TALLINN UNIVERSITY OF TECHNOLOGY
School of Business and Governance

Marian Jaarman

INSIDER OWNERSHIP AND FIRM PERFORMANCE: UNVEILING THE IMPACT OF "SKIN IN THE GAME"

Master's thesis
Programme Finance and Accounting, specialisation Finance

Supervisor: Kalle Ahi, lecturer

Tallinn 2024

I hereby declare that I have compiled the thesis independently
and all works, important standpoints and data by other authors
have been properly referenced and the same paper
has not been previously presented for grading.

The document length is 13 726 words from the introduction to the end of the conclusion.

Marian Jaarman 06.05.2024

TABLE OF CONTENTS

ABSTRACT

The aim of this research was to investigate the performance of stocks with different insider ownership concentrations during different market conditions. Research question to investigate the matter was: To what extent does the performance of stocks with higher insider ownership differ from the performance of stocks with lower insider ownership during different market conditions?

To answer the research question four hypotheses investigating the firm market and financial performance were proposed. Based on theoretical framework, the first two suggested that there is a positive relationship between insider ownership and firm performance and the two others mediated between different market conditions suggesting that the relationship is diminished during down market.

Research was conducted using quantitative methods on S&P 500 constituents for the period 2010-2023. For hypothesis testing dynamic panel data regression model was applied. The model included variables that measure the performance from market performance measured as risk-adjusted returns and financial performance measured as ROE, ROA, and Tobin's Q. Firm market performance as risk adjusted returns were calculated with abnormal returns, Sharpe and Treynor ratio.

Based on the regression results it was concluded that insider ownership does not affect firm performance. The thesis found that down market binary and incremental variables had significant effect on Sharpe and Treynor ratio, implying that there seems to be a difference for insider ownership dynamics depending on whether the market is in a downturn or not. Moreover, the insider ownership impact on market performance measured with Sharpe and Treynor ratio is stronger during down market.

Keywords: insider ownership, firm performance, skin in the game, dynamic panel data

INTRODUCTION

According to the traditional Efficient Market Theory, stock prices reflect all available information, and the prices are hence fairly valued (Fama, 1970). However, the presence of insider ownership challenges the theory as insiders hold a significant stake in the company, suggesting that they have access to private insider information. Additionally, the principal-agent problem, which can be expressed as different objectives between shareholders and managers, has led to development of various concepts, including the agency theory. Moreover, the agency theory aims to find the solution to alignment of the interests between shareholders and managers, which leads to better performance of the company (Jensen & Meckling, 1976; Ross, 1973). Insider ownership should aligns the interests of managers with shareholders, and hence can potentially be a possible option to mitigate the principal-agent problem, ensuring that managerial decisions are in line with long-term shareholder value as the general theory states that having personal stake in the outcomes of our decisions motivates us to perform better (Taleb, 2018).

Due to the difference in time periods observed, methodologies applied, and measures used, there have been conflicting findings in the research of insider ownership dynamics with firm performance. Majority of previous studies have found a positive relationship between insider ownership and performance approaching this problem with different methods and analysing different performance measures (McConnell & Servaes, 1990; Oswald & Jahera, 1991; Kim, Lee & Francis, 1988; Din *et al.*, 2021). However, a study by Dickins and Houmes (2009) found that even though this is generally true, the relationship is diminished during down markets such as the Global Financial Crisis. This is supported by the expectancy theory, according to which one of the important factors influencing expectancy is perceived control, meaning that managers might feel less control over performance during market downturns, which in turn reduces their incentive to outperform other firms financially (Vroom, 1964). Meanwhile authors Core, Guay and Rusticus (2006) and Mura (2007) did not find any significant relationship between insider ownership and firm performance, suggesting that strong form market hypothesis may hold.

The relevance of this study lies in the understanding how corporate insider actions influence market dynamics, particularly in turbulent economic times. This research addresses an empirical gap in assessing insider ownership's role in firm performance also during downturns, providing valuable insights for investors and policymakers. This thesis contributes to the existing literature of studies about the relationship between insider ownership and firm performance known as the skin in the game theory. However, as a given research is performed in a new market situation that covers a recent pandemic and its aftermath, it adds to the current empirical research from a unique perspective, offering new insights into the peculiarities of the financial market and its theories as previous studies have analysed earlier periods. Uniqueness of given thesis also lies in the fact that most of the previous studies have focused on one type of performance measure but given thesis analyses the firm market performance measured as risk-adjusted stock return and firm financial performance measured mostly with accounting-based ratios.

The aim of this research is to investigate the performance of stocks with different insider ownership concentrations during different market conditions. In order to investigate given matter, the research question for given thesis is as follows: To what extent does the performance of stocks with higher insider ownership differ from the performance of stocks with lower insider ownership during different market conditions?

Furthermore, to answer the research question the proposed hypotheses are the following:

H1: There is a positive relationship between higher insider ownership and firm market performance;

H2: There is a positive relationship between higher insider ownership and firm financial performance;

H3: The relationship between higher insider ownership and firm market performance is diminished during market downturn;

H4: The relationship between higher insider ownership and firm financial performance is diminished during market downturn.

Given study uses the S&P 500 index and its constituents as a sample. S&P 500 index is suitable as it tracks the 500 largest companies listed on US stock exchanges, representing various sectors and industries with long historical data. The study applies quantitative methods, more specifically for hypothesis testing dynamic panel data regression model will be applied. The estimated models will include variables that measure the performance from two perspectives, namely firm market

performance measured as risk-adjusted stock performance and financial performance measured as ROE, ROA, and Tobin's Q. Risk-adjusted returns are calculated with abnormal returns, Sharpe and Treynor ratio. For additional and more analytical insights into the relationship between performance and ownership, leverage and firm size will be used as control variables.

The thesis begins with an introduction laying out the framework of ownership dynamics, encompassing various theories such as the efficient market hypothesis, agency theory, skin in the game, and expectancy theory on which the hypotheses are developed. After the theoretical framework, an empirical literature review follows, covering the previous research regarding firm performance and ownership. The data and methodology section outlines the data and research methods employed, including risk-adjusted returns, financial performance measures, and panel data regression. The analysis and discussion section interpret the results, examining market and financial performance, leading to conclusions and implications for further research in the field. Finally, the study concludes by summarizing key findings and insights drawn from the analysis.

1. FIRM OWNERSHIP AND PERFORMANCE DYNAMICS

To propose research hypotheses, associated theoretical frameworks and concepts in addition to previous empirical literature needs to be discussed and analysed. Hence the most relevant theories are described below to form research hypotheses, followed by a discussion on previous research conducted by other authors.

1.1. Theoretical framework

There are four important theoretical frameworks that should be reviewed when discussing the dynamics between firm ownership and performance. Those four theories that help to understand the given matter and to develop hypotheses are the efficient market hypothesis, agency theory, the concept of skin in the game and the expectancy theory.

1.1.1. Efficient market hypothesis

One of the most known financial market theories is the efficient market theory by Fama (1970), which discusses the possibilities of earning abnormal returns depending on the efficiency of financial markets. According to Fama (1970), the market is considered to be efficient if its prices reflect all available information. Hence, in general, the efficient market hypothesis states that asset prices reflect all available information and excess returns cannot be earned on a risk-adjusted basis as the market prices react to only new information. Fama (1970) has explained this theory by claiming that the price should trade around the fair market price and the price changes of stocks are caused by unforeseen and force majeure events. However, even in case of efficient markets, all market participants are not always rational. According to efficient market hypothesis, there are three forms of market efficiency, namely weak, semi-strong and strong form. (*Ibid*.)

The weak form assumes that all public market information is reflected in current market prices, but the prices might not reflect information that has not been yet made public. Moreover, the prices only react to historical information meaning that past information is independent from future prices. This indicates that technical trading strategies cannot yield excess returns because past price

performance does not predict future price action that will be based on new information. This leaves the room for fundamental analysis to earn excess returns. The semi-strong form expands the weak form by adding that prices adjust to new public information rapidly. The only exception for earning excess returns in semi-strong markets is private information. Lastly, the strong form of market efficiency states that current market prices reflect all public historical, current, and new information, as well as private or insider information meaning that there are no market participants who could take advantage of any private information. (Fama, 1970)

Moreover, according to the traditional Efficient Market Theory, stock prices reflect all available information, and the market trading prices are hence fairly valued. In a review article written years after the original article, Fama (1998) acknowledged the importance of understanding investor behaviour and its impact on asset prices. In addition, Fama discussed the limits to market efficiency recognizing that market anomalies exist, potentially leading to abnormal returns contrary to the efficient market hypothesis. Malkiel (2003) has outlined psychological biases and market anomalies that can lead to deviations from rational pricing as some of the most important arguments against the Efficient Market Hypothesis. One of the main arguments as a critique against the hypothesis is from behavioural finance, which implies that investors are not rational and can be influenced by emotions, leading to market inefficencies. Market anomalies such as the momentum effect, which is the tencency for assets that have performed well in the past to continue performing well in the future and value premium which implies that stocks that are undervalued compared to their fundamental value have historically yielded higher returns than predicted are both clear evidences against efficent market. Moreover, market bubbles and crashes such as Dot-Com bubble from the late 1990 and the 2008 Financial Crisis are the most straight-forward examples of investor irrationality that lead to market inefficiencies. (Malkiel, 2003) Similarly, the most recent COVID-19 pandemic is another example of how fear and uncertainty led to panic selling in financial markets, leading to volatile asset prices and market inefficiencies.

It can be argued that the presence of insider ownership challenges the theory as well since insiders, such as company executives or board members, hold a significant stake in the company, suggesting that they have access to non-public information. As discussed before, strong form efficient market hypothesis states that stock prices should immediately reflect any information that insiders may have. However, this idea has been challenged by many authors that have found that firms with higher insider ownership tend to outperform those with lower insider ownership (McConnell & Servaes, 1990; Oswald & Jahera, 1991; Kim, Lee & Francis, 1988; Din *et al.*, 2021). Reason

behind these results could be in the type due to so called inside information which may not be immediately reflected in stock prices. Due to this insider ownership can be a positive signal to investors implying that the people with the most knowledge about the firm are confident in its future. The positive relationship between insider ownership and firm performance suggests that the strong form market efficiency does not hold, and rather weak or semi-strong form may hold instead. Meanwhile, this relationship between insider ownership and firm performance can vary significantly between industries and is dependent on market conditions. Moreover, many authors have not found any significant relationship between insider ownership and firm performance, which would suggest that strong form market hypothesis may hold (Core, Guay & Rusticus, 2006; Mura, 2007). To conclude, the hypothesis of stock prices reflecting all available information has been challenged by researchers suggesting that insider ownership can lead to outperformance due to private insider information.

Moreover, considering that the aim of this research is to investigate the performance of stocks with different insider ownership concentrations, given thesis challenges the Efficient Market hypothesis proposed by Fama (1970), according to which stock prices reflect all available information, and the prices are hence fairly valued and should not leave any possibility to earn excess returns. It is challenged based on the presence of insider ownership as insiders hold a significant stake in the company, suggesting that they have access to private insider information.

1.1.2. Agency theory

The principal-agency problem indicates the conflict that arises from the difference between finance and management. The presence of agency problem has been observed by various authors in the field of finance (Fama, 1980; Fama & Jensen, 1983; Jensen, 1986) and economics (Jensen & Meckling, 1976; Ross, 1973). The principal-agent problem, which can be expressed as different misalignment objectives between shareholders and managers has led to development of various concepts, including the agency theory. Moreover, the agency theory aims to find the solution to alignment the interests between shareholders and managers, which leads to better performance of the company (Jensen & Meckling, 1976; Ross, 1973). Fama and Jensen (1983) researched decision management and control differences in complex and simple companies and found that there is no separation between the two in simple firms, while in complex firms they are separated. Furthermore, the agency problem arises in complex firms as the agents in charge of decisions usually are not affected by their choices. The authors concluded that these agency problems need to be controlled for the survival of the firm. According to Ross (1973), the agency problem is the

problem of incentives, stating that the problem is caused by the compensation decisions and added that the problem applies to the whole society, not solely the firm.

The agency theory and costs associated with separation of ownership and control have been discussed by Jensen and Meckling (1976) stating that companies led by managers with limited or no ownership in the firms are less likely to outperform as they are less likely to take on new profitable opportunities due to the fact that it carries a risk, and the profitability might not affect them directly. In general, it can be stated that the conflict of interest and agency costs rise due to the separation of ownership from control, different risk preferences, information asymmetry and moral hazards (Panda & Leepsa, 2017). Shapiro added an interesting aspect to these costs, stating that often times principals need to hire agents who oversee agents who oversee agents as principals themselves are unable to control the agent behaviour directly (Shapiro, 2005). Moreover, Shapiro (2005) concluded that the agency costs increase as the agents are focusing on wrong things that help them appear to be performing well according to the imperfect surrogate measures set by principals, often at the expense of the true objectives or interests of the principals. Example of this can be short-term profit maximisation or focusing on one specific performance metric (Shapiro, 2005). These agency costs are reflected in the share price paid by shareholders and in order to improve firm value, the costs need to be reduced (Jensen & Meckling, 1976).

Solving the agency problem is not straightforward as shareholders must find the competent managers and give them the right incentives to align their decisions with shareholder interests. Panda and Leepsa (2017) concluded that in order to control agency conflict and associated costs, previous authors have suggested solutions like strong ownership control, managerial ownership, independent board members and different committees. Furthermore, according to agency theory, the higher the firm ownership in the management, the better aligned are the interests of managers and shareholders, hence the higher incentive for managers to achieve better results for the shareholders. In addition, with higher firm ownership in the management, the firm value benefits form the lower agency costs.

The principal-agent problem explains the conflict of interest when an agent acts on behalf of the principal. Meanwhile, the agency theory examines the problems and tries to find solutions to the interactions with a conflict of interests between the principal and agent. However, the skin in the game usually refers to the amount of an investment owned by a company's management. The skin in the game theory can simply be interpreted as having personal stake in the outcomes of our

decisions. In the financial context the concept hence in essence is a one specific angle to the discussion of agency theory and can be seen as one of the possible solutions to the agency problem. One of the most recent modern authors propagating the concept of skin in the game is Nassim Nicholas Taleb (2018). He has highlighted the importance of having a shared risk for important decisions as it is essential for fairness, efficiency, risk management and to understand the world itself (Taleb, 2018). This idea is well aligned with one of the earliest authors to discuss the agency problem, Ross (1973), who stated that the agency problem applies to the whole society, not solely the firm.

As discussed before, insider ownership aims to align the interests of managers with shareholders, mitigating the principal-agent problem, ensuring that managerial decisions are in line with long-term shareholder value as the general theory states that having personal stake in the outcomes of our decisions motivates us to perform better (Taleb, 2018). Furthermore, the hypotheses based this discussion is as follows: H1: There is a positive relationship between higher insider ownership and firm market performance; H2: There is a positive relationship between higher insider ownership and firm financial performance.

1.1.4. Expectancy theory

Considering that so far it has been discussed how insider ownership of management can be seen as one possible solution for the agency problem, it is appropriate to discuss the extent to which it applies. This idea is supported by the expectancy theory, which suggests that individual's acts are driven by conscious choices based on the expected utility and rewards (Vroom, 1964). Vroom (1964) claimed motivation is the most important factor for individuals making behavioural choices. Vroom and Deci (1989) suggested that people can be motivated to achieve their goals if there is a positive correlation between effort and performance, better results will be awarded, rewards will satisfy the person’s needs and the efforts are worth the desire to satisfy one's needs.

Moreover, Vroom (1964) has outlined that the expectancy theory consists of expectancy, instrumentality, and valence. The expectancy represents one’s belief that effort will lead to desired outcome, the instrumentality is the perceived probability that good performance will lead to desired outcomes and the valence is the perceived value of the rewards of an outcome, based on specific individual. There are three important factors that influence the expectancy, namely self-efficacy, goal difficulty and perceived control. Self-efficacy represents the belief of the ability of individual to perform chosen behaviour. Goal difficulty implies the question of whether the

individual has necessary skills to perform the behaviour. Lastly, the perceived control represents individual's belief regarding the extent of control they have over the outcome. (Vroom, 1964) Instrumentality is also affected by three factors, namely trust for those that distribute the rewards, control over how decisions are made and evidence that reflect correlation between performance and outcomes (Chiang & Jang, 2008).

Furthermore, considering that one of the important factors influencing expectancy is perceived control, it can be reasoned that managers feel less control over performance during market downturns, which in turn reduces their incentive to outperform other firms financially. During market downturns, managers may face declining sales often without the ability to raise prices. Additionally, the down market's impact on stock prices adds further pressure. This creates a challenging scenario where managers must navigate falling revenues, stagnant prices, and volatile stock prices, requiring strategic decisions to sustain the business. Considering the latest market downturns, the recent COVID-19 pandemic should be discussed. It was first identified already in December 2019 in Wuhan, China, after which it spread to other areas of Asia, and then it became a global problem in the beginning of 2020 (CDC Museum …, n.d.). The pandemic had extensive effect on the whole world, including the financial world leading to falling stock prices and significant losses.

Considering that the theory suggests that performance can vary in different market conditions, it is investigated in given thesis with the research question: to what extent does the performance of stocks with higher insider ownership differ from the performance of stocks with lower insider ownership during different market conditions? Based on this expectancy theory, additional two hypotheses can be proposed considering different market conditions, the hypotheses being the following: H3: The relationship between higher insider ownership and firm market performance is diminished during market downturn; H4: The relationship between higher insider ownership and firm financial performance is diminished during market downturn.

1.2. Empirical literature review

The topic of insider ownership and firm performance has been researched from various angles and the results have been somewhat conflicting and inconsistent. Some of the authors have researched the firm financial performance while others have investigated the firm market performance

measured as stock returns. It is hence important to note here that the nature of performance measures, including restrictive use of accounting-based measures and market-based measures can be one contributor to this inconsistency. Additionally, the choice of variables and use of public or survey data also varies between authors, which can lead to inconsistent results.

Kim, Lee and Francis (1988) researched random subsample of various industries US firms of from a previous study for the period 1976-1980 and found that insider ownership represents a new statistically significant variable that is associated with abnormal returns. They used stockholdings of officers and directors to measure ownership and market value of outstanding equity shares and price earnings ratio on equivalent earnings per share ratio of for performance measures. Oswald and Jahera (1991) researched the relationship between ownership structure and financial performance. More specifically they used stockholdings of officers and directors to measure insider ownership and return on assets along, return on equity and excess returns to measure performance. Their results found a positive relationship between the ownership and performance. Authors concluded that given higher level of insider ownership implies improved decision-making which results in higher earnings and dividends, highlighting the benefit of corporate strategy for long-term performance. (Oswald & Jahera, 1991) Additionally, McConnell and Servaes (1990) used Tobin's Q to measure firm value of listed US firms. More specifically, the authors researched the relationship between Tobin's Q and the structure of equity ownership for firms in two separate samples for years 1976 and 1986. They found a significant curvilinear relation between Tobin's Q and the percentage of common stock owned by insiders. However, the curve slopes upward until ownership reaches 40-50% after which it slopes slightly down. Furthermore, the authors also found a positive relationship between insider ownership and firm value. (McConnell & Servaes, 1990)

Meanwhile Griffith (1999), Morck, Shleifer, and Vishney (1998), and Chen, Hexter, and Hu (1993) all found that the relationship is dependent on the percentage of insider ownership, suggesting that low and high insider ownership show positive relationship to firm value while average insider ownership displays no relationship. Griffith (1999) used Tobin's Q to measure firm value and the results indicated that firm value rises when the CEO owns between 0 and 15% and declines as CEO ownership increases to 50%. However, as ownership exceeds 50%, the firm value starts to rise, and the author concluded that CEO ownership has a dominating effect on firm value (Griffith, 1999). Furthermore, authors Morck, Shleifer, and Vishney (1998) also measured Fortune 500 firms' performance as Tobin's Q and found that value increases at first and then starts to fall as ownership increases. Similarly, Chen, Hexter, and Hu (1993) measured Fortune 500 Tobin's Q and

found that value increases when ownership is between only 0 and 5-7% and falls as ownership increases to 10-12%. They also noted that over these ranges, firm value behaves differently for different time periods but overall, the study concluded that there is a nonmonotonic relationship between management ownership and corporate value.

Researchers such as Kaserer and Moldenhauer (2008) researched Germany data which is another interesting perspective as in Germany, insider ownership is mostly related to family control and the practice of stock-based compensation is less widespread, and the corporate control had been so far less developed. They analysed pooled data from two different time periods, specifically 2003 and 1998. The authors also found a significant positive relationship between insider ownership and corporate performance measured as three variables, namely stock price performance, market to book ratio and return on assets. They applied 2SLS regression approach to account for endogeneity and still found rather robust results and concluded that ownership structure is potentially important variable for explaining the long-term value creation in the corporate sector. (Kaserer & Moldenhauer, 2008) Din *et al.* (2021) performed a dynamic panel data analysis applying generalized method of moments (GMM) on ownership structure and corporate financial performance. The authors researched the Pakistani stock exchange and analysed relationship between insider ownership and ROA, ROE, MBR and Tobin's Q. They found that there is a significant positive relationship between insider ownership and ROA, ROE, MBR and Tobin's Q, indicating that authors concluded that the agency theory holds (Din *et al.,* 2021).

Hence, many studies have found that companies with skin in the game, implying higher insider ownership, perform better. However, there are some conflicting results as well, for example Dickins and Houmes (2009) found that even though the latter is generally true, the relationship is diminished during down markets such as the Global Financial Crisis. They measured the financial performance of stocks with ROE and ROA. More specifically they found that this is the most applicable for firms with the highest levels of insider ownership. (Dickins & Houmes, 2009) Another contrary finding to the previous results was proposed by Mura (2007), who researched performance relation to ownership structure and board composition with panel data analysis and found that proportional ownership is not a significant variable on firm performance while the proportion of non-executives on board significantly and positively affected the firm performance. Authors Core, Guay and Rusticus (2006) analysed data on US public firms and found that while higher insider ownership can align interests with shareholders, it does not necessarily lead to improved firm performance. More specifically their results do not confirm the hypothesis that

weak governance causes poor stock returns. Additionally, Demsetz & Villalonga (2001) applied GMM methodology to account for potential endogeneity of the independent variables and fixed effects on UK firm's dataset for period of 1991-2001. The authors focused on different dimensions of ownership structures and also did not find any statistically significant relation between non-executives' proportional ownership and firm performance but instead found that the proportion of non-executives on board is significantly and positively related to firm performance. Due to which the authors concluded that only on-executive directors are effective monitors. They explained this result with the idea, that even though diffuse ownership creates some agency problems, the problems are usually offset by yielded compensating advantages (Demsetz & Villalonga, 2001). Kyereboah-Coleman (2008) examined the effect of corporate governance on the performance of firms in Africa, using market and accounting-based performance measures for period of 1997-2001. The author applied dynamic panel data framework and concluded that the impact of governance is dependent on the performance measure applied. Moreover, large and independent boards impact firm value positively while positions of CEO on board chair have a negative impact on corporate performance. (Kyereboah-Coleman, 2008)

Regarding other important factors affecting the firm performance, Jensen (1986) has emphasised the importance of higher levels of debt as a limit to agency problems associated with managers having access to assets since they have less cash on hands after the debt. Jensen argued that creation of debt allows managers to effectively fulfil their promise to pay out future cash flow meaning that debt can be used instead of dividends. Stiglitz (1985) also argued that lenders motivate firms to perform better, which in turn results in better firm performance. Additionally, Modigliani and Miller (1963) who studied the value of tax shields, found a positive relationship between increased leverage and performance. However, it is important to note the possibility and risk of bankruptcy caused by higher leverage which should be priced in the market, leading to lower stock prices. Additionally, Myers (1977) emphasized that firm's leverage can limit their ability to raise new debt and hence the firm might not be able to take on some new profitable investment opportunities.

2. DATA AND METHODOLOGY

Given chapter provides overview of the sample, its collection and applied analysis methods. This study follows previous authors research approaches and combines them to find new insightful outcomes as previous authors have found different results while applying different approaches.

2.1. Data

Previous studies have mostly researched given topic from single perspective such as analysing the relationship between insider ownership and firm market performance or insider ownership and financial performance. However, given research does not focus solely on one specific performance measure and rather expands previous studies through including more variables to reach more consistent results. Given study uses the S&P 500 index and its components as a sample. S&P 500 index is suitable as it tracks the 500 largest companies listed on US stock exchanges, representing various sectors and industries with long historical data. The S&P 500 is considered to be the best representation of large-cap US equities (Preston & Soe, 2021).

For data collection given thesis uses EIKON refinitiv and Bloomberg Terminal. More specifically, S&P 500 individual stocks' data will be downloaded, including their noted share of insider ownership and fundamental variables. Additionally, those stocks' annual prices for chosen time period will be downloaded as well. Most previous authors have also focused on public US stocks such as Core, Guay and Rusticus (2006), Dickins and Houmes (2009), Demsetz and Villalonga (2001) and McConnell and Servaes (1990). Following the examples of previous authors, the most common measurements for financial performance are chosen as ROE, ROA, Tobin's Q (Din *et al.*, 2021; Mura, 2007; Griffith, 1999). Meanwhile some authors have additionally analysed risk-adjusted returns such as Oswald and Jahera (1991). Based on this given thesis has also chosen abnormal returns as market adjusted returns, Sharpe and Treynor ratio for market performance risk-adjusted returns.

Previous authors have mostly also focused on solely annual data as accounting measures ROE, ROA and Tobin's Q have longer time intervals and the use of daily or monthly changes would not make sense. Even though given study additionally considers risk-adjusted returns, only annual changes will be assessed to not overcomplicate the application of variables in market and financial performance models. Using annual stock price changes is also beneficial in a way that the prices are less sensitive to noise such as market sentiment and news meaning that using annual data helps to avoid overfitting. For data analysis R studio and Stata programs will be used.

The sample consists of the current S&P 500 constituents and the S&P 500 index return will be used as a benchmark. The total number of stocks that were included in S&P 500 at the date of data retrieval is 502. The choice of current S&P 500 stocks is caused mostly due to lack of available and reliable data for all stocks that have been in the S&P 500 index during the analysed period. Hence, focusing on the current S&P 500 stocks ensures consistency in the analysis as stocks that were in the index many years ago might have undergone significant changes, such as mergers, acquisitions, spin-offs, or delistings. By focusing on the current constituents, complications that arise from changes in the index composition over time can be avoided. Additionally, today's S&P 500 stocks represent the current market and are more relevant for today's investor as the companies currently listed in the S&P 500 are those that are actively traded and have more relevance. Furthermore, examining these companies offers insights that directly apply to current investment choices. On the other hand, given sample also poses problems such as the survivorship bias as delisted companies could have been managed poorly and are not included in given statistics (Brown, Goetzmann, Ibbotson & Ross, 1992). Additionally, as given thesis analyses only public companies, it is important to note that private companies might have better financial ratios and may be more successful in value creation.

Furthermore, the dependent variables from given sample are firm market performance measures, namely risk adjusted returns, including abnormal returns, Sharpe ratio and Treynor ratio, and financial performance measures ROE, ROA, and Tobin's Q. Tobin's Q can be interpreted to some extent both as market and financial performance measure as it considers both market and book value. In given study it is interpreted as financial performance measure as other market performance measures are focused on risk-adjusted stock returns. Independent control variables are insider ownership, total assets, market capitalization and leverage. S&P 500 index (SPY) annual returns are used to create a dummy and mediating variable to distinguish between normal and down market.

Below in Table 1 descriptive statistics summary provides a descriptive statistic of various key financial metrics of the sample. As it can be seen, the insider ownership ranges from nearly 0% to 52,02%, suggesting significant variability in given dataset in this aspect. An intriguing outcome from adjusting variables for risk is that all ratios suggest that individual stocks offer excess returns as both mean and median values are positive. Abnormal returns show a mean of 0,00%, indicating an average performance in this regard. However, the Sharpe ratio, exhibits a mean of 0,45 and median of 0,39, indicating positive risk-adjusted returns, but not exceptionally high ones. The two financial return metrics namely ROE (Return on Equity) and ROA (Return on Assets) display very wide ranges for given dataset. Additionally, Tobin's Q, a measure of firm value, shows a mean of 2,31, suggesting that, on average, firms are valued at more than twice their total assets. The market capitalization ranges from $62 million to nearly $3000 billion, revealing the wide variation in company sizes within the sample, indicating a diverse set of firms under consideration regardless of the fact that they are all current S&P 500 constituents. Hence, these statistics highlight the variance of given dataset, hopefully providing more applicable results to wider range of firms.

As variables such as Treynor ratio, return on equity, market capitalisation and total assets vary significantly between companies and are highly skewed, it is necessary to reduce the skewness and normalize the values through eliminating outliers with windsorizing by stock in Stata. Winsorizing handles outliers by replacing extreme values with less extreme ones. It is a helpful tool in data transformation as it helps to mitigate the impact of outliers on statistical analysis while still preserving the overall distribution of the data. For market capitalisation it would be useful to take a natural logarithm as this data should not have that many outliers.

Table 1. Descriptive statistics of variables annual data for the period of 2010-2023

	Minimum	Maximum	Mean	Median	Standard deviation	Skewness	Kurtosis
Insider ownership (as %)	0,00	52,02	2,27	1,62	5,09	4,60	27,12
Abnormal returns (as %)	-1,41	1,99	0,00	0,01	0,25	0,06	3,62
Sharpe ratio	-2,85	3,59	0,45	0,39	1,01	-0,23	-0,14
Treynor ratio	-129,09	74,36	0,03	0,08	3,04	-16,98	770,98
ROE (as %)	-4 568,60	28 805,77	41,42	14,89	566,97	41,41	1 992,08
ROA (as %)	-126,67	93,82	6,80	5,68	8,23	-0,87	22,63
Tobin's Q	0,04	36,09	2,31	1,62	2,52	4,28	30,27
LEV	0,00	3,89	0,30	0,27	0,23	4,75	51,97
Market capitalisation (in billions)	0,06	2 994,37	51,12	19,99	132,10	0,01	179,24
Total assets (in billions)	0,02	3 743,57	66,56	17,04	224,96	8,63	89,95

Source: Author's calculations

To assess multicollinearity, correlation statistics between insider ownership and different performance measures was created in R and is presented in Table 2. Insider ownership seems to be significantly positively correlated the most with Tobin's Q and abnormal returns. Surprisingly, Q ratio is significantly positively correlated with all variables except for Treynor ratio, which is significantly negatively correlated with Q ratio. The positive relationship between different market performance measures is not surprising as all are based on stock returns. Additionally, the significantly positive relationship between different financial measures is expected as well. The problem of multicollinearity arises between assets and market capitalisation as both measure size and assets are also included in ROA and Q ratio. Moreover, the correlation between the two variables is very high with a coefficient of 0,72 and the p value is near 0 (see Appendixes 1 and 2), indicating a high significant correlation. Due to this reason, only total assets are not included in the models as separate control variable.

Table 2. Correlation statistics of variables

	IO	Q ratio	ROA	ROE	Abnormal	Sharpe	Treynor
IO	1,00						
Q ratio	0,06***	1,00					
ROA	0,01	0,36***	1,00				
ROE	0,01	0,04**	0,08***	1,00			
Abnormal	0,05***	0,29***	0,14***	0,01	1,00		
Sharpe	0,02	0,21***	0,12***	0,01	0,82***	1,00	
Treynor	-0,01	-0,05***	-0,01	0,00	0,04**	0,06***	1,00

Source: Author's calculations, full correlation matrix and corresponding p-values can be seen in the Appendixes 1 and 2

Notes: Asterixis *, ** and *** are used to denote significance at the 10%, 5% and 1% level respectively.

Furthermore, a variable indicating down market (DOWN) is equal to one for the market downturn periods and is otherwise zero. Different authors have proposed various ways to indicate a market downturn with no single answer on how to clearly fixate it. According to Mishkin & White (2002), to indicate a market crash, the main index must be down by at least 20 percent. According to another study, for specifying down market the criteria is to have significantly negative index return (Dickins & Houmes, 2009). In given study the value of down market is equal to one when the index return is significantly negative for a year. To test the significance of negative index returns one tailed t-test was performed at probability of 10% comparing the annual return to the mean return for the period, similarly to previous authors (Dickins & Houmes, 2009).

Analysed period in given study is 2010-2023 and the uniqueness of given study lies in assessing the most recent market downturn which was caused by the COVID-19 outbreak aftermath which started with a market crash in 2020 March when S&P 500 index experienced one of its largest single days falls as it fell 12% and by August the index had fallen 34% (see Figure 1). The initial plan was to analyse a longer period with multiple market crashes including the Dot-com and Global Financial Crisis. However, this sample period was chosen due to the data implications such as inability to access data for previous years. Furthermore, the most recent extensive market crash happened in 2022 when the index consequently ended the year 10,2% lower. Two additional years with negative returns can be seen from the Figure 1 which are consequently 2015 and 2018. Hence, the variable DOWN is equal to 1 in 2015, 2018 and 2022 and otherwise noted as 0.

Regardless of multiple extensive stock market crashes, the overall SPY index return has been clearly positive, demonstrating resilience and long-term growth calculated as logarithmic returns from year end closing prices. Despite the volatility, the total return for the whole period reached 176%, highlighting the strength of the market over time translating into average annual return of nearly 13% showcasing the potential for consistent growth even amid economic challenges and high volatility.

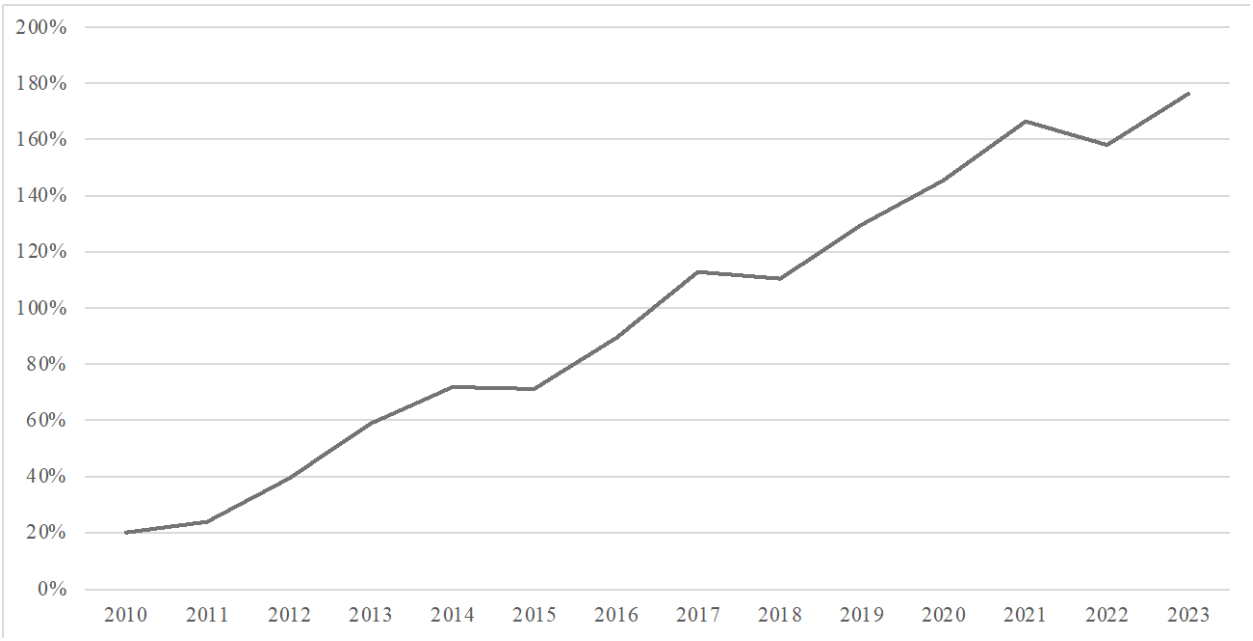

Figure 1. S&P 500 index (SPY) total logarithmic return between 2010-2023
Source: Author's calculations

Furthermore, the choice of performance measures was based on previous empirical literature and other authors results. As authors have reached different outcomes, given study aims to include as many different measures of performance as possible in order to reach insightful results. The S&P 500 index and its constituents, serving as the primary sample, offer a robust dataset spanning 13 years including three years with negative market returns, allowing for a comprehensive analysis of insider ownership dynamics.

2.2. Research methods

This research will be conducted using quantitative methods. For hypothesis testing dynamic panel data regression model will be applied. The model will include variables that measure the

performance from two perspectives, namely firm market performance measured as stock price performance and financial performance measured as ROE, ROA, and Tobin's Q. Firm market performance as risk adjusted returns are calculated with abnormal returns, Sharpe and Treynor ratio. For additional and more analytical insights into the relationship between performance and ownership, leverage and firm size will be used as control variables.

2.2.1. Risk-adjusted returns

For firm market performance three different types of risk adjusted returns from annual stock price changes are calculated with namely abnormal returns, Sharpe and Treynor ratio. Applying multiple approaches for risk adjusted returns calculations provides more in-depth results as all the named risk ratios consider risk differently. It is important to note that given risk-adjusted stock returns are based on historical returns and rely on specific benchmark used. For investment analysis on longer term projects the risk-free rate should be the long-term government bond rate (Damodaran, 1999). Hence, for the risk-free rate in calculations US 10-year treasury bill yield is used as the time period analysed is relatively long.

First of all, annual returns for each individual stock in the index and index itself were calculated from annual price changes using Formula 1.

$$r = ln\left(\frac{P_{t+1}}{P_t}\right) \quad (1)$$

where P_{t+1} is the current stock price and P_t is the previous period stock price (Hudson & Gregoriou 2015).

One of the simplest ways to assess whether stock earns above market return after adjusting for risk is calculating market adjusted returns such as abnormal returns which simply compares the individual stock return to benchmark index or market return and illustrates its excess returns or losses. However, due to the formula simplicity it is sensitive to market events and shocks and can oversimplify the measure of risk (Lyon, Barber & Tsai, 1999). Annual abnormal returns were calculated using Formula 2.

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad (2)$$

where $AR_{i,t}$ is the abnormal return in period t, $R_{i,t}$ is the actual return of stock in period t and $R_{m,t}$ is the market return in period t (Ross *et al.,* 2013).

A more analytical risk adjusted return is Sharpe ratio which was developed by Stanford University finance professor William F. Sharpe in 1966, it compares the return to total risk of investment. Moreover, the Sharpe ratio measures return per unit of risk, incorporating both systematic and unsystematic risk. However, Sharpe ratio assumes that returns are distributed normally, which is not always the case with financial markets. (Sharpe, 1998) Hence in case of extreme events or outliers, the ratio may not illustrate the risk correctly. Sharpe ratio was calculated using Formula 3.

$$S_i = \frac{R_i - R_f}{\sigma_i} \quad (3)$$

where S_i is the Sharpe Ratio for stock i, R_p is the return of p individual stock, R_f is the risk-free rate and σ_i is the standard deviation of expected return (Sharpe, 1998).

Treynor ratio was developed by Jack Treynor in 1965. While Sharpe ratio measures the expected return per unit of risk, Treynor ratio measures portfolio performance and hence accounts for systematic or market risk represented in the formula as beta. (Treynor, 1965, referenced in Pilotte & Sterbenz, 2006). Moreover, the ratio evaluates investment performance by comparing the expected excess return to the expected undiversifiable market risk of the stock. However, the shortcoming of given formula is that it does not account for unsystematic risk that can be diversified. Treynor ratio was calculated using Formula 4.

$$T_i = \frac{R_i - R_f}{\beta_i} \quad (4)$$

where T_i is the Treynor ratio for asset i, R_i is the return of stock, R_f is the risk-free rate and β_i is the beta of the stock (Treynor 1965 referenced in Hodges *et al.* 2003).

$$\beta_i = \frac{Cov(R_i, R_m)}{\sigma_m^2} \quad (5)$$

where β_i represents the beta of an individual stock i, σ_m^2 is the variance of market returns, R_i is the return on individual stock and R_m is the return of the market or benchmark index.

2.2.2. Financial performance measures

Based on previous research results, for firm financial performance measures also three variables will be calculated, namely return on assets (ROA), return on equity (ROE) and Tobin's Q. The return on assets is calculated according to Formula 5 and the return on equity is calculated according to Formulas 6 and 7.

$$\text{ROA} = \frac{\text{Income excluding extraordinary items}}{\text{Average total assets}} \quad (6)$$

$$\text{ROE} = \frac{\text{Income excluding extraordinary items}}{\text{Average total equity}} \quad (7)$$

The Tobin's Q if defined as the ratio of market value of firm to the replacement cost of its assets . (Tobin & Brainard, 1976). It is used in financial problems to explain various corporate phenomena including the relationship between managerial equity ownership and firm value. Tobin's Q logic assumes that if a firm is worth more than it would cost to replace it, excess returns are earned. Shortcoming of given ratio is that is not vey well known and used by managers as the quality and reliability of data for calculations is limited. Due to the fact that actual replacement cost is difficult to find, often book value is used instead as the market value and book value of liabilities are more or less equivalent as the market value does not consider firm's liabilities. The simplified version by Chung & Pruitt (1994) delivers close results to the Tobin's original statistic as it offers a 96.6% approximation to the original formulation. Authors Chung & Pruitt (1994) also initially included the liquidating value of firm's outstanding preferred stock in the formula. However, the liquidating value is relevant if the company is going bankrupt hence it is not necessary in given study and the book value approach should be sufficient. (Chung & Pruitt, 1994) Tobin's Q is calculated based on Formula 8.

$$\text{Q ratio} = \frac{\text{MVS+ Debt}}{\text{TA}} \quad (8)$$

Where MVS is the market value of all outstanding shares, i.e. the firm's Stock Price * Outstanding Shares; TA is firm's total assets; $Debt$ is defined as interest bearing liabilities (Chung & Pruitt, 1994, referenced in Wolfe & Sauaia, 2003).

Some of the previous authors studying firm performance have highlighted that leverage is an important variable and found that it has a positive effect on firm performance (Stiglitz, 1985; Modigliani & Miller, 1963). Hence, to analyse the relationship between the variables of interest, leverage will be assessed in given research as control variable. In order to measure leverage the debt to asset ratio will be used as was done in previous studies, measuring the degree to which company has used debt to finance its assets (Demsetz and Villalonga, 2001; Din *et al.*, 2021). Moreover, for the leverage calculations of firms Formula 5 was used.

$$\text{LEV} = \frac{\text{Total debt}}{\text{Total Assets}} \tag{8}$$

Listed formulas will be applied to calculate named ratios for performance and control variables, and they will be used in the dynamic panel data regression model which will be discussed next.

2.2.3. Econometric methods

Previous studies analysing the relationship between ownership and performance have applied panel data regression models to assess the dynamics between dependent and independent variables. GMM is used with dynamic panel data to address endogeneity and autocorrelation issues commonly present in these dynamic panel data models. It handles endogeneity using instrumental variables and autocorrelation by incorporating lagged variables as instruments. (Roodman, 2009) Authors Din *et al.* (2021) along with Demsetz and Villalonga (2001) have also stressed the importance of panel methods to solve the problem of potential endogeneity of insider ownership. Insider ownership is an endogenous variable due to the fact that insiders themselves often have the ability to acquire ownership stakes in the firm they work for and their decision to hold shares can be based on their private information, creating a situation where insider ownership is endogenous to firm performance (Himmelberg, Hubbard & Palia, 1999). Additionally, firm performance can affect insider ownership as insider selling is usually interpreted as a signal of decreasing performance in the future and when a firm is succeeding, insiders probably want to hold their shares or even buy more, this is known as reverse causality (Jensen & Meckling, 2019). Endogeneity of insider ownership also may exist as when firms are performing well, then managers' stock options can be realised and increase the ownership. Moreover, as ownership is an endogenous variable it is also important factor in given study. Furthermore, Generalised Method of Moments (GMM) estimator can be used to account for the endogeneity of insider ownership and correlated firm-specific effects (Blundell *et al.,* 1992).

Following the examples of Demsetz and Villalonga (2001), Mura (2007) and Din *et al.* (2021) given study will apply the GMM approach. More specifically, one-step system GMM model will be used with the robust option. Including robust option in GMM model is a standard practice to ensure the reliability and validity of regression results as it ensures that potential heteroscedasticity and model misspecification are accounted for. One-step GMM model with robust option can be advantageous due to its computational efficiency, robust standard errors, ability to handle endogeneity, simplicity, and reduced sensitivity to starting values. (Roodman, 2009)

To also include the down-market variable in the model, a specification similar to Dickins & Houmes (2009) example will be followed. The main difference in static panel data regression model and dynamic GMM model is including lagged values of dependent variables (PM_{it}) which are included in the model as independent variables to capture the dynamics of adjustment and to control for endogeneity problem (Udin *et al.,* 2017, as referenced in Din *et al.,* 2021). The GMM model without any dummy or incremental variables to mediate between negative and positive market returns can be seen in Formula 9 and the model with dummy and incremental variable for the down-market can be seen in Formula 10. The dynamic panel data regression analysis is conducted in Stata program using *xtabond2*.

$$PM_{it} = \alpha + \gamma PM_{i,t-1} + \beta_1 IO_{it} + \beta_2 CONTROLS_{it} + \eta_i + \varepsilon_{it} \quad (9)$$

$$PM_{it} = \alpha + \gamma PM_{i,t-1} + \beta_1 IO_{it} + \beta_2 DOWN_{it} + \beta_3 IO * DOWN_{it} + \beta_4 CONTROLS_{it} + \eta_i + \varepsilon_{it} \quad (10)$$

$$\varepsilon_{it} = \mu_i + e_{it}$$

$$E(\mu_{it}) = E(e_{it}) = E(\mu_i e_{it}) = 0$$

Where, PM_{it} is one of the six performance measures: ROA, ROE, Q, abnormal return, Sharpe ratio or Treynor ratio for firm *i* at a time *t*; $PM_{i,t-1}$ is the financial performance of firm *i* at time *t-1*; IO_{it} is one of two ownership measures: IO is a continuous variable equal to the insider ownership percentage of the stock; DOWN is an indicator variable equal to one for the years with significantly negative returns, which are 2015, 2018 and 2022 and zero otherwise; IO*$DOWN_{it}$ is an interaction variable designed to capture the incremental impact of insider ownership during a period of market decline (Dickins & Houmes, 2009); and CONTROLS are variables intended to control for the

effects of size and leverage that have been highlighted in prior research as being related to the measures of performance, including lnmcap and lnassets natural logarithms of market cap and total assets to account for firm size and LEV, total debt divided by total assets to account for leverage. The term η_i is unobserved time variant firm-effect and ε_{it} is the composite error term, μ_i is firm-specific effect, while e_{it} is error term (Din *et al.*, 2021).

The application of lag variables is based on previous empirical studies and helps to capture the dynamic nature of performance measures. This is makes sense for performance measures as financial ratios may not immediately respond to changes in factors like investment or efficiency and stock returns may not immediately reflect new information or market shocks and lag variables capture these delayed effects (Greene, 2002). Additionally, lagged variables smooth out short-term fluctuations in performance and short-term market volatility, making estimates more stable. Lagged variables also help to study how changes in independent variables affect performance over time, providing insights into the dynamic relationships between variables. It is also important to consider that investors' decisions are often based on past market trends. Lagged variables can capture how previous market conditions influence current investment strategies and market performance measures. The positive coefficients of lag variables from regression results would suggest that if the performance ratio for the previous period was high, then the next period performance is expected to increase. Meanwhile, negative coefficients of lag variables would suggest that if the return for the previous period was high, then a lower return for the next period can be expected, which could potentially be expected from stocks due to their volatility. The negative relationship also makes sense form the point of view that when stock prices have been falling significantly, value investors come into play and buy those undervalued stocks and when stock prices reach too high levels, then investors might start to sell when they think they are overpriced.

It is also important to consider the reliability and validity of models. Since we have time-series data, it is important to also assess the autocorrelation in the error terms. Stata dynamic panel data model command automatically returns Arellano-Bond Test results, which assesses the presence of first-order and second-order autocorrelation in the first-differenced residuals. The null hypothesis for is that there is no autocorrelation. To test whether the instruments used in the GMM estimation are valid and whether the model is correctly specified, Stata also gives Sargan Test of Overidentification Restrictions results where the null hypothesis is that the overidentifying restrictions are valid. Moreover, Stata returns the Hansen test which evaluates the validity of all

instruments. Hansen Test Excluding Group to assess the validity of instruments further by excluding a specific group of instruments. The Difference-in-Hansen tests are used to compare the validity of two nested IV models. Additionally, Stata also returns Wald chi2 test results, which test the joint significance of a group of coefficients in the model. The test compares the hypothesis that all coefficients in the specified group are zero against the alternative that at least one of them is not zero. (Roodman, 2009)

In general, a positive coefficient for IO would indicate that an increase in IO is associated with an increase in performance measure, all else being equal. This would suggest that firms with higher insider ownership concentration tend to showcase better performance. Conversely a negative coefficient would indicate that an increase in IO would lead to a decrease in performance measure. The lag variables of each performance measure can be interpreted as: for every one-unit increase in the lagged performance measure, we expect a change of units equal to coefficient in the current performance measure, holding other variables constant. The control variables show their impact on performance measure while holding IO constant.

In the second model, the total effect of insider ownership on performance measure is the sum of the direct effect of insider ownership and the interaction effect of product of insider ownership and down-market indicator if it is significant. The second equation allows to assess whether the effect of insider ownership on performance measure changes depending on the presence of variable DOWN. If the coefficient for IO*DOWN is significant, it indicates that the effect of IO on performance measure differs depending on whether DOWN is present or not. Negative IO*DOWN coefficient would indicate that the effect of IO on performance measure is weaker when DOWN is higher and vice versa with positive coefficient.

3. ANALYSIS AND DISCUSSION

3.1. Interpretation of results

To analyse the dynamics between insider ownership and performance, six performance measures are namely ROA, ROE, Q ratio accounting for financial performance and additionally abnormal returns, Sharpe ratio and Treynor ratio accounting for market performance are assessed through dynamic panel data analysis. For each performance measure two separate regression models are conducted, one for the total period to simply assess the relationship between insider ownership and various performance measures, and another model which also considers DOWN as dummy for negative market return period and incremental variable which is a product of IO and DOWN. One-year lagged explanatory variables are used as instruments in all models. The average beta for constituents turned out to be 1,29, implying that on average, stocks are theoretically 29% more volatile than the index itself.

3.1.1. Market performance

In order to analyse the dynamics between insider ownership and market performance measures, the first model can be seen in Table 3. Given model did not include any dummy or incremental variables to mediate between down and normal market. The coefficient of Sharpe lag variable is negative and statistically significant at the 1% level of significance, validating the dynamic nature of the estimated model. The negative coefficient of lag variable suggests that if the return for the previous period was high, then a lower return for the next period can be expected, illustrating the volatile nature of stocks. However, in given models abnormal returns and Treynor ratio coefficients of lag variables are not significant suggesting that dynamic nature may not be present in given variables. The stability of all three models is however supported by the fact that the lag coefficients of endogenous variables are less than one. Based on the first equation without any dummy and incremental variables, the insider ownership concentration does not seem to have any effect on any of the risk-adjusted returns as none of the results are significant. Additionally, regarding the control variables in given equation, all of the risk-adjusted returns seem to be unaffected by the firm's leverage and size as market capitalisation.

Table 3. Market performance regression results for the first equation

	$Abnormal_{it}$	$Sharpe_{it}$	$Treynor_{it}$
$Abnormal_{i,t-1}$	-0,12	-	-
$Sharpe_{i,t-1}$	-	-0,36***	-
$Treynor_{i,t-1}$	-	-	0,03
IO_{it}	0,00	0,01	0,20
$Leverage_{it}$	-0,16	-0,80	-0,22
$lnMcap_{it}$	0,01	0,08	0,10
Arellano-Bond test for AR(1)	0,00	0,00	0,37
Arellano-Bond test for AR(2)	0,01	0,00	0,45
Sargan test of overid. restrictions	0,00	0,00	1,00
Hansen test of overid. restrictions	0,00	0,00	0,00
Hansen test excluding group	0,00	0,00	0,00
Difference in Hansen test	0,21	0,36	0,61

Source: Author's calculations

Notes: Asterixis *, ** and *** are used to denote significance at the 10%, 5% and 1% level respectively.

To furthermore analyse the dynamics between insider ownership and market performance measures, the second equation regression results can be seen in Table 4, which included dummy and incremental variables to mediate between down and normal market. The lag variables of Abnormal returns and Treynor ratio are not statistically significant at 1% while Sharpe ratio is significantly negative, validating the dynamic nature of the estimated model. The stability of all three models is once more supported by the fact that the lag coefficients of endogenous variables are less than one.

As in the previous equation, there insider ownership does not have any significant effect on any of the three ratios. Moreover, regarding the control variables in given equation, the results seem to be similar to the previous equation meaning that abnormal returns and Treynor ratio are not affected by the firm's leverage or market capitalisation. However, market capitalisation seems to have significantly positive effect on Sharpe ratio. The negative coefficients for variable DOWN are statistically significant at 1% for all three risk adjusted measures, suggesting that when DOWN condition is present, the risk adjusted measure tends to be lower than when DOWN is not present.

This is reasonable as stock returns should move with the overall index return depending on their beta. As the coefficient for IO*DOWN is significant at 5% for Sharpe ratio and Treynor ratio, it indicates that the effect of IO on each ratio differs depending on whether DOWN is present or not. Positive IO*DOWN coefficient indicates that the effect of IO on performance measure is stronger when DOWN is higher. This means that the insider ownership impact on ratios is stronger during down market. Abnormal returns coefficient for IO*DOWN is also positive, indicating that the effect of IO is stronger for down markets. Meanwhile the insignificant coefficient for IO*DOWN for abnormal returns suggests that the effect of IO on ratios does not differ whether the market is down or not.

Table 4. Market performance regression results for the second equation

	$Abnormal_{it}$	$Sharpe_{it}$	$Treynor_{it}$
$Abnormal_{i,t-1}$	-0,09	-	-
$Sharpe_{i,t-1}$	-	-0,11**	-
$Treynor_{i,t-1}$	-	-	0,15
IO_{it}	-0,00	-0,01	-0,01
$Leverage_{it}$	0,09	0,03	0,31
$LNmcap_{it}$	0,00	0,10*	0,09
DOWN	-0,11***	-1,14***	-0,26***
IO*DOWN	0,00	0,01*	0,01**
Arellano-Bond test for AR(1)	0,00	0,00	0,26
Arellano-Bond test for AR(2)	0,00	0,00	0,51
Sargan test of overid. restrictions	0,00	0,00	1,00
Hansen test of overid. restrictions	0,00	0,00	0,00
Hansen test excluding group	0,00	0,00	0,00
Difference in Hansen test	0,14	0,36	0,56

Source: Author's calculations

Notes: Asterixis *, ** and *** are used to denote significance at the 10%, 5% and 1% level respectively.

The p-values to assess model specification and validity suggest the same results in both equations. Starting from abnormal returns, the Arellano-Bond Test showed that there is still evidence for both first-order and second-order autocorrelation as the p-value was below 1%. The Sargan Test returned a p-value lower than 1%, suggesting that there are concerns about the instruments used

in the model and potential issues with model specification. Noting that Sargan test is not robust, but it is not weakened by many instruments. The Hansen test of overidentifying restrictions and test excluding group both returned p-values below 1%, indicating instability or groupwise heteroskedasticity. The Difference-in-Hansen tests however implied that the instruments are valid, and the model is correctly specified with valid overidentifying restriction as the p-value is above a 1%.

Sharpe ratio results validity is the same as abnormal returns results as the Arellano-Bond Test showed that there is still evidence for both first-order and second-order autocorrelation. The Sargan Test suggests that the valid instruments may not be valid, and specification may not be correct. The Hansen test of overidentifying restrictions and Hansen test excluding group both returned p-values below 1%, indicating instability or groupwise heteroskedasticity. Meanwhile The Difference-in-Hansen tests however implied that the instruments are valid, and the model is correctly specified with valid overidentifying restriction.

Treynor ratio model seems to be slightly more reliable as there is no evidence for autocorrelation, The Sargan test returned p-value above 1% suggesting that model instruments are valid, and it is correctly specified. The Hansen test of overidentifying restrictions and Hansen test excluding group both returned p-values below 1%, suggesting that the overidentifying restrictions are likely invalid and that there are differences in the estimated parameters across groups, indicating instability or groupwise heteroskedasticity. Meanwhile at 5% significance, the Difference-in-Hansen tests implied that the instruments are valid, and the model is correctly specified with valid overidentifying restriction.

Additional problem with abnormal returns is that the first equation Wald test results of abnormal returns were not significant at 1%, suggesting that the variables represented by these coefficients do not have a significant impact on the dependent variable in the model. The Wald test was significant for both Sharpe and Treynor ratio in both equations and also significant for abnormal returns second equation.

3.1.2. Financial performance

To analyse the dynamics between insider ownership and financial performance measures, the first equation results can be seen in Table 5, without dummy or incremental variables to mediate between down and normal market. All of the lag variables are all positively and statistically

significant at the 10% level of significance, validating the dynamic nature of the estimated model. The positive coefficients of lag variables suggest that if the performance ratio for the previous period was high, then the next period performance is expected to increase. The stability of ROA and Q ratio models is supported by the fact that the lag coefficients of endogenous variables are less than one. None of the ratios returned significant results for insider ownership, indicating that insider ownership does not have any effect on the ratios. The natural logarithm of market capitalisation has significant positive effect on both ROA and Q ratio. Meaning that for every one unit increase in the natural logarithm of market capitalisation we can expect an increase equal to coefficient for certain measure, holding all other variables constant. Finally, looking at firm's leverage, it does not seem to have significant influence on any variables.

Table 5. Financial performance regression results for the first equation

	ROA_{it}	ROE_{it}	$Q\ ratio_{it}$
$ROA_{,t-1}$	0,30**	-	-
$ROE_{i,t-1}$	-	1,40*	-
$Q\ ratio_{i,t-1}$	-	-	0,60***
IO_{it}	0,09	-15,72	0,02
$Leverage_{it}$	-6,32	-29,29	0,54
$LNmcap_{it}$	1,86***	9,47	0,48***
Arellano-Bond test for AR(1)	0,00	0,22	0,00
Arellano-Bond test for AR(2)	0,02	0,42	0,35
Sargan test of overid. restrictions	0,01	0,00	0,00
Hansen test of overid. restrictions	0,03	0,60	0,00
Hansen test excluding group	0,04	0,06	0,00
Difference in Hansen test	0,24	0,34	0,11

Source: Author's calculations

Notes: Asterixis *, ** and *** are used to denote significance at the 10%, 5% and 1% level respectively.

To further analyse the dynamics between insider ownership and financial performance measures, the second equation results can be seen in Table 6, which included dummy and incremental variables for down market. Once again, the lag variables of all measures are positively and statistically significant at the 10% level of significance, validating the dynamic nature of the

estimated model. Similarly to first equation the stability of ROA and Q ratio models is supported by the fact that the lag coefficients of endogenous variables are less than one. Based on this second equation, insider ownership again does not have any effect on any of the ratios. Considering the control variables, the results are again similar as the market capitalisation has significantly positive effect on ROA and Q ratio. Suggesting that firm performance is significantly positively affected by the firm size. Just as in previous model, the firm's leverage does not have any significant effect on any of the ratios. The negative coefficient for variable DOWN is statistically significant at 1% for Tobin's Q, suggesting that when DOWN condition is present, the ratio tends to be lower than when DOWN is not present. However, as the coefficient for IO*DOWN is insignificant for all three measures, it indicates that the effect of insider ownership on performance does not depend on the fact whether market is in a down or not.

Table 6. Financial performance regression results for the second equation

	ROA_{it}	ROE_{it}	$Q\ ratio_{it}$
$ROA_{,t-1}$	0,28***	-	-
$ROE_{i,t-1}$	-	1,35*	-
$Q\ ratio_{i,t-1}$	-	-	0,70***
IO_{it}	0,10	-16,83	0,01
$Leverage_{it}$	-6,78	-38,89	1,14
$LNmcap_{it}$	1,93***	9,78	0,43***
DOWN	0,42	-30,14	-1,00***
IO*DOWN	-0,01	5,64	0,02
Arellano-Bond test for AR(1)	0,00	0,22	0,00
Arellano-Bond test for AR(2)	0,03	0,43	0,27
Sargan test of overid. restrictions	0,00	0,00	0,00
Hansen test of overid. restrictions	0,04	0,06	0,00
Hansen test excluding group	0,04	0,07	0,00
Difference in Hansen test	0,40	0,25	0,02

Source: Author's calculations

Notes: Asterixis *, ** and *** are used to denote significance at the 10%, 5% and 1% level respectively.

Both ROA models Arellano-Bond Test showed that there is evidence for first-order autocorrelation at 1%. The Sargan Test returned a p-value lower than 0,01 for both models meaning that there are

concerns about the instruments used in the GMM model and potential issues with model specification. The Hansen test of overidentifying restrictions and Hansen test excluding group both returned p-values above 1%, indicating that the that the overidentifying restrictions are valid and that there are no differences in the estimated parameters across groups, that indicate instability or groupwise heteroskedasticity. The Difference-in-Hansen tests also implied that the instruments are valid, and the model is correctly specified with valid overidentifying restriction as the p-value of the is above a 1%, meaning that the overidentifying restrictions are likely valid and the estimated coefficients are stable across groups, and there is no evidence of groupwise heteroskedasticity.

Neither of the ROE models suggests that there is any autocorrelation as p-values are insignificant at 1%. The Sargan Test returned a p-value lower than 0,01 for both models meaning that there are concerns about the instruments used and potential issues with model specification. The Hansen test of overidentifying restrictions and Hansen test excluding group both returned p-values above 1%, indicating that the that the overidentifying restrictions are valid and that there are no differences in the estimated parameters across groups, that indicate instability or groupwise heteroskedasticity. Moreover, the Difference-in-Hansen tests supported this as the p-value of the is above a 1%, meaning that the overidentifying restrictions are likely valid and the estimated coefficients are stable across groups, and there is no evidence of groupwise heteroskedasticity.

The Tobin's Q ratio model is slightly more problematic as there is evidence for first-order autocorrelation in both models. The Sargan Test implies for both models that there are concerns about the instruments used in the GMM model and potential issues with model specification. The Hansen test of overidentifying restrictions and Hansen test excluding group both returned p-values below 1%, indicating that the that the overidentifying restrictions are invalid and that there are differences in the estimated parameters across groups, indicating instability or groupwise heteroskedasticity. However, at 1% significance, the Difference-in-Hansen tests implied that the instruments are valid, and the model is correctly specified with valid overidentifying restriction.

The Wald test results were significant at 1% for all models, suggesting that the variables represented by these coefficients have a significant impact on the dependent variable in the model.

3.2. Findings and conclusions

Comparing the two models for all of the six different performance measures it is possible to assess the direct effect of insider ownership by comparing the coefficient of IO between the two models to see how the inclusion of DOWN and the interaction term IO*DOWN changes the direct effect of IO on performance measure. It is additionally possible to look at the interaction effect (IO*DOWN) as the second model allows to assess whether the effect of IO on performance measure changes depending on the level of DOWN, meaning that if the coefficient for IO*DOWN is significant, it indicates that the effect of IO on performance measure differs depending on whether DOWN is present or not. Moreover, it is possible to assess the overall effect of insider ownership in the second model.

Based on the dynamic panel data regression model approach to the two separate models for each of the six performance measures, it can be concluded that insider ownership does not affect firm performance. As none of the performance measures were significantly affected by the insider ownership in either equation, the direct effect does not seem to exist. The significantly negative binary variable coefficient for down market for all market performance ratios suggests that its presence significantly affects all of the market performance ratios. The incremental variable for Sharpe and Treynor ratio showed significantly positive results, meaning that there seems to be a difference for insider ownership dynamics depending on whether the market is in a downturn or not, more specifically the insider ownership impact on ratios is stronger during down market. Even though the binary variable for market downturn suggests that its presence significantly negatively affects the Tobin's Q, the incremental variable showed no significance, meaning that for Tobin's Q there does not seem to be difference for insider ownership dynamics whether the market is in a downturn or not. The significantly negative effect of down market binary variable on Sharpe, Treynor and Tobin's Q ratio makes sense as all of them consider the historical stock price in their calculations and during down market it can be expected that most stocks experience falling prices.

As it was previously discussed, Tobin's Q can be interpreted as both financial and market performance measure as it considers both, which is why we can consider it in the interpretation to some extent as both measures. It is also possible to look at the results from the perspective that Sharpe measures total risk while Treynor ratio measures the market risk. Based on this it can be concluded that the study found that regardless of the type of risk measured, the results of risk-adjusted ratios considering total and market risk are the equivalent. Considering that the thesis

found significant results for down market only for market performance measures, it is important to note here that stock prices are affected by market sentiment and investor behaviour while financial ratios are usually not impacted directly by those factors. Moreover, the exposure from investors during down market can lead to more significant relationship due to behavioural psychology such as impulsive or irrational selling in down market leading to even more negative stock returns.

The control variable accounting for size as natural logarithm of market capitalisation had significant effect on ROA, Tobin's Q and in the second equation for Sharpe ratio. Leverage did not have significant effect on any of the performance measures even though previous authors have found a positive relationship (Stiglitz, 1985; Modigliani & Miller, 1963). However, as discussed in empirical review, high debt also increases the risk of bankruptcy and may be priced in the market. This outcome can also be reasoned with argument by Myers (1977) who emphasized that leverage can limit firm's ability to raise new debt and hence the firm might not be able to take on some new profitable investment opportunities. Hence the insignificant result can be caused by the complex nature of leverage as a variable affecting performance.

Based on the model validity significance, the results should be reliable for all ratios except for abnormal returns, where the p-value for Wald test turned out to be insignificant. For some of the ratios such as abnormal returns, Sharpe ratio, ROE and Tobin's Q, the issue of either first or second order autocorrelation persisted regardless of using different methods to solve it. Meanwhile the Difference-in-Hansen tests however implied that the instruments are valid, and the model is correctly specified with no evidence for heteroskedasticity. The significance of lag variables also supports the dynamic nature of models for all ratios except for abnormal returns and Treynor ratio. Additionally, as the coefficient for lag variable is less than one for all ratios except for ROE, the models should be stable. Moreover, it is possible to accept the reliability of all models except for abnormal returns but regardless, all models could be improved further.

The aim of this research was to investigate the performance of stocks with different insider ownership concentrations during different market conditions. The research question to investigate the aim was: To what extent does the performance of stocks with higher insider ownership differ from the performance of stocks with lower insider ownership during different market conditions?

Furthermore, to answer the research question, the first two proposed hypotheses stated that there is a positive relationship between higher insider ownership and firm market and financial performance were not proved to be true for any of the six performance measures. These results are in line with authors Core, Guay and Rusticus (2006) and Mura (2007) who did not find any significant relationship between insider ownership and firm performance, suggesting that strong form market hypothesis may hold. The other two hypotheses differentiated between up and down market conditions claiming that the relationship between higher insider ownership and firm market and financial performance is diminished during market downturn. The thesis found that down market binary and incremental variables seemed to have significant effect on Sharpe and Treynor ratio, implying that there seems to be a difference for insider ownership dynamics depending on whether the market is in a down or not. Moreover, the insider ownership impact on firm market performance measured with Sharpe and Treynor ratio is stronger during down market. Tobin's Q also seemed to be affected by the presence of the down market condition, but the insignificant incremental variable indicated that the effect of IO on performance measure did not differ depending on whether DOWN is present or not. These results are contradicting the expectancy theory and study by Dickins and Houmes (2009), who found that the relationship between insider ownership and performance is diminished in down market while given thesis found that the effect is stronger in down market for Sharpe and Treynor ratio representing risk-adjusted market returns measuring total and market risk accordingly.

Given thesis contributes to the existing literature of studies about the relationship between insider ownership and firm performance known as the skin in the game theory. Uniquely, thesis considers also different market conditions, such as down market and analyses the relationship with different performance measures to assess both market and financial performance. Investors and managers can potentially consider this thesis for their investment decisions when trying to understand the importance of insider ownership and firm performance. Additionally, policymakers can take into account given results as well when adjusting policies or creating new ones. Based on this thesis investors, managers and policymakers could conclude that the weight of insider ownership is not as important as some of the previous literature suggests while the market performance could be positively influenced by insider ownership in down markets.

3.3. Implications for further research

One of the weaknesses of given study is the fact that it only focused on current S&P 500 constituents and investigated their performance for the past 13 years. Moreover, it is important to note that bigger market crashes such as Dot-com bubble and Global Financial Crisis are not included in the study. This sample period was chosen due to the data implications such as inability to access data for previous years. Additional problem with given study is the lack of data and its quality given that the data was downloaded from Eikon refinitiv and Bloomberg and there were missing values that could not have been imputed or filled due to logical errors.

For further research, it might be insightful to create a dummy variable equal to one for solely the year 2022 as during that year the index experienced the most extensive negative annual return. Based on this thesis, ownership seems to be slightly more complicated variable than a straightforward regression can analyse which is why it might be reasonable to create additional variables representing certain ownership concentration thresholds as did some of the previous authors as many of them found that the positive relationship is evident only for specific concentration levels. Considering that given study looked at annual data due to the fact that financial ratios are adjusted annually, monthly data could possibly provide more insights for market performance measured with risk-adjusted returns.

CONCLUSION

The aim of this research was to investigate the performance of stocks with different insider ownership concentrations during different market conditions. In order to investigate given matter, the research question for given thesis is as follows: To what extent does the performance of stocks with higher insider ownership differ from the performance of stocks with lower insider ownership during different market conditions?

Based on the dynamic panel data regression model approach with GMM, it can be concluded that insider ownership does not affect firm performance. Considering that none of the performance measures were significantly affected by the insider ownership in either equation, the direct effect does not seem to exist. The significantly negative binary variable coefficient for down market for all market performance ratios suggests that its presence significantly affects all the market performance ratios. The incremental variable for Sharpe and Treynor ratio showed significantly positive results, meaning that there seems to be a difference for insider ownership dynamics depending on whether the market is in a downturn or not, more specifically the insider ownership impact on market performance ratios is stronger during down market. Even though the binary variable for market downturn suggests that its presence significantly negatively affects the Tobin's Q, the incremental variable showed no significance, meaning that for Tobin's Q there does not seem to be difference for insider ownership dynamics whether the market is in a downturn or not. Considering that Sharpe measures total risk while Treynor ratio measures the market risk, it can be concluded that the study found that regardless of the type of risk measured, the results of risk-adjusted ratios considering total and market risk are the equivalent.

Furthermore, to answer the research question, the first two proposed hypotheses stated that there is a positive relationship between higher insider ownership and firm market and financial performance were not proved to be true for any of the six performance measures. These results are suggesting that strong form market hypothesis may hold. The other two hypotheses differentiated between up and down market conditions claiming that the relationship between higher insider ownership and firm market and financial performance is diminished during market downturn. The

thesis found that down market binary and incremental variables seemed to have significant effect on Sharpe and Treynor ratio, implying that there seems to be a difference for insider ownership dynamics depending on whether the market is in a downturn or not. Moreover, the insider ownership impact on market performance measured with Sharpe and Treynor ratio is stronger during down market. It is also important to note here, that stock prices representing market performance ratios are more exposed to investors behavioural decisions and market sentiment meaning that the individual stock returns can face falling prices in down market due to irrational or impulsive selling. Tobin's Q also seemed to be affected by the presence of the down market condition, but the insignificant incremental variable indicated that the effect of IO on performance measure did not differ depending on whether DOWN is present or not. These results are contradicting the expectancy theory and previous findings, which found the relationship between insider ownership and performance is diminished in down market while given thesis found that the effect is stronger in down market for Sharpe and Treynor ratio representing risk-adjusted market returns measuring total and market risk accordingly.

Based on the model validity significance, the results should be reliable for all ratios except for abnormal returns, where the p-value for Wald test turned out to be insignificant. For some of the ratios such as abnormal returns, Sharpe ratio, ROE and Tobin's Q, the issue of either first or second order autocorrelation persisted regardless of using different methods to solve it. Meanwhile The Difference-in-Hansen tests however implied that the instruments are valid, and the model is correctly specified with no evidence for heteroskedasticity. The significance of lag variables also supports the dynamic nature of models for all ratios except for abnormal returns and Treynor ratio. Additionally, as the coefficient for lag variable is less than one for all ratios except for ROE, the models should be stable. Moreover, it is possible to accept the reliability of all models except for abnormal returns but regardless, all models could be improved further.

One of the weaknesses of given study is the fact that it only focused on current S&P 500 constituents and investigated their performance for the past 13 years. Moreover, it is important to note that bigger market crashes such as Dot-com bubble and Global Financial Crisis are not included in the study. This sample period was chosen due to the data implications such as inability to access data for previous years. Additional problem with given study is the lack of data and its quality given that the data was downloaded from Eikon refinitiv and Bloomberg and there were missing values that could not have been imputed or filled due to logical errors.

For further research, it might be insightful to create a dummy variable equal to one for solely the year 2022 as during that year the index experienced the most extensive negative annual return. Based on this thesis, ownership seems to be slightly more complicated variable than a straightforward regression can analyse which is why it might be reasonable to create additional variables representing certain ownership concentration thresholds as did some of the previous authors as many of them found that the positive relationship is evident only for specific concentration levels. Considering that given study looked at annual data due to the fact that financial ratios are adjusted annually, monthly data could possibly provide more insights for market performance measured with risk-adjusted returns.

KOKKUVÕTE

SISERINGI OSALUS JA ETTEVÕTTE TULEMUSLIKKUS: "OMA NAHK MÄNGUS " MÕJU AVAMINE

Marian Jaarman

Antud lõputöö eesmärk oli uurida erineva siseringi osaluse kontsentratsiooniga ettevõtete tulemuslikkust erinevates turutingimustes. Uurimisküsimus selleks oli järgmine: Millisel määral erineb kõrge siseringi osalusega aktsiate tulemuslikkus madala siseringi osalusega aktsiate tootlusest erinevates turutingimustes?

Uurimisküsimusele vastamiseks püstitati neli hüpoteesi, mis uurivad ettevõtte turupõhist ja finantsilist tulemuslikkust. Teoreetilisele raamistikule tuginedes viitasid kaks esimest sellele, et siseringi osaluse ja ettevõtte tulemuslikkuse vahel on positiivne seos, ning kaks ülejäänut võtsid arvesse ka erinevaid turutingimusi, viidates, et positiivne seos on nõrgem langeva turu korral.

Uurimus viidi läbi, kasutades kvantitatiivseid meetodeid S&P 500 komponentide kohta perioodil 2010–2023. Hüpoteesi testimiseks rakendati dünaamilise paneeli andmete regressioonimudelit. Mudel sisaldas muutujaid, mis mõõdavad tootlust kahest vaatenurgast, nimelt ettevõtte turupõhine tulemuslikkus, mida mõõdeti riskiga korrigeeritud tootlusena, ja finantsiline tulemuslikkus, mida mõõdeti suhtarvudega ROE, ROA ja Tobini Q. Ettevõtte turu tulemuslikkus kui riskiga korrigeeritud tootlus arvutati turgu ületava tootluse, Sharpe'i ja Treynori suhtarvuga.

Regressioonitulemuste põhjal jõuti järeldusele, et siseringi osalus ei mõjuta ettevõtte tulemuslikkust. Samuti leiti, et turu binaarsed ja täiendavad muutujad mõjutasid oluliselt Sharpe'i ja Treynori suhet, mis tähendab, et siseringi omandi dünaamika näib olevat erinev sõltuvalt sellest, kas turg on languses või mitte. Täpsemalt on siseringi osaluse mõju Sharpe'i ja Treynori suhtarvudele ehk turupõhisele tulemuslikkusele tugevam turulanguse korral.

LIST OF REFERENCES

Blundell, R., Bond, S., Devereux, M., & Schiantarelli, F. (1992). Investment and Tobin's Q: Evidence from company panel data. *Journal of econometrics, 51*(1-2), 233-257.

Brown, S. J., Goetzmann, W., Ibbotson, R. G., & Ross, S. A. (1992). Survivorship bias in performance studies. *The Review of Financial Studies, 5*(4), 553-580.

Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *Journal of economic perspectives, 17*(1), 59-82.

CDC Museum COVID-19 Timeline. (n.d.). Centres for Disease Control and Prevention. Retrieved from https://www.cdc.gov/museum/timeline/covid19.html, 12 April 2024.

Chiang, C., & Jang, S. (2008). An expectancy theory model for hotel employee motivation. *Hospitality Management, 27*, 313-322.

Chen, H., Hexter, J. L., & Hu, M. Y. (1993). Management ownership and corporate value. *Managerial and decision economics, 14*(4), 335-346.

Chung, K. H., & Pruitt, S. W. (1994). A simple approximation of Tobin's q. *Financial management*, 70-74.

Core, J. E., Guay, W. R., & Rusticus, T. O. (2006). Does weak governance cause weak stock returns? An examination of firm operating performance and investors' expectations. *The Journal of Finance, 61*(2), 655-687.

Damodaran, A. (1999). Estimating risk free rates. *WP, Stern School of Business, New York*, 20.

Demsetz, H., & Villalonga, B. (2001). Ownership structure and corporate performance. *Journal of corporate finance*, *7*(3), 209-233.

Dickins, D., & Houmes, R. (2009). Revisiting the relationship between insider ownership and performance. *The Journal of Business and Economic Studies, 15*(2), 32.

Din, S. U., Khan, M. A., Khan, M. J., & Khan, M. Y. (2021). Ownership structure and corporate financial performance in an emerging market: a dynamic panel data analysis. *International Journal of Emerging Markets*, *17*(8), 1973-1997.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance, 25*(2), 383-417.

Fama, E. F., & Jensen, M. C. (1983). Separation of ownership and control. *The journal of law and Economics, 26*(2), 301-325.

Fama, E. F. (1998). Market efficiency, long-term returns, and behavioral finance. *Journal of financial economics, 49*(3), 283-306

Greene, W. H. (2002). Econometric analysis 5th edition. Pearson Education India.

Griffith, J. M. (1999). CEO ownership and firm value. *Managerial and decision economics, 20*(1), 1-8.

Himmelberg, C. P., Hubbard, R. G., & Palia, D. (1999). Understanding the determinants of managerial ownership and the link between ownership and performance. *Journal of financial economics, 53*(3), 353-384.

Hodges, C. W., Taylor, W. R., & Yoder, J. A. (2003). Beta, the Treynor ratio, and long-run investment horizons. *Applied Financial Economics*, *13*(7), 503-508.

Hudson, R. S., & Gregoriou, A. (2015). Calculating and comparing security returns is harder than you think: A comparison between logarithmic and simple returns. *International Review of Financial Analysis, 38,* 151-162.

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review, 76*(2), 323-329.

Jensen, M. C., & Meckling, W. H. (2019). Theory of the firm: Managerial behavior, agency costs and ownership structure. *In Corporate governance* (pp. 77-132). Gower.

Kaserer, C., & Moldenhauer, B. (2008). Insider ownership and corporate performance: evidence from Germany. *Review of Managerial Science, 2*, 1-35.

Kim, W. S., Lee, J. W., & Francis, J. C. (1988). Investment performance of common stocks in relation to insider ownership. *Financial Review, 23*(1), 53-64.

Kyereboah-Coleman, A. (2008). Corporate governance and firm performance in Africa: A dynamic panel data analysis. *Studies in Economics and econometrics, 32*(2), 1-24.

Lyon, J. D., Barber, B. M., & Tsai, C. L. (1999). Improved methods for tests of long-run abnormal stock returns. *The Journal of Finance, 54*(1), 165-201.

Market Yield on U.S. Treasury Securities at 10-Year Constant Maturity. (n.d.). FRED, Federal Reserve Bank of St. Louis. Retrieved from https://fred.stlouisfed.org/series/DGS10, 2 February 2024.

McConnell, J. J., & Servaes, H. (1990). Additional evidence on equity ownership and corporate value. Journal of Financial economics, 27(2), 595-612.

Mishkin, F. S., & White, E. N. (2002). US stock market crashes and their aftermath: implications for monetary policy.

Modigliani, F., & Miller, M. H. (1963). Corporate income taxes and the cost of capital: a correction. *The American economic review*, 433-443.

Morck, R., Shleifer, A., & Vishney, R. (1988). Management ownership and market evaluation: An empirical analysis. *Journal of Financial Economics, 20*, 293-315.

Mura, R. (2007). Firm performance: Do non-executive directors have minds of their own? Evidence from UK panel data. *Financial Management, 36*(3), 81-112.

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of financial economics, 5*(2), 147-175.

Oswald, S. L., & Jahera Jr, J. S. (1991). The influence of ownership on performance: An empirical study. *Strategic Management Journal, 12*(4), 321-326.

Panda, B., & Leepsa, N. M. (2017). Agency theory: Review of theory and evidence on problems and perspectives. *Indian journal of corporate governance, 10*(1), 74-95.

Preston, H., & Soe, A. M. (2021). What happened to the index effect? S&P Dow Jones Indices. Retrieved from https://www.spglobal.com/spdji/en/documents/research/research-what-happened-to-the-index-effect.pdf, 10 April 2024.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The stata journal, 9*(1), 86-136.

Ross, Westerfield, and Jordan (2013). *Fundamentals of Corporate Finance.* 10th ed, McGraw-Hill.

Ross, S. A. (1973). The economic theory of agency: The principal's problem. *The American economic review, 63*(2), 134-139.

Sharpe, W. F. (1998). The sharpe ratio. *Streetwise–the Best of the Journal of Portfolio Management*, 169-185.

Shapiro, S. P. (2005). Agency theory. *Annu. Rev. Sociol., 31,* 263-284.

Stiglitz, J. E. (1985). Credit markets and the control of capital. *Journal of Money, credit and Banking, 17*(2), 133-152.

Taleb, N. N. (2018). Skin in the game: *Hidden asymmetries in daily life.* Random House. Chicago.

Tobin, J., & Brainard, W. C. (1976). Asset markets and the cost of capital.

Vroom, V. H. (1964). *Work and motivation.* New York: Wiley.

Vroom, V. H., & Deci, E. L. (1989). *Management and Motivation.* Penguin.

Wolfe, J., & Sauaia, A. C. A. (2003). The Tobin q as a company performance indicator. In *Developments in business simulation and experiential learning: proceedings of the annual ABSEL conference* (Vol. 30).

APPENDICES

Appendix 1. Correlation matrix

	DOWN	IO	q_ratio	roa	roe	abnormal	sharpe	treynor	lev	lnassets	lnmcap
DOWN	1,00	-0,02	-0,02	0,03	0,01	-0,06	-0,39	-0,02	0,01	0,05	0,05
IO	-0,02	1,00	0,06	0,01	0,01	0,05	0,02	-0,01	-0,03	-0,15	-0,12
q_ratio	-0,02	0,06	1,00	0,36	0,04	0,29	0,21	-0,05	0,16	-0,44	0,13
roa	0,03	0,01	0,36	1,00	0,08	0,14	0,12	-0,01	0,04	-0,21	0,18
roe	0,01	0,01	0,04	0,08	1,00	0,01	0,01	0,00	0,05	0,00	0,03
abnormal	-0,06	0,05	0,29	0,14	0,01	1,00	0,82	0,04	0,01	-0,17	0,04
sharpe	-0,39	0,02	0,21	0,12	0,01	0,82	1,00	0,06	0,01	-0,14	0,05
treynor	-0,02	-0,01	-0,05	-0,01	0,00	0,04	0,06	1,00	0,00	0,03	0,02
lev	0,01	-0,03	0,16	0,04	0,05	0,01	0,01	0,00	1,00	-0,13	-0,06
lnassets	0,05	-0,15	-0,44	-0,21	0,00	-0,17	-0,14	0,03	-0,13	1,00	0,72
lnmcap	0,05	-0,12	0,13	0,18	0,03	0,04	0,05	0,02	-0,06	0,72	1,00

Source: Author’s calculations

Appendix 2. P-values of correlation matrix

	DOWN	IO	q_ratio	roa	roe	abnormal	sharpe	treynor	lev	lnassets	lnmcap
DOWN	-	0,23	0,07	0,01	0,37	0,00	0,00	0,16	0,28	0,00	0,00
IO	0,23	-	0,00	0,39	0,47	0,00	0,12	0,60	0,00	0,00	0,00
q_ratio	0,07	0,00	-	0,00	0,00	0,00	0,00	0,00	0,08	0,00	0,00
roa	0,01	0,39	0,00	-	0,00	0,00	0,00	0,57	0,00	0,00	0,00
roe	0,37	0,47	0,00	0,00	-	0,33	0,34	0,91	0,00	0,64	0,03
abnormal	0,00	0,00	0,00	0,00	0,33	-	0,00	0,00	0,21	0,00	0,00
sharpe	0,00	0,12	0,00	0,00	0,34	0,00	-	0,00	0,13	0,00	0,00
treynor	0,16	0,60	0,00	0,57	0,91	0,00	0,00	-	0,67	0,03	0,13
lev	0,28	0,00	0,08	0,00	0,00	0,21	0,13	0,67	-	0,00	0,00
lnassets	0,00	0,00	0,00	0,00	0,64	0,00	0,00	0,03	0,00	-	0,00
lnmcap	0,00	0,00	0,00	0,00	0,03	0,00	0,00	0,13	0,00	0,00	-

Source: Author’s calculations

Appendix 3. Non-exclusive licence

A non-exclusive licence for reproduction and publication of a graduation thesis[1]

I Marian Jaarman

1. Grant Tallinn University of Technology free licence (non-exclusive licence) for my thesis Insider ownerhsip and firm performance: unveiling the impact of „skin in the game“,

supervised by Kalle Ahi,

1.1 to be reproduced for the purposes of preservation and electronic publication of the graduation thesis, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright;

1.2 to be published via the web of Tallinn University of Technology, incl. to be entered in the digital collection of the library of Tallinn University of Technology until expiry of the term of copyright.

2. I am aware that the author also retains the rights specified in clause 1 of the non-exclusive licence.

3. I confirm that granting the non-exclusive licence does not infringe other persons' intellectual property rights, the rights arising from the Personal Data Protection Act or rights arising from other legislation.

06.05.2024

[1] *The non-exclusive licence is not valid during the validity of access restriction indicated in the student's application for restriction on access to the graduation thesis that has been signed by the school's dean, except in case of the university's right to reproduce the thesis for preservation purposes only. If a graduation thesis is based on the joint creative activity of two or more persons and the co-author(s) has/have not granted, by the set deadline, the student defending his/her graduation thesis consent to reproduce and publish the graduation thesis in compliance with clauses 1.1 and 1.2 of the non-exclusive licence, the non-exclusive license shall not be valid for the period*