A Comparison of Management Performance Measures

Master’s thesis within Business Administration

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Jönköping May 2013
**Abstract**

**Purpose:** The purpose is to choose from previous research relevant key ratios and performance measures which lend themselves as a basis for management performance evaluation. After selection, we will further analyze the statistical relationships between the measures and their influence on stock price, using a shareholder perspective. In addition, examine weather it is beneficial to combine market and accounting based measures in this regard.

**Background:** The separation of ownership and management which follows naturally by the adoption of joint-stock company corporate structure creates a problem of aligning management’s self interest with that of the shareholders. The gap is often bridged using compensation packages, which needs to be tied to some form of accounting related performance measure that needs to provide some form of basic relation with shareholder value.

**Frame of Reference:** Works by Jensen and Meckling (1976) regarding agency theory and additional theories regarding stakeholder theory, motivation and incentive theory are used to provide a solid background. In addition works by scholars such as Arabsalehi and Mahmoodi (2011) and Bacidore, Boquist, Milbourn and Thakor (1997) constitute the main framework which guides this thesis. The performance measures included were return on equity (ROE), return on assets (ROA), return on capital employed (ROCE), return on sales (ROS), economic value added (EVA) and shareholder value added (SVA).

**Method:** In order to address the purpose, a deductive research approach is used. Secondary data is collected and analysed using several statistical tests such as, panel data tests, correlation tests and coefficient of determination. Linear as well as non-parametric correlation tests were conducted. The regressions were conducted single and pairwise with and without control variables. The most suitable panel data model were selected out of three possible: fixed effects model, random effects model and pooled OLS model. The panel data model were selected using Doughtery’s (2007) panel data selection model as a basis.

**Conclusion:** EVA, ROCE and ROA showed evidence of being more appropriate measures based on prediction- and explanatory power. SVA, although correlating with shareholder wealth at a statistically significant level, were not equally convincing as EVA, ROCE and ROA. Neither ROE or ROS showed evidence of having statistically significant relationships with changes in shareholder wealth, regardless of statistical model. Pairwise combination tests with one accounting based and one market based measure did not increase the explanatory power in shareholder value creation compared to using only a single performance measure.
Abbreviations
CEO - chief executive officer
EBITDA - profit/earnings before interest taxes, depreciation and amortization
EVA - economic value added
SVA - shareholder value added
ROE - return on equity
ROCE - return on capital employed
ROS - return on sales
ROA - return on assets
REVA - refined economic value added
WACC - weighted average cost of capital

Definitions:
We have decided to use the same categorization as Arabsalehi and Mahmoodi (2011), hence we have categorized EVA and SVA as market based measures (also commonly called value based) and ROE, ROCE, ROA and ROS as accounting based (Arabsalehi & Mahmoodi, 2011, p. 120).
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Acknowledgement

We want to acknowledge those who helped make this thesis possible.

Firstly, we wish to thank our tutor Urban Österlund for taking the time and putting in the time to guide us. We would also like to thank Kristofer Månsson for his short but valuable advice regarding issues within statistics. Their recurring feedback and suggestions have greatly aided us in the writing this thesis.

In addition we want to thank Mattias Granat whose expertise in thesis writing has been absolutely crucial which without this task would have been insurmountable. Gratitude is also deserved by our fellow classmates who have provided critical feedback and comments throughout the thesis process.

In conclusion we want to thank our families and friends for their support during this undertaking.

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I Introduction

This chapter serves as an introduction to the thesis, beginning with a short introduction of the topic continued by a background introducing the reader to the nature of the problem. The problem discussion crystallizes the nature of the problem. Finally, the chapter is concluded by detailing the purpose of this paper, the problematical questions that are to be answered, delimitations and target group.

The use of remuneration programs for CEO’s and top management have had its fair share of debate in the last decades. The debate went from being a smouldering fire to a roaring inferno as the financial crisis took hold in 2007 which ultimately led to Occupy Wall Street (Occupy Wall Street, 2013). Many stakeholders were affected by the crisis, not least the shareholders. Shareholders lost value in their stocks, yet management kept their costly compensation packages.

An example of this that is closer to home is David Brennan, CEO of Astra Zeneca. Between January 1st 2006 and June 1st 2012 Brennan received compensation totalling 550 million SEK according to the company’s compensation report. During the same time, the firm’s stock dropped 20,6 percent while the Stockholm stock market as a whole rose 4,3 percent (Neurath, 2013).

At first glance, it might be puzzling as to why shareholders choose to reward management in these circumstances. However, the bigger question in the grand scope of things is; what is the ideal performance measurement for shareholders in the context of compensation?

1.1 Background

In the historical economic development, the stock company plays an important role. It provided many benefits for shareholders which had ripple effects in the economy. Some of the advantages are: Access to large amounts of capital, by issuing new shares. Limited liability of the shareholders, one can only lose the money one put in by acquiring shares. Transferability of said shares, through buying and selling on a stock exchange. However the corporate form is not without drawbacks arising from the separation of ownership and management.

Adam Smith pointed out the problem of separation of ownership and management, it might be one of the most famous ones, albeit not the first one to put the phenomenon of potential conflict of interest into words (cited in Jensen & Meckling, 1976, p. 305):

“The directors of such [joint-stock] companies, however, being the managers rather of other people’s money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own.”

Adam Smith (1776)

Because the managers - or agents - are not required to hold a stake in the firm they cannot be expected to exhibit the same amount of diligence as the principal. One way of exposing the agent to risk is by tying the managerial compensation to the performance of the corporation (Berk & DeMarzo, 2011). The basis for this thesis as previously stated is the separation of ownership and management, the focus is then how to measure performance of management from the perspective of shareholders, in the context of compensation.
Overall, shareholders strive to earn as much return as possible, this is the overarching goal and is maybe the one defining feature that comes to mind when one thinks about capitalism. This was put into words by Milton Friedman in a newspaper article from 1970 in the New York Times, he writes:

“In a free-enterprise, private-property system, a corporate executive is an employee of the owners of the business. He has direct responsibility to his employers. That responsibility is to conduct the business in accordance with their desires, which generally will be to make as much money as possible while conforming to the basic rules of the society, both those embodied in law and those embodied in ethical custom.” Friedman, 1970, p. 32.

On the assumption that shareholders aspire for ever greater profits, they can provide management with more incentives by allowing management to partake in reaping the rewards. This is usually done by providing compensation for outstanding performance. In other words, the more money management earns for its shareholders, the more compensation they become eligible for. The benefits are twofold, expose management to more risk as to make them pay more heed. But also make their compensation vary with the company’s performance to provide incentives for ever greater return (Eisenhardt, 1989).

There are common ways to measure shareholder wealth, usually simply by looking at stock return. But measuring management performance is far more difficult. The hard part is to measure the value created by management and its impact on stock price. Investors’ lack of control over their own capital has given rise to the use of several different valuation procedures and performance measures. Central to value in financial terms, is the ability to generate positive future cash flows. These cash flows may have an impact on share price, but they actually only appear as numbers in companies’ accounting. Although changes in accounting do not always affect the share price in a logical way, the primary source of information for investors and analysts is the financial statement (Damodaran, 2012).

In order to illustrate, figure 1-1, depicts what interest shareholders. The cost of capital is usually included in market based evaluations, however the value is represented by share value and expected future cash flows. According to previous research performance is usually weighed against share value (Berk & DeMarzo, 2011).
1.2 Problem Discussion

Some of the earlier and more well-known research regarding performance was done by Ross (1973), Stiglitz (1975), Mirrlees (1976), Holmström (1979), Diamond and Verrechia (1982) and Murphy (1984). But since all theories are tied to different assumptions (about managers, state of nature, capital markets, etc.) they all have different empirical consequences. The common factor for each model is, however, that actual and observable productivity must be measurable and put in relation to changes in shareholder value. The most appropriate measure of shareholder value is stock price. If one wishes to reward someone for their performance, the performance itself needs to be assessed and measured as well as the outcome of said performance. In order to clarify, it is the relationship between the performance metric and changes in stock price that needs to be studied.

Cote (2009) opined that any compensation based on performance cannot be based upon changes in stock price, but rather tied to a company’s actual accounting result. Stock prices are based on investors’ expectations and even if managers were able to constantly perform better than those, the market would adjust to this. This means, that the output of said performance needs to be made visible and measurable for the shareholders, in the stock’s price. However, the actual measurement of management’s performance, cannot be based on the stock price, it needs to be measured on the company’s accounting and income statements.

There are two kinds of financial performance measures that are commonly used when measuring the performance of firms’. There are market based measures and accounting based measures. The defining feature of a market based measure is that it relies on the market to provide part of the measure, for example economic value added (EVA). This measure takes into account net operating profit after taxes and book value of net capital from accounting, while the weighted average cost of capital incorporates market based variables. This and other measurements will be explained in more detail later on. Accounting based measures rely exclusively on accounting, such as return-on-equity (ROE). Net income divided by equity constitutes ROE (Merchant & Van der Stede, 2007).

As was stated in the work by Bacidore, Boquist, Milbourn and Thakor (1997) ‘Any financial performance measure used in managerial compensation, on the one hand, must be correlated highly with changes in shareholder wealth and, on the other, should not be subject to all of the randomness and “noise” inherent in a firm’s stock price.’ (Bacidore et al., 1997, p. 11). In other words, according to previous research conducted by scholars such as Bacidore et al. (1997) the measurement chosen to measure management performance needs to correlate highly with the share’s stock price, as this is the only way to objectively measure shareholder value.

There is a large number of competing financial performance measures that are available for use. A survey conducted by the Institute of Management Accounting in 1996 found that a low amount of top management respondents, 15%, felt that measurement systems supported top management’s objectives well. 43% felt they were less than adequate or outright poor and even as many as 60% of the respondents answered that they were doing major overhauls to their current measurement systems (Venanzi, 2012).

Inadequacies, real or perceived, have led to an evolution in measures. Generally speaking traditional accounting based-measures have been foregone in favour of several innovations
that take into account economic value. Studies have also investigated and concluded that
good measurement is essential if there is to be good management, because measurement
managed organizations have in studies been shown to perform better than non-
measurement-managed firms. Considerable debate, especially among consulting firms, has
followed as to which measurement captures economic value best, has the fewest flaws in
evaluation and has the best predictive ability (Venanzi, 2012).

In the light of agency-theory, motivation theory and incentive systems, it is important to
find accounting related measurements that are adept at predicting changes in shareholder
value that then can form the foundation for compensation packages. Figure 1-2 below
shows this relation between shareholders and management.

![Figure 1-2. Relationship Model (Authors' figure)](figure)

Shareholders need to have the possibility to measure the performance of the firm or man-
agement and this performance needs to have an impact on the share value. Naturally, stock
prices are full of uncertainty and this relationship will probably be weak. Even so, some
measure of performance based on accounting (Cote, 2009) needs to constitute the basis for
usage as a foundation of compensation programs. This thesis will not delve deeper into the
issue of the construction or design of compensation packages, instead, it will focus on
evaluating proper metrics that can be used as performance measures for shareholders on
which compensation potentially could be based on.
1.3 Purpose

The purpose is to choose from previous research relevant key ratios and performance measures which lend themselves as a basis for management performance evaluation. After selection, we will further analyze the statistical relationships between the measures and their influence on stock price, using a shareholder perspective.

The research questions are:

- Does any of the measurements possess more predictive power when it comes to explaining stock price movements?
- Does combining market based and accounting based measures excel at explaining/predicting changes shareholder value in comparison to using only one measure?

1.4 Methodology

Saunders, Lewis and Thornhill (2007) debate which method is more suited for a given type of study. Generally qualitative studies tend to be more interpretive in nature while quantitative studies are more positivistic. For this thesis, we intend to conduct data analysis using secondary data, hence the positivistic assumption is more appropriate. It adopts the philosophical stance of the natural scientist. This implies that one prefers to work with some form of observable reality and can produce an end product through research can be law-like generalizations.

This usually means that one adopts a research philosophy that guides the researcher in collecting credible data and that these data will generate, in accordance with existing theories, some form of testable hypothesis. By doing so, it is the hope of the researcher to be able to put the theory to a test of some sort. The theory can then be confirmed or refuted, either in whole or part. The outcome of the hypothesis testing ought to be used to extend the development of the theory in order to be tested again, by further research (Saunders et al. 2003).

In the positivist approach, is crucial that the research undertaken, to the extent that it is possible, in a value free fashion. The approach lends itself to quantitative studies, where cold facts (usually data, but can also be any observable phenomena) is examined and tested, but even then it is not possible to totally rule out any bias of the researcher. After all, the researcher has to choose where to select and collect data, maybe even perform a shallow examination of the data before proceeding with the collecting and so, it is never possible to be completely value free. The complete neutrality of the researcher might be impossible, but the decided positivist does his/her best to exclude one's own values and let the data and tests speak for themselves (Saunders et al. 2012)

The purpose of this thesis is to investigate if there exists a relationship between our objective facts and the results of our statistical analysis of the data. The intent is to find the aforementioned relationship as suggested by some prior research, although the research is sometimes ambiguous regarding this relationship. We believe our research philosophy accurately reflects the principle of positivism, as described by Saunders et al. (2003) as we put
great emphasis on objectivity through statistical methods in order to avoid biases as a result of pre-perceptions.

1.5 Research approach

A research approach entails how the collection of data is to be done and how it will be interpreted. The point that forms the basis is that the same investigation should be able to be undertaken at a later time and essentially reach the same result. In addition, another point is that it should be able to be critically scrutinized by the reader.

Literature search, in order to find relevant literature on the subject, the Jönköping International Business School’s (JIBS) library was used. We searched for scientific articles and books using key search terms such as: “remuneration, program, performance, evaluation, measurement, principal, agent, incentive”. In the case of finding the companies’ financial statements the database Retriever Research was used, the database is also used by JIBS university library.

**Exploratory** studies is a way of finding out what is happening, seek new insights, to examine a phenomena in order to ask the appropriate questions. It is mostly useful when one wish to clarify the understanding of a problem, if the precise nature of the problem is not currently well understood. Exploratory research is typically conducted in three ways (Saunders et al. 2005):

- a search of or examination of literature
- interviewing experts within the subject
- conducting focus group interviews

**Descriptive** studies aim to accurately portray events, situations, persons or literature. Descriptive studies are usually a forerunner to exploratory or explanatory studies. This is the case because it is often an implicit requirement to have a clear picture of the phenomena one wishes to investigate, it is usually a means to an end rather than an end in itself. This means that if the research makes use of descriptive approaches then it typically is a precursor to an explanation, such studies are known as descripto-explanatory studies (Saunders et al. 2005).

**Explanatory** studies are studies that attempts to explain something, such as establish relationships between variables. It usually takes the form of quantitative studies and makes use of statistics and/or hypothesis testing. A concrete example of this could be a cursory analysis of quantitative data on manufacturing scrap rates shows a relationship between scrap rates and the age of the machine being operated. In such a case one could go ahead and make use of statistical data and subject it to statistical tests such as correlation (Saunders et al. 2005).

In order to satisfy the purpose of this thesis and to best aid in answering the research questions we chose to use a combination of the descriptive and explanatory approach, the descripto-explanatory approach. The exploratory approach has not been necessary since the problem itself has an adequate description and some research has already been done. Using past research we have described previous findings by different scholars with different angles of approach. In addition we chose the explanatory approach as we wish to subject our data to statistical tests in order to answer our research questions.
Bryman and Bell (2007) said that deductive theory is the idea of a natural relationship between theory and research. Hypotheses are deduced based on theories about the field of studies, which must then be subjected to empirical examination. Using a deductive approach allows us to analyse data using existing theories and testing hypothesis using observations.

Deduction has the power to clarify relationships between variables, but to ensure scientific accuracy the researcher is required to be independent of what is observed (Saunders et al., 2012). The risk of unconsciously steering the research in a biased way is reduced since using secondary data leaves no opportunities for biased thoughts to affect the gathering process of the data. Eriksson and Kovalainen (2008) believed that through experimental and quantitative methods, the main idea behind the deductive research approach is to develop statistical generalizations.
2 Frame of References

This section entails the theoretical background that forms the basis for the thesis. It starts with general theories that constitute the backdrop before moving on to the frame of reference. The latter also includes some general financial theories that are used in certain market based measures. It continues with past research and past methods used. The chapter ends with an overview of relevant performance measures and how they are calculated.

2.1 Background Theories

As was stated in the first chapter, in this thesis we will use the shareholder perspective. We will also use the theoretical background to show where the theory is anchored and have developed from. In addition to providing a more thorough account, the theoretical background will also deal with alternative viewpoints and conflicting theories for the sake of avoiding bias.

2.1.1 Agency Theory

In corporate governance, a very crucial theory is the one that was developed by Jensen and Meckling (1976) concerning the principal (shareholder) and agent (management). The particular phenomenon that the theory focuses on, is the view that management are driven primarily by self-interest. This means that it cannot be assumed that management will always act to maximize shareholder value, which is the purpose of management according to famous scholars such as Milton Friedman (1970). The maximization of profits and return on investment is paramount in the view of the shareholder and is the precise job that management was hired to do. This phenomenon of differing interest and the resulting cost is the focus of Jensen and Meckling: ‘agency costs will be generated by the divergence, between his [CEO] interest and those of outside shareholders’ (Jensen & Meckling, 1976, p. 313).

The agency costs can take many forms, be it in the shape of additional monitoring costs, competition in executive labour markets, incentive systems and so on. Agency costs are the costs that arise when the principal attempts to align the interest of the agent with that of themselves. The two underlying assumptions of agency theory is the aforementioned self-interest. Second, the individual is rational and competent enough to see the connection between the individuals’ behaviour and how these actions affect their own fortune. (Jensen & Murphy, 1990). The logical implication of these two assumptions is that if the interest of the agent does not coincide with that of the shareholder, the shareholder cannot expect that the agent will choose the optimal actions as seen from the point of view of the shareholder. The conflict of interest can be solved, or at least alleviated, by the construction of incentive systems which will ensure proper actions and provides a monitoring tool (Kulik, 2005).

Incentive systems can take on many forms, but the purpose is often the same. The purpose is to tie rewards to performance and the constructions of these systems are flexible enough to provide multi-functionality. They can be used as an information tool in the sense that they communicate areas of extra importance, an example could be sales targets, or profit margins in terms of efficiency (Merchant & Van der Stede, 2007). Many compensation programs are aimed at the executive level or top management, often in the form of long-term incentive plans. Jensen and Murphy (1990) found that it is not how much you pay,
but how you pay that matters. In their article they noted that management, like all people, are often concerned and driven by motivations of their own well-being. One of the difficult tasks that the board of directors face is how to best construct and design incentive systems for top management. ‘One of the most critical roles of the board of directors is to create incentives that make it in the CEO’s best interest to do what’s in the shareholders’ best interests’ (Jensen & Murphy, 1990, p. 139). Conceptually, it is easy, in practical terms, the task can be daunting.

One famous example, of a company where incentive systems and agent culture performed poorly, is the story of Enron. Enron CEO Ken Lay and members of upper management walked away with large sums of money in their pockets while shareholders made huge losses as the house of cards collapsed. Right before the collapse, Ken Lay was named one of the top 25 managers of the year and Fortune named the company Enron the most innovative company for several years. Much of management were given stocks as compensation, which meant that as long as stock price went up, management reaped (perhaps unwarranted) rewards (Kulik, 2005). Enron is but one example of self-interest driven management.

Before the crisis of 2007, some prominent people were deeply concerned with the recent development of remuneration programs and bonus programs, primarily within the banking and investment sector. One person who squarely linked the problems with incentives was Rajan Raghuram. In his paper, Rajan discusses issues such as deregulation, technological and institutional change. However, as stated in the paper ‘My main concern has to do with incentives.’ (Rajan, 2005, p. 315). Rajan goes on to argue that changes in the financial world have altered managerial incentives which changed the amount of risk undertaken by the system with potential for distortions (and destruction of shareholder wealth). Among Rajan’s conclusion is the opinion that the world is better off thanks to these changes, but goes on to say that opportunities can be exploited for both good and bad. ‘This is why it is so critically important to get incentives right.’ (Rajan, 2005, p. 360).

In an effort to rethink management compensation, efforts were made to move away from share prices as performance measure, and stocks as rewards Cote (2009) wrote an article where he propagates the idea that variable pay plans for management should be tied to a company’s actual performance (some accounting measure) as opposed to its share price. Specifically Cote (2009) suggested that the measure EBITDA could be used for this purpose. Bacidore et al. (1997) shared parts of this opinion in the sense that the actual performance measurement needs to be done on accounting measures, or accounting measures in combination with market values, with the added criteria satisfied that these measures necessarily need to correlate with shareholder value.

In the works of Bacidore et al. (1997), Arbsalehi’s and Mahmoodi’s (2011), the necessity of having accounting measures or accounting based measures correlate with stock price (as a measure of shareholder wealth) forms the foundation for their work. The basic principle behind both works is that management should be evaluated based on actual performance. Connected to accounting, which is in the sphere of influence of management and not subject to stock market randomness, bullish or bearish mentalities, speculation and so on. The need for correlation is justified as shareholders ultimately aspire to greater value for themselves, captured as share price. With this background, board of directors should very much be interested in the relationship between performance measures and shareholder wealth, and the research that could aid in refining the construction of compensation systems that provide management with the right incentives (Jensen & Murphy, 1989).
2.1.2 Stakeholder Theory

As previously discussed, according to agency theory, a firm can be viewed as a nexus of contractual relationships between agents and principals. It is a complex process of equilibrium among possibly conflicting individual goals (Jensen & Meckling, 1976). A firm, however, can be viewed in a number of different ways. One could be in terms of the activities that are carried out. Another in terms of what it produces. A third in what characterizes the relationship among the nodes in the company. If one uses the third one, relationships, people can be understood as a description of their respective function (Fontrodona & Sison, 2006).

It has at times been suggested that agency theory takes on a too narrow view of a company and its important parties and that it can be extended further. If one choose to delimit the corporation in a different fashion one can see that several different parties have stakes in a firm. According to some, agency theory restricts itself to describing the relationship between directors and shareholders, and does not take into account lower levels of management, workers, creditors and other external stakeholders. Depending on angle of approach, stakeholder theory can give a more complete picture of internal and external relationships of a company. It has been suggested that firms close to insolvency sometimes takes on high risk/high reward investments in order to keep the effort going. This takes place because management recognizes that it can benefit from this at the expense of the creditors. In such a case the fiduciary duties are shifted from being owed to shareholders to being owed to creditors. Such actions appear to make sense from the perspective of agency theory, but increased risk to stakeholders is better captured by stakeholder theory (Phillips, 1968).

Other researchers have pointed out that value, depending on the definition of value, is best created by attempting to maximize the outcome of joint efforts. More explicitly, the value created through joint efforts by several stakeholders in the firm is more valuable to all stakeholders. Some argue that evidence suggest that efforts that satisfy the needs and wants of two stakeholders is not only additive but possibly even multiplicative. A basic instance could be focusing on customer satisfaction, one stakeholder, which will indirectly affect two other sets of stakeholders, employees and stockholders, who also benefits from greater customer satisfaction (Phillips, 1968).

If the underlying assumption is correct that stockholders benefit more from the outcome of joint efforts by several stakeholders then a performance measure which focuses on capturing the performance of the agent alone, might not be sufficient.

2.1.3 Motivation and Incentive Theory

It is important to distinguish between motivation and incentives. Kressler (2003) argues that motivation is imperative and that the right incentives can increase the efficiency of whatever motivation is originally in place. It does this by pushing individuals to work more effectively, faster and harder. Cote (2009) as previously stated, made a point to clarify that it is not how much you pay, but how you pay. This goes hand in hand with what Kressler (2003) argues, that incentives can increase motivation, but cannot take its place. If there is no motivation to begin with, it does not matter how much money is thrown around. If however, there is motivation present, then the right incentives can increase the effectiveness. As Rajan (2005) pointed out, it is absolutely crucial that the right incentives are in place.
Many researchers in the past have produced findings which show that there are more things than just money that can provide management with incentives to increase motivation. Among others one might find perhaps the most famous scholar, Maslow. Maslow is famous for his theory of hierarchy of needs. The theory basically suggests it is important for individuals to fulfill basic innate needs and one tends to move up on a pyramid of needs in order to finally arrive at the highest point which is self-actualization (Maslow, 1954). For some individuals, money is surely an incentive, while for others prestige might be an incentive or need. Being the CEO of a major global corporation can be appealing to some, working for a charity or non-profit organization can provide incentives for others (Cote, 2009).

It might also be interesting to note some differences between agency theory and motivation theory & incentive theory. The former focuses on suppressing management's self-interest through incentives, while the latter focuses on changing direction of the self-interest through the control of incentives. The added benefit of control, or steering, is one very important aspect of compensation programs which is at the disposal of shareholders through the board of directors (Merchant & Van der Stede, 2007).

2.1.4 Background Summary

Stakeholder theory can in many ways be viewed as an alternative to agency theory. The latter is relatively simplistic and intuitive but might not be able to capture all the complex relationships in a firm. Stakeholder theory can in some instances provide a more complete picture, but the act of defining and measuring different relationships, linking outcomes to actions becomes increasingly complex.

2.2 Previous Research

Prior research in the fields of agent theory and compensation has come to varying and - at times - contradicting conclusions. Initially research suggested that management performance measures should be based on stock price or other closely correlating market based measures. This basically meant that compensation should be paid for actual and observed gains in shareholder value. Aside from stock price, researchers investigated sales, assets, profits and rates of return. Their conclusion was that profits tended to have a strong influence on rewards but sales appeared to have none (Kerr & Bettis, 1987).

However, some researchers argue that using stock price or strong market based measures as a basis for performance measure is not ideal, since stock price and market ultimately reflects investors’ expectations. Instead, they suggest that performance should be based on accounting measures, such as profit or earnings before income tax and depreciation of assets (EBITDA) (Cote, 2009).

Abowd (1990) conducted a study which showed that there was no statistical evidence that after-tax return on equity had an effect on future performance as measured in stock price. It did however show that after-tax gross economic return and total shareholder return had an effect and that the evidence for it was substantial. In his work, he writes ‘It is perhaps surprising that the accounting performance measures did not fare as well as the economic measure or the market measure’ (Abowd, 1990, p. 68). Even though from a theoretical
standpoint, using accounting measures might sound more ideal since it is in the control of management, in the end market based measures tend to do better, as measured in correlation with shareholder value (Abowd, 1990).

Abowd and Kaplan (1999) noted a possible side effect of using accounting measures, in that it can sometimes encourage management to alter or “tamper” with accounting numbers. One such a behaviour was found in studies of nonlinear bonus programs, in which managers choose income-decreasing accruals (use accounting methods that report lower profitability) if their variable pay had hit the ceiling (already eligible for the highest amount of compensation). The ceiling in this case is lower or upper bound, when the pay for performance sensitivity is zero (Healy, 1985). This behaviour by managers was considered rational considering the incentives, which highlights yet again why it is so crucial to get incentives right, and to pay great heed as to what shareholders want to use as a basis for pay-performance programs, as it can affect long-term profitability and performance. If accounting based measures can encourage the shuffling of numbers in the books, then maybe the ideal performance measure is not based solely on accounting, but perhaps a mix of market and accounting based measures.

Biddle, Bowen and Wallace (1997) claimed that market based metrics were hardly or not superior compared to accounting based, especially questioning the efficiency of EVA. R-squares from single regressions were compared to evaluate the information captured in every single variable, showing that EVA added only slightly to the information content beyond earnings. Hence, they concluded that combining one accounting ratio with EVA should in most cases not explain shareholder wealth significantly better than using that accounting measure alone.

2.2.1 Methods Previously Used

Correlation is one of the most used methods of investigating the relationship between value and compensation, performance and compensation or performance and value. Benston (1985) conducted a study in which no relationship was found between corporate performance and management’s compensation. As a plausible explanation for this lack of correlation he put forward the theory that a large portion of management compensation was tied up in stocks or stock options, if so, then the correlation should be weak or insignificant which his study showed.

Coughlan and Schmidt (1985) used abnormal returns as their measure, based on comparisons between performance in current and previous measurement periods. They found statistically significant relationship between abnormal return and stock price, but their model was only able to explain 5.4 percent of the variation in compensation. They argued that the purpose of salary and bonus was to give management income security, rather than provide incentives in which compensation would need to vary with performance.

Kerr and Bettis (1987) wrote and pointed out differences between previous research and commented on methods used. Out of two studies that used raw returns in their primary analysis, one found a positive relationship while the other found no relationship at all. Yet two other studies used abnormal return and both found positive relationships. The problem was that the two used different methods of defining “abnormal” and Kerr and Bettis (1987) insists that the two were entirely different constructs and thus were not comparable. Another issue pointed out is that past methods have often examined the compensation in
relation to a performance variable without adjusting for the time lag. Compensation distributed over year t, are based on the board’s perception of past performance that is the previous year, t-1. In order to capture the true relationship between compensation and performance, or performance and the effect it has on shareholder wealth, then introducing the previously mentioned time lag is something one might take under consideration.

### 2.2.2 Performance Measures Used

When deciding upon what variables to include in our paper the first and formally most interesting aspect is comparing accounting based measures with market based measures. EVA is currently a common and often praised market based measure, especially in the USA, with many companies adopting the measure for evaluation and bonus-related issues. Companies that have been using EVA include several mutual funds and companies such as AT&T, Coca Cola, Whirlpool, Quaker Oats and DuPont (Biddle et al. 1997).

Brown and Hagel (2010) wrote that Wall Street analysts tend to use ROE as their primary measure when evaluating company performance. Though ROE is one of the most commonly used measures, ROA is also a sound and common tool to evaluate long term profitability trends by only including assets used to support the business. Brown and Hagel (2010) also claimed that the popular measure ROS, while measuring the robustness regarding returns on sales, is not as good of a metric as ROA. These measures will all be included in our research primarily due to their popularity, but also since previous research such as Lehn and Makhija (1997) found EVA to be better associated with changes in stock price compared to ROE, ROA and ROS. Another accounting based measure, ROCE will also be included. Though being similar to ROA, return on capital employed takes sources of financing into account (Damodaran, 2012).

Challen (1999) came to the conclusion that the measure SVA could be of significant benefit to state treasury when evaluating government- and state owned companies performance. This is due to the fact that SVA provides a framework which ensures that actions aiming on increasing shareholder wealth are focused upon.

### 2.2.3 Selected Performance Measures

Based on previous research we selected two market based and four accounting based performance measures. The two marked based metrics were EVA and SVA. As for the accounting based we opted to use ROE, ROCE, ROA and ROS. These six measures will be included in this paper mainly because of their perceived superiority, but also due to their popularity.

### 2.3 Performance Measures

Whenever shareholders evaluate a company’s stock, they discount the expected future cash flows in order to arrive at a present value of said cash flows and this helps them determine what the stock ought to be worth today. For example, when a company release their financial statements for the quarter, the stock price tends to move. Either it goes up because earnings are better than expected and as shareholders adjust their expectations, they are willing to pay more for a stock, hence the stock price goes up. The same thing happens in reverse if earnings are lower than expected. A concrete, vivid and contemporary example of
this is the hit Apple’s stock took after releasing their financial statements on January 24th, 2013. Shareholders quickly adjusted their expectations and the stock dropped 10.75 percent (O’Brien, 2013).

Generally there are two categories of performance measures that are widely used, market based and accounting based. Both come with their inherent specific advantages and disadvantages. These two types are described in this paper, as most large organizations make use of them today (Merchant & Van der Stede, 2007).

2.3.1 Accounting Based Performance Measures

Top management in companies have traditionally been evaluated on performance measures with their foundation in accounting books. The reasons are relatively straightforward, the numbers need to be kept track of to be in accordance with countries’ tax laws, market laws, etc. Aside from that they are also relatively accurate, objective and easy to understand, they are used all the time because of this. Critique has been put forward that managers because of this, sometimes experience pressure to perform particularly in the short run which can make long term investments off-putting to undertake (Merchant & Van der Stede, 2007).

Among the major benefits of using accounting based measures is that if compensation is based on actual accounting data, it would be easier for the company to carry compensation costs as they would naturally co vary. If the company is performing well, it is easier for the company to carry the costs associated with compensation, respectively if the company is doing poor there will not be any major costs to carry. Another is that while accounting numbers are not in total control of management, they are far easier to impact than the stock price (Bacidore et al., 1997, Cote, 2009).

2.3.1.1 Return on Equity (ROE)

Return on equity is a popular and widely used measure of corporate financial performance. It enjoys several benefits such as being easy to calculate, is usually provided in companies’ annual accounts and is thereby readily available, can be expanded to be the end result of structured financial ratio analysis in something that is called the Du Pont model. No measurement is without drawbacks and ROE has its fair share. Drawbacks that have been pointed out are the ability to manipulate the numbers in annual accounts within the legal framework. Another is that ROE tends to increase the more leverage in financial terms that the company takes on, as long as the returns exceed the borrowing costs. The last weak point is inflation, profit margin has been found to have a negative relationship with inflation which in turn impacts ROE and expected growth. Even so, investors tend to appreciate ROE because it links the income statement to the balance sheet (Ahsan, 2012).

\[
ROE = \frac{Net \ Income}{Equity}
\]

ROE is widely used by stockholders since it calculates the profitability from an equity investor’s perspective. As the formula shows, this is done by relating the equity investor’s profits to the book value of equity investment. Firms with high growth rate tend to have had experienced years of high ROE, since a high return on equity implies that earnings can be reinvested in the company (Damodaran, 2012).
2.3.1.2 Return on Capital Employed (ROCE)

This measurement is aimed at evaluating how well the company uses its own working capital. The operations of a company are funded through equity or debt and the capital employed needs to compound to a sufficient amount so that either interest or dividends may be paid. In other terms, ROCE measures profitability and efficiency of capital investments. It is calculated by dividing EBIT by total assets minus current liabilities (Andersson 2008).

ROCE is also quite suitable to be used on a divisional level or subsidiary level. This allows management to set goals for the organization. This goal setting can have perverse effects at divisional level. For example, if the official efficiency target is a ROCE of 5%, managers can sometimes believe that there is an unofficial target that is higher, say 10%. If that is the case, managers can then actively choose to disregard investments, actions or the like that are below 10% which will lead to beneficial investments not being considered (Rutherford, 2002).

\[
ROCE = \frac{EBIT}{Total\ Assets - Current\ Liabilities}
\]

2.3.1.3 Return on Sales (ROS)

ROS is a widely used ratio used to measure operational efficiency of a company. It states how much profit is being produced per SEK of sales. Ideally it should be compared to ROS over time for the same company, compared to other companies’ ROS in similar industries. If wider comparisons are made, it typically only gives an estimation of how efficient management is (Damodaran, 2012). ROS is calculated as

\[
ROS = \frac{EBIT}{Sales}
\]

2.3.1.4 Return on Assets (ROA)

According to Damodaran (2012) ROA measures how efficient a company is in generating profits from its assets, by dividing the earnings before interest and taxes by the total assets. In other terms, ROA measures companies operating efficiency before taking the financing effects into account. In most cases, total assets are referred to as the assets measured using book value. Since EBIT is divided by the total assets the computed return does understate companies with substantial current assets. By keeping the financial effects apart from the operational effects, ROA is often claimed to be a better measure of the true return.

\[
ROA = \frac{EBIT}{Total\ Assets}
\]

2.3.2 Market Based Performance Measures

Logically, from a shareholder perspective it would make the most sense to measure management’s performance on the desired value itself, the stock price. An example of such a market based measure is Total Shareholder Return (TSR). But actually doing so in an evaluation of performance context presents a myriad of problems. The most potent problem is that a stock market’s valuation of a stock is largely out of the hands of top management as
was pointed out by Cote (2009). A stock’s value is also dependent on shareholders’ expectations which means that management would be evaluated on meeting said expectations, not on actual results. A striking example of this was put into words by Cote (2009, p. 60):

“What would happen if a quarterback’s pay depended on the number of times the team beat bookmaker’s expectations - the spread they offer the betting public - and not on the number of games won? If a quarterback beats the spread systematically, bookmakers would increase it, anticipating actual results and levelling the odds for bettors. In the long run, beating the spread wouldn’t work as a compensation system, and quarterbacks would fail as often as they won, although it would encourage them to take more chances.”

A company’s stock price is also subject to all the randomness, or “noise” that characterize all stock markets. This is an acronym for all unaccounted variables in a statistical model which in some sense is part of the model as they reside in an error term, but are not subject to any form of investigation or closer scrutiny (Bacidore et al., 1997).

Another issue is that management can perform mediocre but still reap great rewards because the stock market at the time was exhibiting bull-herd mentality, or inversely, can do really well but not reap any rewards at all because of a worldwide market crash. Another potential problem would be the maturity of the company, when a company matures its stock peaks and a stock-based reward system would leave management without rewards (Cote, 2009).

The way that market based measures take into account expected return and debt interest rates is by calculating the weighted average cost of capital (WACC). WACC in turn relies on the capital asset pricing model (CAPM). These two will be explained in more detail.

CAPM is a common and widely used model for determining the theoretical relationship between risk and return for any asset in a well-diversified portfolio when markets are in equilibrium. In a well-diversified portfolio, theoretically the risk tied to a specific asset (non-systematic) becomes less significant which means that the portfolio return is dependent upon the quantity of non-diversifiable risk. The mathematical representation of the model is as follows:

\[ R_e = R_f + \beta \times (R_m - R_f) \]

The model takes into account an asset’s market risk, usually quantified in terms of beta (B), and set it in relation to the expected return of that market as well as the expected risk free rate. CAPM provides a strong basis for the calculation of market-based performance measures. The model justifies the calculation of a theoretical yield for shareholders, by claiming that the theoretical yield on a risky asset is a function of that asset’s market risk. The systematic risk, market return \(R_m\) subtracted by the risk free rate \(R_f\), is multiplied by for example a stocks beta to get it’s expected yield in terms of market exposure, in a well-diversified portfolio. Adding the risk free rate \(R_f\) with the systematic risk gives the theoretical expected return. Market-based performance measures make use of the CAPM theory since a theoretical yield for owners of a firm supports the calculation of the weighted average cost of capital for a firm (Elton, Gruber & Brown, 2011).
WACC is used to calculate the average cost of both equity and borrowed capital. In other terms, the WACC indicates a company’s theoretical minimum rate of return in order to meet lenders’ interest requirements and satisfy owners required returns. The model uses the weight of both debt and equity, relative to total debt. Interest paid to lenders results in tax credit, because of this the model multiply the interest rate with one less the corporate tax rate. The CAPM model derives the expected shareholder return, which can now be used to mathematically calculate a firm’s WACC simply by multiplying each component of capital by the cost of that capital (Stewart, 1991).

\[ r_{WACC} = \frac{D}{(E+D)} \times Rs \times (1 - T) + \frac{E}{(E+D)} \times Re \]

- \( D = \text{Debt} \)
- \( E = \text{Equity} \)
- \( T = \text{Corporate tax rate} \)
- \( Re = \text{Expected shareholder return} \)
- \( Rs = \text{Debt interest rate} \)

### 2.3.2.1 Economic Value Added (EVA)

Stewart (1991) argued that the most appropriate measure of performance that shows how corporate value increase or decrease is EVA (Economic Value Added). EVA includes operating profits but subracts the cost of capital, hence EVA can only increase if more profit is made without having to tie up additional capital. The performance measure also has the advantage of being directly linked to the intrinsic market value of a company.

EVA is defined as

\[ EVA = NOPAT - r_{WACC} \times (NA) \]

\[ NOPAT = \text{Net profit after tax} + \text{after tax interest expense} - \text{after tax interest income} \]

\[ r_{WACC} = \frac{D}{(E+D)} \times Rs \times (1 - T) + \frac{E}{(E+D)} \times Re \]

- \( D = \text{Debt} \)
- \( E = \text{Equity} \)
- \( T = \text{Corporate tax rate} \)
- \( Re = \text{Expected shareholder return} \)
- \( Rs = \text{Debt interest rate} \)

\( NA = \text{is the adjusted book value of net capital, hence it does not include accounts payable} \)

Critics often find that a disadvantage of EVA is that it is complex and time consuming to calculate. In addition, the idea that EVA will provide every employee with a better understanding about the company’s success is well-intended but it is generally an executive’s measurement tool (Shand, 2000).

One interesting question is why one instead of the adjusted book value of net capital were to use the market value of the firm? Damodaran (2012) said, since the market value includes not only capital invested in current assets but also in expected future growth, market value is inappropriate. One could of course use the market value of current assets, but due
to the difficulties of estimating this researcher and investors usually turn to the book value of capital as a proxy. The main idea behind using NOPAT and adjusted net capital is that businesses are truly profitable when they create returns above their cost of capital. Since rWACC multiplied by NA includes the total expected return on net capital, a NOPAT higher than this causes EVA to be positive.

### 2.3.2.2 Shareholder Value Added (SVA)

Accounting measures primarily focus on residual profits after tax measured against the asset base of a company whereas value based (market based) measures takes into account operating performance by adjusting net operating revenue (NOPAT). By making use of NOPAT both SVA and EVA measure incorporate capital charges on the economic operations of a business. Like EVA, SVA also makes use of WACC which implicitly addresses the notion of risk and expectations among shareholders (Challen, 1999).

\[
SVA = NOPAT - (WACC \times Capital)
\]

Value based performance measures result in better accountability for the investment of new capital and provides accountability for the use of already existing investments. Management also benefit from using SVA as it provides a greater focus on shareholder value. One of the limitations of SVA is that it is an aggregate measure, thus in order to make full use of SVA it is critical to understand the drivers of it. These drivers are (Challen, 1999):

- improving revenue and/or decreasing costs
- implicitly requiring that investments return at minimum the opportunity cost of capital
- reducing non-productive assets

![Figure 2-1. SVA Model (Challen, 1999, p. 6). The figure shows the drivers that affect the changes in SVA.](image-url)
2.4 Summary of Frame of Reference

Below we present a summarizing picture, detailing the links between the background theories and the performance measures. These compensation systems prerequisite adequate performance measures in relation to value creation.

![Diagram of Frame of Reference](image)

Initially we described the theoretical background, which deals with the origination of the problem, the stakeholders involved and the importance of right incentives.

In order to suppress self-interest or realign self interest, so that it coincides with the interest of the shareholders, incentive systems are created which prerequisite an objective metric.

The performance of management needs an objective metric which stems either from accounting based measures or measures that rely on both accounting based and market based, which can capture shareholder value changes.

![Figure 2-3. Accounting measures](image)

![Figure 2-4. Market measures](image)
3 Method

This chapter contains the presentation of the chosen method used in this thesis. It entails the description of the research approach, research process, the chosen method and approach to data collection and analysis. The chapter ends with discussions on data reliability, validity as well as limitations of the chosen method.

3.1 Quantitative Data

We will investigate the predictive and explanatory power between commonly used performance measures and stock’s price, using secondary data. Our aim is to investigate the relationship of these variables, with help of an existing theoretical framework. Holme and Solvang (1997) suggest that when investigating the relationship between variables, a quantitative approach is the most suitable one.

Data in raw form hardly explains anything to most people, but processed into information and then analysed enables the investigator to describe and examine relationships within that data (Saunders et al., 2012). By using a quantitative approach we want to statistically examine a sample and from there hopefully gain understanding about the entire population.

3.2 Data Collection and Analysis

For the purpose of our research we decided to make use of secondary data. In the case of research many automatically assume that some form of primary data gathering is the most useful. This need not be so, primary data is usually very time-consuming to collect and not seldom very costly. Secondary data can be a most useful source of information which can be used to answer, or at least aid in answering, research questions (Saunders et al., 2012).

The forms that secondary data usually takes are raw data and some kind of processed or compiled data (Saunders et al., 2012). In this thesis, raw data will be used from the Stockholm stock exchange obtaining stock prices and processed data gathered from companies’ annual accounts retrieved through Retriever Business database, part of Retriever Research. The market premium rates were received from PWC’s (former PricewaterhouseCoopers) website. The theoretical risk free rate, using Swedish government bonds with a 5 year time to maturity were gathered from the Swedish central bank’s website. The historical Swedish corporate tax rate per year were received from Ekonomifakta’s website.

3.3 Population and Sample

The companies included in our thesis were selected for reasons such as size, stock exchange and available information. Swedish large cap public companies traded on the Stockholm OMX were chosen. These firms dominate the Stockholm Stock Exchange and are traded to a greater extent. All enterprises that constitute our population, from where our sample is drawn, have accounting rules and regulations which have been implemented in accordance with IFRS and ÅRL. Listed companies in one of the Swedish stock markets must also be monitored by that very same stock exchange, in our case all companies belong to the same market. The idea behind implementing the same accounting rules and regulations for companies is to protect investors and promote public confidence in the security market (Finansinspektionen, 2011). In our case it also has the advantage of making the data, which in many cases are built upon financial statements, more credible.
In order to get a historical picture of the development of the value creation and in order to provide time for potential long term investments undertaken by management to impact stock price, we have chosen to base our data on the financial statements over a period of 2003 through 2011.

3.4 Data Validity and Reliability

Svenning (1996) describes validity of a study as the ability to measure what was intended to measure. Validity verifies that the results are consistent with reality and certify the link between theory and empiric findings. It also indicates whether or not the investigation make proper generalizations based on specific studies or population sample. Data reliability on the other hand is usually described as an investigation where the data in terms of completeness and accuracy can be used for the intended purpose. The results shall be considered reliable and two studies with the same purpose and method will provide the same result if nothing changes in a population. In other words, regardless of who conducts the research the end results should be identical. Quantitative studies tend to be more generalized, thereby placing even greater demands on data reliability compared to qualitative studies.

Since our study is quantitative, this requires the empirical basis to be reliable. Our study concerns Swedish large cap companies and by incorporating most of these companies in our investigation, the empirical base becomes more reliable in terms of accuracy and completeness. The accounting based data originally came from companies own financial statements which we gathered from the same data base. In this paper only Large Cap stocks were selected to investigate. These stocks are traded more frequently in general, making them more liquid. Hence the actions performed by one of these companies should be better reflected in the stock price compared to smaller and less liquid companies’ stocks (Berk & DeMarzo, 2011).

After gathering the data, the data set had to be scrutinized in order to make sure that all the needed data was actually in the data set in order to carry out the statistical testing. Upon closer scrutiny, we found missing data in some companies for some years. We opted to remove all the companies which had missing data points for all the years from 2003 to 2011. This caused the number of companies used in this thesis to drop from 60 to 33. Because of time constraints imposed, we opted to not manually collect these data points.
3.5 Correlation

Pearson correlation is a measure of linear dependence between two variables. It was developed by Karl Pearson and is today a widely used tool in the sciences, when measuring the strength of linear dependence between two variables. The test makes use of the normal distribution assumption, which means that the variables are thought to be normally distributed. The coefficient is defined as the covariance between the two variables divided by the product of their standard deviations. The test is not so robust, that is to say, it is sensitive to large outliers and its value can be misleading if outliers are present (Aczel & Sounderpandian, 2009). This is where the second test comes into view.

Spearman correlation is the most frequently used nonparametric measure of association between two variables. The test gains some robustness while losing some explanatory power. The Spearman correlation indicates the tendency for two variables to have the same sign. For example, if Y tends to increase when X increases this implies a positive Spearman coefficient and if Y increases when X decreases the relationship is negative. The Spearman test is described as being nonparametric which can have two meanings, first is that the test describes the monotonic function between two variables and the second one is that its exact sampling distribution can be obtained without knowing the joint probability distribution of the dependent and independent variable. Both the Pearson and Spearman tests are bound between 1 and -1, 1 indicates perfect positive relationship, -1 indicates perfect negative relationship and 0 means that there is no correlation at all (Aczel & Sounderpandian, 2009).

In accordance with previous research we will use correlation as a measure of predictive power among key ratios and changes in share price. Bacidore et al (1997) evaluated the predictive ability of EVA using traditional correlation tests and non-parametric tests. Arabsalehi and Mahmoodi (2011) and Biddle et al. (1997) also drew conclusions based on the strength of linear dependence between two variables as measured by linear correlation. This is the common method used when conducting this type of research and forms the basis for research in this field of study.

3.6 Panel data

A more well-known types of analysing data in field of statistics are ordinary single or multiple regressions. These methods are usually used when the data is for example pure time series data or pure cross sectional data (Wooldridge, 2009). Researcher often collect data which have both cross sectional and time series dimensions generally referred to as panel data. In this paper the panel data consists of cross sectional units (33 firms) with a time dimension of nine years. This data set is described as balanced since there is an observation for every unit of company for every time period (Wooldridge, 2009). Various regression models can in fact still be used to deal with this kinds of data, the three more common models; pooled OLS model, fixed dummy variable model and random variable model, will be explained further in section 3.7 (Statistical Model).

The advantages of panel data compared to cross-sectional data and time series data are numerous. For example, by blending the inter-individual differences and intra-individual dynamics leads to the following advantages (Hsiao, 2007):

More accurate inference of model parameters. This is possible because panel data usually have more degrees of freedom and greater sample variability, especially so in comparison to
cross-sectional data. Greater ability for capturing the complexity of human behaviour and interactions than a single cross-section or time series data. Can sometimes be easier to compute, under certain circumstances the computation of panel data estimator or inference can be quite complicated, but in certain cases the availability of panel data actually simplifies computation (Hsiao, 2007).

Furthermore, panel data sets often results in higher number of observations. If there are \( n \) numbers of companies included in a research adding multiple time periods \( T \) will generate at total of \( nT \) observations (Baltagi, 2005). By adding a time dimension to the data this allows our sample to, instead of consisting of merely 33 observations, generate a total of 297 observations.

### 3.7 Statistical Model

Since the aim is to investigate which measurements have the best explanatory power and best predictive power between independent variables and the dependent variable, the statistical relationships needs to be further investigated. A panel data method will be used in this study to examine these relationships between our independent variables and stock price. The idea behind choosing a panel data method is that it allows the sample to be measured repeatedly over time while still being firm specific.

\[
Y_{it} = \alpha i + \beta X_{it} + \epsilon_{it} \quad i = 1, \ldots, N; \quad t = 1, \ldots, T
\]

The dependent variable \( Y_{it} \) represents the firms’ annual stock price. The intercept of the model is alpha and \( X_{it} \) is one of the performance measures (EVA, SVA, ROE, ROCE, ROA or ROS) of firm \( i \) in year \( t \), \( \epsilon \) is the error term. Since both EVA and SVA are high value numbers they will be scaled. Positive currency data is often scaled since it removes some of the extreme observations and makes the data easier to process (Wooldridge, 2009).

There are mainly three different methods when dealing with pooled panel data; pooled methods, fixed effect models and random effect models.

1. Pooled OLS model involves pooling all observations in OLS regression. Some particularly strong assumptions form the basis for this model, such as implicitly assuming that the intercepts are the same for all firms. If intercepts are different between the individuals then one might end up placing firm unique effects in the error term, causing the explanatory variables to no longer be uncorrelated with the error terms. In simple terms the pooled OLS model much like an ordinary single or multiple regression that includes all observations with giving rise to the same intercept for all firms. The pooled OLS model is often assumed to be the model that is most convenient to use since it very similar to ordinary linear regression and neglects the cross section and time dimension of the data (Doughtery, 2007).

2. Fixed effect dummy model allows the intercepts to differ for different observations. An intercept can be estimated for each \( i \) by adding a dummy variable for every cross-sectional observation. This model allows for many explanatory variables, even when the number of observations is low. The fixed effect dummy variable regression provides the exact same estimate of \( B_j \) and standard errors compared to a similar time-demeaned regression. The model uses dummy variables in order to grant each cross-section unit its own intercept (Baltagi, 2005).
3. Random effect model assumes that the intercepts are drawn randomly from a greater population. It assumes no individual fixed effects or in other words no firm specific effects, the variation across companies are assumed to be random and uncorrelated with the independent variables included in the model. This means that if one could reasonably assume that differences among firms could have impact on the dependent variable in a special way, the random effects model could be a better alternative to use instead of the other two models. In comparison to the fixed effect dummy model the random model can avoid ending up with too many fixed parameters and loss of degrees of freedom (Doughtery, 2007).

A wide range of tests can be performed to find the model that best fits the data. Hausman tests will be used initially to distinguish which of the fixed- and random effects models is the most suitable. The test evaluates the significance of an estimator in comparison to another estimator. The null hypothesis is that the intercepts are distributed randomly of the Xit. In other words, the null hypothesis favour the use of the random effects model while rejecting the null hypothesis suggests the use of a fixed effects model. Not being able to reject the hypothesis favours the random effects model since, even though both model are still consistent, using fixed effects means estimating dummy variable coefficient that are unnecessary under those conditions. Furthermore, if the Hausman test is not rejected for the majority of variables, a Breusch-Pagan test statistic will be used to evaluate if the pooled OLS model is more adequate compared to the random effects alternative. This test is designed to detect the presence of random effects and it works by evaluating if the variance of the residuals is independent of variables. The test is trying to find the existence of heteroscedasticity. Rejecting the null hypothesis of a Breusch-Pagan test indicates the presence of random effects and favours the use of the random effects model. An F-test evaluating the joint significance of differing group can also be used if needed to compare the fixed effects model with the pooled OLS model. For a better understanding of the panel data model selection process, a decision making table for fitting a model with panel data will be used (Baltagi, 2005).

![Figure 3-1. Panel Data Selection Model (Doughtery 2007)](image)

As model 3-1 shows, since our observations are random samples, a Hausman test (DWH-test) should be the first test performed in order to see if the observed individuals should
have different fixed intercepts. If the test were not to be rejected, then a Breusch-Pagan test would show if the test includes random effects or not. In a case where no random effects are to be likely to be present, a final F-test could hopefully provide evidence of advantages using a Pooled OLS model.

In this case panel data is optimal to use since it adds three dimensions to the model; variable, cross-sectional and time-periods. Panel data proposes that individual firms are heterogeneous while simple time-series and cross-section studies can face difficulties when controlling for heterogeneity, increasing the probability for biased results (Baltagi, 2005).

The question of whether combining one market based measure and one accounting based measure can produce more explanatory power could be tested. If some variables prove not to be statistically significant in a single variable test they will not be included in the pairwise regression. In order to maintain consistency in our methodical approach, the model chosen to test the relationship between the dependent and one independent variable will also be adopted to the combined tests. The motivation for this is that it is easier to compare the results if the majority of the statistical methods are retained intact. The basic components of the following statistical model will be used:

\[ Y_{it} = \alpha + \beta_1 X_{it}(\text{market based}) + \beta_2 X_{it}(\text{accounting based}) + e_{it} \]

The model is in broad terms almost identical the previous model, with the difference that two independent variables are used in this second one. Again, alpha is the intercept and Xit is the performance measure for company i in year t.

### 3.8 Control variable

According to Wooldridge (2009) economists usually include control variables. The reason for this is to isolate the causal effect of a certain random variable. This problem is called multicollinearity, which is when the independent variables rob one another of explanatory power (Aczel & Sounderpandian, 2009). Practically speaking, this means including among the explanatory variable different controls to clarify the relationship between the variables of interest. Wooldridge (2009) uses an example where the relationship between loan approval rates and the percentage of minorities in a neighbourhood is controlled for by including variables such as average income. Control variables have two major limitations, firstly one must find and properly measure these variables. Many variables are difficult to measure and imperfect measured variables can give biased estimates. Secondly, the fact that no matter how many controls are included there are always a high risk that either too few or too many were included or the wrong crucial variables were left out (Aczel & Sounderpandian, 2009).

Previous researchers such as Bacidore (1997), Arabsalehi and Mahmoodi (2011) and Biddle et al. (1997) in this area with statistical methods comparable to ours, tend not to include any control variables. Based on this there will be two regressions for each independent variable, one including and one excluding a control variable. The control variable will be total assets since it to a certain degree represents the size of a company. Large companies are viewed as being more stable and should therefore be able to gain new capital easier. Large companies also tend to be older, meaning that they are more likely to be a cash cows. The total assets variable will be scaled by the natural logarithm. Positive currency data is often
scaled by the natural logarithm since it removes some of the extreme observations and makes the data easier to process (Wooldridge, 2009).

### 3.9 Coefficient of Determination

R-square is a statistic that will give some information or indication about the goodness of fit of a model, also commonly coined explanatory power of a model. It measures how well the regression line approximates or matches the actual data points in the data. The values of R-square range from 0 to 1, 1 implies perfect fit whereas 0 implies no fit at all (Aczel & Sounderpandian, 2009). In this paper R-squared will be used as a final measure of goodness of fit and to compare single measure regressions with pairwise combination regressions. In social science, particularly when using cross-sectional data, low R-squares are quite common except for certain occasions and models such as the fixed dummy regression (Wooldridge, 2009).

### 3.10 Criticism of the method

An obvious weakness when using a quantitative method is the lack of guarantee that the information collected is relevant for the problem. There is a famous quote from Robson who pointed out the difficulties of investigating real world problems (cited in Saunders et al., 2007, p. 416):

“... a field where it is not at all difficult to carry out an analysis which is simply wrong, or inappropriate for your purposes. And the negative side of readily available analysis software is that it becomes that much easier to generate elegantly presented rubbish.”

Colin Robson (2002)

Since one aspect of this thesis is examining the correlation between variables, there is a fair probability that this statistical relationships can be found. However, correlation can at best show that a change in one variable is accompanied by change in another variable, but which variable that caused the other to change is hard to know (Saunders et al., 2007). Novella (2009) noted that scientists often states that correlation does not necessarily mean causation, indicating that although A seems to cause B to change, A may simply correlate with B due to miscellaneous reasons. Committing the opposite logical fallacy, namely entirely dismissing correlation, can also damage statistical research and would dismiss a large proportion of scientific evidence. By systematically examining the possibility of causal relations and finding statistically significant relationships between our dependent and independent variables, the likelihood of confirming the correlation as real becomes greater.

When conducting research based on correlation, it is often wise to keep in mind that correlation does not imply nor equal causation. The existence of correlation does not mean that one variable causes changes in another one, though it might hint at this relationship. The question of causality is a complex one and cannot be answered directly with the use of regression or correlation analysis alone. If two variables correlate it does not necessarily mean that they correlate in a direct or meaningful way (Aczel & Sounderpandian, 2009).

However, logically there ought to be some form - perhaps weak - relationship between accounting and the value of a stock. After all, there is a whole investing school that make use of this connection called value investing which derives from the ideas of Ben Graham, Da-
David Dodd and Seth Klarman. One of the most well-known value investors is Warren Buffett. The idea behind value investment is to find companies which are valued at a low price on a stock exchange but has very high book value of assets, in other words, there is a form of discount (Graham, Dodd & Klarman, 2008).

One should also keep in mind that the purpose at hand is not to establish any form of causal relationship between accounting and stocks, the latter are inherently full of random noise, investor expectations, speculation and so on (Cote, 2009). The purpose is to investigate which financial performance measures excels at correlating (predicting) changes in share price, since the management of a company can only greatly influence the accounting of the company, all in the context of compensation programs (Bacidore et al., 1997).

As previously mentioned R-squared will be used as a final measure of goodness of fit and to compare single measure regressions with pairwise combination regressions. It is important to note several things regarding the coefficient of determination, or R-squared. The number only expresses the percentage of the variation in the independent variable, explained by the regression or the set of independent variables. Since r-squared cannot be negative, we cannot see by just looking at it, if the line slopes upward or downward, to do this, we need to examine the b1 (or r, or the coefficient of the independent variable). If R-squared is one, this represents a perfect fit between the line and the data points, such cases is probably more likely in fields of science such as physics, but will simply not occur in economics nor business. If one thinks about it, if there would be no errors, which is to say no variation, there would be no need for statistics (Aczel & Sounderpandian, 2009).

The logical line of thought is then, how high should R-squared be in order to be of use or how do we determine the quality of it? No clear, unambiguous answer exists to this question. However, part of the answer depends on the intended use of the regression. If we want to use it for predictive purposes, higher numbers of r-squared implies higher accuracy of our predictions. Too high values of R-squared can even hint that something is wrong with the data or the model, a value of 0.99 or 0.999 should lead to some caution. If the value instead is as low as 0.25 or 0.5, it can still be used, as long as one keeps in mind that predictions will be poor cause of high errors. In relative terms, it can still provide some insight, if one variable has higher values than another, it can point out that some variables are not suitable at all and that some have low values, but they are better than the alternatives that are closer to 0 (Aczel & Sounderpandian, 2009).
4 Results and analysis

In this section, the findings that the data generated is presented through graphs, analysed and discussed in succession according to the statistical tests that were performed. Some tests, such as the Hausman-test, were done in order to find out which tests were more appropriate in order to further advance the analysis.

4.1 Descriptive statistics

This graph shows the changes in the variables over time in relation to the share price. What is important to point out is that the stock-variables are a total cut, hence they do not reflect the large cap index, meaning that the market value is irrelevant in this context. What the graph instead shows is that in our sample the changes in EVA compared to the changes in average share price fits relatively well. ROCE and ROA are very similar to one another and follows the changes in average share price to some extent, though the changes from one year to next are not as volatile as the dependent variable. ROS mimics share price fluctuations quite poorly in comparison to other measures. In addition, at a first glance, the relationship between ROS and stock price appear to be inversely related. One might expect by simply observing ROS that it will have a low or negative correlation with stock price. SVA seems to partly follow the bars, but not enough to appear more suitable than other measure. Of course, studying a graph does not reveal the whole story, the data must be subjected to more statistical tests.
Table 4-1 below displays the descriptive statistics of all the independent variables. The most interesting aspect of these findings are the fact that all means and medians are positive. These findings are similar to Arbsalehi’s and Mahmoodi’s (2011), although their variables’ means were slightly higher for ROA, ROS, EVA and SVA. The mean and median for ROE were much lower and the minimum and maximum for ROE were not as extreme as those calculated by Arbsalehi’s and Mahmoodi’s (2011). The tremendous maximum and minimum values of ROS belongs to the same company and if excluding this would give less shocking minimum (-0.65131) and maximum (0.89266) values.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>roce</td>
<td>0.155172</td>
<td>0.144862</td>
<td>-0.857618</td>
<td>0.558723</td>
<td>0.132583</td>
</tr>
<tr>
<td>roe</td>
<td>0.228528</td>
<td>0.229300</td>
<td>-7.45250</td>
<td>3.69720</td>
<td>0.611776</td>
</tr>
<tr>
<td>roa</td>
<td>0.110628</td>
<td>0.100500</td>
<td>-0.794400</td>
<td>0.459500</td>
<td>0.102165</td>
</tr>
<tr>
<td>ros</td>
<td>0.195540</td>
<td>0.154617</td>
<td>-9.57449</td>
<td>10.7519</td>
<td>1.08550</td>
</tr>
<tr>
<td>eva</td>
<td>0.500233</td>
<td>0.256269</td>
<td>-1.90917</td>
<td>3.00307</td>
<td>0.676708</td>
</tr>
<tr>
<td>sva</td>
<td>0.269680</td>
<td>0.136881</td>
<td>-2.20091</td>
<td>2.20350</td>
<td>0.463812</td>
</tr>
</tbody>
</table>

Furthermore, as table 4-1 shows the highest standard deviation can be found in ROS row indicating that this measure is indeed by far the most volatile one. ROE and EVA have the highest standard deviation after ROS while ROA and ROCE have the lowest standard deviation. One can see in figure 4-1 how this looks visually.

Comparing the mean to the median for the variables shows that they are fairly similar which implies that the distribution of the sample is symmetric, with the exception of EVA and SVA. The differences of mean and median regarding these two measures can hint at the possibility of skewness or outliers. In appendix 7-5, one can see histograms of the six variables. Upon closer analysis of SVA’s and EVA’s histograms, one can deduce that they appear to have right-skewed distribution. According to Aczel and Sounderpandian (2009), a symmetric distribution is one where mode = mean = median. For a right-skewed distribution, the mean is to the right of the median. This appears to the case of EVA and SVA, which can be further seen in the box plots below (Table 4-2).

As can be seen in, the plots of these two variables seem to indicate that possibly, they do not have a normal distribution.
The box-plots in Table 4-2 visually describes the samples of populations whose distribution are hard to approximate. The central limit theorem (for further explanation see appendix 7.7) states that samples including more than 30 observations may in some aspect be viewed as being normally distributed regardless of the unobservable population distribution (Aczel and Sounderpandian, 2009), rejecting EVA and SVA from parametric tests may be wrong.

Even though EVA and SVA appear to be right-skewed in their distributions, they could be difficult to compare with the other measurements whose samples appear to be more symmetrically distributed. The market based measures are at the same time not completely unrelated to the accounting based measures if one reasons about the way they are calculated. Even though EVA and SVA to some extent reflects the accounting data, their somewhat skewed histograms (see appendix 7-5) distinguish themselves from the other metrics’ distribution.

Aczel and Sounderpandian (2009) argues that real world quantities are hard to analyse since the actual distribution and mean of the population are not only unobservable but also hard to approximate, this justifies the use of the central limit theorem and the assumption of normal distribution in controlled tests. With this in mind we have chosen not only to use statistical methods relying on normal distribution assumptions, these are called parametric tests. Since we wish to carry out this study without neglecting to examine what is actually of interest while not making unreasonable assumptions, non-parametric methods will be used as well to study the variables. What distinguishes non-parametric tests from parametric tests is that non-parametric tests do not rely on any distribution assumptions (Aczel & Sounderpandian, 2009).

### 4.2 Correlation

The first statistical tests were conducted to, as stated in the method section, test for statistical linear and parametric relationships. These tests, while not being time adjusting, are revealing clear correlations between many of the independent variables and stock price. The Spearman tests are indeed more robust as was suspected and show evidence of high correlation for five measures, but the linear Pearson correlation test only rejects four out of six p-values.

<table>
<thead>
<tr>
<th>Correlation Pearson</th>
<th>roce</th>
<th>roe</th>
<th>roa</th>
<th>ros</th>
<th>eva</th>
<th>sva</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock price</td>
<td>0.277</td>
<td>0.0369</td>
<td>0.2366</td>
<td>0.0227</td>
<td>0.2646</td>
<td>0.1874</td>
</tr>
<tr>
<td>T-statistics</td>
<td>4.5020***</td>
<td>0.4043</td>
<td>3.7451***</td>
<td>0.3469</td>
<td>3.8533***</td>
<td>3.0881***</td>
</tr>
<tr>
<td>P-value</td>
<td>0.0000***</td>
<td>0.6863</td>
<td>0.0002***</td>
<td>0.7289</td>
<td>0.0001***</td>
<td>0.0022***</td>
</tr>
</tbody>
</table>

| The null hypothesis of no correlation. H0= the variables do not correlate |
| Note:* significant at 0.10; ** significant at 0.05; ***significant at 0.01. |

<table>
<thead>
<tr>
<th>Correlation Spearman</th>
<th>roce</th>
<th>roe</th>
<th>roa</th>
<th>ros</th>
<th>eva</th>
<th>sva</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock price</td>
<td>0.3659</td>
<td>0.3323</td>
<td>0.3269</td>
<td>0.0406</td>
<td>0.3422</td>
<td>0.3678</td>
</tr>
<tr>
<td>T-statistics</td>
<td>6.3644***</td>
<td>5.7042***</td>
<td>5.5997***</td>
<td>0.6585</td>
<td>5.8961****</td>
<td>6.4015***</td>
</tr>
<tr>
<td>P-value</td>
<td>0.0000***</td>
<td>0.0000***</td>
<td>0.0000***</td>
<td>0.5108</td>
<td>0.0000***</td>
<td>0.0000***</td>
</tr>
</tbody>
</table>

| The null hypothesis of no correlation. H0= the variables do not correlate |
| Note:* significant at 0.10; ** significant at 0.05; ***significant at 0.01. |

Table 4-3. Correlation Results (Authors’ table)
As can be seen in the table 4-2 several variables’ correlations with the Y-variable are significant at a 1% level. However, ROS shows no evidence of correlation with the dependent variable on either the Pearson or Spearman tests. ROE have no significance regarding correlation when observing the Pearson table, instead its correlation as a measure of linear dependence with stock movements is remarkably low (3,6%). The Pearson table indicates that ROCE (36,59%) and EVA (34,22%) have the highest correlation, closely followed by ROA (33,23%). SVA (18,74%) although being statistically significant at a one percent level, is not experiencing as high correlation compared to ROA or ROCE. Even compared to the quite similar performance measure EVA, SVA does not state to be better in context of shareholder value creation.

According to Spearman table SVA (36,78%) have the highest correlation indicating that SVA to a greater extend tend to have the same sign as changes in stock price, but at the same time not especially higher that the rest of the performance measures except ROE. Since the Spearman test is merely a rank test it is quite robust and should therefore be able to reject the null hypothesis more often compared to common linear correlation tests. However, with this in mind the Spearman test shows only two variables tendency to have the same signs and hence the test have lower explanatory power in comparison with the Pearson test. In our case all variables except ROS have a statistically significant tendency to have monotonic relationships with stock price. Therefore when analysing and comparing both tests together they uniformly show that statistically significant relationships in terms of correlation exists for the measures ROCE, ROA, EVA and SVA with stock price.

### 4.3 Results for single measures

After the correlation analysis, tests on panel data were conducted to provide a better idea of the statistical significance each variable had in relation to shareholder wealth. Table 4-3 below summarizes all the individual regressions performed.
The coefficient for each independent variable varies quite a lot. A change in the two market based measures will not cause stock price to move in any significant way since these performance measures are absolute numbers that are scaled. For example, if SVA increases by 1,000,000 SEK, stock price would increase by 3.157 SEK. The accounting based measures are ratios based on percentages, hence only a slight change in ROA or ROCE will cause the stock price to change dramatically. If ROA increases by 1%, stock price increases by 1.801 SEK.

<table>
<thead>
<tr>
<th>Panel Data Results (Authors’ table)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table 4</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Coefficient for each independent variable varies quite a lot. A change in the two market based measures will not cause stock price to move in any significant way since these performance measures are absolute numbers that are scaled. For example, if SVA increases by 1,000,000 SEK, stock price would increase by 3.157 SEK. The accounting based measures are ratios based on percentages, hence only a slight change in ROA or ROCE will cause the stock price to change dramatically. If ROA increases by 1%, stock price increases by 1.801 SEK.</strong></td>
</tr>
</tbody>
</table>

---

**Note:** The table above provides the coefficient estimates for various independent variables, indicating the impact on stock price. The significance levels are also indicated (e.g., *** indicates p < 0.01). The model includes controls for various firm characteristics to ensure robustness of the results.
The first step in our analysis was to decide upon the most appropriate panel data method. The fixed- and random effects models were compared to see if any of these were more suitable. The statistics program Gretl has a built in function for this, which uses several tests for verifying the most appropriate model. The Hausman-test was one of these, indicating that for several variables (EVA, ROA and ROCE) the fixed effect model was superior in comparison. Out of the four significant variable three out of four Hausman tests were rejected. ROS and ROE were not rejected regardless of model and their preference of model will be ignored. According to figure 3-1 after performing both fixed effects and random effects regressions, the fixed effect model should be used if this is indicated by a Hausman test.

It is complex comparing and analysing the findings from these three models, all the coefficients and errors seem quite similar to each other regardless of the type of models. The variables EVA, ROA, ROCE and SVA were clearly rejected, the same p-values and t-ratios were clearly statistically significant for every model. Including a control variable seem to have a minor effect, both tables rejects the same variables. However, the variable SVA got less significant when not adding the control variable, but is still significant at the 5% or 10% level. The fixed model suggests that ROS should have a negative beta-coefficient, although not affecting stock price in any considerable way. ROE did not influence stock price statistically nor did the metric have high linear correlation. Abowed (1990) showed that there was no statistical evidence that after-tax return on equity had any effect on stock price and our results based on our data tell the same story. These findings tell us that each company has different intercepts and that there seem to be relationships between our dependent variable and four of the independent variables (EVA, ROA, ROCE and SVA).

### 4.4 Explanatory power

Simple regression models were used to determine the R-square of each variable in order to assess the explanatory power of each variable. As can be seen in table 4-5 the coefficient of determination show tendencies to match those in the correlation table 4-3. Actually, these results show that the R-squares have the same ranking according to size as in our Pearson correlation test, indicating that some variables indeed contains more explanatory power of our dependent variable compared to other.

| R-squared |  
|-----------|----------|
| roe       | 0.2047   |
| roce      | 0.3377   |
| roa       | 0.3198   |
| ros       | 0.0191   |
| eva       | 0.3373   |
| sva       | 0.2353   |

Table 4-5. Coefficient of determination single regressions (Authors’ table)

Woolridge (2009) claims that the R-squared for dummy variables regression it is usually somewhat higher compared to more common regression models such as the pooled OLS model. Despite this, the measure can still explain how the variables in terms of explanatory
power relate to each other. The most obvious result is that the explanatory power in ROS is very low, especially if one bear in mind that a fixed dummy regression of panel data often produces R-squares containing a certain amount of inflation. It is reasonable to assume that ROS is unlikely to have much in common with changes in shareholder wealth when evaluating the goodness of fit. Brown and Hagel (2010) showed the same result in their study that ROS is inferior compared to ROA. Arbsalehi and Mahmoodi (2011) found that the R-squared for ROA was higher compared to SVA, ROS and ROE. It is interesting to note, that EVA has close to the same explanatory power and correlation as more traditional accounting based measures. Again, these results are consistent with Arbsalehi’s and Mahmoodi’s (2011) findings, who also could not state that market based measures were superior to accounting based. It does however point to the fact that, choosing any performance measure should be done after careful consideration.

4.5 Multivariate Regressions, Pairwise combination tests

As stated in the method section, in order to maintain consistency in our methodical approach, the fixed dummy model chosen to test the relationship between the dependent and one independent variable will also be adopted for the multiple regressions. The main idea is to see if combining two rather different measures can add explanatory power.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVA &amp; ROA</td>
<td>eva</td>
<td>2.30066e-06</td>
<td>7.03258e-07</td>
</tr>
<tr>
<td></td>
<td>roa</td>
<td>90.5927</td>
<td>46.8652</td>
</tr>
<tr>
<td>EVA &amp; ROCE</td>
<td>eva</td>
<td>2.16993e-06</td>
<td>6.56944e-07</td>
</tr>
<tr>
<td></td>
<td>roce</td>
<td>106.325</td>
<td>32.4244</td>
</tr>
<tr>
<td>SVA &amp; ROA</td>
<td>sva</td>
<td>-1.245e-06</td>
<td>8.7243e-07</td>
</tr>
<tr>
<td></td>
<td>roa</td>
<td>186.211</td>
<td>45.5242</td>
</tr>
<tr>
<td>SVA &amp; ROCE</td>
<td>sva</td>
<td>-1.42214e-06</td>
<td>8.62675e-07</td>
</tr>
<tr>
<td></td>
<td>roce</td>
<td>137.808</td>
<td>33.3293</td>
</tr>
</tbody>
</table>

Note:* significant at 0.10; ** significant at 0.05; ***significant at 0.01.

Table 4-6. Additional content test of panel data (Authors’ table)

According to the table, the models consisting of EVA in combination with any of the two accounting based measures provides p-values that are statistically significant for both independent variables. The model combining EVA and ROA rejects both independent variables at a 1% level. The table also shows that SVA loses its significance in a multiple regression. Stewart (1991) argued that the most appropriate measure of performance is EVA, even among most of the common market based measures.

Arbsalehi and Mahmoodi (2011) also concluded that combining EVA and ROA produced a highly statistically significant model. In their paper they did manage to reject both variables SVA+ROA, but only at a higher level of significance. One reason might be that they had access to much more data hence could perform tests based on a larger number of observations.
Table 4-7. Coefficient of determination pairwise tests (Authors table)

<table>
<thead>
<tr>
<th></th>
<th>R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>roce &amp; eva</td>
<td>0.3646</td>
</tr>
<tr>
<td>roa &amp; eva</td>
<td>0.3473</td>
</tr>
<tr>
<td>roce &amp; sva</td>
<td>0.2653</td>
</tr>
<tr>
<td>roa &amp; sva</td>
<td>0.3252</td>
</tr>
</tbody>
</table>

SVA was proven to not be statistically significant in a multivariate test. The pairwise combination of ROCE with EVA increases the explanatory power in explaining shareholder wealth. Although all the four combinations have R-squares in the range of 26%< R-squared <36%, using both value- and market based measures together add only slightly to the information content compared to using a single of the four measures. These results are consistent with those found by Arabsalehi and Mahmoodi (2011) as well as Biddle et al. (1997), who revealed similar results when evaluating pairwise combinations of market- and accounting based performance measures.

One measurement seem to capture most of the explanatory power in stock price questioning the usefulness of combining two measures. If one assumes that there is a time and economic cost attached to producing accounting figures in annual accounts, one might question if the benefits outweighs the costs in attempting to provide more advance measures. It would seem that one measure is enough, if this is true perhaps it would be more reasonable to focus on finding one alternative that is better than all the others.
5 Conclusion

In this chapter we present the conclusions made in the light of the analysis.

The purpose of this thesis was to choose from previous research relevant key ratios and performance measures which lend themselves as a basis for management performance evaluation. After selection, we further analyzed the statistical relationships between the measures and their influence on stock price.

To answer the first research question the selected performance metrics were subjected to statistical tests in order to compare if any of the measurements possessed more predictive power when it came to explaining stock price movements?

According to our findings, ROE and ROS showed no evidence of having statistically significant relationships with changes in shareholder wealth. This holds regardless of statistical model. Surprisingly, ROE showed no signs of being related to stock price, even though being one of the most commonly used performance measure. Changes in these performance measures will most likely not cause or influence changes in stock price. EVA, ROA, ROCE and SVA were all significant, again without regard of statistical panel data model, indicating that these metrics are related to stock price changes.

After evaluating correlation tests between the performance measures and stock price, we arrived at the conclusion that some measures are more appropriate than others, while some were even insignificant. Among the significant measures, there were no major differences in prediction- or explanatory power, with the exclusion of SVA. EVA, ROCE and ROA were consistently more adept, as shown by higher R-squares and higher correlation values, in both the Pearson and the Spearman tests. The individual variable tests (correlation, panel data test and R-squared) all provided next to no incentive to use either ROE or ROS as a basis for management performance evaluation.

The second research question was the idea that combining market based and accounting based measures might excel at explaining/predicting changes shareholder value in comparison to using only one measure.

Our pairwise combination tests of one market based measure and one accounting based measure revealed that explanatory power did not increase in any significant way. Since combining measures adds only marginally to explanatory power, based on these results, it indicates that there is no major benefit in doing so. As can be seen in table 4-5, combining SVA with other measures made SVA lose its significance, as it was no longer significant even at the 10% level. It would appear that combining market and accounting measures add only slightly to information content, as compared to only using one of either kind.

Based on our findings we conclude that there appear to be more or less suitable accounting based measures. ROCE and ROA stand out as good candidates and EVA and SVA also appear to be good candidates from the market based measures. Combining a market and accounting measure does not capture any significant additional information.
5.1 Further Research

As a suggestion for further research we want to suggest using databases with better volume of data in order to be able to make generalizations when arriving at a conclusion included measurements. In addition, more measurements can be included as independent variables as to be able to discriminate between appropriate and inappropriate measures in this narrow context.

When more measures are included, the number of possible combinations can be increased which can be studied further so as to identify better combinations of two or more variables. These combinations of measurements can then be used by shareholders to evaluate management more accurately and may form the foundation for reward systems.

In this thesis we opted to use CAPM to estimate the cost of capital when calculating the market based variables (EVA and SVA). There are other, perhaps more appropriate approaches to doing this, such as using arbitrage pricing theory (APT) or Gordon growth model. In line with previous research we also opted to use stock prices as dependent variable, measurements can be put in relation to other, perhaps more appropriate measures of changes in shareholder value. Examples of this could be market value added (MVA) or Tobin's Q. This would of course require preceding studies to see which measure best captures changes in value for the shareholders.

5.2 Discussion

The literature that formed the basic framework for our thesis suggested it is imperative to move away from stocks as rewards for several reasons. One of them being that rewards of management should be tied to a firms accounting, not on changes in the firm's stock price caused by expectations in the stock market. If management holds stocks in the company the shareholders - through board of directors - lose the ability to give reward or punishment for whatever the result is. Another reason was that the performance of management cannot be measured in stock price, rather it should be measured on something that stems from the firms accounting. It is true that accounting numbers can be manipulated by management to some extent even when shareholders use external auditors, but the market value of the stock is not within management's grasp. It can be considered illogical to base someone's rewards on something they cannot affect.

When it comes to selecting an appropriate accounting related measure to be able to gauge how well management is doing, there are several possible candidates. ROS for example, did not perform well as measured by correlation nor r-square. ROE however, did decently when it comes to correlation. Both of these ratios are easy to calculate and sometimes is provided by companies in their annual accounts. If shareholders want to be certain that the metric they choose to base rewards on do well both in terms of correlation and r-square, they should look to one of the other four metrics studied in this thesis.

For example, ROA and ROCE performed quite well, as did SVA and EVA. One might, however, question the use of market based metrics as accounting measures seem to do the job well enough. ROA and ROCE can be calculated using only numbers already present in the accounting while the two market based ones need market values provided through the use of CAPM. Assuming that market based measures provide no more information in relation to the changes in shareholder value, then the added cost of calculating these numbers
can be called into question. Often practitioners prefer simple methods over complicated ones and in that sense, they should perhaps look into the simpler accounting based measures ROA and ROCE.

The act of measurement will always be important, no matter what field one works in. Many fields of sciences put great importance on correct measurements. Examples of such fields might be technical physics, engineering, particle physics and the list goes on. The wide field of economics and the more narrow field of compensation programs also rely on accurate measurements. The need for accurate measures of performance extends beyond that of faceless shareholders. Today, in Sweden most of the population are indeed shareholders, through the act of pension systems. It ought to be in everyone’s best interests, that management reap no more rewards than they have earned, that there is a clear connection between performance and compensation.

Perhaps, when and if a superior performance measure is found, we might no longer see news articles in the press questioning large rewards for management. If the connection between rewards and performance is clear, this discussion might come to an end.
6 List of references


Occupy Wall Street, 2013, retrieved 2013-01-17 http://occupywallst.org/


Appendices

A1 Government bonds

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A2 Market rate data (market premium)

Appendix A2. Market premium rate (PWC).
**A3 Corporate tax rate data**

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Appendix A3. Swedish corporate tax rate (Ekonomifakta).
### A4 Companies included

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Appendix A4. Companies included (Authors appendix).
A5 Histograms of the six variables
A6 Panel Tests

Model EVA: Fixed-effects, using 297 observations
 INCLUDED 33 cross-sectional units
 Time-series length = 9
 Dependent variable: kurs
 Robust (HAC) standard errors

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R-squared 0.337318 Adjusted R-squared 0.231234
F(41, 255) 3.171525 P-value(F) 1.29e-08
Log-likelihood -1654.089 Akaike criterion 3392.178
Schwarz criterion 3547.315 Hannan-Quinn 3454.285
rho 0.034557 Durbin-Watson 1.714529

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(32, 255) = 2.35022
with p-value = P(F(32, 255) > 2.35022) = 0.000130914

Model ROA: Fixed-effects, using 297 observations
 INCLUDED 33 cross-sectional units
 Time-series length = 9
 Dependent variable: kurs
 Robust (HAC) standard errors

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F(41, 255)  2.924402  P-value(F)  1.39e-07
Log-likelihood  -1658.049  Akaike criterion  3400.098
Schwarz criterion  3555.235  Hannan-Quinn  3462.205
rho  0.003870  Durbin-Watson  1.715664

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(32, 255) = 2.20063
with p-value = P(F(32, 255) > 2.20063) = 0.000406858

Model ROCE: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs
Robust (HAC) standard errors

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R-squared  0.319820  Adjusted R-squared  0.210457
F(41, 255)  2.924402  P-value(F)  1.39e-07
Log-likelihood  -1658.049  Akaike criterion  3400.098
Schwarz criterion  3555.235  Hannan-Quinn  3462.205
rho  0.003870  Durbin-Watson  1.715664

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(32, 255) = 2.11822
with p-value = P(F(32, 255) > 2.11822) = 0.000750058

Model ROE: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs
Robust (HAC) standard errors
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R-squared 0.204753  Adjusted R-squared 0.165806
F(41, 255) 2.434968  P-value(F) 0.000014
Log-likelihood -1666.218  Akaike criterion 3416.436
Schwarz criterion 3571.573  Hannan-Quinn 3478.543
rho 0.011074  Durbin-Watson 1.710833

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(32, 255) = 2.39406
with p-value = P(F(32, 255) > 2.39406) = 9.34297e-005

Model ROS: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs
Robust (HAC) standard errors
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R-squared 0.019092  Adjusted R-squared 0.013155
F(41, 255) 2.428213  P-value(F) 0.000014
Log-likelihood -1666.334  Akaike criterion 3416.668
Schwarz criterion 3571.573  Hannan-Quinn 3478.775
Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(32, 223) = 1.80511
with p-value = P(F(32, 223) > 1.80511) = 0.00744317

Wald test for joint significance of time dummies
Asymptotic test statistic: Chi-square(7) = 0.626344
with p-value = 0.99884

Model EVA: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

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<td>0.0817</td>
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<td>18.3536</td>
<td>0.1734</td>
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<td>dt_7</td>
<td>4.76237</td>
<td>18.3027</td>
<td>0.2602</td>
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<td>dt_8</td>
<td>-2.31936</td>
<td>18.2763</td>
<td>-0.1269</td>
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</table>

Mean dependent var 112.4486  S.D. dependent var 78.13901
Sum squared resid 1227841  S.E. of regression 74.20252
R-squared 0.235371  Adjusted R-squared 0.098218
F(40, 223) 1.716121  P-value(F) 0.007896
Log-likelihood -1489.316  Akaike criterion 3060.632
Schwarz criterion 3207.246  Hannan-Quinn 3119.546
rho -0.046366  Durbin-Watson 1.851238

Test for differing group intercepts -
Null hypothesis: The groups have a common intercept
Test statistic: F(32, 223) = 1.80511
with p-value = P(F(32, 223) > 1.80511) = 0.00744317

Wald test for joint significance of time dummies
Asymptotic test statistic: Chi-square(7) = 0.626344
with p-value = 0.99884

Model EVA: Pooled OLS, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
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<tbody>
<tr>
<td>const</td>
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<td>5.38966</td>
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<td>eva</td>
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<td>6.62831e-07</td>
<td>4.7126</td>
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</tbody>
</table>

rho 0.013838  Durbin-Watson 1.705381
Mean dependent var | 108.1680 | S.D. dependent var | 78.10881
Sum squared resid   | 1679455 | S.E. of regression | 75.45242
R-squared           | 0.070013| Adjusted R-squared | 0.066861
F(1, 295)           | 22.20888| P-value(F)         | 3.77e-06
Log-likelihood      | -1704.502| Akaike criterion  | 3413.003
Schwarz criterion   | 3420.391| Hannan-Quinn      | 3415.961
rho                 | 0.201553| Durbin-Watson     | 1.400005

Model ROA: Pooled OLS, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
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<tbody>
<tr>
<td>const</td>
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<td>6.3862</td>
<td>13.9129</td>
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<tr>
<td>roa</td>
<td>180.804</td>
<td>43.2226</td>
<td>4.1831</td>
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</table>

Model ROCE: Pooled OLS, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
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<th>p-value</th>
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<tr>
<td>const</td>
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<td>6.34766</td>
<td>13.4441</td>
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<td>roce</td>
<td>154.786</td>
<td>31.2638</td>
<td>4.9510</td>
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Model ROE: Pooled OLS, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
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<th>Coefficient</th>
<th>Std. Error</th>
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<th>p-value</th>
</tr>
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<tbody>
<tr>
<td>const</td>
<td>107.084</td>
<td>4.8477</td>
<td>22.0897</td>
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<tr>
<td>roe</td>
<td>0.0494938</td>
<td>0.0779954</td>
<td>0.6346</td>
</tr>
</tbody>
</table>

Mean dependent var | 108.1680 | S.D. dependent var | 78.10881 |
Sum squared resid | 1803430 | S.E. of regression | 78.18774 |
R-squared | 0.001363 | Adjusted R-squared | -0.002022 |
F(1, 295) | 0.402683 | P-value(F) | 0.526199 |
Log-likelihood | -1715.078 | Akaike criterion | 3434.156 |
Schwarz criterion | 3441.543 | Hannan-Quinn | 3437.113 |
rho | 0.195344 | Durbin-Watson | 1.378214 |

Model ROS: Pooled OLS, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
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</table>

Mean dependent var | 108.1680 | S.D. dependent var | 78.10881 |
Sum squared resid | 1804964 | S.E. of regression | 78.22099 |
R-squared | 0.000513 | Adjusted R-squared | -0.002875 |
F(1, 295) | 0.151550 | P-value(F) | 0.697339 |
Log-likelihood | -1715.204 | Akaike criterion | 3434.408 |
Schwarz criterion | 3441.796 | Hannan-Quinn | 3437.366 |
rho | 0.196344 | Durbin-Watson | 1.375408 |

Model SVA: Pooled OLS, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
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<tbody>
<tr>
<td>const</td>
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<td>sva</td>
<td>3.1573e-06</td>
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<td>3.0882</td>
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Mean dependent var | 112.4486 | S.D. dependent var | 78.13901 |
Sum squared resid | 1549403 | S.E. of regression | 76.90091 |
R-squared | 0.035121 | Adjusted R-squared | 0.031439 |
F(1, 262) | 9.536767 | P-value(F) | 0.002230 |
Model EVA: Random-effects (GLS), using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
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<th>p-value</th>
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<tbody>
<tr>
<td>const</td>
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<td>6.6881</td>
<td>14.1023</td>
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<tr>
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<td>2.91864e-06</td>
<td>6.36984e-07</td>
<td>4.5820</td>
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Mean dependent var 108.1680
S.D. dependent var 78.10881
S.E. of regression 75.33708
Akaike criterion 3413.099
Schwarz criterion 3420.487
Hannan-Quinn criterion 3416.057

'Within' variance = 5036.55
'Between' variance = 1167.96
theta used for quasi-demeaning = 0.3078

Hausman test:
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(1) = 2.88925
with p-value = 0.0891724

Model ROA: Random-effects (GLS), using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
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<tr>
<td>const</td>
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<td>7.28982</td>
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<tr>
<td>roa</td>
<td>162.557</td>
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Mean dependent var 108.1680
S.D. dependent var 78.10881
S.E. of regression 75.91339
Akaike criterion 3417.626
Schwarz criterion 3425.014
Hannan-Quinn criterion 3420.584

'Within' variance = 5172
'Between' variance = 1067.77
theta used for quasi-demeaning = 0.266382

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(1) = 5.15084
with p-value = 0.0232351

Model ROCE: Random-effects (GLS), using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
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Mean dependent var | 108.1680 | S.D. dependent var | 78.10881 |
Sum squared resid | 1668428  | S.E. of regression | 75.07716 |
Log-likelihood    | -1703.523| Akaike criterion  | 3411.047 |
Schwarz criterion | 3418.434 | Hannan-Quinn      | 3414.004 |

'Within' variance = 5096.49
'Between' variance = 968.385
theta used for quasi-demeaning = 0.235301

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(1) = 6.90608
with p-value = 0.00859031

Model ROE: Random-effects (GLS), using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
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<th>p-value</th>
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<td>0.0360609</td>
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<td>0.4776</td>
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Mean dependent var | 108.1680 | S.D. dependent var | 78.10881 |
Sum squared resid | 1803611  | S.E. of regression | 78.05947 |
Log-likelihood    | -1715.093| Akaike criterion  | 3434.186 |
Schwarz criterion | 3441.573 | Hannan-Quinn      | 3437.143 |

'Within' variance = 5372.83
'Between' variance = 1381.59
theta used for quasi-demeaning = 0.34266

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(1) = 0.426481
with p-value = 0.513721

Model ROS: Random-effects (GLS), using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
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<th>t-ratio</th>
<th>p-value</th>
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<tr>
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</table>

Mean dependent var 108.1680 S.D. dependent var 78.10881
Sum squared resid 1805206 S.E. of regression 78.09399
Log-likelihood -1715.224 Akaike criterion 3434.448
Schwarz criterion 3441.836 Hannan-Quinn 3437.406

'Within' variance = 5374.86
'Between' variance = 1378.15
theta used for quasi-demeaning = 0.341715

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(1) = 0.5963
with p-value = 0.439993

Model SVA: Random-effects (GLS), using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
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<tbody>
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<td>15.3798</td>
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<tr>
<td>sva</td>
<td>3.11109e-06</td>
<td>9.89983e-07</td>
<td>3.1426</td>
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</table>

Mean dependent var 112.4486 S.D. dependent var 78.13901
Sum squared resid 1549415 S.E. of regression 76.75487
Log-likelihood -1520.022 Akaike criterion 3044.048
Schwarz criterion 3051.195 Hannan-Quinn 3046.917
'Within' variance = 5353.43
'Between' variance = 1280.01
theta used for quasi-demeaning = 0.276956

Hausman test -
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(1) = 0.0688642
with p-value = 0.792998

Model EVA+ROA: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
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<th>p-value</th>
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<tbody>
<tr>
<td>const</td>
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<tr>
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<td>7.03258e-07</td>
<td>3.2714  0.00122 ***</td>
</tr>
<tr>
<td>roa</td>
<td>90.5927</td>
<td>46.8652</td>
<td>1.9330  0.05434 *</td>
</tr>
<tr>
<td>dt_2</td>
<td>-35.1979</td>
<td>16.7782</td>
<td>-2.0978 0.03691 **</td>
</tr>
<tr>
<td>dt_3</td>
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<td>16.7719</td>
<td>-2.7075 0.00724 ***</td>
</tr>
<tr>
<td>dt_4</td>
<td>-6.26802</td>
<td>16.7883</td>
<td>-0.3734 0.70919</td>
</tr>
<tr>
<td>dt_5</td>
<td>-35.5087</td>
<td>16.7897</td>
<td>-2.1149 0.03541 **</td>
</tr>
<tr>
<td>dt_6</td>
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<td>16.821</td>
<td>-2.8518 0.00470 ***</td>
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<tr>
<td>dt_7</td>
<td>11.0651</td>
<td>16.7768</td>
<td>0.6595  0.51014</td>
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<td>dt_8</td>
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<td>16.8046</td>
<td>-1.8878 0.06019 *</td>
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<tr>
<td>dt_9</td>
<td>-51.4819</td>
<td>16.8011</td>
<td>-3.0642 0.00242 ***</td>
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</table>

Mean dependent var | 108.1680 | S.D. dependent var | 78.10881
Sum squared resid | 1178669  | S.E. of regression | 68.12070
R-squared | 0.347320 | Adjusted R-squared | 0.239397
F(42, 254) | 3.218208 | P-value(F) | 6.32e-09
Log-likelihood | -1651.920 | Akaike criterion | 3389.840
Schwarz criterion | 3548.671 | Hannan-Quinn | 3453.426
rho | 0.026866 | Durbin-Watson | 1.715291

Model EVA+ROCE: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>const</td>
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<td>12.4559</td>
<td>8.8291  &lt;0.00001 ***</td>
</tr>
<tr>
<td>eva</td>
<td>2.16993e-06</td>
<td>6.56944e-07</td>
<td>3.3031  0.00109 ***</td>
</tr>
<tr>
<td>roce</td>
<td>106.325</td>
<td>32.4244</td>
<td>3.2792  0.00119 ***</td>
</tr>
<tr>
<td>dt_2</td>
<td>-37.7826</td>
<td>16.5826</td>
<td>-2.2784 0.02353 **</td>
</tr>
<tr>
<td>dt_3</td>
<td>-46.1957</td>
<td>16.5472</td>
<td>-2.7918 0.00564 ***</td>
</tr>
<tr>
<td>dt_4</td>
<td>-3.81206</td>
<td>16.5906</td>
<td>-0.2298 0.81845</td>
</tr>
</tbody>
</table>
dt_5   -37.8301  16.5889  -2.2804  0.02341    **
dt_6   -48.9118  16.5842  -2.9493  0.00348    ***
dt_7   11.5745  16.5521   0.6993  0.48502

dt_8   -34.6248  16.6163  -2.0838  0.03818    **
dt_9   -52.4202  16.5757  -3.1625  0.0017    ***

Mean dependent var 108.1680  S.D. dependent var 78.10881
Sum squared resid 1147433  S.E. of regression 67.21199
R-squared 0.364617  Adjusted R-squared 0.259554
F(42, 254) 3.470450  P-value(F) 5.36e-10
Log-likelihood -1647.932  Akaike criterion 3381.863
Schwarz criterion 3540.694  Hannan-Quinn 3445.449
rho 0.014747  Durbin-Watson 1.723872

Model SVA+ROA: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
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<tbody>
<tr>
<td>const</td>
<td>117.735</td>
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<td>9.2384</td>
</tr>
</tbody>
</table>
| sva         | -1.245e-06 | 8.7243e-07 | -1.4271 | 0.15479
| roa         | 186.211    | 45.5242 | 4.0904  | 0.00006    *** |
| dt_2        | -35.4675   | 17.0635 | -2.0786 | 0.03866    **
| dt_3        | -46.385    | 17.0677 | -2.7177 | 0.00703    ***
| dt_4        | -7.41829   | 17.0838 | -0.4342 | 0.66449
| dt_5        | -35.4277   | 17.0838 | -0.4342 | 0.66449
| dt_6        | -47.2657   | 17.118  | -2.7612 | 0.00618    ***
| dt_7        | 7.99674    | 17.0851 | 0.4681  | 0.64015
| dt_8        | -31.2328   | 17.1053 | -1.8259 | 0.06904    *
| dt_9        | -52.1072   | 17.1053 | -3.0462 | 0.00256    ***

Mean dependent var 108.1680  S.D. dependent var 78.10881
Sum squared resid 1218562  S.E. of regression 69.26391
R-squared 0.325230  Adjusted R-squared 0.213653
F(42, 254) 2.914865  P-value(F) 1.21e-07
Log-likelihood -1656.863  Akaike criterion 3399.726
Schwarz criterion 3558.557  Hannan-Quinn 3463.312
rho 0.001668  Durbin-Watson 1.707788

Model SVA+ROCE: Fixed-effects, using 297 observations
Included 33 cross-sectional units
Time-series length = 9
Dependent variable: kurs

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>const</td>
<td>90.1082</td>
<td>6.212</td>
<td>14.5055</td>
</tr>
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</table>
| sva         | -1.42214e-06 | 8.62675e-07 | -1.6485 | 0.10044

59
When referring to efficient capital markets people usually imply that all information available is reflected in each security’s respective price (Elton, Gruber, Brown & Goetzmann, 2011). However since the costs associated with information are clearly positive, perhaps a more accurate definition would be that information is reflected in prices only until the marginal costs equals the marginal benefits of trading using this information. Research in finance has heavily been dedicated to event studies, which includes investigating the effect announcements have on share prices (Kraus & Stoll 1972). The overall conclusion was that markets are indeed efficient. This study allow suggested that accomplishments and announcements made by companies are actually reflected in stock prices to some degree. This supports our view that historical stock prices serves as a good variable when investigating the existence of a relationship between CEO compensation and shareholder wealth.

The central limit theorem is a widely known statistical theory that exists in a number of different varieties, though with the same strong theoretical basis. The theorem states that the mean of a large number of independent variables will be normally distributed. In statistics, normal distributions are very important and often used in social science for variables whose distributions are unknown. The central limit theorem hence claims that the mean of an actual and observable sample tends to be normally distributed in spite of the distribution of the population. Samples of 30 or more observations are viewed as being sufficiently large enough to assume normal distribution under the central limit theorem. This theory is related to the law of large numbers where, as the sample size grows towards infinity, the sample mean approaches the true population’s mean (Aczel & Sounderpandian, 2009).

The simplest example of normal distribution would be rolling two dices constantly and for an eternity. The sum of the them would appear random at first, but eventually the sum of seven would appear more frequently than for example a sum of two. Real world events are harder to explain since researcher tend not to know the actual mean and probability distribution of the population. This justifies the use of the central limit theorem and the assumption of normal distribution in controlled tests (Aczel & Sounderpandian, 2009).