The Dynamics of Risk and Return in the Stock Market of Finland During Pre and Post Financial Crisis Periods

Aleksandra Motorina

Bachelor's thesis
May 2021
School of Business
Degree Programme in International Business

jamk | Jyväskylän ammattikorkeakoulu
University of Applied Sciences

jamk

Description

Motorina, Aleksandra

The Dynamics of Risk and Return in the Stock Market of Finland During the Pre and Post Financial Crisis Periods

Jyväskylä: JAMK University of Applied Sciences, May 2021, 44 pages

School of Business. Degree Programme in International Business. Bachelor's thesis.

Permission for web publication: Yes

Language of publication: English

Abstract

In a high-risk situation such as a financial crisis, investors need to properly allocate resources for insurance purposes and accurately predict possible market movements and reactions. The situation on the stock markets could be predicted according to the previous behaviour, especially in a time of crisis. Therefore, it is crucial to know the market behaviour according to various historical periods. The research aims to understand Finnish stock companies' risk and return dynamics during the pre and crisis, post-crisis, and recovery period. The timescale for investigation was 15 years, starting from 2005.
The appropriate literature and the previous studies were reviewed. Secondary data of historic risk and return values were collected and analysed in several ways (graphical and descriptive analysis) to answer research questions. These values were analysed with the usage of the MS Excel analysis software.
It can be concluded after the findings that Finnish companies stock returns had been performing at their peak during the post-crisis period. Compared to their interventions before and after the crisis, the systemic risk, unsystematic risk, and overall risk increased during the crisis. The relationship between risk and returns has been established in terms of their interdependence.
Exploring the crisis provides investors with a practical foundation for making decisions about future investments and behaviour in the stock markets. The research technique can also be applied to other stock markets to determine risk and return dynamics.

Keywords/tags (subjects)

Stock market, risk, return, financial crisis, systematic risk, unsystematic risk, Jensen's Alpha

Miscellaneous (Confidential information)

Contents

Figures

Tables

1 Introduction

The introduction chapter provides background and motivation for research and presents the research objectives that were examined in the thesis.

1.1 Background

Several significant developments have occurred in the capital markets of Finland over the past few decades. The history of the Finnish capital exchange over these years can be summarized through two interrelated processes: general liberalization and internationalization. The financial sector has experienced rapid expancion and improvement, especially in the last decade. The estimated cost of capital equity has increased by many times. Investors also have access to a vast range of new financial instruments. Simultaneously, the number of business dealing in various markets has increased, making those markets more effective than before. Global buyers now have more opportunities to purchase Finnish securities as a result of these procedures, making this market very appealing.

The situation on the stock markets could be predicted according to the previous behavior, especially in a time of the crisis. So it is vital to know the market behaviour according to various historical periods. The main research area of the thesis is the Finnish stock market companies through a time of crisis in 2008. The aim is to understand the dynamics between risk and return performance during the pre and crisis, post-crisis and recovery times. The topic is interesting to research, and it has a practical implementation and possibilities for deeper analysis in the future.

1.2 Motivation for research

Prices on stocks are changing every day. Sometimes, it is hard for investors to make the right decision, so it is vital to analyze the historical data before creating a portfolio and making the investment. Investment in the time of an unstable economy could bring investor more systematic and unsystematic risks, so it is also crucial to know how the chosen companies perform in different periods. This research adds to the current literature by specifically discussing stock market uncertainty as a possible predictor for macroeconomic factors, in addition to concentrating on the predictive results of financial markets. A clear understanding of the market situation in the pre and

crisis, post-crisis and recovery periods is essential to make a strategic decision according to future investments.

1.3 Research objectives

The objectives of the study are to examine the stock performance of companies listed on Finnish stock market throughout financial crisis by analyzing risk and return dynamics of companies stocks in the pre and crisis, post-crisis and recovery periods.

The research questions formed for this study are the following:

How does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019?

How does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019 against the market performance?

How does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019 depend on the company sector?

To achieved above mentioned objectives the dataset was formed from the 25 Finnish companies listed on the Nasdaq OMX Nordic stock exchange, which stocks are altogether formed the OMX Nordic 25 stock index. The secondary data for the researched period 2005 - 2019 was composed from the statistics from website nasdaqomxnordic.com.

1.4 Structure of the thesis

The current thesis persues the recommendations by JAMK reporting instructions for conducting the bachelor's thesis and consists of five chapters that structure the study in a logical and easy-to-read way. The first chapter "Introduction" presents the topic background of the research and the author's motivation to implement the research according to research objectives.

The second chapter "Theoretical framework" contains the review of previous research and it covers the main theoretical concepts and variables such as stock market, risk and return dynamics in crisis periods, beta, the required and actual rate of return, Jensen's Alpha.

The third chapter "Methodology" presents research methods used for the thesis and strategies for data collection. It contains the data analysis and the main ways of conducting the analysis. In the

next chapter "Findings" the author had shown the precise results of the research, interdependence between variables mentioned before in the theoretical background overview, and answers to the research questions mentioned earlier.

In the final chapter "Conclusion and discussion" the ethicality and reliability of the research paper are presented, as well as the summary of key findings of the thesis research and limitations of the work. At the end of the chapter author also mentioned recommendations for future researches to consider.

2 Theoretical framework

The following chapter provides a extensive overview of analyses implemented previously on the topic presented in the thesis. The main concepts of the theme are the Finnish stock market, crisis, risk, systematic and unsystematic risk, beta, return, the required and actual rate of return.

2.1 Finnish stock market

The market is a platform on which sellers and buyers are interacting. Economic relations between sellers and buyers of monetary resources and investment assets are manifested in the financial market. The international financial market is a complex of national and international markets that ensure the direction, collecting and distribution of monetary capital between market participants with support of financial institutions to reach an average balance between supply and demand for capital (E-Finance management, 2017). Exchanges and markets that issuing and dealing with the stocks of publicly held companies and others assets take place ordinary called the stock market. Stock markets also could be called "the equity market". It is a vital component of the economy because it allows companies to have access to funds and gives the investors the opportunity of ownership. Stock prices almost always fall before a recession and rise sharply as signs of a coming recovery emerge. Investors can effectively beat the buy-and-hold strategy if they can forecast the market cycle (Siegel, 2002).

The Helsinki Stock Exchange (HSE) is the only place in Finland where companies can trade stocks. The HSE was founded in 1912 and has been in continuous operation since then. In the beginning the exchange was a nonprofit cooperative that was restructured into a Limited Liability Company

in November 1995. The HSE and SOM (Finnish/Suomi Options Market) signed a merger deal in 1997. They combined their activities in a new market named HEX Ltd., which stands for Helsinki Security and Derivatives Exchange, Clearing House (Nasdaq, n.d.). Over the past decades a several significant interrelated processes have characterized the past of the Finnish capital exchange. Global buyers now have more options to purchase Finnish securities due to the general liberalization and internationalization processes with some tax regulations became reduced by government (Bank of Finland, 1996). Furthermore, technological, informational, and regulatory advancements have transformed the HSE into a globally competitive stock exchange.

2.2 Financial crisis

The financial crisis is an economic situation when the rapid decline of the value of financial institutions or/and assets happens. The cost of financial instruments and securities falls dramatically, which leads to problems, such as companies attempt to fulfil their debt liabilities and financial institutions do not have enough cash of assets to turn into cash to meet emergency needs (Hundal, Sandstrom, Uskumbayeva, 2018). Customers' profits and savings are jeopardized, making it difficult for them to cover their loans. Investors lose trust in the value of their transactions, and customers' earnings and assets are in danger.

The financial crisis can become an inevitable phenomenon of modernised capitalism, a logical aftereffect of the interaction of human behaviour and the inability to adapt, rival and change. Nevertheless, even if the crisis cannot be avoided, its negative consequences can be significantly reduced thanks to the parties' actions and considering possible risks.

In the end of 2000s, the Great Recession, which attributes to both the United States of America collapse, was described by a drastic decline in economic growth. The experts extensively consider the Global Financial Crisis of 2008 as the worst shrinkage of the market since the Great Depression in 30’s when in 1929 the Stock Market Crash happened (Boyle, 2020). The financial crisis started with the default of investment of Lehman Brothers bank in 2008, and rise into a global banking crisis that began with a mortgage lending critical situation. The financial crisis can be divided into three phases. Firstly, financial processes can be ruined for various reasons, including regulatory and infrastructure disadvantages, bad structural financial management, and others. Next stage, the banking system collapse, leaving financial institutions, firms, customers and othe parties

unable to meet their promises and obligations. Finally, investments depreciation happens while overall liabilities levels increases (Kenton, 2021).

Finland's economy expanded gradually after the recession of the 1990s until 2007, at a similar pace to Sweden and a lot quickier than Germany. (See Figure 1.) Nevertheless, as a concequence of the world financial crisis, gross domestic product (GDP) of Finland fell by approximately 9% in 2009, demonstrating the country's economic susceptibility to international developments. Probably more concerning is that demand fell again in 2012 and 2013, even though growth stayed moderate in 2010–2011. The amount of gross value added is used to calculate total production. The growth contributions of the industries and output factors presented are best illustrated when measured as the cumulative total of annual logarithmic percentage differences rather than the traditional index; growth is showed as the cumulative total of logarithmic yearly percentage changes rather than the conventional index presentation.

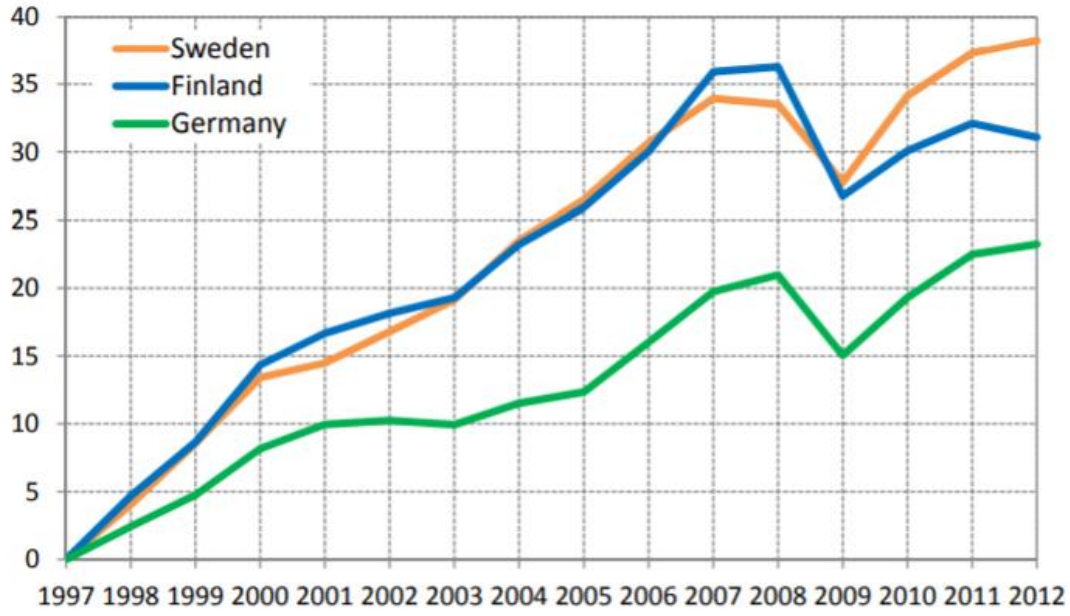

Figure 1 Growth of the economy 1997-2012, % (Holmström et al., 2014.)

According to a sectoral report, the concerns are traced back to the industrial sector, namely the metal industry, according to a sectoral report. (See Figure 2.) Manufacturing contributed to half of the economy's growth from 1998 to 2007, with 60% coming from the electronics industry and from other metal industries almost 20%. Therefore, the situation has drastically changed since

then, with industrial production sharply decreasing. Another part of the economy, mainly private services, has continued to expand.

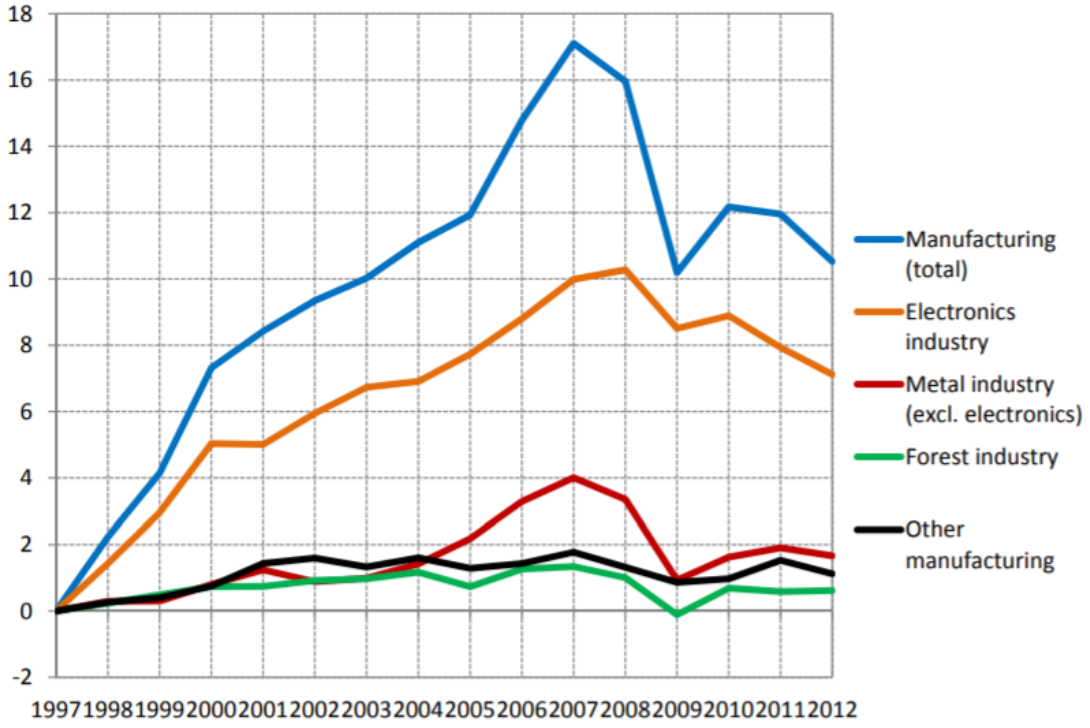

Figure 2 Growth by industry of total performance of the economy, % points (Holmström et al., 2014.)

The contribution of a sector to the growth of the economy's overall production is determined by multiplying its growth by its share of total output value. The electronics industry has suffered the most, but essential metals, machines, metal goods, and transportation equipment have also suffered. Nokia's potential to succeed in fierce international competition is a core factor in the electronics industry. (Holmström et al., 2014.)

2.3 Financial risk

According to Peterson (2012), risk means decisions that we make in a world where our outcomes are unpredictable, but their odds are known in advance. Each of us is in danger of some type of risk every day – would it be from walking on the street, running, investing, finincial planning, or anything else. In finance risk is described as the expectation that the real gains of an event or investment will vary from an predicted result or return. Danger entails the opportunity to lose any

or all of an original investment. Risk is described by the International Federation of Accountants (1999) as ambiguity in potential circumstances that can affect the achievement organisational, financial or political objectives of the company (Harvey, 2008). Typically, the risk is measured by taking historical data and findings into consideration. The standard deviation is a typical risk-based metric in finance. Standard deviation indicates the ambiguity in stock prices in a specific time comparing to their historical median values. Overall, it is possible and clever to understand the investment risks by analyse the fundamentals of risk and calculating it (Hundal, Eskola, 2020). It can help various kinds of investors and company managers to prevent needless and expensive losses by discover the risks that can lead to risky situations and handle them holistically. The risk is also a possibility that the investor's actual return on investment could be different from the expected rate. The possibility of risk means that the investor could lose part or all of its investments. An investor's appearance, age, lifestyle are some of the main considerations to remember for financial management and risk prevention. There is a distinctive risk portrait for each investor type that defines their readiness and ability to tolerate risk. To compensate the high risk the investor’s require the higher rate of return. Risk is always uncertain for a company of individuals. The process of making and executing decisions to decrease the probability of an adverse result and minimise possible losses called risk management. The purpose of risk management in the economic sphere is to increase the competitiveness of economic entities through protection against the implementation of net risks. As proposed by Fabozzi (2002), the standard deviation or variation is the most general and regular way to calculate these outcomes. The calculation of risk associated with any stock of a firm, according to Brealey et al. (2011), could be subdivided into two level: systematic and unsystematic risk.

2.3.1 Systematic risk

Systematic risk known as "market risk" connected with the market situation, it is measures the unpredictiveness performance of the whole market or a part of the market. According to Brealey et al. (2011), systematic risk is uncertain and investors cannot avoid it entirely. Diversification will not work in this case, however, the hedging or using the strategy of correct asset allotment can ease the systematic risk. For example, industry risk is based on systematic risk. If an investor pays too much attention and contributes resources only to one healthcare industry, then to reduce risk, assets can also be purchased from other industries, such as telecommunications or energy. However, systematic risk includes a wide range of global changes. Changes in interest rates,

inflation, wars can affect the entire market and more likely cannot be prevented by changes in positions in the investment portfolio. The systematic risk could be measured with several quantitative variables that assist to indicate and control the overall risk level in the financial system. A collection of measures could be helpful to research the specific risk effect, for instance: leverage (amount of credit in the financial system), liquidity (how easy it is to turn investments into cash), correlation (relations between variables) and others.

2.3.2 Unsystematic risk

The kind of risk that can be avoided by diversified allocation of investents it is an unsystematic risk, on the other hand, is known as "specific risk" or "idiosyncratic risk" because it is unique to every company stocks (Brealey, Myers, & Allen, 2011). Unsystematic risk is the polar opposite of systemic risk, and it involves a small number of securities or single security. Unsystematic risk attribute to the possibility of getting a loss within a specific industry, while systemic risk refers to the danger of a failure in the whole sector.

2.4 Beta

The beta measurement should be used to understand the stock return and risk dynamics and the sensitivity to the market performance. It is also connected to the sensitive variation term in the market. Begg et al. (2005) mentioned that betas are calculated by bankers and stockholders based on the historical performance of individual securities and the whole stock exchange. According to Brealey et al. (2011) The value of beta equals 1.0 shows that an activity of stock pricing is positively correlated with the market (the level of correlation is high). Systematic risk exists in a portfolio with a beta of 1.0. The beta measurement, on the other hand, is unable to detect any unsystematic danger. If the investor will add in a portfolio a stock with a beta of 1.0 it does not raise risk, but in the same time it also does not increase the probabaility of the portfolio performing an additional return. The negative beta ot the securities, prom another point of view, significantly minimize the probability of a portfolio whose other elements fluctuate with the market (Begg, 2005). In theory, a beta means less than 1.0 signifyes that the stock behaved less risky than the market. If the current stock would be added in a portfolio, it makes it less changeable than a portfolio without it. Utility stocks, for instance, have low betas, and they shift more slowly than the price averages. If the security has a beta value of 1.0, it probably will be more volatile compare to the stock market. For instance, beta 1.2 means that the stock expected

to be 20% more volatile than the market. The portfolio risk will rise if the investor includes the stock with a beta value higher than 1; however, the possible return will rise too. A beta value of stock *i* usually statistician would define by statisticians as

$$\beta(i) = \frac{covariance\ of\ the\ stock\ returns\ and\ the\ market\ returns}{variance\ of\ the\ returns\ on\ the\ market}$$

Current covariance to variance ratio measures a stock's imput to investment portfolio risk (Brealey et al., 2011).

2.5 Return

Return on investment is a factual return investor planning to gain when deciding to invest. To understand and calculate the future rates of return, the professional investors and analysts use the availiable historical and economic data on return in the industry. With the estimation of future return rates, investors evaluating numerous asset as well as various securities and takes the final decision to reach the goal of maximizing their return over time. When the economy is shrinking, there is also evidence that stock returns provide details that can be used to forecast growth, but the evidence is less evident in nonrecession cycles (Henry, Olekalns, & Thong, 2004). Return ratios are a type of financial ratio that assesses the efficiency with which expenditure is handled. They aid in determining whether an investment is yielding the best possible return. Return rates, in general, equate the resources used to achieve profit, such as asset or equity allocation, to net profits (Hayes, 2021).

2.5.1 Types of return

There are three types of return described by Mayor (2008) expected, realized and actual return. The expected return is the median rate of return that potential investors in a business can expect on a given financial investment. Other words, it is the average rate of return that an investor might expect, but it is not always the preciase financial result expected to be gained for that specific investment project or decision.

The company's historical data were used to calculate the realized return. The realized return is referred to by some scholars as an understood return. It is the lowest amount of return that an investor would expect to agree on the value of risk inherent in an investment, and it refers to the

expense of an investment that may be received on a particular project with comparable risks (Hundal et al., 2019). This condition will assist investors in making final decisions by serving as a benchmark.

The actual rate of return is the value of earnings received on a specific purchase, which varies depending on market dynamics and stock availability within an organisation.

Brealey et al. (2011) mentioned the way of describing uncertainty is "more things can happen than will happen". As we saw with the coin-tossing game, an asset's vulnerability can be fully represented by writing all potential consequences and probabilities. This is inconvenient and often unlikely to happen. To summarize the range of possible results, researchers and investors use variance or standard deviation. Standard deviation is widely used by investors to forecast potential returns, but it assumes a natural distribution. There are risk indices that are derived naturally. If the result of the coin-tossing game had been known the standard deviation would have value of zero. Since researchers and investors don't know what will happen, the actual standard deviation is positive. When analysing the stock's performance the investor should consider the expected return and the standard deviation as essential values (Hundal, Eskola, & Tuan, 2019).

Since few return distributions are like average, skewness is a safer metric to use when predicting results. Skewness is a shift or asymmetry in a sequence of data that differs from the symmetrical bell curve or regular distribution. The bent of the curve means its movement to the left or right. Skewness is a measure of the variety of a given distribution from regular distribution (Chen, 2021).

Individual stock prices are influenced by anticipated or average returns as well as risk factors. The risk characteristics of its shares determine the estimated return on a firm's stock for them to compete with other shares. Higher expected profits mean a higher current share price for a given required return (Begg, 2005).

2.5.2 Jensen's Alpha

To accurately evaluate the results of investment portfolios, individual shares, or investments, the investor must consider the cost and return of a given fund and see if the investment return compensates for the danger inherent in the investment.

The Jensen's measure or Jensen's Alpha is the residue between the actual rate and expected rate of return. The investment considered to be underperformed (performed with minor success than expected) if the earned actual return is less than the expected return. In that case, the value of Jensen's Alpha would perform negatively. If Jensen's measure has a positive value, it means that the shares overperformed the market (performed with higher success than expected)(Lo, 2008).

3 Methodology

One of the most critical components of the analysis is the research methodology. This section would describe numerous instruments and procedures that have been applied to the conduct of this research. As discussed by Saunders et al. (2019) in the book "Research Methods for Business Students", research methodology can be defined as the theory used for the application of research procedure during a particular process. This chapter reflects on describing the actions taken and the decisions made during the conduct of this analysis to illustrate all the conclusions and important details that are helpful to understand the research process (Saunders, Lewis & Thornhill 2019). For better understanding the research philosophy and theory development approaches the "Research Onion" model was reviewed (ibid.). (See Figure 3.)

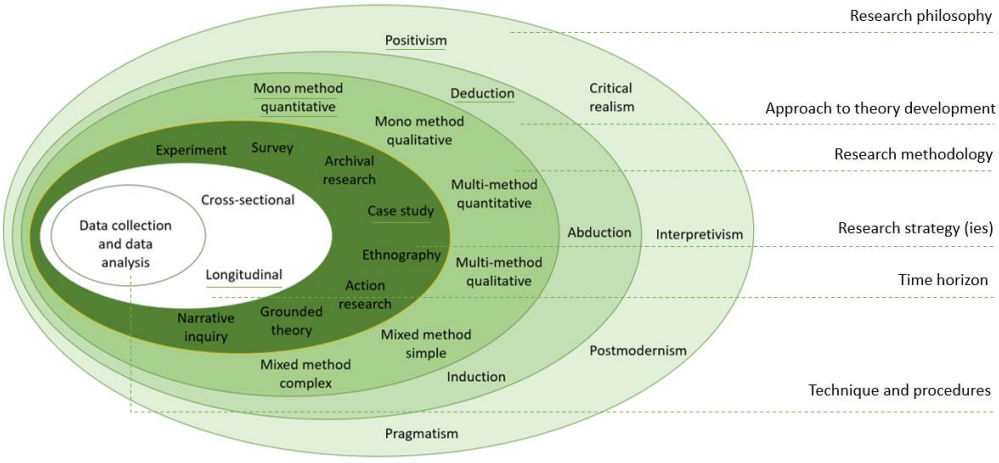

Figure 3 Research Onion (Saunders et. al. 2019). The underlined elements are chosen for the research

The current chapter describe the authors choice of a research method: the research philosophy from positivism, critical realism, interpretivism, postmodernism and pragmatism. The research approach inductive, deductive or abductive. The research methodological choice from qualitative, quantitative or multiple methods. The choice of research strategy and time horizons.

3.1.1 Research philosophy

The term research philosophy attribute to a structure of beliefs and assumptions that appear as the foundation in the development and improvement of knowledge. According to Crotty (1998) the assumptions that author take form the understanding the aim of study and research question, influence on the practices to use for research and interpret findings in the end. The following three nature of assumptions usually taken into account: epistemological assumption (about the human knowledge), ontological assumptions (about the realities that author face in the research) and axiological assumptions (about the value and paths that authors beliefs influence the research technique)(Saunders, Lewis, & Thornhill 2019).

Saunders et al. (2019) consider for research the five dominant philosophies: positivism, critical realism, interpretivism, postmodernism and pragmatism.

The author conducts the study in a value-free way as much as possible and stays neutral and detached from the data to avoid any influence on the findings. The research is quantitative, and it implemented with number dataset with statistical and descriptive analysis, based on the theory of correlation that existed between stock's risk and return of the firms; therefore, only one interpretation of results applicable, the author chooses the research plan based on Positivism Ontology.

3.1.2 Research approaches

The choice of the research approach depends on how the theory is influencing the study. According to this the three approaches were proposed by Saunders et. al. (2019). The first, deductive approach is used when the research has a goal to investigate a certain theory and it is built on the theoretical knowledge. The second, inductive approach could be selected when the new theory is formed from the collected data. The third one, abductive approach exercised when research aim is to test and modify existing theory with the methods of data collection aplicable in the pattern’s recognition (Saunders, et. al. 2019).

The author chose a deductive approach for performing this research. The leading objective of this research is to test the theory that economic crisis is influencing the stock market and dynamic of companies' stocks risk and return.

3.1.3 Methodological choice

The methodological choice is divided between several methods such as quantitative, qualitative, multi-methods and mixed-methods. Qualitative research is a methodical approach to collect and analyse information to make a conclusion. The quantitative approach uses as foundation the numerical and mathematical data to compile and interpret results. Other words, it is all about statistics is quantitative evidence. The multi-methods means the choice of both quantitative and qualitative methods, so the researcher uses more than one data collection technique but it could be ether quantitative or qualitative. Moreover, mixed methods could combine both quantitative and qualitative methods in the research design (Creswell, 2009).

The author chose the quantitative methodology research. The data in the form of daily returns was retrieved from the website of the Finnish stock market to calculate unsystematic (firm) risk, systematic (market) risk, total risk and beta. As well as risk free rate to calculate the expected return and Jensen's alpha ratios.

3.1.4 Research strategy

To answer the research questions set above the researcher conducted the quantitative analysis of the case study of companies listed on the Finnish stock market and OMX Helsinki 25 Index financial data in the time horizon of fifteen years. To better understand the risk and return dynamics during the crisis the researched time was splited into three periods mentioned following pre and crisis period (from 2005 until 2008), post-crisis period (from 2009 until 2012), recovery period (from 2012 until the end of 2019).

The year 2020 was excluded from the research horizon due to the possible Covid-19 pandemic impact to present the research most objectively.

3.1.5 Time horizons

Time horizon highlights a period when research is intended to be finished. In that case, the research papers could be divided into cross-sectional and longitudinal studies. A cross-sectional

time horizon attribute to the data acquisition at a certain point and at a specific time, more similar to a “snapshot” collection. If the analysis is recorded more like a 'diary' and reflects the events over a given time than it is called longitudinal. The value of this time is that it can study changes and development (Saunders et al. 2019). The author aims to study the change and development in Finnish stock market in a time period of 15 years, so the longitudinal time horizon was chosen for research.

3.2 Data collection

Data collection include the historical stock prices since the year 2005. During the process of collecting information, the researcher found that two companies from the general dataset do not have sufficient historical stock prices for research. For research objectivity, the data of these companies were excluded from further analysis. Thereby, the complete dataset consisted of 23 companies listed on the Finnish market and a OMX Helsinki 25 market index (Appendix 1, 2). Information required for research about the sector of each company also was collected from the website nasdaqomxnordic.com. After collecting all the data the author analyzed the risk and return dynamics according to thesis objectives.

3.3 Analysis of data

Following the research questions, the historical data of the companies studied, the indicators are calculated and the results are formed at the end. The secondary data obtained about companies, which means that the data was collected before the research for unknown purpose and to answer the research questions adopted in this research. Secondary data from 23 companies listed on the Finnish stock exchange and the OMX Helsinki 25 market index were collected to answer the thesis question and analyzed using statistical analysis similar to that used by Saunders et al. (2019). The origin of the secondary data are sites with historical prices of companies shares. The following parameters calculated by the researcher in this thesis: stock return, average stock return, annualised return and risk, total systematic risk, total unsystematic risk, beta, expected return and Jensen's Alpha (Appendices 3, 4, 5).

To find the earned profit and calculate the stock return the autor used the difference between current day closing price of the stock and previous day closing price of the stock, and divided the result by its closing price for previous day (Brealey et al., 2011).

$$Stock\ return = (P_1 - P_0)/P_0$$

where, $P_1 - Closing(Ending)\ Stock\ Price, P_0 - Initial\ Stock\ Price$

Average daily stock return was calculated afterwards to perform the Average annual return. Total annualized risk and return were calculated both for the Index and each company with usage of the following formulas.

$$Annual\ Stock\ Return = [(Average\ Daily\ Stock\ Return + 1)^{252} - 1] * 100$$

where 252 is the average ammount of trading days per year.

Average daily total risk calculated as a standard deviation of Stock return and Average annual risk performed as Average daily total risk multiplied on square root or 252 trading days.

The SLOPE function of Microsoft Excel was used to measure beta using the Stock daily returns and the market return (Levine, 2017). The magnitude of beta for the companies thus discovered is then used in next calculations to determine the systemic risk for shares of these companies.

The analysis of systematic and unsystematic risks was required. The value for Total systematic risk was obtained by multiplying the beta for the period and the Annual Total Market Risk. And following the Unsystematic risk value found by subtraction Total systematic risk value from Annual total risk of stocks.

Assessment of the performance of the companies was implemented by comparison the actual and required (expected) return with the usage of Jensen's Alpha measure tool. Expected return for calculations required the Risk free rate value, and calculated as follows:

$$Expected\ Return = RFR + Beta * (Annual\ Market\ Return - RFR)$$

where, RFR – risk free rate.

Afterwards the Jensen's Alpha indicator was calculated with the usage of the previous data gained by following formula.

$$Jensen's\ Alpha = Annual\ Stock\ Return - Expected\ Return$$

The next way of data analysis was the graphical analysis. It was implemented to compare risk and return dynamics during researched period and compare its with market return. The following step

was the descriptive analysis implemented with Data Analysis Add-In in Excel for the variables: stock return, total risk, systematic risk, unsystematic risk, beta, Jensen's alpha for 23 Finnish stock market listed companies.

The following step was the comparison and analyzing risk and return according to companies secrors of operations. The author researched the sector-based risk and return dynamics analysisn the average annualized return of companies from the specific sector during the researched periods. Afterwards the same analysis was implemented with the annualised total risk values. The collected data for three researched periods presented in tables to better understanding and see comparison between risk and return dynamics.

4 Findings

This chapter contains the empirical results of the conducted research, which author presented with theusage of descriptive statistics, graphical representation and sector-based analysis; and which are then used to shape conclusions of the research. Firstly, the study for the values identify the returns and risks illustrated for different researched periods. Secondly, the descriptive statistics analysis implemented for the three periods: pre and crisis, post-crisis, and recovery. The stock returns of 23 companies listed on the Finnish stock market from the data set are used.

Graphical analysis

The graphic analysis based on the secondary data collected for research purposes from 2005 through 2019. The graph shops the visual presentation of analyzed values. (See Figure 2 and Figure 3.) In the current research, graphical visualisation for the annualized stock returns and risks associated with the 23 Finnish companies are represented during three researched periods. These graphs are representing market trends followed by the companies. The risk variations by researched periods are presented as the systematic (market) risk, the unsystematic (firm) risk and total risk. Moreover, the return on stocks of these companies retained on fluctuating during the researched time. Mentioned fluctuations reflected in graphs on Figure 2 and Figure 3 following.

Risk and return dynamics of 23 Finnish companies by period

The Figure 4 shows the annualized stock return during the pre and crisis period that had fallen and moved towards zero. The minimum value of return was in the pre and crisis period 0.002575, the

maximum value was 0.255948 in the recovery period. The highest value of total risk was 0.394338 in the post-crisis period fall to 0.288785 in the recovery period. Systematic risk growth during the researched period from a minimum of 0.019551 to its maximum value of 0.164601 in the recovery period. According to the graph, the opposite dynamics with unsystematic risk could be observed, the value fall from its maximum value of 0.367428 in the pre and crisis period to its minimum of 0.124185 in the recovery period. Dynamics of Jensen's Alpha values shown similarly to return value and had their peak in the post-crisis time with a value of 0.228617. The recovery period value (0.007394) approximately gets on the same level as in the pre and crisis period (0.004074).

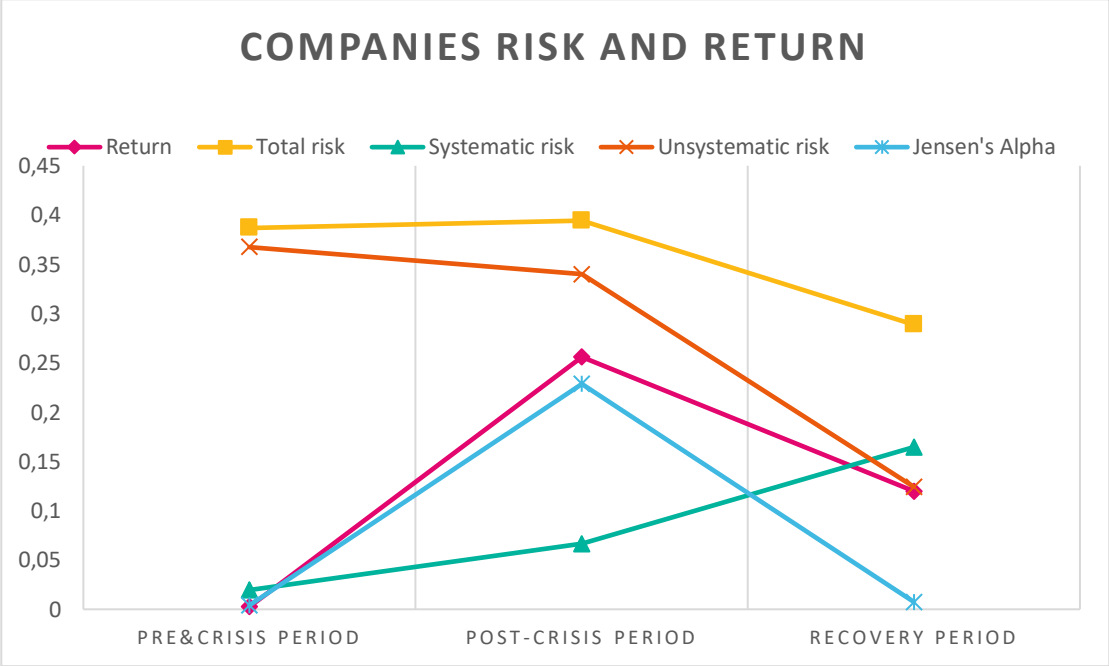

Figure 4 Graphical analysis companies' risk and return during periods

Risk and return dynamics of 23 Finnish companies and OMX Helsinki 25 Index by period

The Figure 5 shows the companies risk and returns dynamics in comparison to the market annual return and risk. Market return and risk had a positive correlation and changed during researched period relatively reached the peak in the post-crisis period with a value of 0.1398 for market return and 0.2710 for market risk.

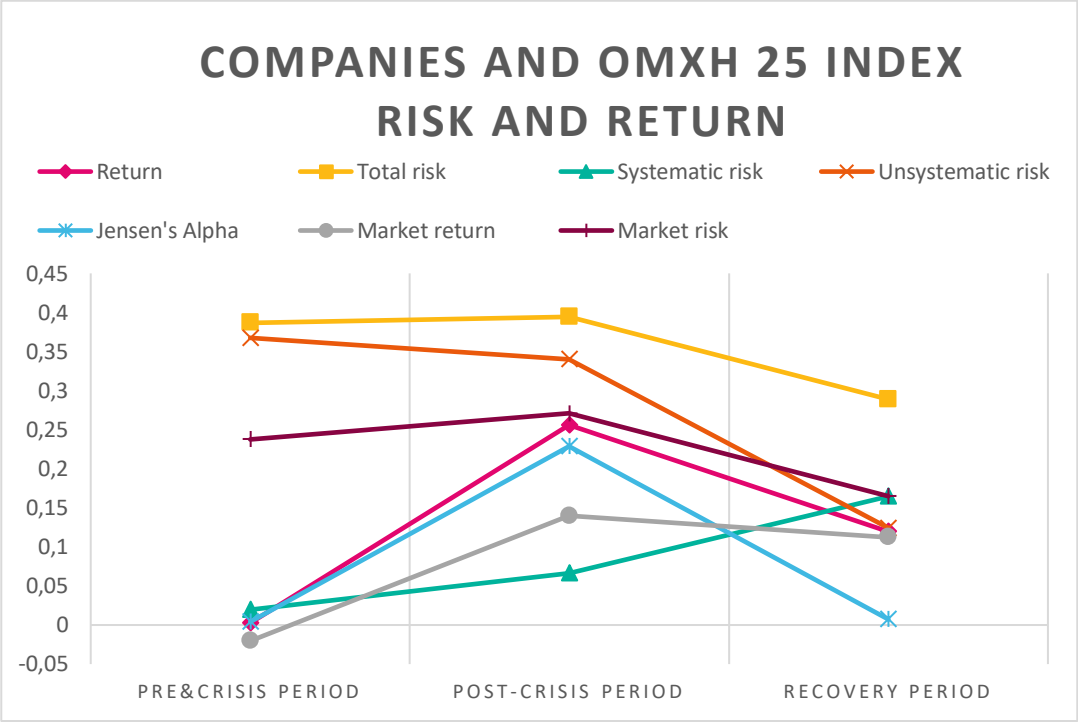

Figure 5 Graphical analysis companies' and OMXH 25 Index risk and return during periods

According to the graph, the minimum value of market return was in the pre and crisis period (-0.0204) and for the market risk, it reached its minimum value of 0.1649 in the recovery period.

Descriptive statistics analysis

The relationship between risk and return can be clearly understood by measuring and analyse the risk and returns of a market's stocks over researched periods.

The descriptive statistics analysis implemented with considering the statistics for the variables: stock return, total risk, systematic risk, unsystematic risk, beta, Jensen's alpha for 23 Finnish companies and analysed for the decent observation of the performance of the Finnish stock companies in time of the pre and crisis (2005-2008), post-crisis (2009-2012) and recovery periods (2013- 2019). The risk-free rate of return for Finnish companies continues to be a constant value of 0.02% for every company because all 23 researched companies perform on the same market. The rate of return for the Finnish stock market continues to be a constant number of -0.02, 0.14, 0.11 for three periods, respectively—these values taken as annualized values to make an accurate comparison with the annualized stock return.

For the implementation of this thesis, the 5% significance factor is frequently exersised as the standard error considering that the value gets lower for the set of data. A typical significance

factor of 1% is used in this method of analysis. The significance factors with 1%, 5%, and 10% are included in the application of this analysis. The descriptive figures for stock returns during three periods of study are seen in the table below to measure the differences in stock returns for listed on Finnish stock market firms.

Stock return

The annualized stock return of 23 listed on the Finnish stock market companies evaluated during the researched periods (Table 1).

Table 1 Descriptive statistics for stock return by periods

Stock Return	*Pre&Crisis Period*	*Post-crisis period*	*Recovery period*
Mean	0,0026	0,2560	0,1197
Standard Error	0,0277	0,0458	0,0220
Median	0,0215	0,2580	0,0950
Mode	#N/A	#N/A	#N/A
Standard Deviation	0,1330	0,2199	0,1054
Sample Variance	0,0177	0,0483	0,0111
Kurtosis	0,2320	-0,5725	3,0786
Skewness	-0,6724	-0,1153	1,4106
Range	0,5372	0,8397	0,4720
Minimum	-0,3220	-0,1884	-0,0211
Maximum	0,2152	0,6513	0,4509
Sum	0,0592	5,8868	2,7527
Count	23	23	23

The Table 1 shows the trends for the periods under consideration. It can be observed that the mean had the least number of 0.0026 before and during the crisis, in other periods it increased to 0.2560, but eventually fall again in the recovery period to 0.1197.

The negative value of skewness for the first two periods indicates a left skewed stock variation od return, which displays the difference from the normal distribution was negative, which grow more in the time of the crisis that ultimately became a positive number for the recovery period, became right skewed.

Total risk

The total risk is compared over the researched periods for 23 Finnish companies. The value of total risk highly depends on the systematic and unsystematic risks. The Table 2 shows the trends for the total risk for the periods under consideration. The mean value for the first two periods stays approximately the same: 0.3870 and 0.3943 respectively and decrease for the recovery period 0.2888.

Table 2 Descriptive statistics for total risk by periods

Total risk	*Pre&Crisis Period*	*Post-crisis period*	*Recovery period*
Mean	0,3870	0,3943	0,2888
Standard Error	0,0150	0,0199	0,0168
Median	0,3599	0,4157	0,2841
Mode	#N/A	#N/A	#N/A
Standard Deviation	0,0721	0,0956	0,0805
Sample Variance	0,0052	0,0091	0,0065
Kurtosis	2,1831	0,1448	3,6021
Skewness	1,1640	0,3445	1,6908
Range	0,3179	0,3867	0,3504
Minimum	0,2852	0,2445	0,1862
Maximum	0,6031	0,6312	0,5366
Sum	8,9005	9,0698	6,6421
Count	23	23	23

The total risk is highest during the post-crisis period. The lowest rate of the total risk showed in the recovery period. The skewness stays positive during the researched time and revealed to be

right skewed from the normal distribution. The value of kurtosis stays positive for all considered periods.

Systematic risk

The systematic risk is compared over the researched periods for 23 Finnish companies and presented in the Table 3. The highest mean of systematic risk is in the recovery period 0.1646. The systematic risk has a wide influence on the stock market. The positive skewness values indicate that the systematic risk values had been right skewed. At the same time kurtosis for the recovery period has a negative value and indicates the less severe than the other tails of the distribution.

Table 3 Descriptive statistics for systematic risk by periods

Systematic risk	*Pre&Crisis Period*	*Post-crisis period*	*Recovery period*
Mean	0,0196	0,0664	0,1646
Standard Error	0,0083	0,0138	0,0096
Median	0,0169	0,0625	0,1515
Mode	#N/A	#N/A	#N/A
Standard Deviation	0,0397	0,0664	0,0462
Sample Variance	0,0016	0,0044	0,0021
Kurtosis	15,6082	15,5665	-0,1233
Skewness	3,6319	3,6413	0,7119
Range	0,2022	0,3380	0,1723
Minimum	-0,0151	0,0084	0,1058
Maximum	0,1871	0,3464	0,2781
Sum	0,4497	1,5274	3,7858
Count	23	23	23

Unsystematic risk

The unsystematic risk for the 23 Finnish companies is compared during the researched periods and presented in the Table 4. The mean of unsystematic risk remains to be the most (0.3674) in pre-crisis and crisis period and gets to its lowest value (0.1242) only in the recovery period. The kurtosis remains to be positive for all researched periods so as the skewness. The positive skewness values indicate that the unsystematic risk values had been right skewed.

Table 4 Descriptive statistics for unsystematic risk by periods

Unsystematic risk	*Pre&Crisis Period*	*Post-crisis period*	*Recovery period*
Mean	0,3674	0,3400	0,1242
Standard Error	0,0141	0,0154	0,0108
Median	0,3576	0,3416	0,1122
Mode	#N/A	#N/A	#N/A
Standard Deviation	0,0675	0,0736	0,0519
Sample Variance	0,0046	0,0054	0,0027
Kurtosis	2,6457	0,3252	1,2765
Skewness	1,1932	0,4905	1,2352
Range	0,3018	0,3014	0,2059
Minimum	0,2712	0,2256	0,0527
Maximum	0,5731	0,5270	0,2585
Sum	8,4508	7,8189	2,8562
Count	23	23	23

Beta

The beta is compared over the researched periods for 23 Finnish companies. The table 5 shows the beta variations for researched companies over three periods. The values was maximal for the recovery period, 0.9987 in contract to the pre-crisis, during and post-crisis values. The standard deviation also was the highest during the recovery period. The kurtosis had a negative value during post and recovery periods illustrate the less extreme than the other tails of the distribution.

The skewness stays positive for all researched periods and tends to be shifted to the left with positive skewed distribution.

Table 5 Descriptive statistics for beta by periods

Beta	*Pre&Crisis Period*	*Post-crisis period*	*Recovery period*
Mean	0,0823	0,2007	0,9987
Standard Error	0,0348	0,0202	0,0584
Median	0,0711	0,2308	0,9192
Mode	#N/A	#N/A	#N/A
Standard Deviation	0,1671	0,0971	0,2803
Sample Variance	0,0279	0,0094	0,0786
Kurtosis	15,6082	-0,7884	-0,1233
Skewness	3,6319	0,0659	0,7119
Range	0,8512	0,3535	1,0453
Minimum	-0,0635	0,0311	0,6420
Maximum	0,7877	0,3845	1,6873
Sum	1,8933	4,6167	22,9711
Count	23	23	23

Jensen's Alpha

The Jensen's Alpha values for the 23 Finnish companies is compared during the researched periods and shown in the Table 6. The higher value of Jensen's Alpha mean is 0.2286 in the time of the post-crisis which shows that the stock was beating the market and had the better performance than during other periods. The same true also for the standard deviation and variance values. The kurtosis illustrate a positive numbers during pre-crisis and recovery but negative in the post-crisis for the Jensen's alpha being less severe than the tails of the normal distribution.

Table 6 Descriptive statistics for Jensen's Alpha by periods

Jensen's Alpha	*Pre&Crisis Period*	*Post-crisis period*	*Recovery period*
Mean	0,0041	0,2286	0,0074
Standard Error	0,0279	0,0454	0,0236
Median	0,0228	0,2343	-0,0026
Mode	#N/A	0,3712	#N/A
Standard Deviation	0,1339	0,2179	0,1132
Sample Variance	0,0179	0,0475	0,0128
Kurtosis	0,2367	-0,4954	2,5320
Skewness	-0,6187	-0,2571	1,1017
Range	0,5514	0,8241	0,5262
Minimum	-0,3202	-0,2267	-0,1756
Maximum	0,2312	0,5974	0,3505
Sum	0,0937	5,2582	0,1701
Count	23	23	23

Sector based analysis

The sector-based analysis was implemented with the average risk and return values of companies from the same sector.

Pre and crisis period

In the pre and crisis period, the highest rate of return researcher detected for companies performing in the Insurance sector, and the negative rate of return for companies operates in technology, basic resources, chemicals, energy, bank, and health care. The Table 7 presented for these observations with a filter on the rate of return from highest values to lowest. The table 8 shows the results for the same period with a filter on the total risk from lowest to the highest rate. It is clear seen that the sector with the lowest risk and positive return was also insurance. The

researcher detected the highest risk for automobile and parts, industrial goods and services and technology sectors.

Table 7 Sector based analysis pre and crisis period, filter on average return from high to low

Sector	***Average return***	*Average total risk*
Insurance	**0,1154**	0,2941
Utilities	**0,0988**	0,3599
Personal Care, Drug and Grocery Stores	**0,0658**	0,3649
Industrial Goods and Services	**0,0442**	0,4328
Telecommunications	**0,0374**	0,3349
Automobiles and Parts	**0,0215**	0,4747
Health Care	**-0,0158**	0,2852
Banks	**-0,0222**	0,3460
Energy	**-0,0340**	0,3996
Chemicals	**-0,0706**	0,3505
Basic Resources	**-0,0863**	0,3927
Technology	**-0,1765**	0,4204

Table 8 Sector based analysis pre and crisis period, filter on total risk from low to high

Sector	*Average return*	***Average total risk***
Health Care	-0,0158	**0,2852**
Insurance	0,1154	**0,2941**
Telecommunications	0,0374	**0,3349**
Banks	-0,0222	**0,3460**
Chemicals	-0,0706	**0,3505**
Utilities	0,0988	**0,3599**
Personal Care, Drug and Grocery Stores	0,0658	**0,3649**
Basic Resources	-0,0863	**0,3927**
Energy	-0,0340	**0,3996**
Technology	-0,1765	**0,4204**
Industrial Goods and Services	0,0442	**0,4328**
Automobiles and Parts	0,0215	**0,4747**

Post-crisis

For the post-crisis period, the highest rate of return researcher detected for companies operating in the health care sector (0.6513), and the lowest but still positive rate of return for companies perform in personal care, drug and grocery stores (0.0763). The table 9 presented for these observations with a filter on the rate of return from highest values to lowest.

Table 9 Sector based analysis post-crisis period, filter on average return from high to low

Sector	***Average return***	*Average total risk*
Health Care	**0,6513**	0,6312
Energy	**0,4495**	0,2917
Utilities	**0,4469**	0,4157
Automobiles and Parts	**0,4084**	0,4856
Telecommunications	**0,2889**	0,3995
Basic Resources	**0,2644**	0,3703
Insurance	**0,2196**	0,3057
Industrial Goods and Services	**0,1854**	0,4269
Chemicals	**0,1532**	0,3234
Technology	**0,1452**	0,2822
Banks	**0,1143**	0,2497
Personal Care, Drug and Grocery Stores	**0,0763**	0,4164

The table 10 shows the results for the same period with a filter on the total risk from lowest to the highest meanings. The sector with the smallest rate of risk (0.2497) was banks. The researcher detected the highest risk for health care.

Table 10 Sector based analysis post-crisis period, filter on total risk from low to high

Sector	*Average return*	***Average total risk***
Banks	0,1143	**0,2497**
Technology	0,1452	**0,2822**
Energy	0,4495	**0,2917**
Insurance	0,2196	**0,3057**
Chemicals	0,1532	**0,3234**
Basic Resources	0,2644	**0,3703**
Telecommunications	0,2889	**0,3995**
Utilities	0,4469	**0,4157**
Personal Care, Drug and Grocery Stores	0,0763	**0,4164**
Industrial Goods and Services	0,1854	**0,4269**
Automobiles and Parts	0,4084	**0,4856**
Health Care	0,6513	**0,6312**

Recovery period

For the recovery period, the highest rate of return was observed for companies operating in the health care sector (0.2201) as in the pre and crisis period, and the lowest negative value of return for companies perform in the technology sector (-0.0211). The table 11 presented for these observations with a filter on the rate of return from highest values to lowest.

The table 12 shows the results for the same period with a filter on the total risk from lowest to the highest rate. The sector with the smallest risk value (0.1862) was insurance. The researcher detected the highest risk for industrial goods and services (0.3575).

Table 11 Sector based analysis recovery period, filter on average return from high to low

Sector	***Average return***	*Average total risk*
Health Care	**0,2201**	0,3221
Banks	**0,1958**	0,2177
Personal Care, Drug and Grocery Stores	**0,1918**	0,3011
Chemicals	**0,1703**	0,2333
Energy	**0,1395**	0,2228
Telecommunications	**0,1307**	0,2725
Automobiles and Parts	**0,1204**	0,3282
Industrial Goods and Services	**0,1146**	0,3575
Basic Resources	**0,1080**	0,2610
Insurance	**0,0885**	0,1862
Utilities	**0,0216**	0,2672
Technology	**-0,0211**	0,1994

Table 12 Sector based analysis recovery period, filter on total risk from low to high

Sector	*Average return*	***Average total risk***
Insurance	0,0885	**0,1862**
Technology	-0,0211	**0,1994**
Banks	0,1958	**0,2177**
Energy	0,1395	**0,2228**
Chemicals	0,1703	**0,2333**
Basic Resources	0,1080	**0,2610**
Utilities	0,0216	**0,2672**
Telecommunications	0,1307	**0,2725**
Personal Care, Drug and Grocery Stores	0,1918	**0,3011**
Health Care	0,2201	**0,3221**
Automobiles and Parts	0,1204	**0,3282**
Industrial Goods and Services	0,1146	**0,3575**

5 Conclusion and Discussion

The final chapter contains an overview of the analysis procedure thus conducted during analysis and the overall summary that provides the answers to the research questions and explains the research work results. This section also provides an outline for the practical application, understanding of findings. The chapter covers the validity and reliability aspect of the study and reveals the existing limitations. A few recommendations that are important in this regard to improve future research work are also included.

Validity and reliability

The validity of the research is a degree to which a term is accurately measured in research. According to Ihantola and Kihn (2011), a study is accurate if another researcher can replicate the same analysis method under similar conditions and come up with precisely the same or slightly different results. To implement the study in a valid form and to evade the statistical errors, the information for the study was carefully selected. According to Saunders et al. (2009), as primary data is supplemented with secondary data, it becomes a more accurate source of information (267). Following this recommendation, the author of the following study looked at secondary data sources on the subject and compared the results to those of previous studies. The researcher used the secondary data only from verified and reliable sources such as the historical values of the prices of NASDAQ OMX Nordic and the website of The Finnish bank, which are reliable sources of information. The time horizon for the study was 15 years and the entire volume of historical market stock price data was collected thoughtfully.
The reliability is the second metric of consistency in quantitative analysis. In other words, the degree to which a test instrument reliably performs similar effects when used in the same condition many times.

Summary of key findings

As a result of the analysis and research, the researcher revealed a strong positive correlation between stock return and risk in the Finnish stock markets. Comparing the understudied periods, the author concludes that in the pre-crisis and crisis times, the companies' profitability fell, in contrast to the two subsequent periods. Even though the volume of risk in the first two periods is approximately at the same level, the profitability is different. At the same time, in the recovery

period, both return and risk values are falling, which confirms the correlation between these two indicators.

The current research was focused on the three main questions: first, how does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019; second, how does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019 against the market performance; and third, how does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019 depends on the company sector. The study applies statistical analysis to research the historical data to answer the questions mentioned above.

The research questions answered well by observing the practical implementation of the study.

1. How does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019?

The rate of return analysed companies had changed during the observed time. The changes are evident from the graphical and descriptive analysis that focused on the market stock performances of 23 Finnish companies in the pre and crisis, post-crisis and recovery period. The mean of stock return has its lowest value of 0.0026, indicates the 0.2% return on stocks on average during the first period and the highest in the researched time value of 0.2560, increase the performance to 25% in the post-crisis period. The stock returns increased strongly through the post-crisis period, which connected to the market rise during that time, and fall slightly to the level of 0.1197 in the recovery period. The rate of risk of analysed companies had changed during the observed time. The changes are clear from the graphical and descriptive analysis that focused on the risk values of 23 Finnish companies in the pre and crisis, post-crisis and recovery period. Since the graphical analysis reveals the positive correlation between risk and returns, the highest risk rate was observed during the post-crisis period with the value of 0.3943 when the returns were high, compared to the lower rate in the pre and crisis period (0.3870) and the weakest risk value in the recovery period (0.2888). However, the unsystematic risk associated with company risk had its highest value of 0.3674 during the whole pre and crisis period. It decreased only in the post-crisis period and reached the lowest value of 0.1242 in the recovery.

2. How does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019 against the market performance?

An average company's performance during the pre and crisis period was higher with a rate of return of 0.002 compared to the market's -0.0204. Same pattern the researcher observed for the other two periods where the return values of companies were higher than the market rate of return. Nevertheless, the market risk had lower values during the whole researched period. The results for the first researched question presents that, according to numbers, the overall companies' risk and return performance was superior than the market during the post-crisis period. The researcher used Jensen's Alpha values to recognise this. Positive values for all the periods indicate that the companies return was compensated for the risk that existed over the researched period. The highest value of Jensen's Alpha observed during the post-crisis period and was 0.2286 (23%). In the recovery period, this value decreased but remain positive (0.0074) and still higher than in the pre and crisis period (0.0041).

3. How does the dynamics between risk and return of companies changes during the crisis period on Finnish stock markets 2005-2019 depends on the company sector?

The sector-based analysis was used to recognise the sectors less or more harmed by the crisis. Relatively low-risk value and highest return were detected for companies from the insurance sector. The negative average return was a sign of a significant crisis influence for the pre and crisis period. The negative performance was detected for the companies in the health care, banks, energy, chemicals, basic resources, technology. With the negative return, companies from named sectors operated with low or average total risk. The most riskier sectors with a positive return in the period were automobile and parts, industrial goods and services. In the post-crisis, the health care sector had a higher rate of return among all companies with a relatively high amount of total risk. All values for average return was positive that indicates economic growth. The riskier sectors were banks, technology and energy. Health care is still the most profitable sector in the recovery period, followed by banks and personal care, drug and grocery stores. The technology sector shows negative returns with the second smallest total risk value. The insurance sector has a lowes risk value during the period. To summarise the researcher observation during the periods, the safest and profitable sectors to invest in with average risk values were insurance, utilities, personal care, drug and grocery stores, industrial goods and services, telecommunications, automobiles and parts. The technology sector turned out to be a little riskier in the pre and crisis period but return positive performance after the crisis.

According to the researcher's plan, the author implemented risk and returned dynamics analysis on the Finnish stock market during the crisis. The researcher reviewed appropriate literature and previous studies, collected secondary data and analyzed it in several ways to give a clear answer to research questions.

Limitations and recommendations

This study is limited to data for such a small group of companies since the analysis was conducted on a research of 23 listed on the Finnish stock market companies and the market index. Since the findings of this analysis were not extended to other companies of the same kind or companies from another markets, the market is not covered in a full way, and the experiment suffers because of the limited sample size. The statistical importance of the study' findings will increase as the number of companies observed grows.

The direction of the potential study can be determined by the limitations encountered during the research. Nevertheless, the analysis is solely based on determining performance of stocks by acknowledged the stock's risk and returns, this test can in the future be implemented by using alternative factors in the equation to dig deeper into the research. The sector-based study is also limited with the small number of companies researched and can give only a brief overview of the topic. However, it provides the foundation for future research of the related risk and returns dynamics through various economic sectors.

For future research, the author recommends the wider sample size of the companies and expanding the number of indicators to analyze, for instance, the values of unlevered beta with usage of equity and debt of the companies. To conclude, the Covid-19 pandemic influence the time horizon choice for the researcher and future studies could be aimed at studying the impact of the pandemic on stock markets.

References

Bank of Finland. 1996. *Financial Markets in Finland. Bank of Finland Bulletin*, Special Issue 1. Accessed on 1 May 2021. Retrieved from https://helda.helsinki.fi/bof/handle/123456789/16304

Begg, D., Fischer S., Dornbusch R. 2005. *Economics*. 8th ed., McGraw-Hill Higher Education

Boyle, M.J. 2020. *The great recession*. Investopedia, 23 October 2020. Accessed on 1 May 2021. Retrieved from https://www.investopedia.com/terms/g/great-recession.asp
Brealey, R., Myers, S. and Allen, F. 2011. Principles of corporate finance. 10th ed., New York: McGraw-Hill Higher Education

Chen, J. 2021. *Skewness*. Article on the Investopedia website, 30 April 2021. Accessed on 1 May 2021. Retrieved from https://www.investopedia.com/terms/s/skewness.asp

Creswell, J. 2009. *Research design: qualitative, quantitative, and mixed method*. 4th ed. California: SAGE Publications.

Fabozzi, F., & Markowitz, H. 2002. *Theory and practice of investment management*. New Jersey: John Wiley & Sons

Harvey, J. 2008. *Introduction to managing risk*. Topic Gateway series no.28. Document on CIMA website. Accessed on 22 March 2021. Retrieved from http://www.cimaglobal.com/Documents/ImportedDocuments/cid_tg_intro_to_managi ng_rist.apr07.pdf

Hayes, A. 2021. *Return*. Article on the Investopedia website, 29 April 2021. Accessed on 1 May 2021. Retrieved from https://www.investopedia.com/terms/r/return.asp

Henry, O., Olekalns, N., Thong, J. 2004. *Do Stock Market Returns Predict Changes to Output? Evidence from a Nonlinear Panel Data Model.* Accessed on 1 May 2021. Retrieved from https://www.researchgate.net/publication/24055003_Do_stock_market_returns_predict_changes_to_output_Evidence_from_a_nonlinear_panel_data_model

Holmström, B., Korkman, S., Pohjola, M. 2014. *The nature of Finland's economic crisis and the prerequisites for growth*. Accessed on 1 May 2021. Retrieved from https://vnk.fi/documents/10616/5375865/The+nature+of+Finland's+economic+crisis+and+the+prerequisites+for+growth+memorandum#:~:text=Finland%20has%20not%20recovered%20from,Finland%27s%20economy%20and%20its%20prospects.

Hundal, S., Eskola, A. 2020. *Board of directors, capital structure, investment decisions and firm-performance: An empirical study of Nordic firms* [Special issue]. Corporate Ownership & Control, 17(4), 377-390. http://doi.org/10.22495/cocv17i4siart14

Hundal, S., Eskola, A., Tuan, D. 2019. *Risk–return relationship in the Finnish stock market in the light of Capital Asset Pricing Model (CAPM)*. Journal of Transnational Management, pp. Pages 305-322.

Hundal, S., Sandstrom, A., and Uskumbayeva, A. 2018. *The Impact of the Financial Crisis on Corporate Capital Structure in the Nordic Countries, in the Eurasian Journal of Economics & Finance (EJEF)*, Vol. 6, No. 3, pp. 34-51.

Ihantola, E-M., Kihn, L-A. 2011.*Threats to validity and reliability in mixed methods accounting research.* Qualitative Research in Accounting and Management, Vol. 8, No. 1, pp. 39-58 Accessed on 3 May 2021. Retrieved from https://trepo.tuni.fi/bitstream/handle/10024/66045/threats_to_validty_and_reliability_2011.pdf?sequence=1

International Financial Markets. 2017. E-Finance management. Accessed on 1 May 2021. Retrieved from https://efinancemanagement.com/international-financial-management/international-financial-markets

Kenton, W. 2021. *Financial crisis.* Article on the Investopedia website, 23 April 2021. Accessed on 1 May 2021. Retrieved from https://www.investopedia.com/terms/f/financial-crisis.asp

Levine, D. 2017. *Statistics for managers using Microsoft Excel.* 7th ed. Pearson Education

Lo, A. 2008. Finance theory. MIT Sloan MBA Program. Accessed on 28 April 2021. https://www.academia.edu/39255288/5_401_Finance_Theory_15_401_Finance_Theory_MIT_Sloan_MBA_Program

Lo, A. 2019. *Hedge Funds, Systemic Risk, and the Financial Crisis of 2007-2008: Written Testimony for the House Oversight Committee Hearing on Hedge Funds.* Social Science Research Network. Accessed on 27 April 2021. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=13012 17&download=yes

Mayor, H. 2008. *Investments: An introduction*. Michigan: Thomson Higher Education.

Nasdaq Nordic. Accessed on 1 May 2021. Retrieved from http://www.nasdaqomxnordic.com/about_us

Peterson, S. 2012. *Investment Theory and Risk Management.* Accessed on 1 May 2021. Retrieved from https://onlinelibrary.wiley.com/doi/book/10.1002/9781119205197

Return. 2008. Dictionary of Financial Terms. Accessed on 1 May 2021. Retrieved from https://financial-dictionary.thefreedictionary.com/Return

Saunders, M., Lewis, P., & Thornhill, A. 2019. *Research Methods for Business Students*. 8th ed. Harlow: Pearson Education Limited

Siegel, Jeremy J. 2002. *Stocks for the Long Run: The Definitive Guide to Financial Market Returns and Long-Term Investment Strategies*. 5th ed., McGraw-Hill Companies

Vaihekoski, M. 1997. *The Finnish stock market: Recent trends and important events.* Accessed on 1 May 2021. Retrieved from https://www.researchgate.net/publication/228776812_The_Finnish_stock_market_Recent_trends_and_important_events

Appendices

Appendix 1. Companies listed on Finish stock exchange, with sectors (italic companies excluded from the research)

№	*Company*	*Sector*
1	Cargotec Oyj	Industrial Goods and Services
2	Elisa Oyj	Telecommunications
3	Fortum Oyj	Utilities
4	Huhtanäki Oyj	Industrial Goods and Services
5	Konecranes Oyj	Industrial Goods and Services
6	Kemira Oyj	Chemicals
7	Kesko Oyj B	Personal Care, Drug and Grocery Stores
8	Kone Oyj	Industrial Goods and Services
9	*Korjamo Oyj*	*Real Estate*
10	Metsä Board Oyj B	Basic Resources
11	Metso Outotec Oyj	Industrial Goods and Services
12	Nordea Bank Abp	Banks
13	Neles Oyj	Industrial Goods and Services
14	Neste Oyj	Energy
15	Nokia Oyj	Telecommunications
16	Orion Oyj B	Health Care
17	Outokumpu Oyj	Basic Resources
18	Sampo Oyj A	Insurance
19	Stora Enso Oyj R	Basic Resources
20	Telia Company	Telecommunications
21	TietoEVRY Oyj	Technology
22	Nokian Renkaat Oyj	Automobiles and Parts
23	UPM-Kymmene Oyj	Basic Resources
24	*Valmet Oyj*	*Industrial Goods and Services*
25	Wärtsilä Oyj Abp	Industrial Goods and Services

Appendix 2. Companies listed on Finish stock exchange included in the research, by sector

№	*Company*	*Sector*
1	Nokian Renkaat Oyj	Automobiles and Parts
2	Nordea Bank Abp	Banks
3	Metsä Board Oyj B	Basic Resources
4	Outokumpu Oyj	Basic Resources
5	Stora Enso Oyj R	Basic Resources
6	UPM-Kymmene Oyj	Basic Resources
7	Kemira Oyj	Chemicals
8	Neste Oyj	Energy
9	Orion Oyj B	Health Care
10	Cargotec Oyj	Industrial Goods and Services
11	Huhtanäki Oyj	Industrial Goods and Services
12	Konecranes Oyj	Industrial Goods and Services
13	Kone Oyj	Industrial Goods and Services
14	Metso Outotec Oyj	Industrial Goods and Services
15	Neles Oyj	Industrial Goods and Services
16	Wärtsilä Oyj Abp	Industrial Goods and Services
17	Sampo Oyj A	Insurance
18	Kesko Oyj B	Personal Care, Drug and Grocery Stores
19	TietoEVRY Oyj	Technology
20	Elisa Oyj	Telecommunications
21	Nokia Oyj	Telecommunications
22	Telia Company	Telecommunications
23	Fortum Oyj	Utilities

Appendix 3. Pre and Crisis period calculations (2005-2008)

№	*Company*	*Annual-ized Re-turn*	*Total Risk*	*Systematic Risk*	*Unsystematic Risk*	*Risk*	*Jensen's Alpha*
1	Cargotec Oyj	-20,18%	42,23%	2,98%	39,25%	0,13	-19,94%
2	Elisa Oyj	6,86%	33,97%	-0,26%	34,23%	-0,01	6,82%
3	Fortum Oyj	9,88%	35,99%	1,75%	34,24%	0,07	10,01%
4	Huhtanäki Oyj	-17,84%	33,08%	2,36%	30,73%	0,10	-17,65%
5	Konecranes Oyj	21,52%	46,04%	18,71%	27,33%	0,79	23,12%
6	Kemira Oyj	-7,06%	35,05%	2,69%	32,35%	0,11	-6,85%
7	Kesko Oyj B	6,58%	36,49%	-0,63%	37,12%	-0,03	6,50%
8	Kone Oyj	16,05%	34,96%	1,48%	33,49%	0,06	16,16%
9	Metsä Board Oyj B	-32,20%	43,82%	2,35%	41,47%	0,10	-32,02%
10	Metso Outotec Oyj	10,90%	60,31%	3,00%	57,31%	0,13	11,14%
11	Nordea Bank Abp	-2,22%	34,60%	-1,05%	35,65%	-0,04	-2,33%
12	Neles Oyj	2,32%	42,61%	2,98%	39,63%	0,13	2,56%
13	Neste Oyj	-3,40%	39,96%	3,95%	36,01%	0,17	-3,08%
14	Nokia Oyj	5,03%	35,07%	-1,51%	36,57%	-0,06	4,88%
15	Orion Oyj B	-1,58%	28,52%	-0,20%	28,72%	-0,01	-1,62%
16	Outokumpu Oyj	-1,44%	45,01%	2,26%	42,75%	0,10	-1,27%
17	Sampo Oyj A	11,54%	29,41%	2,28%	27,12%	0,10	11,72%
18	Stora Enso Oyj R	-10,99%	35,91%	0,15%	35,76%	0,01	-11,00%
19	Telia Company	-0,68%	31,44%	-0,71%	32,16%	-0,03	-0,76%
20	TietoEVRY Oyj	-17,65%	42,04%	0,38%	41,66%	0,02	-17,64%
21	Nokian Renkaat Oyj	2,15%	47,47%	1,69%	45,78%	0,07	2,28%
22	UPM-Kymmene Oyj	10,14%	32,32%	-0,50%	32,82%	-0,02	10,08%
23	Wärtsilä Oyj Abp	18,20%	43,75%	0,81%	42,93%	0,03	18,25%

Appendix 4. Post-crisis period calculations (2009-2012)

№	*Company*	*Annualized Return*	*Total Risk*	*Systematic Risk*	*Unsystematic Risk*	*Risk*	*Jensen's Alpha*
1	Cargotec Oyj	40,84%	48,56%	7,20%	41,37%	0,27	37,12%
2	Elisa Oyj	11,43%	24,97%	0,84%	24,13%	0,03	37,12%
3	Fortum Oyj	2,16%	28,17%	4,06%	24,11%	0,15	10,97%
4	Huhtanäki Oyj	36,68%	33,72%	3,12%	30,60%	0,12	0,04%
5	Konecranes Oyj	32,13%	43,00%	10,13%	32,87%	0,37	26,88%
6	Kemira Oyj	34,79%	43,24%	5,56%	37,68%	0,21	31,90%
7	Kesko Oyj B	15,32%	32,34%	3,49%	28,85%	0,13	13,50%
8	Kone Oyj	44,95%	29,17%	2,97%	26,20%	0,11	43,40%
9	Metsä Board Oyj B	65,13%	63,12%	10,42%	52,70%	0,38	59,74%
10	Metso Outotec Oyj	56,33%	46,07%	6,70%	39,37%	0,25	52,86%
11	Nordea Bank Abp	25,91%	44,35%	4,76%	39,59%	0,18	23,43%
12	Neles Oyj	52,48%	45,59%	7,60%	37,99%	0,28	48,55%
13	Neste Oyj	5,16%	37,46%	6,51%	30,95%	0,24	1,78%
14	Nokia Oyj	-18,84%	49,41%	7,40%	42,01%	0,27	-22,67%
15	Orion Oyj B	19,99%	24,45%	1,89%	22,56%	0,07	19,00%
16	Outokumpu Oyj	-11,24%	51,53%	8,04%	43,49%	0,30	-15,40%
17	Sampo Oyj A	21,96%	30,57%	2,92%	27,65%	0,11	20,44%
18	Stora Enso Oyj R	7,63%	41,64%	34,64%	34,64%	0,26	4,00%
19	Telia Company	14,52%	28,22%	2,06%	26,15%	0,08	13,44%
20	TietoEVRY Oyj	25,80%	36,75%	2,59%	34,16%	0,10	24,44%
21	Nokian Renkaat Oyj	53,27%	43,34%	7,19%	36,15%	0,27	49,54%
22	UPM-Kymmene Oyj	7,60%	39,74%	6,39%	33,35%	0,24	4,29%
23	Wärtsilä Oyj Abp	44,69%	41,57%	6,25%	35,32%	0,23	41,45%

Appendix 5. Recovery period calculations (2012-2019)

№	*Company*	*Annualized Return*	*Total Risk*	*Systematic Risk*	*Unsystematic Risk*	*Risk*	*Jensen's Alpha*
1	Cargotec Oyj	12,04%	32,82%	20,22%	12,61%	1,23	-1,75%
2	Elisa Oyj	19,58%	21,77%	10,96%	10,80%	0,67	12,10%
3	Fortum Oyj	9,50%	23,25%	12,72%	10,53%	0,77	0,82%
4	Huhtanäki Oyj	22,66%	24,47%	13,87%	10,60%	0,84	13,19%
5	Konecranes Oyj	6,01%	31,25%	10,58%	20,67%	0,64	-1,22%
6	Kemira Oyj	5,03%	25,42%	14,38%	11,04%	0,87	-4,78%
7	Kesko Oyj B	17,03%	23,33%	11,36%	11,97%	0,69	9,28%
8	Kone Oyj	13,95%	22,28%	15,15%	7,13%	0,92	3,61%
9	Metsä Board Oyj B	22,01%	32,21%	19,34%	12,87%	1,17	8,81%
10	Metso Outotec Oyj	2,30%	46,21%	22,88%	23,34%	1,39	-13,30%
11	Nordea Bank Abp	2,93%	23,98%	15,67%	8,31%	0,95	-7,76%
12	Neles Oyj	6,40%	31,09%	19,59%	11,50%	1,19	-6,96%
13	Neste Oyj	45,09%	31,47%	14,70%	16,76%	0,89	35,05%
14	Nokia Oyj	8,19%	35,24%	20,69%	14,55%	1,26	-5,91%
15	Orion Oyj B	13,89%	28,60%	12,58%	16,02%	0,76	5,31%
16	Outokumpu Oyj	1,39%	53,66%	27,81%	25,85%	1,69	-17,56%
17	Sampo Oyj A	8,85%	18,62%	13,35%	5,27%	0,81	-0,26%
18	Stora Enso Oyj R	19,18%	30,11%	22,92%	7,19%	1,39	3,55%
19	Telia Company	-2,11%	19,94%	11,19%	8,75%	0,68	-9,75%
20	TietoEVRY Oyj	12,59%	24,27%	13,05%	11,22%	0,79	3,69%
21	Nokian Renkaat Oyj	1,92%	29,08%	16,82%	12,26%	1,02	-9,55%
22	UPM-Kymmene Oyj	24,69%	28,41%	20,97%	7,44%	1,27	10,39%
23	Wärtsilä Oyj Abp	2,16%	26,72%	17,78%	8,94%	1,08	-9,97%