strong indication for a reversal. (Wang & Kim 2018) The mathematical value of the EMA is calculated in three steps:

$$\text{Simple moving average} = \frac{(n-s)}{n} \quad (3)$$

where            n = number of day's used  
                       s = sum of stock closing prices in the period

$$\text{Weighted multiplier} = 2 \div (n + 1) \quad (4)$$

$$EMA = p(t) \times k + EMA(y) \times (1 - k) \quad (5)$$

where  $p$  = closing price of the security  
 $k$  = weighted multiplier  
 $t$  = today  
 $y$  = yesterday

The first step is calculating a simple moving average (SMA), which will be used as a starting point for the first EMA calculation. After that, a calculation for a weighted average is needed, which ultimately gives the EMA its emphasis on a more recent price. Finally, you can calculate the EMA for the current day. When you calculate it for the first time the SMA is needed for the EMA of yesterday. After that you can use the previous EMA for the calculation of the next. (Pring 1991, 225-228)

### 2.3.1 Interpretation

In Figure 2 are the price changes of Caverion's stock in a 6-month time period highlighted by a blue line. The orange line trending above and below it is the 26-day EMA and the thicker yellow line is a 200-day used to display the differences in length. The buy (green) and sell (red) signals given by the indicator are shown for the stock. From Figure 2, we can look at the different things this average indicates.



**Figure 2.** Caverion stock price movement with buy (green circle) and sell (red circle) signals and its 26 (orange) and 200-day (yellow) EMA lines

When the closing price of the security moves over the EMA line a buy-signal is generated (see Figure 2). A sell signal comes naturally after the buy signal after the closing price has moved below the EMA. Because we are using a MA considered short-term, the average follows the price closely and numerous crossings occur. The use of a sensitive average follows in a larger number of trades and some false signals. This is considered “noise”, which can be seen clearly on the month of February. However, shorter averages have an advantage on giving information on trend signals earlier. A longer average is slower to react but more reliable with its changes. The challenge with MAs is to find an average responsive enough to give early signals, but insensitive enough to avoid the random noise of false trend changes (Murphy 1999, 195-203).

We can identify these properties with the case of Caverion’s stock (shown in Figure 2). The 200-day EMA gives a broader sense of the stocks trend. By utilizing it, you will miss some opportunities such as the spike in January, but despite that it will spare you in unnecessary commissions by saving you from irrelevant sell and buy signals. Another interesting thing is that the two MAs only share one buy signal at the end of March, which turned out to be the best trading opportunity in this time frame.

Because the use of one moving average has some disadvantages, it is popular to employ two or more moving averages together. By comparing EMAs of different periods it is possible to identify changes in trends. A shorter-term EMA crossing above a longer one is considered as the start of an uptrend and falling back below a downtrend. (Schwager 1999, 104) In the case of Caverion, every time the short EMA crossed the longer one, a positive trend resulted from that action. In this study we employ the use of two EMAs to factor in the current trend of a specific stock at the oversold condition.

### **2.3.2 Studies on the performance of the EMA in the financial markets**

The exponential moving average has been studied extensively for its ability to forecast stock volatility and trend direction as well as its potential for excessive returns. The most acclaimed study conducted was done by Brock and others (1992) where they

studied the EMA trading rules on the Dow Jones Index for almost a 100-year period. They found out that the EMA buy signals generated consistently higher returns than the sell signals. They also found out that the volatility of the returns was easily anticipated. McMillan et al. (2000) found supporting evidence on this in the London Stock Exchange when they established that the EMA demonstrated the best monthly, weekly and daily forecasts for stock volatility.

Tse (1991) studied this same effect on the Tokyo Stock Exchange. The weighted exponential moving average provided the best results for the volatility of the stock returns. Ederington and Guan (2005) arrived in contradicting results to this in the futures market, where they found that the generalized autoregressive conditional heteroskedasticity model yielded better forecasts than the EMA model. Arévalo et al. (2017) coordinated a more recent study where they developed an automatic and dynamic trading rule based on pattern recognition with an EMA indicator to filter the trades. They found out that the EMA was especially suitable for short-term price prediction. EMA was also superior in profitability and risk compared to the B&H strategy even after taking the transaction costs into account.

Costa et al. (2015) found also that the EMA strategy can exceed the B&H strategy in terms of profitability. However, they concluded that its predicative abilities were weak on a developing market. Hansun et al. (2019) found alternatively that on the five big developing markets of Asia the EMA forecasted successfully all the exchanges.

Balaban et al. (2006) tested numerous forecasting models on 15 European markets for a period of 10-years. The EMA was able to satisfactorily forecast all the markets confirming the earlier findings. Chong (2004) studied the EMAs profitability on the foreign exchange market and concluded that the strategy for the most part resulted in positive returns, but the transaction costs outweighed them.

In conclusion, the EMA has been successfully used to forecast the volatility of markets, prices of stocks and gain excess profits compared to a B&H strategy. It has also been used recently in the Helsinki Stock Exchange by Pätäri and Vilska (2014), where they gained abnormal profits with its use. Therefore, it shows great potential to be used in price and trend prediction in this research.

## 2.4 Market efficiency

The existence of technical analysis and these indicators strongly contradict with the financial theory of market efficiency. According to the hypothesis of efficient markets (EMH), all the information available is already included in the prices of securities, hence it would be impossible to gain excess profits. Therefore, technical analysis and its methods are useless, because it should be impossible to forecast future performance on past prices. Theory of efficient markets also renders all fundamental analysis and strategies such as value investing and growth investing useless. (Hämäläinen & Oksaharju 2016, 76-77)

The hypothesis of efficient markets comes from the financial studies done in the 1960s by Eugene Fama (1970), where he reviewed the theoretical and empirical literature of EMH and formalized that a market can be called efficient if the prices fully reflect all information. In the same paper Fama also concluded that evidence for technical analysis are incompatible with the EMH. Empirical evidence in the 1990s started to contradict this hypothesis, when Lakonishok, Schleifer and Vishny (1994) studied value investing strategies comprehensively for over 20 years and found that value strategies yield consistently higher returns, due to the inefficiency of the market. At the same time Brock and others (1992) found that significant technical trading profits could have been made during the 89 years examined.

After a rise in new contradicting information Fama & French (1996) concluded that anomalies that disprove EMH may appear short-term, but they largely disappear when the time-horizon is extended. However, our research focuses on short time frames, where it is possible that market inefficiencies exist has, which can be exploited.

In a more recent study, Urquhart and McGroat (2016) studied market efficiency on a 24-year period in larger markets and found that the predictability of a market varies depending on time and the market selected. Each market adapts differently to different market conditions, as a result, investors should view each market and its degree of predictability independently. Östermark (1989) studied the predictability of individual stocks at the Helsinki Stock Exchange with a moving average model and found that

most stock prices are somewhat predictable. Consequently, the indicators outlined in earlier chapters, should be applicable to be used in price prediction in this research.

## 2.5 Evaluating an optimal portfolio

The evaluation of a portfolio can be conducted with a myriad of different performance measures (PM) and methods. In this research we have chosen two risk-adjusted return indicators, Jensen's alpha and Sharpe's ratio. Although they have both been developed in the sixties, they still hold a position of being accepted and prevailing measures, while assessing the performance of a fund or a portfolio (Fung et al. 2002). New measures for fund performance have been proposed by the academia, but it has been found (Eling & Schumacher 2007) that PMs representing the same element produce almost identical results. The Sharpe ratio is used to represent a relative PM, where its aim is to compare the expected excess return of a chosen portfolio, per unit of risk. Therefore, it compares the possible benefits of the portfolio, relative to its elemental risk. Jensen's alpha is used as an absolute PM, where the measure is impacted positively when the chosen portfolio's performance increases or the parallel theoretical portfolios performance decreases. (Caporin et al. 2014)

### 2.5.1 Sharpe ratio

Sharpe (1966) developed a reward to variability ratio to measure a portfolio's risk-adjusted return. It measures the excess return over the risk-free return, in proportion to the standard deviation of those excess returns of the same portfolio. Thus, it accommodates the portfolio's performance for the excess risk that was taken. It is calculated as follows:

$$SR = \frac{\bar{r}_p - \bar{r}_f}{\sigma_{ER}} \quad (6)$$

where  $r_p$  = average return of the chosen portfolio  
 $r_f$  = average risk-free return  
 $\sigma_{ER}$  = standard deviation of the portfolio's excess return

The measure estimates the premium acquired by a portfolio's manager per unit of total risk. The standard deviation is used to measure the total risk of the investment,

including both, systematic and idiosyncratic risk (Sharpe et al. 1999, 844). This has also formed the main critique of the measure. Deviations from the average are not distinguished from good and bad. Subsequently if the portfolio's returns are not normally distributed, the result of the ratio is distorted (Kane & Marks 1988).

### 2.5.2 Jensen's alpha

Jensen (1968) developed a PM in his dissertation, which measures the excess return of a portfolio compared to that expected by the Capital Asset Pricing Model (CAPM). It is calculated as follows:

$$\alpha_p = R_p - R_f - B_p(R_m - R_f) \quad (7)$$

where

- $\alpha_p$  = Jensen's alpha (additional ROI over the CAPM forecast)
- $R_p$  = return of the chosen portfolio
- $R_f$  = risk-free return
- $B_p$  = the beta multiplier for systemic risk of the chosen portfolio
- $R_m$  = average market return

The measure assesses the impact of a portfolio manager's choices to the performance of his portfolio. The value of the alpha rises as a result of exceptional stock picking skills. Despite the popularity of the measure it has one large object of criticism. Misspecification of the beta multiplier can lead to significant errors in the value of the alpha (Cohen et al. 1983). Hence, forming the market portfolio accurately is essential for the functionality of the alpha, due to the sensitivity of it to the variability of the beta.

### 2.5.3 Beta coefficient

Risk measures that utilize the CAPM require a beta coefficient, which represents the systematic risk, to be calculated. The risk premium of individual stocks is proportional to the risk premium of the market portfolio. Therefore, we need the beta to measure in which extent the returns of the stock market and the individual stocks move together. (Bodie et al. 2005, 285) It is calculated as follows:

$$\beta = \frac{\text{Covariance}(R_e, R_m)}{\sigma_m^2} \quad (8)$$

where  $R_e$  = average stock return  
 $R_m$  = average market return  
 $\sigma_m^2$  = variance of market return

The equity market as a whole has a beta coefficient of 1. A stock with a beta below that has less systematic risk than the market and a beta above that means an above-average risk and return. (Bodie et al. 2005, 288)

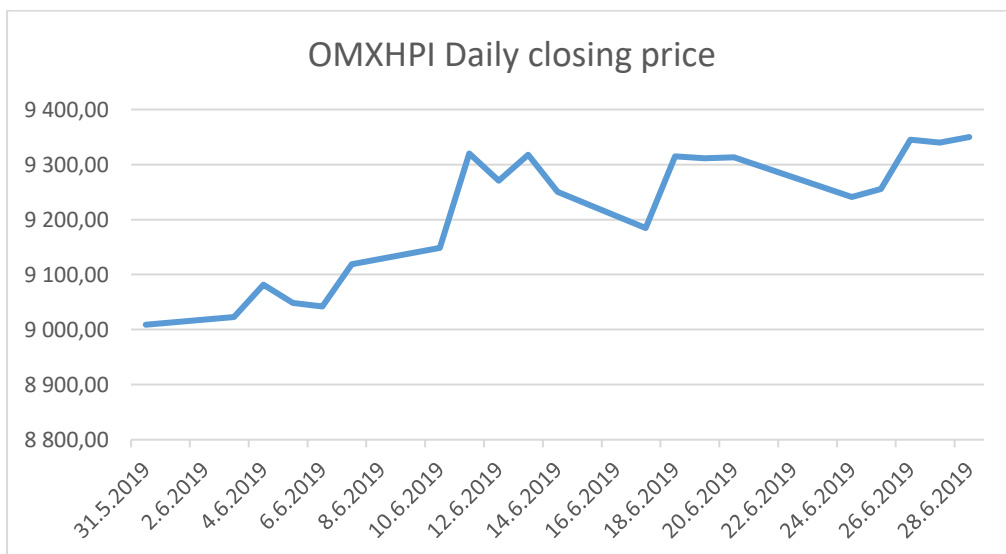


### 3. Research Material and Method

This chapter contains the description of the research material and the methods used to construct our portfolios. In the first part we go over the details of our data and the techniques of gathering it, and in the second part the metrics of technical analysis indicators are presented, from which we conduct our stock classification.

#### 3.1 Data

The data for the empirical section of this research consist of the daily values of stocks listed in the OMX Helsinki Price Index (OMXHPI). OMXHPI is a market-weighted general index for all stocks listed in the Helsinki Stock Exchange (Osakeliitto 2016). This index will also work as our market-portfolio and from the 135 stocks listed in it will be formed our other portfolio's, with the exclusion of Fiskars, which dealt an additional dividend at our period of measure (Haapala 2019). The daily data for the closing prices of the stocks is collected from the Nasdaq (2019) historical databases. As our risk-free rate we will use a 1-month U.S. treasury bill, which at the start of the study period offers a better return (2,35%) than equivalent European obligations (U.S. Treasury 2019). The foreign exchange rate risk arising from the exchange rate differences between the euro and the dollar is not taken into account in this work. Also, a 10-year Finnish government obligation could be considered, but the current level of interest rates is abnormally low, which does not represent normal market conditions (Suomen Pankki 2019).



**Figure 3.** Development of OMXHPI over the review period

The short-term review period for the study of 31.05.2019 - 28.06.2019 (Figure 3) was selected to be investigated. The period was chosen randomly to represent a normal market condition after the last first quarter earnings reports were published and all dividends were split, so that the stock prices would not be influenced by unexpected events. Two major macroeconomic events happened during this timeline. The European (6.06.2019) and the US (19.06.2019) central banks decided to keep interest rates unchanged. It has been shown (Kholodilin et al. 2009; Kontonikas et al. 2013) that changes made in the rates in either directions have a negative impact on stock returns. Therefore, it can be argued that the positive advancement of the index can be partially attributed to these decisions. The trade dispute of China and the US and the lower economic growth than estimated in Finland has resulted in a poor month of May in the stock market (Inderes 2019a; Inderes 2019b). The growth of the index can be considered likewise a natural rebound to this overreaction. Also, it is noteworthy that the RSI's performance diminishes during a bull market (Cohen & Cabiri 2015), which may affect our results.

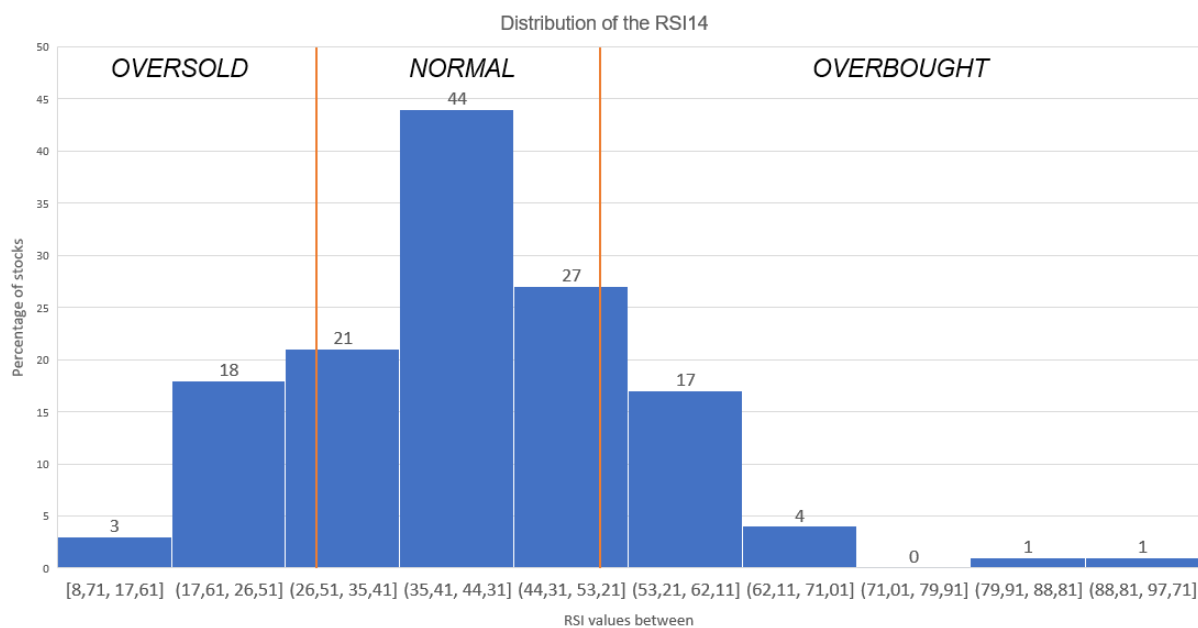
All the results and calculations have been obtained by using the Microsoft Excel 2019 spreadsheet software. The percentual changes of prices, risk-adjusted return and the technical analysis indicators have been calculated from the closing prices of stocks. The information of stocks selected to different portfolio's and the essential statistics for them can be found in Appendix 1.

### **3.2 Methods**

The method used to analyze the performance of different strategies is a quantitative portfolio analysis conducted in Excel. The aim of this study is to examine the short-term performance of oversold stocks compared to other categories. The methods for building portfolios are described in the next subchapter. From the formed portfolio's their cumulative returns of the study period, Jensen's alphas and Sharpe's measures are reviewed. From these key figures the performance of the portfolio's and the risk they contain can be analyzed reliably and comparably.

### 3.2.1 Methods for forming portfolios

The technical analysis indicators presented in the literature section of this study are used to categorize the stocks in six different categories. The first indicator to be included is the RSI, which is used to categorize the stocks in oversold/overbought conditions. The 14-day time period was chosen for it because the length of the study period consists of 28-days. Kaufman (2013, 386-387) pointed out that maximum divergence occurs when the RSI spans exactly half the time span of the cycle studied. If the period would be shorter, more frequent oversold conditions would occur, but the idea here is to capture fewer larger continuous moves.



**Figure 4.** Distribution of the RSI14 in our data

Traditional zones to determine overbought/sold conditions are 70-30. Aan (1985) studied the distribution of the 14-day RSI values and found out that 50% of the values fall between 72 and 32. This would suggest that the traditional range is too narrow. Also, the RSI is sensitive to the trend of the market. The OMXHPI has fallen 6,24% in the three months preceding the period. This downward trend would point in the direction of lower limits of the RSI than normal. Because the RSI is dependent on market conditions and clear limits cannot be placed, we will use the distribution of our data to set our margins. The lowest 20% of our data's RSI values will be considered "oversold" and the top 20% "overbought" (Figure 4). This will set the normal zone

between 28,58- 50,88, which is descriptive of the market conditions. If we would have used the traditional measures, only 2 stocks would have been treated as oversold.

**Table 1.** Portfolio selection criteria

| Portfolio | Description                                  | RSI14           | EMA            |
|-----------|--|-----------------|----------------|
| 1         | Oversold while downtrending                  | <28,58          | EMA90 > EMA14  |
| 2         | Oversold while uptrending                    | <28,58          | EMA90 < EMA14  |
| 3         | somewhat sold / bought while<br>downtrending | 28,58-<br>50,88 | EMA90 > EMA14  |
| 4         | somewhat bought / sold while<br>uptrending   | 28,58-<br>50,88 | EMA90 < EMA14  |
| 5         | Overbought while downtrending                | >50,88          | EMA90 > EMA14  |
| 6         | Overbought while uptrending                  | >50,88          | EMA90 < EMA 14 |
| 7         | Market portfolio                             |                 |                |

After the evaluation of the stock's recent trading strength, two EMAs are used to determine the short-term trend the stock is experiencing at the moment of its oversold/bought condition. The 14-day EMA is chosen due to the 28-day length of the period. Its purpose is to showcase the current short cycle the stocks price is on. On the other hand, the 90-day EMA represents the 6-month trend the stock is on. A shorter EMA crossing above a longer one serves as a confirmation for a change in trend (Pring 1991, 223). Therefore, if a stocks short-term performance outperforms its long-term one (EMA14 > EMA90), it will be considered "uptrending" and if its recent performance falls below the long-term (EMA14 < EMA90), the stock is considered "downtrending". The inclusion of the stocks trend will distinguish two more divisions: stocks that were performing well before their sudden reaction and vice versa. This distinction will help gain understanding to our results and add more depth to this research.

In our data there were 46 stocks on an uptrend and the rest 88 were downtrending. This is reasonable due to the current downward secondary trend. This same criteria for trend, was used by Sahin and Ozbayoglu (2014) when the RSI's effectiveness in different trends was studied. Due to the standardized distribution, 27 different stocks were categorized as oversold and another 27 to overbought. The rest 80 stocks were

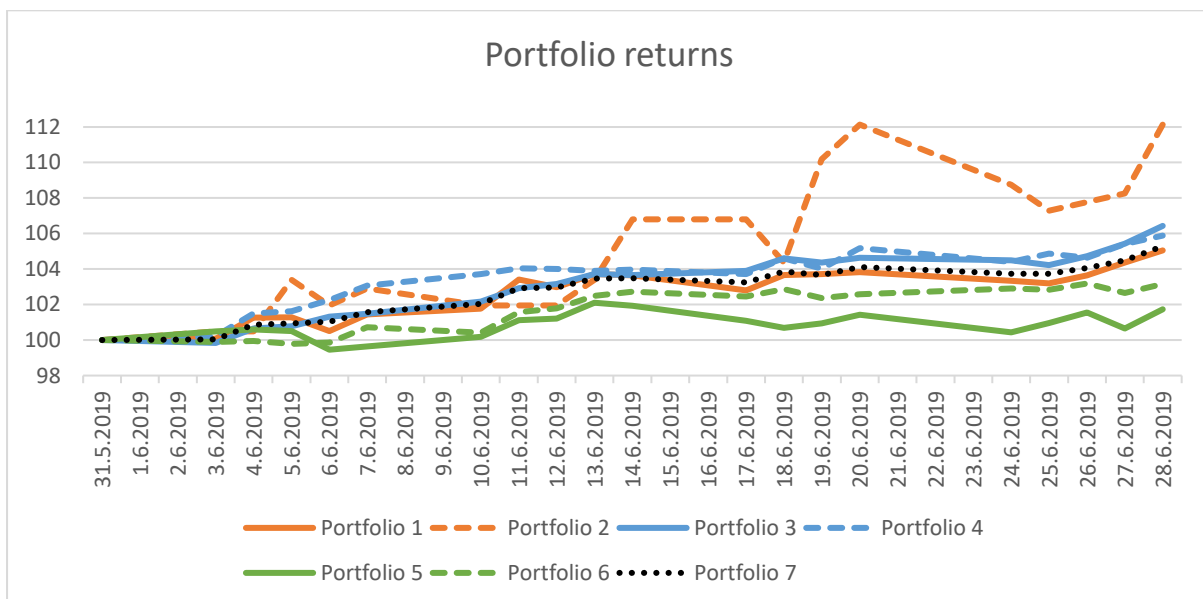
considered normal. The descriptions and criteria for the 6 portfolios are found in Table 1. The seventh portfolio is our OMXHPI market portfolio, with Fiskars removed. The stocks categorized by the criteria are purchased at the closing price of the first day of the period and held without further action till the end of the 28 days. After the sorting of the stocks, 26 stocks were placed into portfolio 1, 1 stock into portfolio 2, 51 into portfolio 3, 29 into portfolio 4, 12 into portfolio 5 and 15 into portfolio 6. The same amount of cash was invested to the portfolios regardless of the number of stocks. The stocks were not market value-weighted within the portfolios and no transaction costs were taken into account.

## 4. Results

In this chapter we will describe and analyze our results from the empirical research. We begin by going over the returns of the different portfolio's and consider causes for them. After that we go over the key figures that measure portfolio risk.

### 4.1 Portfolio returns

To demonstrate the portfolio performance of this classification, the cumulative returns of the portfolios are reported first. Figure 5 showcases the advancement of value in the different portfolios. The first day's closing price of each portfolio is indexed to 100 points to better illustrate the growth. A straight line represents a downtrending portfolio (1, 3, 6) and a dotted line an uptrending one (2, 4, 6). The orange lines exhibit the oversold portfolios (1, 2), blue lines the normal ones (3, 4) and the green lines the overbought portfolios (5, 6). The black dotted line represents the market portfolio (7). Table 2 below Figure 5 has the essential descriptive statistics of the portfolios.



**Figure 5.** The cumulative return of the portfolio's during the research period

Starting with the oversold portfolios (1, 2) we can see that according to our starting hypothesis, the portfolio that was oversold while the stocks in it were uptrending (2), performed significantly the best, by having a 12,14% return. This may be attributed to the fact that portfolios with short-term good performers, that have positive momentum in them, tend to succeed better (Hendricks et al. 1993). Another logical assumption

would have been that an uptrending stock that was oversold, would have had a peak and a change in trend, which would result in poor performance, but this study found no evidence to this assumption. This portfolio (2) also had the highest volatility (2,08%), which indicates it has the highest risk. Sadly, the portfolio had one major drawback. In our period there was only one stock that was still considered uptrending while oversold. This hampers the validity majorly, and without further research, it cannot be determined if this was luck or a repeatable pattern. There is also a possibility that this condition is remarkably rare, and it does not form often, but it cannot be proven here.

The other oversold portfolio (1, downtrending) did not beat the market, but it achieved profits close to it (5,05%). Also, it had the most similar performance compared to the index, with one difference. It had the second highest volatility (0,64%), which showed in the performance of individual stocks. It was the most interesting portfolio in individual stock performance with 35% of the 26 stocks gaining more than 9,3%. Unfortunately, the rest of the list had almost no change in price, and one stock fell a comfortable -33,71% which lagged the rest of the portfolio. The small change in price can be explained with the same anomalia as above, where poor performers usually continue to perform poor in the future. This is the problem with some oversold stocks that the inclusion of trend tried to correct. The 35% of stocks that recovered enjoyed great profits, but others continued their poor performance to the future.

**Table 2.** Descriptive statistics

|             | <b>Return</b> | <b>Mean</b> | <b>Median</b> | <b>Stdev</b> | <b>Number of stocks</b> |
|-------------|---------------|-------------|---------------|--------------|-------------------------|
| Portfolio 1 | 5,05 %        | 0,25 %      | 0,09 %        | 0,64 %       | 26                      |
| Portfolio 2 | 12,14 %       | 0,59 %      | 0,23 %        | 2,08 %       | 1                       |
| Portfolio 3 | 6,43 %        | 0,31 %      | 0,24 %        | 0,38 %       | 51                      |
| Portfolio 4 | 5,88 %        | 0,29 %      | 0,27 %        | 0,53 %       | 29                      |
| Portfolio 5 | 1,74 %        | 0,09 %      | 0,14 %        | 0,64 %       | 12                      |
| Portfolio 6 | 3,16 %        | 0,16 %      | 0,13 %        | 0,43 %       | 15                      |
| Portfolio 7 | 5,29 %        | 0,26 %      | 0,20 %        | 0,36 %       | 134                     |

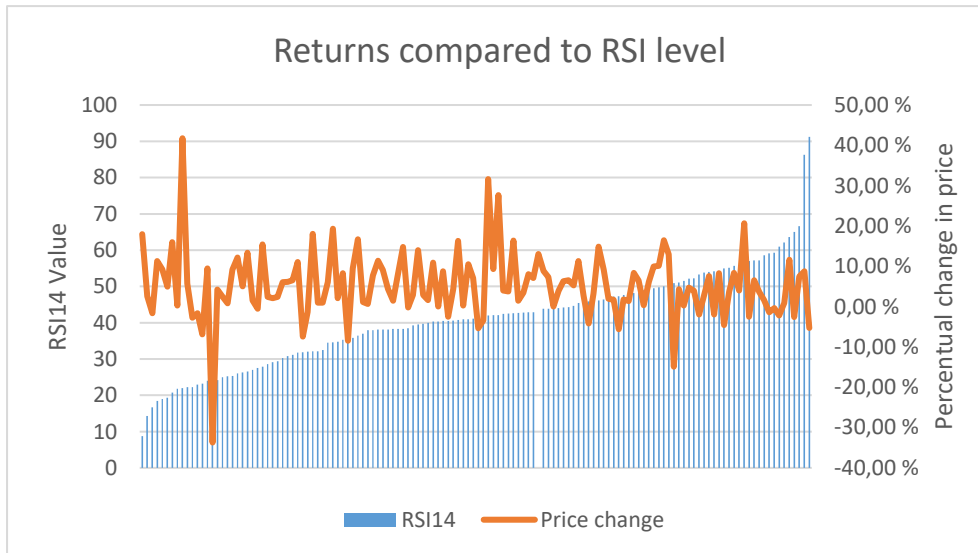
The two portfolios (3, 4) that were neither overbought or sold had solid, and almost identical performance to one another, and the market portfolio (7). The uptrending one (4) had the best performance of them all the first 12-days, but the rest of the period smoothed its progress with little growth. In terms of stocks, it had the highest ratio of winners, with 89,4% of its stocks having positive returns. It had similar performance compared to the downtrending oversold one (1). Consistent to that, its descriptive values were also extremely comparable. The normal downtrending one (3) achieved the second largest profits. It also was the least volatile (0,38%) portfolio after the index, and it could be considered the safest portfolio. The second highest return (6,43%) on it can be considered irregular, due to the wide empirical evidence on positive relation between risk premium and volatility (French et al. 1987). The downtrending portfolio (3) beating the uptrending (4) could be explained by the fact that the stocks trending downward may have had more room in the price of the stock to account for the benefits achieved from the constant interest rates.

The overbought portfolio's (5, 6) acted both in accordance to our hypothesis. The downtrending one (5) was the worst performer in our categories. It also had relatively high volatility (0,64%) in comparison to its bad returns. In terms of individual stocks, it reached first place in losers, with 50% of its 12 stocks gaining negative returns on a period where the average stock gained over 5%. Its performance was in line with other portfolio's up until the halfway point of our period. From there its performance started to decline. This can be considered the moment when the temporary overbought condition starts to end, the RSI values fall and the stocks experience a pullback in their price, back in line with their downward short-term trend. The uptrending overbought stocks (6) performed better but still fell short for the index. It lagged at the start of the period but had positive growth in the latter part. This can be considered a characteristic of an overbought stock, because in uptrends overbought instruments usually stay overbought for an extended period of time and do not experience an immediate pullback (Murphy 1986, 245).

Generally, the trend of the stock showed positive impact when it was taken into account on oversold/overbought conditions. On the case of oversold stock's (1, 2), the inclusion of the trend improved returns by over two-fold. A similar situation was witnessed with overbought stocks (5, 6) where the stocks on an uptrend cultivated



81,6% better returns. On the two normal portfolios (3, 4), the effect of the trend is opposite, but the difference between categories was not significant. Finally, let's investigate the performance of the stocks if the effect of trend is dismissed, so we can isolate the performance of the stocks purely by their RSI.



**Figure 6.** The growth of RSI in relation to magnitude of price change

Figure 6 shows the RSI14 value of all our stocks in ascending order. The change in price is added to illustrate the relationship between the severity of the stock's RSI level and its volatility. Based on this we can say that it seems that the stocks with the most severe oversold conditions seem to have only quite large positive returns (RSI > 22,22). When we go to less severe oversold stock's we see negative returns and smaller positive ones. Earlier we said that 35% of the 26 downtrending oversold stocks (1) gained upwards of 9%. This would point in the direction that the severity of the oversold condition positively affects returns and the limits for oversold conditions could be tightened. In our case the average return for stocks with RSI>22,22 is 10,81%, while the rest of the oversold portfolio scored only 1,89%.

If on the other hand we go over the overbought stocks, it seems that the severity of it does not affect the performance significantly. All the stocks with RSI values over 50 perform consistently poor in the studied time frame. In fact, the difference in return between the top and bottom half of the overbought portfolio is just 0,04%. In our data the most consistent interval of performers fall between RSI values of 32-43. This could

partially confirm the slight eminence of our downtrending normal portfolio (average RSI 41,38) to the uptrending one (average RSI 40,41). After crossing the 43 line, the consistency of the profits degrades. Table 3 showcases the performance of the stocks categorized only by their RSI14.

**Table 3.** Statistics of stocks categorized only by their RSI

| Condition  | RSI14       | Return | Stdev  | Winners | Number of stocks |
|------------|-------------|--------|--------|---------|------------------|
| Oversold   | <28,58      | 5,32 % | 0,70 % | 76,92 % | 27               |
| Normal     | 28,58-50,88 | 6,23 % | 0,43 % | 88,75 % | 81               |
| Overbought | >50,88      | 2,55 % | 0,52 % | 64,29 % | 27               |
| Market     |             | 5,29 % | 0,36 % | 81,34 % | 134              |

When the effect of trend is dismissed, we can see that now the oversold stocks as a whole, outperformed the market portfolio by a small margin, but still losing to the normal stocks. Also, the oversold portfolio has the highest volatility and therefore carries the most risk. However, its ratio of winning stocks is still higher compared to the overbought portfolio. The overbought portfolio has the least winners, the lowest return and still the second highest volatility, which confirms the fact that overbought stocks were the worst category examined to invest in. Diversely our market portfolio had great profits within our period and had the lowest standard deviation consistently, which is why it could have been considered the most sensible one. The oversold stocks had many great performers, but the inconsistency in them handed it high volatility and a profit margin so small, that its risk may not be worth it. In the next chapter we will evaluate the portfolios with risk-adjusted indicators, so that we can analyze the performance more thoroughly.

## 4.2 Portfolio performance based on measures

Since returns alone do not convey the success of different portfolio's enough, these risk indicators have been employed to measure the portfolio's performance in relation to their risk. Measures as well as detailed statistics are presented in Table 4.

**Table 4.** Portfolio risk measures

| <b>Portfolio</b>           | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>Market (7)</b> |
|----------------------------|----------|----------|----------|----------|----------|----------|-------------------|
| Average return             | 0,25 %   | 0,59 %   | 0,31 %   | 0,29 %   | 0,09 %   | 0,16 %   | 0,28 %            |
| Risk free return (daily)   | 0,08 %   | 0,08 %   | 0,08 %   | 0,08 %   | 0,08 %   | 0,08 %   | 0,08 %            |
| Risk free return (monthly) | 2,35 %   | 2,35 %   | 2,35 %   | 2,35 %   | 2,35 %   | 2,35 %   | 2,35 %            |
| Beta                       | 1,544    | 0,19     | 0,865    | 1,041    | 0,909    | 0,6171   | 1                 |
| Standard deviation         | 0,64 %   | 2,08 %   | 0,38 %   | 0,53 %   | 0,64 %   | 0,43 %   | 0,36 %            |
| Jensen's alpha             | -1,84 %  | 9,23 %   | 1,54 %   | 0,48 %   | -3,28 %  | -1,00 %  | 0,00 %            |
| Sharpe measure             | 0,272    | 0,255    | 0,639    | 0,404    | 0,014    | 0,184    | 0,515             |

Let's start with analyzing the beta's calculated for the portfolios. What can be considered "expected" is the high beta (1,5) of the downtrending oversold portfolio (1). It landed the highest beta in our portfolios, which is descriptive of its high reactions to the change of the market. The movements for its stock prices can be treated as 50% more volatile than the market, and the results are in correspondence with their standard deviations. The other oversold portfolio (2) had peculiar movement in comparison to the market, with a large average daily return (0,59%). The stock prices of the portfolio seem to move almost in opposite direction with the market, which evokes interesting further research measures. The performance of the normal portfolios (3, 4) can be considered expected due to their extremely similar betas close to 1. This can be attributed to their stock's daily movement in correspondence with the market seen in Figure 5. The downtrending overbought portfolio (5) also moved in relation to the market, but its average return (0,09%) was extremely poor. The other overbought portfolio (6) had the second lowest beta (0,6), which is descriptive of the oversold/bought stock movement, because it seems they have a different momentum in comparison to the rest of the market by this evidence.

In terms of Jensen's alpha's 3 out of 6 portfolios (1, 5, 6) did not earn enough return in comparison to the risk taken. The overbought downtrending portfolio (5) had the biggest risk in relation to its poor returns. However, the other oversold portfolio (2), although having large volatility (2,08%), earned still more than enough return to compensate the risk. Altogether the alphas suggest that the oversold/overbought stocks carry more risk than can be expected from their returns.

Although the Sharpe's ratio is not dependent on the selected market portfolio and the betas, but the standard deviation, it still shows a similar story. None of the ratio's were complimentary, but from the normal downtrending portfolio (3), you would get the best return on a risk-adjusted basis. All the other portfolio's fell short for the market portfolio (7), with the overbought portfolio (5) keeping the top spot on this as well. The oversold portfolio (2) that just showed good performance is now the third poorest.

As a whole, measured in terms of risk, a risk averse person would not touch the overbought category (5, 6) even as a joke in the studied timeframe. They had miserable performance with the Sharpe's ratio (0,01; 0,2), their alphas (-3,3%; -1%) weren't favorable either and both standard deviations (0,64%; 0,43%) were high in comparison to the poor returns (0,09%; 0,16%). The oversold portfolio's (1, 2) showed similar rough performance with Sharpe (0,27; 0,26), albeit the alphas (-1,8%; 9,2%) shed some light. The normal portfolios (3, 4) performed fair in comparison to the market. They beat it in alpha return and their average with Sharpe is higher. The downtrending normal portfolio (3) would offer the best performance in excess return per a unit of risk. The uptrending oversold one (2) would give the best return in comparison to the market portfolio, measured with the alpha. Finally, the market portfolio (7) showed best performance in comparison to the portfolio's volatility.

## 5. Conclusions

The aim of this thesis was to find out whether abnormal returns can be gained within the stock market short-term, by categorizing the stocks to oversold/overbought conditions with an RSI and take into account their short-term trend. The research was conducted in the Helsinki stock exchange with stocks that were listed in the primary index. The stocks were analyzed by their return as well as risk-adjusted indicators. The momentum caused by these conditions, and the short-term benefit from it had been observed by Chong and Ng (2008) and Rodríguez-González and others (2011) and the intention was to confirm these findings in Helsinki. The inclusion of trend was added to make the research more interesting and to add depth to it to differ it from former studies.

The research was conducted as a quantitative portfolio analysis, by utilizing a time series data collected from the Nasdaq databases between 31.05.2019 – 28.06.2019. The empirical section of the study was conducted in Excel, where the data was handled, and the indicators calculated from the closing prices of the stocks. The research was presented for an individual investor's perspective, and it tried to give understanding for the short-term momentum of stock prices as well as give suggestions for the short-term strategy that could be utilized to compound profits.

The main research question that was derived from our problem was:

*“How will the stocks selected by their relative strength index perform compared to the stock market index”*

Stocks were divided by their RSI to three categories: oversold/normal/overbought. The oversold portfolio consisted of 20% of the stocks with the worst recent trading strength. The best recent stocks were placed to the overbought portfolio, and the rest were categorized as normal. The normal stocks performed the best in our study period with a 6,23% return. The oversold stocks were second (5,32%) beating the market portfolio by an inch (5,29%). The overbought stocks performed significantly the worst with a 2,55% return. In terms of risk the normal stocks gave best returns per unit of risk, but the oversold stocks had the largest profits in comparison to the risk taken. Cabiri and

Cohen (2015) stated that during bull markets the RSI's effectiveness decreases, which is confirmed here with its loss to the normal stocks.

To deepen our understanding for the results our first sub question was:

*“How will the short-term trend of the stock affect its ability to react to an oversold/overbought condition”*

The inclusion of trend affected the results significantly. After the effect of short-term trend was taken into account the performance of both oversold and overbought stocks increased. The oversold stocks that had been experiencing an uptrend at the time of the oversold condition gave a 12,14% return. This portfolio also gave the best return for the risk taken. The return of the downtrending oversold stocks fell below the market return to 5,05%. In the case of overbought stocks, after the separation the uptrending stocks returns gave a return 3,16%. The downtrending overbought stocks gave the lowest return of all categories: 1,74%. In normal stocks the effect of trend was opposite, but not as major. The uptrending normal stocks returned 5,88% and the downtrending was a little bit more, 6,43%. Sahin and Ozbayoglu (2014) found similar results, where the RSI trading rules worked better on uptrending stocks.

The second sub question tried to more insight to the relation between the trend and the value of the RSI:

*“Is there a level of relative appreciation where the stocks perform consistently the best regardless of the short-term trend”*

The stocks that had most consistent profits regardless of the past trend fell in between an RSI value of 32-43, which would imply normal condition. In this range 88,5% of stocks gave positive returns. However, after the effect of trend was added, this percentage rose to 93,3%. Of all our six portfolios as a whole, the one in normal range with downtrending stocks had the overall best percentage of positive returns (89,4%). The best percentage was acquired in the 32-43 range.

Our final sub question tried to sort out if results in severe conditions differ in some way:

*“Does the magnitude of the oversold/overbought condition affect a stock’s performance”*

In our portfolio selection a 20% criteria was used to determine the oversold condition. This was done to include enough variation between the portfolios. After this was reduced to 10%, (RSI>22,22) the results were compelling. The stocks that were heavily oversold gained a 10,81% during our period, while the rest of the oversold portfolio returned only 1,89%. Similar results were achieved by Sahin and Ozbayoglu (2014), where the profits increased after a reduction in the RSI limit. When this same split was done to overbought stocks, the difference between returns was only 0,04%. From our evidence, it seems that the severity of the oversold condition affects returns positively, but in overbought stocks there is no difference. The results with overbought limits are inconsistent with former research, because it is found that severe oversold conditions cause momentum, due to the herding of investors to well performing stocks (Ni et al. 2015).

## **5.1 Suggestions for future research**

From the results of this study, many potential subjects for further research emerged. First let’s begin from our timeframe. The results provided interesting insight on the effect of trend to oversold conditions. However, the results of this study are limited by the fact that we did not take into account the existence of differing market trends, and we used one isolated period. Defining and including these into the analysis is left for future research efforts. Also, the study should be repeated throughout multiple periods during multiple years. These periods should contain rising, consolidating and falling prices. If there would be consistency in results between the periods, the validity would be higher.

Then for use of the RSI indicator, the criteria for selecting stocks was rather rough. The divergence or trend of the RSI was not taken into account. The only norm was to have the value within a certain range. By adjusting the criteria for the RSI, better results

may be obtained. The same thing can be said about the EMA. Only criteria for the trend was the position of the two lines. In some downtrending situations, there was evidence of the change of trend for the stocks that could be observed from the change of trend of the EMA, but since the lines had not crossed, it was considered downtrending in this research. The lines that determine oversold/overbought conditions could be studied further, and the relationship of the lines to differing economic conditions. We received positive results by tightening the criteria, but in other studies the lines have been more open for interpretation (Aan 1985).



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# APPENDICES

## Appendix 1. Descriptive statistics of portfolio's

| Portfolio 1              |       |        |       |          |        |         |         |
|--------------------------|-------|--------|-------|----------|--------|---------|---------|
| Stock                    | RSI14 | EMA14  | EMA90 | Return   | Stdev  | Mean    | Median  |
| Lehto Group              | 8,71  | 2,572  | 3,926 | 17,96 %  | 2,56 % | 0,86 %  | 0,21 %  |
| Altia                    | 14,29 | 7,26   | 7,52  | 2,54 %   | 0,98 % | 0,13 %  | 0,07 %  |
| PunaMusta Media          | 16,67 | 6,3    | 6,4   | -1,63 %  | 1,05 % | -0,08 % | 0,00 %  |
| Ovaro Kiinteistösijoitus | 18,42 | 4,09   | 4,48  | 11,28 %  | 1,95 % | 0,55 %  | 0,44 %  |
| Stora Enso R             | 18,97 | 9,985  | 11,12 | 9,23 %   | 2,23 % | 0,47 %  | 0,72 %  |
| Sanoma                   | 19,35 | 8,33   | 8,745 | 4,95 %   | 1,22 % | 0,25 %  | 0,12 %  |
| Metsä Board B            | 20,72 | 4,372  | 5,468 | 15,96 %  | 1,91 % | 0,76 %  | 0,98 %  |
| HKScan A                 | 21,82 | 1,762  | 1,91  | 0,25 %   | 2,62 % | 0,04 %  | -0,12 % |
| Outotec                  | 22    | 3,542  | 3,9   | 41,76 %  | 3,47 % | 1,81 %  | 0,57 %  |
| Oriola A                 | 22,22 | 1,94   | 2,02  | 5,76 %   | 2,02 % | 0,30 %  | 0,38 %  |
| Taaleri                  | 22,22 | 7,42   | 7,54  | -2,78 %  | 0,79 % | -0,14 % | -0,14 % |
| Panostaja                | 22,95 | 0,858  | 0,938 | -1,68 %  | 1,43 % | -0,07 % | 0,12 %  |
| Basware                  | 23,21 | 20,32  | 25,32 | -6,87 %  | 0,81 % | -0,35 % | -0,27 % |
| Finnair                  | 24    | 6,72   | 7,46  | 9,46 %   | 2,15 % | 0,47 %  | 0,18 %  |
| Valoe                    | 24    | 0,2915 | 0,308 | -33,71 % | 4,12 % | -1,95 % | -1,97 % |
| UPM-Kymmene              | 24,18 | 23,14  | 25,32 | 4,24 %   | 1,68 % | 0,22 %  | 0,02 %  |
| Alma Media               | 25    | 5,82   | 6,05  | 2,45 %   | 1,30 % | 0,13 %  | 0,00 %  |
| Nordea Bank Abp          | 25,2  | 6,618  | 7,322 | 0,79 %   | 1,03 % | 0,04 %  | 0,00 %  |
| Konecranes               | 25,35 | 32,44  | 32,87 | 9,14 %   | 1,47 % | 0,45 %  | 0,35 %  |
| Soprano                  | 26,32 | 0,292  | 0,332 | 5,00 %   | 1,00 % | 0,25 %  | 0,00 %  |
| Cargotec                 | 26,59 | 31,28  | 33,4  | 13,38 %  | 1,65 % | 0,64 %  | 0,59 %  |
| NoHo Partners            | 26,97 | 8,32   | 8,5   | 1,50 %   | 1,10 % | 0,08 %  | -0,12 % |
| Ilkka-Yhtymä 2           | 27,5  | 3,71   | 3,76  | -0,55 %  | 0,67 % | -0,03 % | 0,00 %  |
| Metsä Board A            | 27,89 | 6,62   | 7,22  | 15,44 %  | 2,34 % | 0,75 %  | 0,78 %  |
| Kesla A                  | 28,57 | 4,32   | 4,4   | 2,37 %   | 1,59 % | 0,13 %  | 0,00 %  |

| Portfolio 2 |       |       |       |         |        |        |        |
|-------------|-------|-------|-------|---------|--------|--------|--------|
| Stock       | RSI14 | EMA14 | EMA90 | Return  | Stdev  | Mean   | Median |
| Nixu        | 26    | 10,8  | 10,5  | 12,14 % | 2,08 % | 0,59 % | 0,23 % |



| Portfolio 3                 |       |        |        |         |        |         |         |  |  |
|-----------------------------|-------|--------|--------|---------|--------|---------|---------|--|--|
| Stock                       | RSI14 | EMA14  | EMA90  | Return  | Stdev  | Mean    | Median  |  |  |
| Sotkamo Silver              | 29,12 | 0,3665 | 0,397  | 2,08 %  | 1,39 % | 0,11 %  | 0,00 %  |  |  |
| Rapala VMC                  | 29,41 | 3      | 3,08   | 2,37 %  | 0,53 % | 0,12 %  | 0,00 %  |  |  |
| Silli Solutions             | 30,23 | 8,7    | 8,84   | 6,06 %  | 0,95 % | 0,30 %  | 0,23 %  |  |  |
| Keskisuomalainen A          | 31,17 | 9,22   | 10,1   | 6,50 %  | 1,27 % | 0,32 %  | 0,00 %  |  |  |
| SSAB A                      | 31,8  | 2,931  | 3,241  | 11,08 % | 1,85 % | 0,54 %  | 0,46 %  |  |  |
| Nurminen Logistics          | 31,82 | 0,35   | 0,362  | -7,41 % | 3,29 % | -0,33 % | 0,00 %  |  |  |
| Raute A                     | 32    | 23,4   | 25,3   | -1,30 % | 2,10 % | -0,04 % | 0,00 %  |  |  |
| SRV Yhtiöt                  | 32,14 | 1,625  | 1,77   | 0,94 %  | 1,62 % | 0,06 %  | 0,31 %  |  |  |
| Lassila & Tikanoja          | 34,52 | 13,76  | 14,7   | 6,06 %  | 1,45 % | 0,30 %  | 0,00 %  |  |  |
| Ålandsbanken A              | 34,78 | 14,5   | 14,6   | 2,10 %  | 1,73 % | 0,12 %  | 0,00 %  |  |  |
| SSAB B                      | 35,29 | 2,586  | 2,767  | 8,28 %  | 1,99 % | 0,42 %  | 0,02 %  |  |  |
| Atria A                     | 35,87 | 7,31   | 8,02   | 9,49 %  | 1,47 % | 0,46 %  | 0,54 %  |  |  |
| Martela A                   | 37,97 | 2,9    | 3,17   | 7,72 %  | 2,11 % | 0,39 %  | 0,16 %  |  |  |
| Stockmann A                 | 38,1  | 2,31   | 2,48   | 11,36 % | 4,17 % | 0,62 %  | 0,00 %  |  |  |
| YIT                         | 38,12 | 5,015  | 5,26   | 9,07 %  | 1,99 % | 0,45 %  | 0,15 %  |  |  |
| F-Secure                    | 38,13 | 2,455  | 2,545  | 4,42 %  | 1,38 % | 0,23 %  | 0,21 %  |  |  |
| Uponor                      | 38,29 | 9,075  | 9,84   | 7,98 %  | 1,37 % | 0,39 %  | 0,34 %  |  |  |
| Dovre Group                 | 38,33 | 2,25   | 2,3    | 14,81 % | 1,52 % | 0,70 %  | 0,00 %  |  |  |
| Apetit                      | 38,46 | 8,72   | 9,02   | -0,23 % | 0,70 % | -0,01 % | 0,00 %  |  |  |
| Aktia Pankki A              | 39,24 | 8,28   | 8,9    | 2,86 %  | 1,05 % | 0,15 %  | 0,00 %  |  |  |
| Outokumpu                   | 39,57 | 2,776  | 3,337  | 13,98 % | 2,86 % | 0,69 %  | 0,81 %  |  |  |
| Scanfil                     | 39,71 | 3,87   | 4,1    | 2,90 %  | 1,02 % | 0,15 %  | 0,00 %  |  |  |
| Efore                       | 40,3  | 0,0556 | 0,0578 | 10,91 % | 1,96 % | 0,54 %  | 0,00 %  |  |  |
| Wärtsilä B                  | 40,49 | 13,59  | 14,24  | -2,52 % | 1,48 % | -0,12 % | 0,12 %  |  |  |
| Robit                       | 40,63 | 2,66   | 2,72   | 4,40 %  | 2,09 % | 0,24 %  | 0,38 %  |  |  |
| Oma Säästöpankki            | 40,91 | 7,3    | 7,38   | 0,27 %  | 1,35 % | 0,02 %  | 0,00 %  |  |  |
| Teleste                     | 40,91 | 5,44   | 5,86   | 10,49 % | 1,07 % | 0,51 %  | 0,17 %  |  |  |
| Sampo A                     | 41,12 | 39,3   | 40,62  | 7,07 %  | 1,03 % | 0,35 %  | 0,07 %  |  |  |
| Trainers' House             | 41,94 | 0,396  | 0,419  | -3,35 % | 2,78 % | -0,13 % | 0,00 %  |  |  |
| Endomines                   | 41,96 | 0,351  | 0,491  | 31,66 % | 5,36 % | 1,51 %  | 1,15 %  |  |  |
| Stora Enso A                | 42,05 | 12,7   | 12,95  | 9,31 %  | 1,60 % | 0,46 %  | 0,20 %  |  |  |
| SSH Communications Security | 42,11 | 1,15   | 1,385  | 27,63 % | 5,26 % | 1,35 %  | 0,17 %  |  |  |
| Honkarakenne B              | 42,42 | 2,27   | 2,35   | 4,00 %  | 1,75 % | 0,21 %  | 0,00 %  |  |  |
| Evli Pankki                 | 42,55 | 7,64   | 8,08   | 3,73 %  | 0,78 % | 0,19 %  | 0,00 %  |  |  |
| Tieto                       | 42,79 | 25,42  | 26,02  | 3,41 %  | 1,65 % | 0,18 %  | 0,00 %  |  |  |
| Ahlstrom-Munksjö            | 42,86 | 13,26  | 13,5   | 8,06 %  | 2,16 % | 0,41 %  | 0,29 %  |  |  |
| Stockmann B                 | 43,09 | 2,024  | 2,232  | 13,08 % | 2,66 % | 0,65 %  | 0,45 %  |  |  |
| CapMan                      | 43,84 | 1,582  | 1,63   | 8,82 %  | 1,30 % | 0,43 %  | 0,18 %  |  |  |
| Nokian Renkaat              | 43,85 | 26,13  | 28,95  | 7,31 %  | 0,91 % | 0,36 %  | 0,26 %  |  |  |
| eQ                          | 45,72 | 0,355  | 0,49   | 2,70 %  | 0,84 % | 0,14 %  | 0,00 %  |  |  |
| Bittium                     | 45,86 | 6,65   | 6,78   | -4,15 % | 0,69 % | -0,21 % | -0,16 % |  |  |
| Exel Composites             | 45,9  | 4,1    | 4,22   | 3,17 %  | 1,24 % | 0,16 %  | 0,00 %  |  |  |
| Aspo                        | 46,43 | 8,46   | 8,68   | 9,18 %  | 0,79 % | 0,44 %  | 0,33 %  |  |  |
| Sievi Capital               | 47,22 | 1,215  | 1,3    | 1,67 %  | 1,41 % | 0,09 %  | 0,00 %  |  |  |
| Oriola B                    | 47,67 | 1,986  | 2,224  | 1,78 %  | 2,44 % | 0,12 %  | 0,18 %  |  |  |
| Tokmanni Group              | 48,19 | 7,51   | 8      | 8,38 %  | 1,24 % | 0,41 %  | 0,31 %  |  |  |
| Neo Industrial              | 48,29 | 2,02   | 2,21   | 6,44 %  | 3,28 % | 0,36 %  | -0,23 % |  |  |
| Kamux                       | 48,94 | 5,44   | 5,74   | 0,37 %  | 1,38 % | 0,03 %  | 0,00 %  |  |  |
| Orion A                     | 49,51 | 29,4   | 30,85  | 9,98 %  | 1,04 % | 0,48 %  | 0,16 %  |  |  |
| Orion B                     | 49,75 | 29,59  | 31     | 10,08 % | 0,98 % | 0,49 %  | 0,41 %  |  |  |
| Yleiselektronikka E         | 50    | 7,7    | 7,85   | 12,99 % | 3,06 % | 0,65 %  | 0,00 %  |  |  |

| <b>Portfolio 4</b> |              |              |              |               |              |             |               |
|--------------------|--------------|--------------|--------------|---------------|--------------|-------------|---------------|
| <b>Stock</b>       | <b>RSI14</b> | <b>EMA14</b> | <b>EMA90</b> | <b>Return</b> | <b>Stdev</b> | <b>Mean</b> | <b>Median</b> |
| Valmet             | 30,84        | 22,33        | 22,28        | 6,10 %        | 1,60 %       | 0,31 %      | 0,00 %        |
| Harvia             | 32,14        | 6,44         | 6,28         | 18,04 %       | 1,74 %       | 0,85 %      | 0,30 %        |
| Saga Furs C        | 32,47        | 11,04        | 10,62        | 0,99 %        | 4,44 %       | 0,14 %      | 0,00 %        |
| Metso              | 34,55        | 30,41        | 30,37        | 19,34 %       | 1,53 %       | 0,90 %      | 0,76 %        |
| Tallink Grupp      | 35,29        | 1,068        | 1,06         | -8,44 %       | 2,51 %       | -0,41 %     | 0,00 %        |
| Innofactor         | 36,43        | 0,564        | 0,538        | 16,67 %       | 6,90 %       | 0,97 %      | -0,16 %       |
| Incap              | 36,99        | 13,15        | 10,9         | 1,14 %        | 1,39 %       | 0,07 %      | 0,00 %        |
| Wulff Group        | 37,93        | 1,615        | 1,61         | 0,63 %        | 1,57 %       | 0,04 %      | -0,31 %       |
| Revenio Group      | 38,29        | 20,3         | 17,7         | 1,42 %        | 1,26 %       | 0,08 %      | 0,12 %        |
| Aspocomp Group     | 40           | 5,12         | 4,62         | 1,58 %        | 1,02 %       | 0,08 %      | 0,00 %        |
| Tecnotree          | 40,31        | 0,0692       | 0,0662       | 0,00 %        | 3,96 %       | 0,07 %      | 0,00 %        |
| Tulikivi A         | 40,48        | 0,138        | 0,1305       | 8,76 %        | 3,36 %       | 0,47 %      | 0,00 %        |
| Qt Group           | 40,74        | 11,5         | 10,45        | 16,30 %       | 2,13 %       | 0,78 %      | 0,00 %        |
| Elecster A         | 41,43        | 9,45         | 9,4          | -5,38 %       | 2,22 %       | -0,25 %     | 0,00 %        |
| Cramo              | 42,59        | 18,07        | 17,95        | 16,39 %       | 2,52 %       | 0,79 %      | 0,16 %        |
| Pihlajalinna       | 42,7         | 11           | 10,58        | 1,44 %        | 1,06 %       | 0,08 %      | 0,63 %        |
| Asiakastiето Group | 42,86        | 27,4         | 26,7         | 7,06 %        | 1,81 %       | 0,36 %      | 0,37 %        |
| Terveystalo        | 43,92        | 9,16         | 9            | 0,00 %        | 1,90 %       | 0,02 %      | -0,32 %       |
| Ålandsbanken B     | 44           | 14,05        | 13,95        | 3,93 %        | 1,06 %       | 0,20 %      | 0,00 %        |
| Kone               | 44,2         | 50,16        | 46,98        | 6,33 %        | 0,60 %       | 0,31 %      | 0,33 %        |
| Etteplan           | 44,29        | 8,54         | 8,34         | 6,56 %        | 1,06 %       | 0,32 %      | 0,34 %        |
| Kemira             | 44,68        | 12,33        | 11,7         | 5,29 %        | 1,21 %       | 0,26 %      | 0,08 %        |
| Digia              | 45,45        | 3            | 2,86         | 11,33 %       | 1,38 %       | 0,55 %      | 0,00 %        |
| Caverion           | 46,15        | 6,06         | 5,82         | 14,83 %       | 1,66 %       | 0,71 %      | 0,46 %        |
| QPR Software       | 46,77        | 2,04         | 1,94         | 1,96 %        | 1,12 %       | 0,10 %      | 0,00 %        |
| Suominen           | 47,3         | 2,47         | 2,42         | -5,60 %       | 2,07 %       | -0,27 %     | 0,00 %        |
| Raisio V           | 47,83        | 2,93         | 2,8          | 1,40 %        | 1,68 %       | 0,08 %      | 0,08 %        |
| Huhtamäki          | 49,49        | 34,09        | 32,28        | 6,10 %        | 1,49 %       | 0,31 %      | 0,22 %        |
| Viking Line        | 50           | 15,6         | 15,5         | 16,46 %       | 3,03 %       | 0,81 %      | 0,30 %        |

| <b>Portfolio 5</b> |              |              |              |               |              |             |               |
|--------------------|--------------|--------------|--------------|---------------|--------------|-------------|---------------|
| <b>Stock</b>       | <b>RSI14</b> | <b>EMA14</b> | <b>EMA90</b> | <b>Return</b> | <b>Stdev</b> | <b>Mean</b> | <b>Median</b> |
| Glaston            | 50,89        | 1,51         | 1,55         | -14,90 %      | 2,67 %       | -0,77 %     | -0,39 %       |
| Telia Company      | 51,12        | 3,768        | 3,888        | 4,34 %        | 0,70 %       | 0,22 %      | 0,24 %        |
| Digitalist Group   | 53,25        | 0,051        | 0,053        | -2,00 %       | 3,07 %       | -0,06 %     | 0,00 %        |
| Kesko A            | 54,24        | 43,7         | 46,1         | 8,28 %        | 1,76 %       | 0,41 %      | 0,66 %        |
| Investors House    | 55           | 6,55         | 6,65         | -4,55 %       | 0,90 %       | -0,23 %     | 0,00 %        |
| Kesko B            | 55,87        | 47,08        | 49,8         | 4,02 %        | 1,20 %       | 0,20 %      | 0,39 %        |
| Componenta         | 56,67        | 0,127        | 0,137        | 20,63 %       | 2,65 %       | 0,98 %      | 1,40 %        |
| Nokia              | 57,01        | 4,488        | 4,905        | -2,54 %       | 1,35 %       | -0,12 %     | -0,16 %       |
| Marimekko          | 57,14        | 25           | 25,6         | 6,56 %        | 2,18 %       | 0,34 %      | 0,00 %        |
| Solteq             | 57,14        | 1,4          | 1,43         | 3,57 %        | 2,78 %       | 0,21 %      | 0,00 %        |
| Biohit B           | 59,26        | 2,82         | 3,01         | -0,36 %       | 1,91 %       | 0,00 %      | 0,36 %        |
| Consti Yhtiöt      | 60,94        | 5,32         | 5,54         | -2,20 %       | 1,44 %       | -0,10 %     | 0,00 %        |

| <b>Portfolio 6</b> |              |              |              |               |              |             |               |
|--------------------|--------------|--------------|--------------|---------------|--------------|-------------|---------------|
| <b>Stock</b>       | <b>RSI14</b> | <b>EMA14</b> | <b>EMA90</b> | <b>Return</b> | <b>Stdev</b> | <b>Mean</b> | <b>Median</b> |
| DNA                | 51,52        | 21           | 19,28        | 0,29 %        | 0,28 %       | 0,01 %      | 0,00 %        |
| Silmäasema         | 52,13        | 5,24         | 5,22         | 4,74 %        | 1,65 %       | 0,24 %      | 0,00 %        |
| Olvi A             | 52,24        | 32,8         | 32,5         | 3,95 %        | 1,56 %       | 0,21 %      | 0,29 %        |
| Tikkurila          | 53,85        | 14,3         | 14,26        | 2,64 %        | 1,43 %       | 0,14 %      | -0,20 %       |
| Afarak Group       | 54,01        | 0,83         | 0,831        | 7,60 %        | 1,20 %       | 0,37 %      | 0,00 %        |
| Rovio              | 54,17        | 7,11         | 6,25         | -1,92 %       | 1,59 %       | -0,09 %     | -0,17 %       |
| Hoivatilat         | 55,17        | 9,45         | 8,8          | 3,75 %        | 1,49 %       | 0,19 %      | 0,00 %        |
| Ponsse             | 55,67        | 29,05        | 28,8         | 8,35 %        | 1,46 %       | 0,41 %      | 0,74 %        |
| Fortum             | 58,6         | 19,19        | 19,18        | 1,59 %        | 1,01 %       | 0,08 %      | 0,12 %        |
| Neste              | 59,11        | 30,76        | 29,74        | -1,39 %       | 1,66 %       | -0,06 %     | -0,20 %       |
| Citycon            | 62,15        | 9,045        | 8,965        | 0,94 %        | 0,57 %       | 0,05 %      | 0,00 %        |
| Vaisala A          | 63,64        | 19,4         | 18,7         | 11,62 %       | 2,26 %       | 0,58 %      | 0,35 %        |
| Talenom            | 65,06        | 33,8         | 28,8         | -2,62 %       | 1,88 %       | -0,12 %     | -0,15 %       |
| Elisa              | 66,59        | 39,53        | 38,5         | 7,49 %        | 0,85 %       | 0,37 %      | 0,32 %        |
| Kojamo             | 86,32        | 11,38        | 10,28        | 8,79 %        | 1,40 %       | 0,43 %      | 0,40 %        |
| Uutechnic Group    | 91,23        | 0,418        | 0,386        | -5,26 %       | 1,80 %       | -0,25 %     | 0,00 %        |

## Appendix 2. Returns of individual stocks

| Daily procentual change   | 28.6.2019 | 27.6.2019 | 26.6.2019 | 25.6.2019 | 24.6.2019 | 20.6.2019 | 19.6.2019 | 18.6.2019 | 17.6.2019 | 14.6.2019 |
|---------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Lehto Group               | 6,45 %    | 2,56 %    | 4,68 %    | 0,00 %    | -4,15 %   | 1,35 %    | 1,71 %    | -1,43 %   | 0,25 %    | 0,17 %    |
| Altia                     | -0,27 %   | 0,41 %    | 0,97 %    | 0,14 %    | 1,55 %    | -2,21 %   | -0,55 %   | 0,00 %    | 0,41 %    | 0,42 %    |
| PunaMusta Media           | 0,00 %    | 0,00 %    | -2,42 %   | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    | 2,48 %    |
| Ovaro Kiinteistösi joitus | 0,00 %    | -0,45 %   | 1,13 %    | -0,23 %   | -1,34 %   | 0,45 %    | 0,68 %    | -4,11 %   | 0,43 %    | 0,66 %    |
| Stora Enso R              | 3,09 %    | 0,55 %    | 0,89 %    | 3,52 %    | -1,40 %   | -1,06 %   | 1,81 %    | 3,24 %    | -1,15 %   | -1,98 %   |
| Sanoma                    | 1,56 %    | 0,00 %    | 0,42 %    | -0,24 %   | -1,18 %   | -0,59 %   | 0,47 %    | 3,68 %    | 0,12 %    | -2,10 %   |
| Metsä Board B             | 3,01 %    | 1,24 %    | 2,07 %    | 1,23 %    | -0,14 %   | -0,81 %   | 0,73 %    | 1,34 %    | -1,41 %   | -2,31 %   |
| HKScan A                  | 0,50 %    | -3,82 %   | -5,42 %   | -2,21 %   | 0,78 %    | 2,39 %    | 1,98 %    | -1,04 %   | 1,05 %    | 6,83 %    |
| Outotec                   | 0,96 %    | 0,72 %    | 1,56 %    | 0,42 %    | 0,16 %    | 0,93 %    | -0,87 %   | 7,51 %    | 1,89 %    | -2,46 %   |
| Oriola A                  | 1,00 %    | 0,50 %    | 2,05 %    | 0,26 %    | -0,26 %   | 0,52 %    | -4,90 %   | 3,55 %    | -2,48 %   | 4,12 %    |
| Taaleri                   | 0,00 %    | 0,57 %    | 0,29 %    | -0,86 %   | 0,00 %    | 1,16 %    | -1,70 %   | -0,28 %   | 0,28 %    | 1,44 %    |
| Panostaja                 | -1,44 %   | 1,96 %    | 0,25 %    | -1,93 %   | 1,22 %    | -3,30 %   | 0,95 %    | 0,00 %    | -0,71 %   | 0,48 %    |
| Basware                   | -0,55 %   | -0,22 %   | 0,00 %    | -1,61 %   | -0,43 %   | -0,53 %   | 0,97 %    | -1,17 %   | -0,21 %   | 0,11 %    |
| Finnair                   | 1,52 %    | 0,15 %    | 2,68 %    | -0,22 %   | 0,52 %    | -0,52 %   | 1,13 %    | -3,63 %   | -3,90 %   | -0,28 %   |
| Valoe                     | -2,23 %   | 4,07 %    | -1,71 %   | -5,91 %   | 0,00 %    | 0,00 %    | -6,53 %   | 2,05 %    | -7,14 %   | -0,47 %   |
| UPM-Kymmene               | 1,79 %    | -0,78 %   | 0,43 %    | 1,72 %    | -1,95 %   | -2,53 %   | 1,15 %    | 2,09 %    | -1,16 %   | -1,19 %   |
| Alma Media                | 0,00 %    | 3,17 %    | -0,35 %   | 0,35 %    | 0,00 %    | 1,07 %    | 0,72 %    | -1,06 %   | -0,35 %   | -0,35 %   |
| Nordea Bank Abp           | -0,96 %   | 0,00 %    | 2,54 %    | -1,43 %   | -0,27 %   | -1,14 %   | 0,68 %    | 0,34 %    | -1,81 %   | -0,41 %   |
| Konecranes                | 0,06 %    | -0,36 %   | 1,23 %    | 1,28 %    | -1,76 %   | 1,24 %    | 0,64 %    | 2,40 %    | -0,37 %   | -2,66 %   |
| Nixu                      | 3,59 %    | 0,45 %    | 0,45 %    | -1,34 %   | -3,03 %   | 1,76 %    | 5,58 %    | -2,27 %   | 0,00 %    | 3,29 %    |
| Soprano                   | -0,68 %   | 2,07 %    | 0,00 %    | 0,00 %    | 1,40 %    | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    |
| Cargotec                  | 0,42 %    | 0,85 %    | -0,84 %   | 0,54 %    | -1,67 %   | 1,20 %    | 2,78 %    | 2,54 %    | -0,76 %   | -1,31 %   |
| NoHo Partners             | 0,50 %    | -0,25 %   | -0,49 %   | -0,49 %   | -0,24 %   | -0,24 %   | 0,00 %    | 0,99 %    | 0,00 %    | -0,73 %   |
| Ilkka-Yhtymä 2            | 0,84 %    | -0,28 %   | 0,28 %    | 0,00 %    | -0,83 %   | 0,00 %    | 0,28 %    | 0,00 %    | 0,56 %    | -0,56 %   |
| Metsä Board A             | 0,00 %    | 3,93 %    | -0,30 %   | 0,61 %    | -1,20 %   | 4,38 %    | -3,32 %   | 1,85 %    | -4,13 %   | 1,19 %    |
| Kesla A                   | -0,92 %   | 1,87 %    | 0,00 %    | -0,47 %   | 0,00 %    | 0,00 %    | 1,42 %    | 1,44 %    | -1,42 %   | -1,40 %   |
| Sotkamo Silver            | -0,86 %   | 0,29 %    | -0,29 %   | 0,87 %    | 1,18 %    | -0,58 %   | -1,72 %   | 1,16 %    | 0,58 %    | 0,88 %    |
| Rapala VMC                | 0,67 %    | 0,00 %    | -0,66 %   | 0,33 %    | -0,33 %   | 0,33 %    | 0,33 %    | 0,00 %    | -0,66 %   | 0,67 %    |
| Silli Solutions           | 0,00 %    | 2,02 %    | 1,59 %    | -1,79 %   | 0,90 %    | 0,68 %    | -1,12 %   | 1,60 %    | 0,23 %    | 1,16 %    |
| Valmet                    | 0,00 %    | 0,00 %    | -1,08 %   | -1,16 %   | -1,15 %   | 0,80 %    | -0,79 %   | 3,00 %    | 0,55 %    | -1,08 %   |
| Keskisuomalainen A        | 2,81 %    | 0,00 %    | -0,86 %   | 1,30 %    | 0,66 %    | 0,00 %    | 0,00 %    | 0,00 %    | -1,30 %   | -0,64 %   |
| SSAB A                    | -0,16 %   | 1,97 %    | 1,29 %    | 0,58 %    | -3,92 %   | 1,90 %    | -1,09 %   | 3,65 %    | -0,71 %   | -1,70 %   |
| Nurminen Logistics        | 3,45 %    | 0,00 %    | 0,00 %    | -2,03 %   | -1,33 %   | 3,45 %    | -3,33 %   | 1,35 %    | -1,33 %   | 0,00 %    |
| Raute A                   | -0,87 %   | -0,87 %   | -1,70 %   | -5,62 %   | 0,40 %    | 0,81 %    | -0,40 %   | -2,76 %   | 5,39 %    | 0,42 %    |
| Harvia                    | 6,88 %    | 0,58 %    | 0,29 %    | 1,17 %    | 2,70 %    | 2,46 %    | -0,91 %   | -0,30 %   | 0,00 %    | 2,17 %    |
| SRV Yhtiöt                | 1,57 %    | -2,15 %   | 1,56 %    | -2,14 %   | 2,19 %    | -0,62 %   | 0,63 %    | 0,00 %    | -1,84 %   | 1,87 %    |
| Saga Furs C               | 0,00 %    | 7,89 %    | 0,00 %    | -1,04 %   | -5,88 %   | 6,92 %    | -3,05 %   | 0,41 %    | -4,39 %   | 0,00 %    |
| Lassila & Tikanoja        | -0,69 %   | 0,00 %    | -0,28 %   | -0,41 %   | -1,36 %   | 2,07 %    | -0,14 %   | 0,56 %    | -3,23 %   | 2,90 %    |
| Metso                     | -1,14 %   | 1,16 %    | 0,26 %    | 0,61 %    | -1,24 %   | 2,88 %    | 1,11 %    | 3,86 %    | 0,60 %    | -1,66 %   |
| Ålandsbanken A            | 0,00 %    | 0,69 %    | 4,32 %    | 0,00 %    | -4,14 %   | -0,68 %   | 2,10 %    | -2,05 %   | -0,68 %   | 1,38 %    |
| SSAB B                    | 0,30 %    | 0,23 %    | 1,07 %    | 0,73 %    | -2,76 %   | -0,22 %   | -0,78 %   | 3,40 %    | -1,54 %   | -1,85 %   |
| Tallink Grupp             | 0,00 %    | 1,68 %    | -2,06 %   | -0,21 %   | 0,41 %    | 0,21 %    | -10,56 %  | 0,93 %    | 0,47 %    | -0,47 %   |
| Atria A                   | 2,38 %    | 1,07 %    | 0,67 %    | -1,98 %   | -1,05 %   | 3,10 %    | 0,54 %    | 0,27 %    | 0,55 %    | 0,55 %    |
| Innofactor                | 0,00 %    | 1,29 %    | 0,32 %    | 1,64 %    | -0,97 %   | -1,60 %   | -1,88 %   | 1,27 %    | -0,32 %   | -0,94 %   |
| Incap                     | 1,52 %    | -1,13 %   | 0,00 %    | 0,38 %    | -1,12 %   | 0,75 %    | -1,12 %   | 2,28 %    | 1,15 %    | -1,89 %   |
| Wulff Group               | -0,62 %   | 1,27 %    | 0,00 %    | -0,63 %   | -0,62 %   | -1,23 %   | -0,61 %   | 1,87 %    | 0,00 %    | -0,62 %   |
| Martela A                 | 0,33 %    | 2,68 %    | -1,65 %   | 4,12 %    | 1,75 %    | -3,38 %   | 1,37 %    | 1,39 %    | -2,04 %   | 2,80 %    |
| Stockmann A               | 2,51 %    | -3,63 %   | -0,80 %   | 0,00 %    | 8,23 %    | -5,71 %   | 3,81 %    | -5,22 %   | 10,67 %   | 4,65 %    |
| YIT                       | 2,66 %    | -0,47 %   | 3,52 %    | -2,76 %   | 4,68 %    | -1,95 %   | -1,73 %   | 1,16 %    | 0,10 %    | -0,87 %   |
| F-Secure                  | 1,02 %    | 1,24 %    | -1,82 %   | -0,20 %   | 0,41 %    | 1,86 %    | -0,21 %   | 1,25 %    | 0,63 %    | -0,42 %   |
| Revenio Group             | 0,00 %    | 1,32 %    | -2,03 %   | 0,75 %    | 1,11 %    | -2,80 %   | 0,99 %    | 0,50 %    | -1,72 %   | 0,00 %    |
| Uponor                    | 0,63 %    | 0,05 %    | 3,10 %    | 0,82 %    | -0,65 %   | -1,02 %   | -0,05 %   | 1,14 %    | -0,81 %   | -2,17 %   |
| Dovre Group               | 1,64 %    | 0,00 %    | -0,41 %   | 2,08 %    | 0,42 %    | 2,14 %    | 1,30 %    | 0,43 %    | 0,00 %    | 0,00 %    |
| Apetit                    | -0,23 %   | 0,47 %    | -0,23 %   | -0,23 %   | 0,93 %    | -0,23 %   | 0,47 %    | 0,47 %    | -0,70 %   | 0,00 %    |
| Aktia Pankki A            | -0,46 %   | -0,34 %   | 1,40 %    | -1,38 %   | 1,40 %    | 1,66 %    | 0,96 %    | 0,12 %    | 0,00 %    | -0,36 %   |
| Outokumpu                 | 1,11 %    | 0,51 %    | 4,38 %    | -1,60 %   | -3,75 %   | 1,63 %    | -0,41 %   | 7,62 %    | -2,28 %   | -4,66 %   |
| Scanfil                   | -1,76 %   | 2,32 %    | -0,51 %   | -1,27 %   | -0,25 %   | 1,54 %    | -1,02 %   | -1,01 %   | 0,76 %    | 0,00 %    |
| Aspocomp Group            | -0,39 %   | 0,00 %    | 0,39 %    | -0,39 %   | 2,38 %    | -1,18 %   | 0,00 %    | 0,79 %    | 0,00 %    | 0,00 %    |
| Efore                     | 1,67 %    | 1,69 %    | -1,67 %   | 0,00 %    | 0,00 %    | 3,45 %    | 0,00 %    | -3,33 %   | 0,00 %    | 0,00 %    |
| Tecnotree                 | -6,94 %   | -1,37 %   | 0,00 %    | 2,82 %    | -5,33 %   | 8,70 %    | 0,00 %    | -2,82 %   | 0,00 %    | 0,00 %    |
| Tulikivi A                | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    | 0,00 %    | 2,76 %    | 0,00 %    | 1,40 %    | 0,00 %    | -1,38 %   |
| Wärtsilä B                | -1,12 %   | -1,15 %   | 0,08 %    | 0,77 %    | -1,97 %   | -0,75 %   | 0,76 %    | 2,52 %    | 0,16 %    | -2,91 %   |
| Robit                     | -4,40 %   | 3,02 %    | 1,92 %    | 0,00 %    | -1,89 %   | 0,76 %    | -0,38 %   | 0,38 %    | 1,54 %    | -4,07 %   |
| Qt Group                  | 2,33 %    | 1,18 %    | 7,14 %    | 0,00 %    | -0,83 %   | -1,23 %   | -0,41 %   | 0,41 %    | 0,41 %    | -0,82 %   |
| Oma Säästöpankki          | 1,94 %    | 0,00 %    | 0,00 %    | 0,00 %    | -2,96 %   | 3,05 %    | -0,28 %   | 1,69 %    | -1,93 %   | 0,55 %    |
| Teleste                   | 1,72 %    | 2,84 %    | 0,71 %    | -1,75 %   | 0,00 %    | -0,35 %   | 0,35 %    | -0,70 %   | 0,35 %    | 0,35 %    |
| Sampo A                   | 0,14 %    | -0,62 %   | 0,36 %    | -0,43 %   | 1,04 %    | -0,70 %   | 0,51 %    | 1,80 %    | 0,15 %    | -0,59 %   |

|                         |         |         |         |         |         |         |         |         |         |         |
|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Elecster A              | 0,00 %  | 1,15 %  | -6,95 % | 0,00 %  | 0,00 %  | 1,63 %  | 0,00 %  | 0,00 %  | -1,60 % | -2,09 % |
| Trainers' House         | 4,17 %  | -2,70 % | 1,37 %  | -2,14 % | 0,00 %  | 0,00 %  | 0,00 %  | 1,36 %  | -1,34 % | 1,36 %  |
| Endomines               | 18,98 % | 5,06 %  | 3,19 %  | 0,00 %  | 2,99 %  | 1,52 %  | -0,30 % | -1,19 % | -9,70 % | -4,38 % |
| Stora Enso A            | 2,27 %  | 3,12 %  | 2,40 %  | 1,63 %  | -1,99 % | -0,79 % | 0,40 %  | 2,02 %  | -1,20 % | 1,63 %  |
| SSH Communications Secu | 0,00 %  | 0,69 %  | 0,35 %  | -1,37 % | -2,67 % | 3,45 %  | 0,35 %  | -4,30 % | -0,33 % | 3,41 %  |
| Honkarakenne B          | 1,30 %  | 0,87 %  | -0,87 % | -0,43 % | -0,85 % | 3,08 %  | -4,22 % | 3,04 %  | -1,29 % | 1,30 %  |
| Evli Pankki             | 1,04 %  | -0,26 % | 0,00 %  | -0,52 % | -0,26 % | 0,00 %  | 0,00 %  | -0,26 % | 0,00 %  | 0,26 %  |
| Cramo                   | 5,03 %  | -1,00 % | 2,19 %  | -0,76 % | -1,20 % | 0,70 %  | 1,17 %  | 0,20 %  | -1,06 % | 0,51 %  |
| Pihlajalinna            | 0,72 %  | 0,72 %  | 1,28 %  | 0,55 %  | -0,91 % | -0,36 % | 0,91 %  | -1,62 % | -0,54 % | 0,90 %  |
| Tieto                   | 1,16 %  | 0,63 %  | -0,16 % | 0,16 %  | -0,23 % | -1,31 % | -2,77 % | 4,05 %  | 0,00 %  | -2,13 % |
| Ahlstrom-Munksjö        | 1,69 %  | 0,71 %  | 1,14 %  | 0,43 %  | -1,56 % | -5,10 % | -0,93 % | 1,62 %  | 0,14 %  | -0,27 % |
| Asiakastieto Group      | 2,13 %  | 1,44 %  | -2,46 % | 2,15 %  | 0,36 %  | -0,36 % | -0,71 % | 3,69 %  | -0,37 % | 0,74 %  |
| Stockmann B             | -1,56 % | 0,67 %  | 0,23 %  | -1,77 % | 3,43 %  | -0,68 % | 2,09 %  | -2,49 % | 9,41 %  | -0,98 % |
| CapMan                  | -0,47 % | 0,59 %  | 0,35 %  | -0,59 % | -0,47 % | 0,12 %  | 0,35 %  | 0,24 %  | 0,00 %  | -0,58 % |
| Nokian Renkaat          | 0,22 %  | 0,18 %  | 1,33 %  | -0,70 % | -0,95 % | 0,33 %  | 2,13 %  | 0,49 %  | 0,30 %  | -1,08 % |
| Terveystalo             | -0,87 % | -0,75 % | -0,32 % | -0,74 % | -3,79 % | 0,00 %  | 5,05 %  | -0,53 % | -1,27 % | 0,64 %  |
| Ålandsbanken B          | 2,46 %  | -0,35 % | -0,35 % | 0,00 %  | 0,35 %  | -0,35 % | -2,72 % | 0,00 %  | 1,73 %  | -0,34 % |
| Kone                    | -0,38 % | 0,35 %  | 0,50 %  | 0,51 %  | -0,16 % | 0,98 %  | -0,43 % | 1,59 %  | 0,60 %  | -0,79 % |
| Etteplan                | 0,00 %  | 1,34 %  | -1,32 % | 0,22 %  | 0,89 %  | 0,22 %  | 1,13 %  | -1,33 % | 1,35 %  | -1,11 % |
| Kemira                  | 0,31 %  | -0,46 % | 0,15 %  | 1,25 %  | -1,24 % | -0,54 % | 1,25 %  | 2,31 %  | -0,48 % | -1,71 % |
| Digia                   | 2,77 %  | 4,50 %  | -1,27 % | 1,94 %  | 0,00 %  | 1,64 %  | -0,33 % | 0,99 %  | -0,66 % | 0,00 %  |
| eQ                      | 1,11 %  | 0,44 %  | 0,00 %  | 1,35 %  | -0,45 % | -1,11 % | -0,22 % | 0,89 %  | 0,67 %  | -0,67 % |
| Bittium                 | 0,16 %  | 0,81 %  | 0,98 %  | -0,97 % | 0,00 %  | -1,59 % | -0,63 % | 0,00 %  | 0,48 %  | -0,16 % |
| Exel Composites         | 0,24 %  | -0,24 % | 0,00 %  | 0,00 %  | -1,17 % | 1,18 %  | -0,24 % | 1,19 %  | -0,48 % | -0,24 % |
| Caverion                | -0,14 % | 5,02 %  | 1,08 %  | 0,62 %  | -1,22 % | 0,62 %  | -0,91 % | 1,55 %  | -1,37 % | 1,71 %  |
| Aspo                    | 0,00 %  | 0,00 %  | 0,44 %  | 0,90 %  | 0,22 %  | 0,23 %  | 1,37 %  | 0,00 %  | 0,00 %  | 0,69 %  |
| QPR Software            | -0,95 % | -1,87 % | 1,90 %  | 0,00 %  | 0,00 %  | 1,94 %  | -1,90 % | 0,96 %  | 0,00 %  | 0,00 %  |
| Sievi Capital           | 0,83 %  | 2,54 %  | -2,88 % | 1,25 %  | 0,00 %  | 0,00 %  | -1,64 % | 0,00 %  | 1,24 %  | 2,55 %  |
| Suominen                | 0,00 %  | -2,07 % | -0,41 % | 0,00 %  | 0,00 %  | 0,00 %  | -2,02 % | 0,00 %  | 0,82 %  | 2,08 %  |
| Oriola B                | 0,25 %  | 1,52 %  | 1,55 %  | 0,83 %  | 0,10 %  | 0,73 %  | -6,01 % | 3,36 %  | -3,01 % | 5,03 %  |
| Raisio V                | -2,02 % | -0,17 % | -2,30 % | 0,00 %  | -1,94 % | 0,16 %  | -0,16 % | 0,65 %  | -1,91 % | 0,64 %  |
| Tokmanni Group          | -0,50 % | 1,38 %  | -1,12 % | -0,50 % | -0,98 % | 0,87 %  | -0,12 % | 0,62 %  | 2,42 %  | -0,76 % |
| Neo Industrial          | -0,46 % | 7,46 %  | 0,00 %  | -0,99 % | -0,98 % | 3,54 %  | 1,02 %  | 5,95 %  | 2,78 %  | -5,01 % |
| Kamux                   | 0,75 %  | -0,37 % | -0,37 % | 1,50 %  | 1,53 %  | -1,50 % | -1,12 % | 0,00 %  | -0,37 % | 0,37 %  |
| Huhtamäki               | 0,92 %  | -1,13 % | 0,61 %  | 0,33 %  | -1,16 % | 2,57 %  | 0,11 %  | 3,66 %  | -1,81 % | 2,18 %  |
| Orion A                 | 0,47 %  | -0,47 % | 1,43 %  | 0,64 %  | 0,16 %  | 0,00 %  | -1,11 % | 1,94 %  | -0,96 % | 0,16 %  |
| Orion B                 | 0,66 %  | -0,06 % | 0,60 %  | 1,53 %  | 0,10 %  | -1,32 % | -0,53 % | 2,57 %  | -0,95 % | -0,35 % |
| Viking Line             | 1,10 %  | 1,11 %  | -2,17 % | 2,22 %  | 0,00 %  | 6,51 %  | 0,60 %  | -1,18 % | 3,03 %  | 5,77 %  |
| Yleiselektronikka E     | 0,58 %  | 0,00 %  | 0,00 %  | -0,57 % | 0,58 %  | 0,00 %  | 0,00 %  | 0,00 %  | 13,07 % | 0,66 %  |
| Glaston                 | -0,39 % | 1,18 %  | -1,92 % | 0,39 %  | -0,38 % | 0,00 %  | -2,99 % | -1,11 % | 1,50 %  | 1,52 %  |
| Telia Company           | 0,51 %  | -0,89 % | -0,13 % | 0,82 %  | -0,38 % | 0,54 %  | -1,24 % | 1,96 %  | -0,46 % | 1,01 %  |
| DNA                     | -0,57 % | -0,09 % | 0,19 %  | 0,29 %  | 0,57 %  | -0,66 % | -0,09 % | 0,19 %  | 0,00 %  | 0,19 %  |
| Silmäasema              | 2,32 %  | -1,52 % | 3,95 %  | -1,94 % | -0,77 % | 0,00 %  | -1,14 % | 0,00 %  | 0,38 %  | 0,00 %  |
| Olvi A                  | -1,72 % | 0,87 %  | 0,73 %  | -2,42 % | 1,59 %  | 2,22 %  | -0,59 % | -1,16 % | 0,58 %  | -1,16 % |
| Digitalist Group        | 0,00 %  | -5,77 % | 0,00 %  | 4,00 %  | -3,85 % | -1,89 % | 6,00 %  | -3,85 % | -1,89 % | 0,00 %  |
| Tikkurila               | -0,13 % | -2,50 % | -1,94 % | 1,31 %  | 2,00 %  | 0,00 %  | 1,49 %  | -0,40 % | -0,27 % | -0,40 % |
| Afarak Group            | 1,43 %  | 0,78 %  | 0,00 %  | 0,33 %  | 2,51 %  | 0,11 %  | 0,00 %  | 0,46 %  | 0,00 %  | 0,00 %  |
| Rovio                   | 0,07 %  | -0,56 % | 0,00 %  | -2,32 % | 2,09 %  | -3,49 % | 1,92 %  | 1,32 %  | 0,63 %  | -0,55 % |
| Kesko A                 | 3,29 %  | 0,88 %  | 1,35 %  | 0,00 %  | -2,41 % | 0,88 %  | -1,74 % | 1,77 %  | -0,22 % | -4,02 % |
| Investors House         | 0,00 %  | -1,56 % | 0,79 %  | 0,00 %  | -0,78 % | 0,00 %  | 0,00 %  | -0,78 % | 0,00 %  | -0,77 % |
| Hoivatilat              | 1,63 %  | 0,82 %  | 0,83 %  | 0,42 %  | -2,83 % | 0,00 %  | 0,20 %  | -0,40 % | -2,94 % | 0,49 %  |
| Ponsse                  | 2,75 %  | 1,31 %  | -1,77 % | 0,65 %  | 1,48 %  | 0,83 %  | -2,89 % | 0,65 %  | 0,98 %  | -0,33 % |
| Kesko B                 | 0,10 %  | 1,16 %  | 0,31 %  | -0,45 % | -2,32 % | 1,16 %  | -1,79 % | 1,98 %  | 0,47 %  | -1,12 % |
| Componenta              | 1,33 %  | -3,23 % | 1,97 %  | -2,56 % | 5,41 %  | 2,78 %  | 0,00 %  | -2,04 % | -3,29 % | 6,29 %  |
| Nokia                   | 0,37 %  | -1,02 % | 0,46 %  | -1,13 % | -2,75 % | 1,86 %  | 0,43 %  | 1,09 %  | 0,32 %  | -1,44 % |
| Marimekko               | 1,56 %  | 2,40 %  | 0,40 %  | -0,40 % | 2,04 %  | -0,41 % | 4,24 %  | -1,67 % | -2,04 % | -1,61 % |
| Solteq                  | 4,32 %  | -4,14 % | 2,11 %  | 5,19 %  | -3,57 % | 0,00 %  | 0,00 %  | 0,00 %  | -1,41 % | 1,43 %  |
| Fortum                  | -0,66 % | 0,85 %  | 1,17 %  | 1,16 %  | 0,11 %  | -1,10 % | -1,64 % | 2,15 %  | -0,47 % | -0,10 % |
| Neste                   | -1,13 % | 0,33 %  | 3,01 %  | 1,14 %  | -1,94 % | 0,99 %  | -1,25 % | -0,17 % | -4,21 % | -0,77 % |
| Biohit B                | 0,72 %  | 3,36 %  | 0,00 %  | 0,75 %  | 0,38 %  | -1,49 % | 0,37 %  | -2,19 % | -2,14 % | -3,45 % |
| Consti Yhtiöt           | 0,75 %  | -1,85 % | 1,12 %  | 0,38 %  | -3,62 % | 1,85 %  | 0,00 %  | 0,00 %  | 0,00 %  | 0,00 %  |
| Citycon                 | 0,55 %  | -0,22 % | -0,22 % | -0,44 % | 0,88 %  | -1,03 % | -0,59 % | 0,65 %  | 0,00 %  | 0,27 %  |
| Vaisala A               | 3,79 %  | -6,43 % | -0,44 % | 0,00 %  | -0,44 % | 2,94 %  | 0,45 %  | 0,92 %  | 0,00 %  | 3,81 %  |
| Talenom                 | -2,05 % | 4,28 %  | -0,91 % | -1,49 % | -0,30 % | -1,18 % | 0,00 %  | 0,00 %  | 0,00 %  | -0,58 % |
| Elisa                   | 0,63 %  | -1,00 % | 0,58 %  | 0,19 %  | 0,45 %  | 0,12 %  | -0,63 % | 1,81 %  | -0,21 % | 0,50 %  |
| Kojamo                  | 1,08 %  | -2,26 % | 0,76 %  | 0,30 %  | 2,18 %  | 0,47 %  | -1,84 % | 0,31 %  | 0,00 %  | 1,40 %  |
| Uutechnic Group         | -0,46 % | -1,81 % | 0,00 %  | 1,84 %  | -2,69 % | 2,76 %  | -0,91 % | 0,00 %  | 1,39 %  | 0,93 %  |

| Daily procentual change   | 13.6.2019 | 12.6.2019 | 11.6.2019 | 10.6.2019 | 7.6.2019 | 6.6.2019 | 5.6.2019 | 4.6.2019 | 3.6.2019 | 31.5.2019 |
|---------------------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|-----------|
| Lehto Group               | 2,61 %    | -0,35 %   | 1,85 %    | 5,10 %    | -0,19 %  | -0,46 %  | 0,74 %   | -1,10 %  | -2,59 %  | 0,00 %    |
| Altia                     | -0,28 %   | 0,28 %    | -0,55 %   | -0,27 %   | 0,14 %   | 0,00 %   | -0,82 %  | 2,81 %   | 0,42 %   | 0,00 %    |
| PunaMusta Media           | 0,00 %    | 0,00 %    | -2,42 %   | -0,80 %   | 0,00 %   | 0,00 %   | 0,00 %   | 0,00 %   | 1,63 %   | 0,00 %    |
| Ovaro Kiinteistösi joitus | -0,87 %   | 0,22 %    | 0,66 %    | 3,63 %    | 1,15 %   | 2,11 %   | 0,71 %   | 6,00 %   | 0,25 %   | 0,00 %    |
| Stora Enso R              | 2,17 %    | -3,09 %   | 3,76 %    | -0,45 %   | 2,22 %   | -3,12 %  | -2,57 %  | 1,37 %   | 1,50 %   | 0,00 %    |
| Sanoma                    | 1,46 %    | 0,18 %    | 1,55 %    | 0,44 %    | 0,12 %   | 0,06 %   | -0,68 %  | 0,75 %   | -1,05 %  | 0,00 %    |
| Metsä Board B             | 4,41 %    | 0,19 %    | 3,61 %    | 0,00 %    | 2,32 %   | -2,55 %  | -1,47 %  | 2,47 %   | 1,28 %   | 0,00 %    |
| HKScan A                  | -0,49 %   | -0,12 %   | -1,10 %   | -0,12 %   | -0,36 %  | -2,02 %  | 0,24 %   | -0,24 %  | 4,09 %   | 0,00 %    |
| Outotec                   | -0,52 %   | -1,24 %   | 10,08 %   | 4,63 %    | 8,19 %   | -0,84 %  | 0,29 %   | 5,46 %   | -0,55 %  | 0,00 %    |
| Oriola A                  | -2,02 %   | 1,54 %    | 2,09 %    | 0,53 %    | 1,06 %   | 0,00 %   | -0,79 %  | -1,04 %  | 0,26 %   | 0,00 %    |
| Taaleri                   | -1,42 %   | -1,12 %   | -0,84 %   | 0,56 %    | -0,28 %  | -0,28 %  | 0,28 %   | -0,28 %  | -0,28 %  | 0,00 %    |
| Panostaja                 | 1,45 %    | 0,48 %    | 0,24 %    | -1,44 %   | -1,88 %  | -0,47 %  | 0,23 %   | -0,23 %  | 2,64 %   | 0,00 %    |
| Basware                   | 0,43 %    | -0,85 %   | 0,64 %    | 0,11 %    | -0,32 %  | 0,00 %   | -0,32 %  | -0,32 %  | -2,77 %  | 0,00 %    |
| Finnair                   | 2,64 %    | 0,21 %    | 0,58 %    | -0,71 %   | 5,42 %   | 3,83 %   | -0,54 %  | 0,70 %   | -0,08 %  | 0,00 %    |
| Valoe                     | -5,80 %   | -3,03 %   | 0,43 %    | -4,56 %   | -5,49 %  | -6,93 %  | 8,30 %   | 1,20 %   | -5,30 %  | 0,00 %    |
| UPM-Kymmene               | 2,71 %    | -1,21 %   | 3,30 %    | -0,13 %   | 1,35 %   | -1,95 %  | -0,92 %  | 1,65 %   | 0,04 %   | 0,00 %    |
| Alma Media                | 0,71 %    | -0,35 %   | 0,00 %    | 1,07 %    | 2,19 %   | -3,52 %  | -0,35 %  | 0,00 %   | -0,35 %  | 0,00 %    |
| Nordea Bank Abp           | -0,32 %   | -0,18 %   | 0,66 %    | 1,07 %    | 0,02 %   | 0,28 %   | -0,46 %  | 1,74 %   | 0,54 %   | 0,00 %    |
| Konecranes                | 1,44 %    | -1,18 %   | 2,62 %    | -0,25 %   | 2,58 %   | -0,79 %  | -0,44 %  | 1,34 %   | 1,95 %   | 0,00 %    |
| Nixu                      | 1,43 %    | 0,00 %    | 0,00 %    | -0,94 %   | 0,95 %   | -1,41 %  | 2,90 %   | 0,00 %   | 0,49 %   | 0,00 %    |
| Soprano                   | 0,00 %    | 0,00 %    | 2,14 %    | -0,71 %   | 0,00 %   | -2,08 %  | 1,41 %   | 0,00 %   | 1,43 %   | 0,00 %    |
| Cargotec                  | 0,88 %    | 0,63 %    | 5,39 %    | -1,12 %   | 1,81 %   | -0,20 %  | -0,53 %  | 1,07 %   | 1,15 %   | 0,00 %    |
| NoHo Partners             | 2,25 %    | -1,96 %   | 3,29 %    | 0,00 %    | 0,00 %   | -0,25 %  | 0,25 %   | -0,75 %  | -0,25 %  | 0,00 %    |
| Ilkka-Yhtymä 2            | 0,28 %    | -0,28 %   | -0,28 %   | -1,64 %   | 1,67 %   | 0,28 %   | 0,00 %   | -0,28 %  | -0,55 %  | 0,00 %    |
| Metsä Board A             | 4,69 %    | 0,95 %    | -0,63 %   | 3,57 %    | 1,32 %   | -0,33 %  | 0,99 %   | 2,37 %   | -1,01 %  | 0,00 %    |
| Kesla A                   | 0,47 %    | -0,47 %   | 1,90 %    | -1,86 %   | 0,00 %   | 0,00 %   | -2,27 %  | 4,76 %   | -0,47 %  | 0,00 %    |
| Sotkamo Silver            | 2,73 %    | 0,61 %    | -0,91 %   | -0,60 %   | -2,63 %  | 0,00 %   | -0,87 %  | -0,86 %  | 3,26 %   | 0,00 %    |
| Rapala VMC                | 0,00 %    | 0,00 %    | -0,66 %   | 1,00 %    | 0,00 %   | -0,33 %  | 0,33 %   | 0,00 %   | 1,36 %   | 0,00 %    |
| Siili Solutions           | 0,93 %    | -0,47 %   | 0,47 %    | -0,47 %   | 0,70 %   | -0,70 %  | 0,23 %   | 0,23 %   | -0,23 %  | 0,00 %    |
| Valmet                    | 0,82 %    | -1,17 %   | 3,16 %    | -1,46 %   | 1,11 %   | 3,84 %   | -1,42 %  | 0,57 %   | 1,65 %   | 0,00 %    |
| Keskisuomalainen A        | 3,33 %    | 0,22 %    | 2,04 %    | 1,15 %    | -0,68 %  | -0,68 %  | 0,91 %   | -1,13 %  | -0,67 %  | 0,00 %    |
| SSAB A                    | 0,33 %    | -1,16 %   | 2,20 %    | 3,35 %    | 0,14 %   | 1,92 %   | -0,81 %  | 2,43 %   | 0,66 %   | 0,00 %    |
| Nurminen Logistics        | 0,00 %    | -2,60 %   | 2,67 %    | -9,09 %   | 1,85 %   | 1,89 %   | -1,24 %  | 5,23 %   | -5,56 %  | 0,00 %    |
| Raute A                   | 0,42 %    | -0,42 %   | 1,69 %    | 1,29 %    | 0,00 %   | 1,75 %   | -0,87 %  | -0,43 %  | 0,87 %   | 0,00 %    |
| Harvia                    | 1,26 %    | -0,31 %   | -0,62 %   | 0,63 %    | 0,95 %   | -0,32 %  | 0,00 %   | 0,32 %   | 0,00 %   | 0,00 %    |
| SRV Yhtiöt                | -1,23 %   | 1,25 %    | 0,00 %    | 2,24 %    | -3,40 %  | 1,25 %   | 0,63 %   | 0,63 %   | -1,25 %  | 0,00 %    |
| Saga Furs C               | 0,00 %    | -6,39 %   | -1,35 %   | -2,63 %   | -0,87 %  | 6,98 %   | 4,88 %   | -5,53 %  | 6,90 %   | 0,00 %    |
| Lassila & Tikanoja        | 1,69 %    | 0,14 %    | 1,14 %    | 0,00 %    | 2,48 %   | 1,93 %   | -0,44 %  | -1,03 %  | 0,74 %   | 0,00 %    |
| Metso                     | 1,47 %    | 0,60 %    | 3,89 %    | 1,56 %    | 2,41 %   | -0,44 %  | 0,03 %   | 1,13 %   | 0,90 %   | 0,00 %    |
| Ålandsbanken A            | 0,00 %    | -0,68 %   | 1,39 %    | 1,41 %    | -2,07 %  | 0,00 %   | 0,00 %   | 0,69 %   | 0,70 %   | 0,00 %    |
| SSAB B                    | 0,04 %    | -1,74 %   | 2,99 %    | 3,84 %    | 2,38 %   | -0,63 %  | -0,47 %  | 4,17 %   | -0,81 %  | 0,00 %    |
| Tallink Grupp             | 0,00 %    | 0,00 %    | 0,47 %    | -0,93 %   | 1,42 %   | 0,47 %   | 0,00 %   | 0,00 %   | 0,00 %   | 0,00 %    |
| Atria A                   | 0,14 %    | -0,95 %   | 2,51 %    | 2,14 %    | 1,15 %   | -1,56 %  | 0,00 %   | 1,73 %   | -1,98 %  | 0,00 %    |
| Innofactor                | -0,31 %   | -0,62 %   | -2,42 %   | 0,00 %    | -2,08 %  | 1,81 %   | -6,76 %  | 29,09 %  | 1,85 %   | 0,00 %    |
| Incap                     | -1,12 %   | -0,74 %   | -0,74 %   | 1,12 %    | -1,47 %  | 0,00 %   | 2,63 %   | -1,48 %  | 2,27 %   | 0,00 %    |
| Wulff Group               | -2,42 %   | 3,12 %    | -0,62 %   | -2,42 %   | 3,77 %   | 0,00 %   | -0,62 %  | 0,00 %   | 1,27 %   | 0,00 %    |
| Martela A                 | 0,00 %    | 0,00 %    | -0,35 %   | -1,71 %   | -2,34 %  | 0,67 %   | 3,13 %   | 2,86 %   | -1,75 %  | 0,00 %    |
| Stockmann A               | 1,90 %    | 0,00 %    | -1,86 %   | -1,83 %   | 1,86 %   | 0,00 %   | 2,87 %   | -4,13 %  | -0,91 %  | 0,00 %    |
| YIT                       | 0,68 %    | -0,19 %   | 2,48 %    | 0,20 %    | 0,20 %   | 0,10 %   | 2,41 %   | 1,49 %   | -2,62 %  | 0,00 %    |
| F-Secure                  | -0,62 %   | -1,84 %   | 0,20 %    | 2,09 %    | 0,84 %   | -2,26 %  | 3,18 %   | -1,05 %  | 0,21 %   | 0,00 %    |
| Revenio Group             | 0,00 %    | 0,49 %    | -0,49 %   | -0,49 %   | 0,74 %   | 0,49 %   | 0,25 %   | -0,49 %  | 2,94 %   | 0,00 %    |
| Uponor                    | 0,69 %    | -1,57 %   | 2,14 %    | 2,47 %    | 1,84 %   | -0,56 %  | 1,41 %   | -0,39 %  | 0,79 %   | 0,00 %    |
| Dovre Group               | 0,00 %    | 0,00 %    | -0,43 %   | 3,13 %    | 1,82 %   | -2,22 %  | -0,44 %  | 0,00 %   | 4,63 %   | 0,00 %    |
| Apetit                    | 0,71 %    | -2,07 %   | 0,93 %    | -0,23 %   | 0,23 %   | -0,92 %  | 0,23 %   | 0,46 %   | -0,23 %  | 0,00 %    |
| Aktia Pankki A            | 0,24 %    | -0,83 %   | -0,12 %   | 1,69 %    | 0,97 %   | 1,11 %   | -0,49 %  | -0,37 %  | -2,26 %  | 0,00 %    |
| Outokumpu                 | 1,27 %    | 2,25 %    | 4,33 %    | 2,45 %    | 1,18 %   | -0,15 %  | -1,20 %  | 2,07 %   | -0,87 %  | 0,00 %    |
| Scanfil                   | 0,00 %    | 0,77 %    | 1,29 %    | 0,52 %    | 0,00 %   | 0,26 %   | 0,52 %   | -0,52 %  | 1,32 %   | 0,00 %    |
| Aspocomp Group            | 1,20 %    | -0,40 %   | -1,18 %   | 1,60 %    | -1,57 %  | -0,78 %  | 0,39 %   | 1,59 %   | -0,79 %  | 0,00 %    |
| Efore                     | 1,69 %    | 5,36 %    | -1,75 %   | 0,00 %    | 1,79 %   | 0,00 %   | 1,82 %   | -1,79 %  | 1,82 %   | 0,00 %    |
| Tecnotree                 | 1,43 %    | 0,00 %    | 0,00 %    | -1,41 %   | 9,23 %   | -2,99 %  | -4,29 %  | 2,94 %   | 1,49 %   | 0,00 %    |
| Tulikivi A                | -2,03 %   | -0,67 %   | -1,32 %   | 0,67 %    | -1,32 %  | 12,59 %  | 0,00 %   | 3,85 %   | -5,11 %  | 0,00 %    |
| Wärtsilä B                | 0,57 %    | -1,20 %   | 1,52 %    | 0,34 %    | 1,47 %   | -0,12 %  | -3,19 %  | 1,45 %   | 0,42 %   | 0,00 %    |
| Robit                     | 3,85 %    | 0,39 %    | 0,39 %    | 1,18 %    | -1,92 %  | 1,56 %   | 0,00 %   | 0,00 %   | 2,40 %   | 0,00 %    |
| Qt Group                  | -0,81 %   | 5,13 %    | 0,00 %    | 2,63 %    | 0,44 %   | -0,44 %  | -0,87 %  | 0,00 %   | 1,32 %   | 0,00 %    |
| Oma Säästöpankki          | -0,28 %   | -0,28 %   | 0,00 %    | 0,00 %    | -1,63 %  | 1,37 %   | -1,09 %  | 0,27 %   | 0,00 %   | 0,00 %    |
| Teleste                   | 0,00 %    | 1,79 %    | 1,82 %    | 0,00 %    | 0,00 %   | 0,00 %   | 1,85 %   | 0,00 %   | 1,12 %   | 0,00 %    |
| Sampo A                   | 0,20 %    | -0,12 %   | 2,51 %    | -0,67 %   | 1,29 %   | -0,43 %  | -0,03 %  | 2,79 %   | -0,26 %  | 0,00 %    |

|                           |         |         |         |         |         |         |         |         |         |        |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| Elecster A                | 0,00 %  | 0,00 %  | 0,00 %  | 0,00 %  | 0,00 %  | 0,00 %  | 5,52 %  | -0,55 % | -2,15 % | 0,00 % |
| Trainers' House           | -4,42 % | 7,54 %  | -4,02 % | -1,84 % | -2,06 % | 0,00 %  | 0,78 %  | 1,85 %  | -2,58 % | 0,00 % |
| Endomines                 | 0,78 %  | 2,94 %  | 4,18 %  | -0,55 % | -2,70 % | 5,10 %  | 1,73 %  | 2,66 %  | 0,00 %  | 0,00 % |
| Stora Enso A              | 0,00 %  | -0,40 % | 0,82 %  | -0,41 % | -1,99 % | 2,45 %  | -1,61 % | 1,63 %  | -0,81 % | 0,00 % |
| SSH Communications Securi | -1,68 % | 2,76 %  | -4,61 % | 8,57 %  | 3,70 %  | 5,06 %  | -3,38 % | 18,75 % | -1,75 % | 0,00 % |
| Honkarakenne B            | -0,86 % | -0,43 % | 0,00 %  | -0,43 % | 0,00 %  | 0,86 %  | -0,85 % | 3,54 %  | 0,44 %  | 0,00 % |
| Evli Pankki               | -0,26 % | 0,78 %  | -0,77 % | 2,90 %  | -0,26 % | 0,00 %  | 0,00 %  | 0,53 %  | 0,80 %  | 0,00 % |
| Cramo                     | -1,99 % | -1,08 % | 0,59 %  | 8,35 %  | 4,24 %  | -1,48 % | 0,11 %  | 1,28 %  | 0,00 %  | 0,00 % |
| Pihlajalinna              | 0,73 %  | -0,36 % | -1,25 % | 1,64 %  | 0,92 %  | -1,80 % | 0,91 %  | 0,73 %  | -1,62 % | 0,00 % |
| Tieto                     | 2,34 %  | -1,16 % | 2,20 %  | -0,24 % | 1,43 %  | 1,21 %  | -1,59 % | 1,12 %  | -1,11 % | 0,00 % |
| Ahlstrom-Munksjö          | 7,08 %  | 0,87 %  | 1,03 %  | 0,44 %  | 1,65 %  | -0,15 % | -0,30 % | 0,15 %  | -0,45 % | 0,00 % |
| Asiakastieto Group        | -0,37 % | 0,37 %  | 0,75 %  | -1,83 % | -0,36 % | 1,11 %  | -3,90 % | 2,55 %  | 2,23 %  | 0,00 % |
| Stockmann B               | 2,72 %  | 1,85 %  | 1,14 %  | -1,63 % | 0,93 %  | 1,04 %  | -0,83 % | -2,22 % | 1,64 %  | 0,00 % |
| CapMan                    | 0,23 %  | 5,44 %  | 1,25 %  | 1,14 %  | 1,02 %  | -0,64 % | 0,51 %  | 0,13 %  | 0,00 %  | 0,00 % |
| Nokian Renkaat            | 0,37 %  | -0,15 % | 2,10 %  | 0,42 %  | 0,85 %  | 0,12 %  | -0,58 % | 1,80 %  | -0,04 % | 0,00 % |
| Terveystalo               | 1,18 %  | 1,64 %  | 1,33 %  | -1,10 % | -0,33 % | -2,14 % | 1,52 %  | 2,67 %  | -1,86 % | 0,00 % |
| Ålandsbanken B            | 1,05 %  | 1,06 %  | -0,70 % | 1,42 %  | 0,00 %  | 0,00 %  | 0,00 %  | 0,71 %  | 0,00 %  | 0,00 % |
| Kone                      | 0,32 %  | 0,00 %  | 1,51 %  | 0,65 %  | 0,14 %  | -0,24 % | 0,10 %  | 0,35 %  | 0,59 %  | 0,00 % |
| Etteplan                  | 0,00 %  | 1,81 %  | 0,46 %  | 0,63 %  | 0,00 %  | 0,46 %  | 0,93 %  | -1,60 % | 2,34 %  | 0,00 % |
| Kemira                    | 1,58 %  | -0,32 % | 2,84 %  | -0,56 % | 0,49 %  | -0,16 % | 0,24 %  | 1,57 %  | -1,22 % | 0,00 % |
| Digia                     | 0,66 %  | -0,98 % | 0,99 %  | 0,67 %  | -0,99 % | 1,00 %  | 0,00 %  | 0,00 %  | 0,00 %  | 0,00 % |
| eQ                        | 0,22 %  | -0,45 % | 0,00 %  | 1,58 %  | -1,56 % | 1,35 %  | -0,45 % | 0,23 %  | -0,22 % | 0,00 % |
| Bittium                   | -1,25 % | -1,24 % | 0,78 %  | -0,31 % | -0,46 % | -0,31 % | -0,15 % | 0,00 %  | -0,31 % | 0,00 % |
| Exel Composites           | -0,47 % | 0,71 %  | 0,72 %  | 0,24 %  | -1,88 % | 4,17 %  | 0,00 %  | 0,99 %  | -1,46 % | 0,00 % |
| Caverion                  | -1,23 % | -0,61 % | 0,31 %  | 2,19 %  | 3,23 %  | 2,48 %  | 1,34 %  | -0,50 % | 0,00 %  | 0,00 % |
| Aspo                      | 0,69 %  | -0,69 % | 2,11 %  | 0,47 %  | 0,00 %  | 0,95 %  | 1,94 %  | 0,73 %  | -1,21 % | 0,00 % |
| QPR Software              | 0,00 %  | 0,97 %  | 0,98 %  | 0,99 %  | -0,98 % | -0,97 % | 0,98 %  | 0,99 %  | -0,98 % | 0,00 % |
| Sievi Capital             | -0,42 % | -1,67 % | 0,00 %  | 1,69 %  | -0,84 % | -1,65 % | 0,83 %  | 0,00 %  | 0,00 %  | 0,00 % |
| Suominen                  | 0,00 %  | 0,00 %  | 0,84 %  | 2,59 %  | 0,00 %  | -2,93 % | 3,91 %  | -2,54 % | -5,60 % | 0,00 % |
| Oriola B                  | -1,73 % | -0,81 % | 3,24 %  | 0,63 %  | -0,31 % | 1,70 %  | -2,19 % | -1,13 % | -1,42 % | 0,00 % |
| Raisio V                  | 5,76 %  | 0,34 %  | 0,68 %  | 0,69 %  | 1,22 %  | -0,35 % | 0,35 %  | -0,35 % | 0,35 %  | 0,00 % |
| Tokmanni Group            | 1,41 %  | -1,26 % | 1,54 %  | 2,10 %  | 0,66 %  | -0,92 % | 2,68 %  | 1,09 %  | -0,41 % | 0,00 % |
| Neo Industrial            | 0,26 %  | -1,82 % | -1,53 % | 1,82 %  | -1,29 % | -2,51 % | 5,00 %  | -5,00 % | -0,99 % | 0,00 % |
| Kamux                     | -0,37 % | 0,37 %  | -0,74 % | 0,74 %  | 0,00 %  | 3,46 %  | -3,70 % | 0,37 %  | 0,00 %  | 0,00 % |
| Huhtamäki                 | -0,87 % | -2,08 % | 1,65 %  | 0,35 %  | 0,97 %  | 1,46 %  | -0,86 % | -0,53 % | -0,23 % | 0,00 % |
| Orion A                   | 0,64 %  | 1,80 %  | -0,16 % | 0,16 %  | 2,01 %  | 2,22 %  | -0,85 % | -0,17 % | 1,72 %  | 0,00 % |
| Orion B                   | 1,48 %  | 0,97 %  | 0,49 %  | 0,16 %  | 2,07 %  | 1,28 %  | -0,14 % | 0,34 %  | 0,82 %  | 0,00 % |
| Viking Line               | -8,24 % | 0,00 %  | 0,00 %  | 3,03 %  | 3,13 %  | 0,00 %  | 1,27 %  | 0,00 %  | 0,00 %  | 0,00 % |
| Yleiselektroniikka E      | 1,33 %  | -1,32 % | 0,00 %  | 0,00 %  | -0,65 % | -1,29 % | 1,97 %  | 0,66 %  | -1,95 % | 0,00 % |
| Glaston                   | 6,05 %  | 2,48 %  | -3,20 % | -3,85 % | -1,52 % | -5,38 % | -3,79 % | -3,65 % | -0,33 % | 0,00 % |
| Telia Company             | 0,39 %  | 0,13 %  | 0,03 %  | 0,18 %  | 0,82 %  | 0,34 %  | 0,56 %  | -0,19 % | 0,29 %  | 0,00 % |
| DNA                       | 0,00 %  | 0,00 %  | 0,00 %  | 0,10 %  | 0,29 %  | -0,10 % | 0,00 %  | -0,19 % | 0,19 %  | 0,00 % |
| Silmäasema                | 0,00 %  | 0,38 %  | 0,38 %  | 0,00 %  | 0,78 %  | 0,00 %  | -2,64 % | 3,92 %  | 0,79 %  | 0,00 % |
| Olvi A                    | 0,29 %  | 3,29 %  | 0,75 %  | -2,50 % | 0,29 %  | 1,95 %  | 1,84 %  | 0,15 %  | -0,91 % | 0,00 % |
| Digitalist Group          | 3,92 %  | -1,92 % | 1,96 %  | 0,00 %  | 2,00 %  | -3,85 % | 0,00 %  | 0,00 %  | 4,00 %  | 0,00 % |
| Tikkurila                 | -0,53 % | -0,40 % | 3,57 %  | 0,83 %  | 1,26 %  | -1,38 % | -0,82 % | 1,67 %  | -0,55 % | 0,00 % |
| Afarak Group              | 0,00 %  | -1,14 % | 0,00 %  | 0,57 %  | 3,43 %  | -0,35 % | 1,68 %  | -0,24 % | -2,11 % | 0,00 % |
| Rovio                     | -2,44 % | 0,00 %  | -0,61 % | -1,13 % | 1,97 %  | -0,47 % | -0,54 % | 2,76 %  | -0,34 % | 0,00 % |
| Kesko A                   | 2,60 %  | -1,71 % | 1,74 %  | 0,44 %  | 0,44 %  | 1,56 %  | 0,45 %  | 1,59 %  | 1,38 %  | 0,00 % |
| Investors House           | 0,00 %  | 0,78 %  | -0,77 % | 0,00 %  | -1,52 % | 0,76 %  | 1,55 %  | -2,27 % | 0,00 %  | 0,00 % |
| Hoivatilat                | 4,00 %  | 1,67 %  | 1,27 %  | 0,00 %  | -0,21 % | 0,00 %  | 0,00 %  | 0,00 %  | -1,04 % | 0,00 % |
| Ponsse                    | 1,82 %  | 1,34 %  | 2,06 %  | 1,39 %  | -0,86 % | 0,00 %  | 1,58 %  | -1,21 % | -1,53 % | 0,00 % |
| Kesko B                   | -1,05 % | -1,19 % | 1,94 %  | 0,49 %  | 1,40 %  | 1,06 %  | 0,27 %  | 1,10 %  | 0,53 %  | 0,00 % |
| Componenta                | 0,70 %  | 2,90 %  | 1,47 %  | 1,49 %  | 0,00 %  | -1,47 % | 2,26 %  | 3,91 %  | 1,59 %  | 0,00 % |
| Nokia                     | -0,78 % | -0,91 % | 3,55 %  | -1,62 % | 0,63 %  | -0,32 % | -0,70 % | 0,07 %  | -0,51 % | 0,00 % |
| Marimekko                 | -2,73 % | 3,23 %  | 1,22 %  | 2,94 %  | 3,03 %  | -3,75 % | -0,83 % | -0,82 % | 0,00 %  | 0,00 % |
| Solteq                    | 0,00 %  | 0,72 %  | 0,00 %  | 2,96 %  | 0,00 %  | -1,46 % | -3,52 % | 5,19 %  | -3,57 % | 0,00 % |
| Fortum                    | 0,16 %  | -1,54 % | 0,13 %  | -0,03 % | 0,91 %  | 0,92 %  | 0,50 %  | -1,43 % | 0,60 %  | 0,00 % |
| Neste                     | 0,97 %  | -1,38 % | 2,43 %  | 1,26 %  | 1,93 %  | -0,57 % | -0,47 % | -1,09 % | -0,23 % | 0,00 % |
| Biohit B                  | 1,75 %  | -1,38 % | 0,35 %  | 2,13 %  | -3,42 % | 1,04 %  | 2,48 %  | -1,05 % | 1,79 %  | 0,00 % |
| Consti Yhtiöt             | 0,74 %  | -1,47 % | 2,25 %  | 0,75 %  | 0,38 %  | -1,49 % | 0,00 %  | -2,55 % | 0,73 %  | 0,00 % |
| Citycon                   | 0,82 %  | -0,22 % | 0,50 %  | 0,28 %  | -0,28 % | 0,06 %  | -0,87 % | 0,99 %  | -0,17 % | 0,00 % |
| Vaisala A                 | 3,70 %  | 1,55 %  | 0,30 %  | 0,40 %  | -0,90 % | 1,32 %  | -0,10 % | -1,10 % | 1,73 %  | 0,00 % |
| Talenom                   | 1,18 %  | -0,59 % | 1,80 %  | 0,00 %  | 1,21 %  | -1,20 % | -4,84 % | -0,57 % | 2,92 %  | 0,00 % |
| Elisa                     | -0,62 % | 1,44 %  | 0,12 %  | -0,36 % | 2,08 %  | 1,34 %  | 0,93 %  | -0,65 % | 0,58 %  | 0,00 % |
| Kojamo                    | 1,58 %  | 1,12 %  | 3,14 %  | -1,14 % | 1,66 %  | 0,33 %  | 1,69 %  | -0,51 % | -1,66 % | 0,00 % |
| Uutechnic Group           | 0,00 %  | -2,28 % | 2,82 %  | -4,48 % | 0,45 %  | -0,89 % | 0,00 %  | -1,75 % | 0,00 %  | 0,00 % |