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Exploring the Relationship between Accounting, Stock Market, and R&D Measures on Economic Value Added (EVA): An Empirical Analysis

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Description

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Abstract

The concept of Economic Value Added (EVA) as a firm performance measurement tool has been the topic of multiple research papers over time. The investigation of the impact of various variables on EVA was an intriguing topic and motivated the researcher to provide further insight into the matter. The empirical evidence and theoretical background inspired the researcher to form two research questions and three hypotheses. Firstly, the objective was to observe a possible mutual causation between traditional accounting measures, stock market measures, and EVA. Secondly, the researcher investigated the effect of research and development expenditure on EVA.

The nature of the research guided the approach towards a quantitative study. Quantitative methods were used to interpret the data according to the research objectives. The methods were employed to make observations on fifty companies based in the United States over a three-year period. Data was acquired from the annual income statements of each company and their stock market records. Calculations based on formulas were made to acquire the needed variables for further analysis and conclusion. Qualitative methods were also used as a complementary resource to facilitate a more comprehensive understanding and evaluation of the hypotheses.

Based on the information that was acquired, an empirical analysis was used to investigate the research questions and hypotheses through a regression model made from the gathered variables. The analysis of the empirical part of the research showed that the results partly supported the hypotheses, but there was no reliable evidence of every measure influencing EVA. While two of the three hypotheses were partly supported in the regression analysis, it's important to note that other factors outside of the variables used in the regression analysis might have had a significant impact on EVA, making the studied variables only partly responsible of the value creation process. The partial support for the hypotheses suggests that there is still much to be explored in this subject matter, and that further research may be needed to fully understand the complexities of the relationships between traditional accounting measures, stock market measures, R&D expenditure, and EVA. These findings highlight the importance of using a multi-dimensional approach when evaluating firm performance, and the need for a deeper understanding of the different variables that contribute to value creation.

Keywords/tags (subjects)

Economic Value Added, EVA, Return on Equity, Return on Assets, R&D, Cost of Equity

Salmi, Perttu

Tutkimus kirjanpito-, pörssi- ja tutkimus&kehitys -mittareiden vaikutuksesta taloudelliseen lisäarvoon (EVA): empiirinen analyysi

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Tiivistelmä

Taloudellisen lisäarvon (EVA) käsite yritysten taloudellisen suorituskyvyn mittarina on ollut aiheena usealle tutkimukselle. Erilaisten muuttujien vaikutuksen tutkiminen EVA:han oli kiehtova aihe, joka motivoi tutkijaa tutkimaan ja selvittämään lisätietoa aiheesta. Empiiriset näytöt sekä teoreettinen tausta innoittivat tutkijaa muodostamaan aiheesta kaksi tutkimuskysymystä ja kolme hypoteesia. Tavoitteena oli havaita mahdollinen keskinäinen syy-yhteys perinteisten kirjanpitotoimenpiteiden, osakemarkkinamittareiden, sekä EVA:n välillä. Toiseksi tutkija tutki tutkimus- ja kehittämiskulujen vaikutusta EVA:han.

Tutkimuksen luonteen takia tutkimustavaksi valikoitui määrällinen tutkimustapa. Määrällisiä menetelmiä käytettiin aineiston tulkintaan tutkimustavoitteiden mukaisesti. Menetelmiä käytettiin viidenkymmenen Yhdysvalloissa sijaitsevan yrityksen havainnointiin kolmen vuoden aikajänteeltä. Tiedot hankittiin kunkin yrityksen vuosittaisista tuloslaskelmista ja yritysten pörssitiedoista. Kaavoihin perustuvia laskelmia tehtiin, jotta saataisiin tarvittavat muuttujat jatkoanalyysiä ja johtopäätöksiä varten. Laadullisia menetelmiä käytettiin myös täydentävinä resursseina hypoteesien kattavamman ymmärtämisen ja arvioinnin helpottamiseksi.

Hankittujen tietojen perusteella käytettiin empiiristä analyysia tutkimuskysymysten ja hypoteesien tutkimiseksi. Tämä toteutettiin kerätyistä muuttujista laaditun regressiomallin avulla. Tutkimuksen empiirisen osan analyysi osoitti, että vaikka tulokset tukivatkin osittain hypoteeseja, ei ollut luotettavaa näyttöä siitä että jokainen toimenpide vaikuttaisi EVA:han. Kaksi kolmesta hypoteesista sai osittaista tukea regressioanalyysissä, mutta on olennaista huomata, että muilla regressioanalyysissä käytettyjen muuttujien ulkopuolisilla tekijöillä saattoi olla merkittävä vaikutus EVA:han. Tutkitut muuttujat olivat tässä tapauksessa vain osittain vastuussa arvonluontiprosessista. Hypoteeseissa osoitettujen oletusten osittainen tuki viittaa siihen, että aihepiirissä on vielä paljon tutkittavaa ja että lisätutkimuksia saatetaan tarvita, jotta perinteisten kirjanpitomittareiden, pörssimarkkinamittareiden, T&K-menojen ja EVA:n välisten suhteiden monimutkaisuutta voidaan ymmärtää täysin. Nämä tulokset korostavat moniulotteisen lähestymistavan käytön tärkeyttä, kun arvioidaan yrityksen suorituskykyä ja tarvetta ymmärtää syvällisemmin arvon luomiseen vaikuttavia eri muuttujia.

Avainsanat (Asiasanat)

Taloudellinen lisäarvo, Oman pääoman tuotto, Kokonaispääoman tuotto, Pääomakustannus

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1 Introduction

In the introduction chapter, the author is going to go through different subtitles related to making the reader acquainted with the background, motivation, research questions, and structure of the thesis, which divides the introduction chapter into four different parts.

1.1 Background

Investors need to find use for their capital and in order to do this, they need to take different variables in to consideration. Corporate performance plays a great role in the process of making investment decisions. The company has certain parameters that need to be accomplished adquately. These include but are not limited to financial, market, and shareholder performance. Corporate performance is a mixture of most important parameteres. Eventually, measuring the corporate performance can be done with numerous different ways. Johnson and Kaplan (1987) argue against traditional accounting measurements by emphasizing on the fact that the horizon of the managers is very short-term due to their need to produce a quarterly profit and loss statement. This leads to considering a good deal of cash expenditures as expenses for the period they are made in even though they may be of service for future periods. For example, cash can be directed towards innovative products and production processes, training employees, and overall improvement of the company to produce future cash flows in the coming periods. The above study further argues that a very traditional measure, return on investment (ROI), makes financial managers rely primarily on periodic financial statements. The value creation in this situation may be overlooked in search of short-term success.

The reason for developing performance measures for corporations in the first place has been to keep track of and maintain the strategic processes in the organization and to achieve the general goals and objectives. Performance measures have a crucial role as future indicators for the management to predict company's economic success and specify the need of any possible changes in the firm's operation strategy. Organiations face an arduous task when making the decision of which performance measures to use when monitoring the economic success of the company.

A major limitation of the traditional accounting measures allows the companies to bend them to try to meet the expectations of investors. If accountants believe that equity capital comes without a cost, they are making a crucial mistake. Cost of equity is an opportunity cost, because the company needs investors, and the investors need to receive a return for their investment. If the company cannot provide a comfortable return when considering the risk of the investment for the investors, they will look for more lucrative possibilities elsewhere. The company will only be profitable after it can secure the opportunity cost of their equity capital. If the investor wants to take opportunity cost into account, there must be a way of calculating the value creation process more precisely. Economic Value Added (hereafter, EVA) works as a measurement tool in this case, because it takes the cost of capital into consideration. EVA has greatly impacted the perceived value in the world of finance and it is a tool that creates a better way for investors to observe the value of a company (Phillips 2007). It is a portfolio analysis tool that determines whether the investment should be kept or liquidated to seek for better value elsewhere (Mard et al., 2004).

Besides opportunity cost, there are also other "hidden" variables that can greatly impact a company's value. The current study is going to use Research and development (hereafter, R&D) as a variable, and try to discover whether emphasizing the investments R&D creates more economic value for the company. R&D can be seen as an investment for the company, although it widely differs from a regular investment. For example, the firms gain an intangible asset by hiring specialists that have a high education and knowledge to the matter they are researching. This will create them profits, but in a different way than investing to, for example, other financial operations or infrastructure. There also lies an uncertainty when investing to R&D, because of the probability of success may be small, but the amount of success can be substantial. This means that the companies may not pass the test for the rate of return (Hall 2002). In previous research (Hall et al., 1998), there has been a correlation between the companies' expenditure on investments, and cash flow, sales, and profit. The research also points out that the Anglo-American environment is more responsive to the signals of changes in the market demand or the increased cost of external capital.

In the current research, the effect of traditional accounting measures (Return on Equity (hereafter, ROE) and Return on Assets (hereafter, ROA)) on EVA and the companies expenditure on R&D and its effect on EVA is being investigated. The companies that were used for the research are 50 randomly selected firms from the S&P500 index. The S&P500 index is a stock index that is tracking

500 large US companies and it is one of the most popularly followed equity indexes in the world. The data, which consists of stock returns and balance sheet information has been collected from a 3-year time period; which are the years 2017-2019.

The key findings of the current study so far include the fact that importance of performance measures for corporations cannot be overstated, particularly in the areas of financial, market, and shareholder performance. Traditional accounting measures, such as ROA and ROE, have been criticized for not accurately reflecting a company's profitability and their potential to create value. This is due to their failure to consider the cost of equity, which can result in companies that appear profitable on paper but are actually destroying value. To address this issue, EVA will be presented as a more accurate measurement tool that takes the cost of capital into consideration.

Moreover, the text has highlighted the unique nature of R&D investments, which have an uncertain success rate and can create profits in a different way from regular investments. This has raised the research question of whether increasing the expenditure on R&D investments can create more economic value for a company through examining the matter by using proposed EVA as a measure for value creation. Therefore, the current study examines the possible correlation and the effects between EVA and R&D expenditure, as well as other variables for 50 randomly selected firms from the S&P500 index. The following analysis will provide insights into the effectiveness of R&D investments in creating economic value and improving a company's performance, as well as finding the possible mutual causation between EVA and traditional accounting measures.

The current study will also use stock market measurement tools, such as annualized return, annualized risk, beta, effective tax rate, and market capitalization and find out their effects on EVA.

1.2 Motivation for research

Evaluating the company when making an investing decision is a crucial process and is a part of the repertoire for every rational investor. An investor must assess a company's financial performance, future prospects, and competitive advantage to make an informed investment decision. Conducting a thorough evaluation can help investors avoid potential risks and enhance the

likelihood of achieving their investment objectives. Using different performance measures to define the value of a company are a standard procedure when making investing decisions. EVA differs from traditional measures, for example ROE and ROA, because the cost of invested capital is taken into consideration. Two companies that have similar ROE/ROA might seem correspondent when measuring their success with traditional measures, but their EVA's might variate a lot, thus proving that the companies are not equally successful after all (Kyriasis & Anastassis, 2007). The author is interested to investigat whether EVA reflects the company's performance more accurately than these traditional measures, and if EVA has a correlation with the R&D spending of each company. The stock market measures and their effect on EVA is also under investigation. The effects of R&D spending can sometimes be overlooked when evaluating a business. R&D appears as a numerical value in the annual income statement, but it does not tell where the money has been spent to. The lack of previous material gives the author an opportunity to examine new findings and the author is also fascinated by the subject, and desires to find out new and different ways to measure the performance of publicly listed companies.

1.3 Research questions

The main objective of the research is to investigate the nature of EVA as a measurement tool for company performance and find out whether there is a mutual causation amongst variables that possibly have an effect on EVA. The research also has an objective to find out whether R&D expenditure positively affects EVA. Two main elements of the thesis can therefore be addressed as the research questions:

1. Does mutual causation amongst traditional accounting measures, stock market measures, and EVA exist?
2. Does R&D expenditure affect EVA?

1.4 Structure of the thesis

The research is made up of an introduction part, that includes background and motivation for the research. These subchapters explain the basic idea of the research and the motivation to start researching the open questions. The remainder of the research is divided in to five different chapters. Literature review part consists of introducing the reader with the theoretical background and methods used in the study, mainly focused on the concepts of EVA, R&D, and the variables used to build the correlation matrix and regression analysis with. It also consists of prior research

done concerning EVA. The methodology part goes more into detail about the data and the methods used to analyze it, the formulas used, and mathematics behind the research. The intend of chapter 4 is to analyze the data that MS Excel calculations and SPSS regression model have revealed. The conclusion section aims to evaluate the effectiveness of the methods employed in addressing the research questions and whether they were able to support the hypotheses, and to assess the limitations which the study may have.

2 Literature review

In the current chapter, an effort has been made to do the in-depth literature review of the core concepts and their empirical evidence. The chapter has been divided into six different parts. First part (2.1) focuses on two traditional performance measures, which the author will later compare with EVA. Second part is about the firms that have been caught of using creative bookkeeping and why this is detrimental from a fundamental viewpoint. Third part (2.3) concentrates on corporate performance and risk, and how to measure Beta. The author also introduces Weighted Average Cost of Capital (hereafter, WACC) before going into detail about EVA and the components that make up for the performance measure. The literature review is concluded by developing three different hypotheses that are emerging from the theoretical background and empirical evidence of the previous studies gained through the literature review. These hypotheses are empirically tested in chapter 4 with the data that has been gathered, calculated, and transferred into variables in MS Excel.

2.1 Traditional firm performance measures

This subchapter will focus on introducing two key firm accounting measurements used in the current research, which are ROA and ROE. The effect of ROA and ROE on EVA will be tested later in the research after introducing the theoretical background of these measurements.

Traditional accounting measures, which are used in contrast with a more modern-day value-based measure for this research, are ROA and ROE. Financial experts prioritize consistent income, making it essential for managers to focus on maximizing the company's ROA to enhance shareholder wealth. Therefore, the company must identify the factors that affect ROA (Fama & French, 2012). ROA refers to the average earnings generated per unit of assets. A higher ROA implies that the

company has attained a greater level of profit, indicating its management's ability to utilize its assets effectively (Restanti et al., 2023). In their study, Jewell & Mankin (2010) show that there are multiple different ways to calculate Return on Assets. The researchers found that in 70 finance textbooks, there were 11 different ways to calculate ROA. The most popular formula, which contributed to 40% of the sample size, used Net Income / Total Assets as the formula for ROA, and it shall be used in this research as well. The second most popular way to calculate ROA in the above research was Net Income / Average Total Assets, and the third most popular formula was (Net Income + Interest Expense) / Average Total Assets. Together, these three ways to calculate ROA account for 47/70, or 67,14% of the sample size.

The way to calculate ROE is to divide the net income with the shareholder's equity (equity capital). Petersen & Schoeman (2008) argue that there is an inverse relationship between the amount of shareholder's equity and ROE, meaning that as the amount of equity capital decreases, ROE increases. ROE is used to determine the equity element in the investment. It informs the equity investors about left-over earnings after the service costs for debt have been considered for the investment (Damodaran 2007). There has also been some criticism towards using ROE as a financial measurement tool, mostly towards the argument that accounting has become an instrument for enhancing earnings reports. Also, the fact that ROE does not consider the aspect that equity itself has a cost, can be problematic when using ROE as a measurement tool. A company that seems profitable on paper may be destroying value in the process (De Wet & Du Toit 2007). A higher ROE is expected to positively impact stock return, as it signals a more profitable company that is better able to generate returns for investors. The relationship between ROE and stock return is an important consideration for investors, as it can help them make informed investment decisions (Alfiyah & Lupis 2021).

In conclusion, this subchapter has introduced two essential accounting measurements, ROA and ROE, and provided an explanation of their calculation methods. It has also highlighted the significance of these measurements in assessing a company's profitability and shareholder wealth. The findings suggest that ROA and ROE are widely used in finance and that there are different ways to calculate these measurements. Additionally, it has been noted that while ROE is a crucial tool for equity investors, it has been criticized for not considering equity's cost and its potential to be used for enhancing earnings reports. Overall, the discussion of these measurements provides a

solid foundation for the subsequent examination of their impact on EVA in the later stages of this research.

2.2 Creative accounting – a limitation of traditional firm performance measurements

No performance measure is perfect when describing the value that the company creates. Because performance measures are based on numerical values, companies can artificially inflate or deflate certain variables to make the outcome seem more favorable than it is. Accounting standards may include certain loopholes that allow companies to practice creative accounting. The pressure to meet short-term goals or yearly financial targets can be huge for a publicly traded company, because these metrics define majority of the share price. This may lead to some accountants tweaking certain parameters that will make the end results on an income statement differ from reality. One example about creative accounting could be revenue recognition, which allows the companies to include revenue in their statements before a good has been sold. Recognizing sales prematurely is not forbidden which may lead to misleading outcomes in the income statements.

The practice of creative accounting is widespread and has significant negative impacts on the financial markets and society at large. According to a research article by Stern Stewart Research (2002), the present system for accounting is flawed and in need of significant reform. The article highlights the fact that the present accounting system established by outdated principles that do not reflect the true economic reality of companies. Financial statements are often manipulated to fulfill the desires of stakeholders, leading to the distortion of the true financial position of a company. This practice is detrimental to the financial markets and society at large, as it undermines the trust and confidence of investors and other stakeholders.

To address the issue of creative accounting, the article (Stern Stewart Research, 2002) proposes a radical reform of the accounting system. The proposed reform includes the use of a new accounting framework that reflects the true economic reality of companies because traditional financial measurements are often based on accounting principles that are outdated and do not accurately reflect a company's true economic value. The article also advocates for increased transparency and accountability in financial reporting, which would help to restore belief and confidence in the financial markets.

In conclusion, creative accounting is a serious issue that impacts the financial markets, as well as the society. The current accounting system is flawed and in need of significant reform. The proposed reforms, such as using EVA as an alternative for traditional measurements, put forth in the Stern Stewart Research's article are a step in the right direction towards addressing this issue and restoring trust and confidence in the financial markets.

2.3 Corporate performance and risk measures (Beta)

Corporate performance and risk are critical components of organizational success that are closely intertwined. Company's potential to reach its strategic objectives and create value for its stakeholders is contingent upon the management of risk. An article related to risk management (Kaplan & Mikes, 2012) introduces a new framework for managing risks in organizations that integrates risk management with strategic planning and decision-making. The authors suggest that traditional approaches to risk management can be limiting, as they tend to focus on avoiding and mitigating risks, rather than taking calculated risks that can lead to value creation. The Risk Management Cycle proposed in the article includes identifying, assessing, mitigating, and monitoring risks, and it emphasizes the need to make informed decisions about risk-taking in order to achieve strategic objectives. By managing risk in this way, organizations can optimize their performance and enhance their long-term value creation.

Understanding and effectively managing risk is crucial when making investment decisions, particularly when it comes to investing in equities. While there are different types of risks involved in equity investments, the two most common ones are systematic and unsystematic risk. It is impossible to eliminate risk entirely when investing in equities but using competent risk management tactics when purchasing equities is essential to maximize returns and minimize losses. By applying the Risk Management Cycle proposed in Kaplan and Mikes' (2012) framework for managing risks, investors have the necessary knowledge and understanding to make knowledgeable and rational choices about risk-taking and optimize their investment performance. For instance, by recognizing and judging the risks that are associated with investing in a certain stock, an investor can mitigate the risks and monitor the investment to make informed decisions about when to buy or sell, and in doing so, enhance their long-term value creation.

As stated in the previous paragraph, the stock market includes risk that can be divided into two types. These types are systematic and unsystematic risk. Unsystematic risk can be seen as a stock-specific risk, whereas systematic risk is the risk that carries throughout the market as a whole. When an investor diversifies their portfolio, they are decreasing the unsystematic risk of their investments, because their individual stock picks are less volatile to market fluctuations through diversification. Beta coefficient determines the covariance of a stock with the return of the market, which means that beta recognizes the volatility of a stock against the market. The investor can only trust diversification so far since systematic risk cannot be cancelled out completely by adding more shares to your portfolio (Arnold 2013).

The concept of diversification also works in a way that if an investor puts all their money into different investments that have highly correlated returns or are from the same sector, they are more likely to lose their money because of the high covariance between the returns of the stocks. If one stock goes broke, it is likely that the other stocks will eventually face the same faith (Fabozzi et al., 2002).

Systematic risk cannot be fully avoided since the whole market is vulnerable to its effects. There are ways to reduce the risk, however. For example, hedging works in a way that it helps to lessen the effects of market risk. Taking positions in stock index futures can lower the need of “timing the market” and help the investor to adapt to possible market movements (Graham & Jennings 1987). A study (Junkus & Lee 1984) was done to investigate the effects of different hedging strategies and how they reduce systematic risk. All the hedge models reduced the risk, but they were strongly dependent on the expectations on spot, futures, and basis changes. Beta coefficient is used to measure the amount of market risk in an investment.

2.4 Weighted Average Cost of Capital (WACC)

This section of the paper aims to provide a throughout review of the literature on the Weighted Average Cost of Capital (WACC), its components, and its applications in evaluating investment opportunities, with a focus on the possible causation between R&D spending and EVA.

The WACC is the average cost of the capital which the firm has raised from all sources, together with equity and debt, and WACC considers the cost of financing the company's operations. The

weightings for each source of capital are dictated by the portion of each source in the company's overall structure of capital. Calculating WACC involves estimating the cost of equity, cost of debt, and the weightings of the capital sources.

The cost of equity is the rate of return that shareholders demand from their investment in the company's shares, and it generally exceeds the cost of debt. The cost of debt is the interest rate of the debt that the company has to pay. The determination of the weightings of each source of capital in the capital composition of a company is based on the proportion of each source utilized. The WACC is used as a benchmark to compare the expected return of an investment to the cost of the capital used to finance it (Brealey et al., 2011).

2.5 Concept of Economic Value Added (EVA)

One frequently utilized technique for assessing a firm's financial health is through the analysis of financial ratios, but it has a major weakness as it does not take the risks that the company faces into consideration. In order to address this issue, an alternative approach to measuring a company's financial performance was created, which involves assessing the value that the organization adds to its economic performance. This is where EVA comes in handy. EVA is calculated by deducting the WACC from the after-tax profit and then multiplying it by the company's total assets minus current liabilities. This approach provides a more precise estimate of a company's true profitability and whether the company has created added value (Sundari et al., 2023).

EVA is a model that has been developed by Stern Value Management (previously known as Stern Stewart & Co.) in 1983. Stern Stewart & Co. created this model to better pinpoint the value maximation when analyzing a firm. EVA measures the amount of value a company creates or destroys each year and is equivalent to economic profits. A firm which produces a positive EVA is called a value creator, while a firm with a negative EVA is called a value destroyer. All companies have an unexpressed required rate of return to their investors and the holders of their debt obligations, which is a representation of the opportunity cost that each investor carries when investing in the chosen company.

EVA is a tool of a high standard for measuring the value that the company creates, since it deducts the cost of capital. If a business breaks even in terms of accounting profits, it is truly making a loss, since the cost of capital is not covered. EVA is also a good indicator for highlighting the areas in the business that are not performing as desired to. A negative EVA in company's division might indicate that the assets could be better employed elsewhere. EVA gives a straightforward way for managers to analyze data and make investment decisions based on whether the investment decision covers the cost of capital. If it does, it is a good investment, and if it does not, it is something that is detrimental to the company (Brealey et al., 2011).

According to Biddle et al. (1999), EVA is a comprehensive measure which considers the cost of capital, making it a useful tool for calculating the value that the company creates. The article states that companies that consistently generate positive EVA tend to have higher stock returns than those that generate negative EVA. This suggests that EVA is an effective measure for investors to use when evaluating potential investments.

Moreover, the article suggests that EVA is a greater forecaster of future performance than traditional accounting measures, indicating that companies that focus on generating positive EVA have a higher probability of achieving long-term success. Proper calculation of the cost of capital is crucial for accurate measurement of EVA, which highlights the importance of the WACC in calculating EVA. By using the WACC as a benchmark, managers can make investment decisions based on whether the investment decision covers the cost of capital, which ultimately determines whether the investment is beneficial or detrimental to the company.

The WACC is used as a benchmark for determining the minimum rate of return required by investors to invest in a company. Investors anticipate a return on the investment that compensates them for the risks associated with investing in a particular company. When calculating EVA, the WACC is used as the cost of capital since it portrays the average cost of capital utilized by the company, including both debt and equity. The WACC is calculated based on the cost of debt, the cost of equity, and the proportion of debt and equity in the company's capital structure (Lovata & Costigan, 2002).

Overall, the referenced literature sources above suggest that EVA is a powerful instrument for measuring a company's financial performance and predicting its future success. It provides

managers with an explicit picture of the value created by the company and helps them make informed investment decisions based on the cost of capital. By focusing on generating positive EVA, companies can increase their stock returns and achieve long-term success.

2.5.1 Net Operating Profit After Taxes (NOPAT)

NOPAT is a financial performance measure that represents a company's operating profit after taxes have been paid but before any interest expenses have been deducted. NOPAT is a crucial component of the EVA calculation, which aims to determine whether a company is creating value for its shareholders.

According to a survey (Weaver 2001), NOPAT is one of the most commonly used metrics by proponents of the EVA approach. The survey found that 94% of respondents use NOPAT in their EVA calculations, making it one of the most widely used financial metrics in this context.

NOPAT is an important metric for EVA because it represents the true profit generated by a company's operations, regardless of how the company is financed. By excluding interest expenses, NOPAT removes the effect of a company's capital structure on its profitability, allowing for a more accurate assessment of its operating performance.

NOPAT is calculated by taking a company’s operating income, which is the difference between its operating expenses and the revenue, and subtracting taxes. This calculation provides a clear picture of how much money a company is earning from its core operations before considering any financing costs.

In summary, NOPAT provides an accurate assessment of a company's operating profitability, regardless of its capital structure or financing costs, and is widely used by proponents of the EVA approach. By understanding the role of NOPAT, investors and analysts can gain valuable insights into a company's operating performance and its ability to create value for its investors.

2.5.2 EVA versus traditional measures

In this chapter, the author is going to compare EVA against traditional corporate performance measurements. The traditional measurements which are going to be contrasted with EVA are ROA and ROE. The objective of this subchapter is to describe why EVA gives a more comprehensive picture about a company's profitability.

A study (Lestari et al., 2022) suggests EVA is considered superior to ROA in evaluating the financial performance of a company. The study found that EVA provides a more precise and complete impression of the profitability by considering both the cost of capital and the opportunity cost of invested capital. In contrast, ROA only considers the return on assets without factoring in the cost of capital. EVA is a more effective measure for evaluating a company's management performance in generating profits, as it considers the level of investment required to generate those profits. Therefore, EVA is a more comprehensive and reliable measure when compared to ROA when assessing the matter from firm performance point-of-view.

In addition to the points mentioned in the previous paragraph, the study further explains that EVA has several advantages over ROA. Firstly, EVA is a more forward-looking metric, as it focuses on future performance rather than past performance. This is because EVA is derived from the principle of value creation, which means that it measures the extent to which a company is generating value for its stakeholders. Secondly, EVA provides a more accurate estimate of a company's cost of capital, which is essential for making investment decisions. By considering the cost of capital, EVA helps companies to identify which investments are likely to be profitable in the long run. Finally, EVA is more transparent than ROA, as it clearly shows how a company's profits are generated and how they are used to create value for stakeholders. This makes it easier for shareholders to understand a company's financial performance and make enlightened investment selections. Overall, the study concludes that EVA is a superior metric for assessing a company's financial performance compared to ROA.

ROE has long been a popular metric for evaluating a company's financial performance, but it has some significant limitations. For example, ROE fails to consider the cost of equity capital, which is a crucial factor in assessing if a firm is producing value for its investors. ROE also fails to consider the consequences of debt on a company's earnings, which can misrepresent the real picture of a firm's

profitability. Additionally, ROE measures short-term profitability rather than long-term value creation, which can lead companies to prioritize short-term profits at the expense of long-term goals. Opposed to this, EVA provides a more complete and precise measure of a company's financial performance. EVA incorporates the cost of both equity and debt capital, and also the consideration of opportunity cost associated with invested capital in determining whether a company is creating value for its stakeholders. EVA also measures long-term profitability, encouraging companies to invest in growth that has continuation, rather than short-term gains. Therefore, EVA is a superior metric to ROE in evaluating how a firm is operating financially.

Moreover, EVA has several advantages over ROE that make it a more reliable and comprehensive measure of a company's financial performance. EVA provides a more transparent measure of a company's profitability by revealing the actual amount of value created or destroyed by a company's operations. In contrast, ROE can be easily manipulated by accounting practices or other factors that do not consider the actual value of a firm's operations. EVA also provides a clearer picture of a company's cost of capital, making it easier for potential investors to estimate the company's investment opportunities. Additionally, EVA allows for more accurate comparisons between companies in different industries, as it takes into account the unique characteristics of each industry in determining a company's cost of capital. Therefore, EVA is a more reliable and useful metric than ROE in assessing a company's financial performance and making investment decisions (De Wet & Du Toit 2007).

2.6 Hypotheses

Based on the current theoretical background gained through the literature review part of this research, the author can form hypotheses for the practical part of the research. In the present subchapter, the author presents a series of hypotheses that are under investigation. Once the hypotheses are provided, the researcher presents the corresponding variables to be utilized in the analysis of the research topic.

H_1: Accounting measures positively affect EVA.

H_2: Stock market measures (annualized return, annualized risk, beta, and market capitalisation) positively affect EVA.

H_3: R&D expenditure positively affects EVA.

The findings of the analysis will supply insights into the relative strengths and weaknesses of these financial performance metrics and their usefulness in evaluating the financial performance of companies. The author will use the theoretical background from chapter 2 along with the research methods, which will be introduced in chapter 3 to form results and a conclusion for the current hypotheses.

In order to test hypothesis H_1, the author will use EVA, ROA, and ROE as the variables. The formulas for these variables will be introduced in chapter 3. Hypothesis H_2 will use EVA and stock market measures as the variables to test the hypothesis. The data for the stock market measures has been collected from the annual income statements from every respected company and transferred into variables by using calculations in MS Excel.

Testing hypothesis H_3 will require the author to use EVA and R&D expenditure as the variables. The data for R&D expenditure has been collected from the annual income statements of each company.

3 Methodology

In the methodology chapter, the main components of the current research are gathered and are given a thorough explanation. The components are variables used to build the correlation matrix, and the data, along with the sources to gather it.

3.1 Research approach and design

A crucial aspect of conducting research is the design of the study, which outlines the approach that the researcher plans to take in order to address the research questions. It is essential to develop a clear and compact research design to make certain that the research questions are systematically and effectively answered. Therefore, constructing an appropriate research design is a fundamental requirement for any research effort (Lewis et al., 2009).

The term “research” involves the systematic gathering and analysis of data using various techniques and tools. The three types of research include quantitative, qualitative, and mixed method (Lewis et al., 2009). The focal point in the current study is to test the hypotheses listed in chapter 2.6 and to find out whether the variables introduced in the research affect positively on EVA and if they help companies create more economic value. The nature of the research initiated the researcher to adopt quantitative approach, since it had proven to be the most efficient out of the three possible research types to interpret the data and summarize the key findings. The research questions require the author to evaluate and encompass data from multiple different sources and to use empirical methods along empirical statements (Sukamolson 2007). For the purpose of the current research, the quantitative approach is presented by calculations of various financial ratios and gathering numerical data from the annual balance sheets and income statements to either compare straight or use in the calculations for the financial ratios. The quantitative approach is accompanied by some qualitative features, such as the topic-related theoretical studies to extract the information from the data and create a theoretical base for the conclusions.

3.2 Data collection

The current research involves gathering data from 50 randomly selected S&P500 companies. The data collection process includes collecting accounting numbers and other relevant data from the annual reports and balance sheets of these companies. Financial statements and balance sheets play a significant role in the data collection process, particularly in constructing the correlation matrix. The data concerning the historical stock prices has been collected from Investing.com, by using their historical data -tool to interpret past stock prices in to an excel sheet. The data collection for the research is quantitative, since it is social research that employs empirical methods in the data collection and interpretation. The nature of the research is quantitative because it explains phenomena using numerical data, which is then calculated and analyzed using mathematical methods (Sukamolson 2007). This research was based on building a correlation coefficient between external secondary data, so there was no need to collect primary data.

The data collected is manually uploaded into a spreadsheet (MS Excel) to calculate the needed financial ratios and to build the table of variables. The variables are then uploaded to IBM SPSS for

further examination and to build the regression analysis. The daily stock market prices used in the current research are from the years 2017, 2018, and 2019.

3.3 Variables

A research article (Kaur et al., 2018) suggests that data can be summarized by interpreting the connection between variables in a sample. This paper focuses on calculating descriptive statistics and uses two out of the four types of variables (nominal, ordinal, interval, and ratio). First variable group used is nominal variables, which are representing entities that can be counted, for example, Research & Development expenses, EBIT (Earnings before interest and taxes), etc. There are also ratio variables used in this research. A ratio variable is symbolizing relative measures, such as R&D/Sales.

3.3.1 Dependent variables

In research, a dependent variable is the variable being evaluated or tested in relation to another variable, called the independent variable. The dependent variable represents the outcome or effect that the researcher is fascinated in understanding, predicting, or describing. According to Lewis and Lucido (1983), the dependent variable is "the variable that is affected by the independent variable and which is measured or observed by the researcher" (p. 102). In other words, if there is a change in the independent variable, it causes changes in the dependent variable. The dependent variable is typically measured using quantitative data and statistical techniques to discover the relationship between the independent variable and the dependent variable. The use of dependent variables is a fundamental aspect of scientific research, and understanding how to define and measure dependent variables is essential for conducting valid and reliable research in variety of fields.

The current research will have the following dependent variables: Annualized return, Annualized risk, Beta, EVA, ROA, and ROE. Microsoft Excel was used in this research to calculate the dependent variables.

3.3.2 Independent variables

An independent variable is a variable that is controlled or changed by the researcher in the research. It is the variable that is thought to have a causal effect on the dependent variable. Independent variables are important when the cause-and effect is determined between the variables. By controlling or changing the independent variable, researchers can test hypotheses about their effects on dependent variable and derive a result about the relationship between the two. The choice and design of independent variables are crucial to the success of an experimental study, as they can impact the viability of the results acquired (Huber 1974).

3.3.3 Economic Value Added (EVA)

This subchapter focuses on the concepts that are being used to determine the EVA for each company. The concepts which EVA consists of have been introduced in various subchapters of chapter 2: Literature review. Key components that make up EVA are NOPAT, WACC, Debt, and Equity. Debt financing refers to borrowing funds from external sources, such as banks or bondholders, with the obligation to pay interest and repay the principal over time. The cost of debt is the interest rate that the company pays to its lenders. The cost of debt can be influenced by various factors, such as the company's creditworthiness, the conditions of the current market, and the terms of the loan. Additionally, measuring the cost of debt accurately can be challenging, as different loans may have different interest rates, fees, and maturity dates that need to be considered. Equity financing refers to trading ownership stakes in the firm to external investors, such as through issuing new shares or conducting initial public offerings (IPOs). The cost of equity is the return that investors require on their investment, which reflects the risk and return expectations of the market. The cost of equity can be influenced by various factors, such as the company's growth prospects, profitability, and the general economic conditions. Measuring the cost of equity accurately can also be challenging, as different investors may have different return expectations, and the market conditions may change over time (Durand, 1952).

The NOPAT must be big enough to compensate for the risk that the investors are bearing. The risk is calculated by figuring out the WACC for the company in question. As stated in previous chapters, EVA is a trademark of the Stern Value Management and it is used as a framework by both the managers of the firms, and the investors trying to value the companies. The formula in equation form for EVA could be seen as:

$$EVA = NOPAT - WACC * (D + E)$$

NOPAT - Net Operating Profit After Taxes

WACC - Weighted Average Cost of Capital

D + E - Debt + Equity (capital invested)

(Chan 2001)

3.3.4 Systematic risk (Beta)

Beta working mechanics are based on its ability to imply the volatility of the investment compared to the whole market (Arnold 2013). A beta of 1,3 would give the stock's return 30% more volatility than the return of the market. To compute the beta coefficient, historical data for both the stock return and the market return must be gathered. The market return in this research paper is the return of the S&P500 index, since every single company that is being analyzed is a part of this index. The formula for beta is:

$$\beta = \frac{\sigma_{im}}{\sigma_m^2}$$

σ_{im} - The covariance between stock returns and market returns

σ^2_m – Market return variance

(Brealey et al., 2011)

3.3.5 NOPAT

Net operating profit after taxes is another key component when determining EVA. It is found in the income statement of each company. NOPAT is calculated by summing the after-tax interest with the company's net income.

$$NOPAT = Net\ income + (1 - Tax\ rate)$$

(Corporate Finance Institute, 2022)

3.3.6 WACC

The WACC is one of the components that make up the EVA. WACC is used to compute the firm's cost of capital, where all the categories of capital are proportionally weighted. It is a tool that incorporates the tax savings made from taking debt. (Berk & DeMarzo, 2006) WACC is dependent of the firm's beta and return on equity (ROE). As these two variables increase, so does the WACC. When performing discounted cash flow (DCF) analyses, WACC is commonly used as the discount rate for the future cash flows. In the EVA calculations, WACC is used to determine the cost of capital for the company. The formula for WACC:

$$WACC = \frac{E}{D+E}(r_e) + \frac{D}{D+E}(r_d)(1-t)$$

E – Value of equity

D – Value of debt

r_e – Cost of equity

r_d – Cost of debt

t – Corporate tax rate

(Cortright, 2023)

3.4 List of case companies

Current chapter will focus on the companies selected from the S&P500 stock index for the purpose of the research. The author selected 50 companies randomly out of the 500 companies in the index.

The list of companies can be found at the end of the research paper from appendix 1. The most frequent sector that appears in the list is Information Technology (17). Next is Health Care (11), Consumer Staples (7), Industrials (6), Communication Services (5), Consumer Discretionary (2), and Energy (2).

3.5 Methods used to gather the variables

To present the evidence to test the hypotheses, the data from annual balance sheets and income statements need to be transformed into variables. The calculations to transfer the data into variables in the current research are made via MS Excel. Every company has had the variables calculated that are listed in the chapters 3.3.1 and 3.3.2. The variables are different for each calendar year (2017, 2018, and 2019). In order to calculate EVA for a company, the author needs to find out NOPAT, Debt (millions), Shareholder's equity, and WACC. NOPAT is calculated by taking EBIT from the annual financial statement of the company and multiplying EBIT with (1 – Effective tax rate). The effective tax rate can be calculated with the following formula:

$$Effective\ tax\ rate = \frac{Corporate\ tax}{Profit\ before\ tax}$$

Debt (millions) and Shareholder's equity have been obtained directly from macrotrends.com for each company. For the WACC calculation, the author needs to figure the weight of debt (hereafter W_d) and equity (W_e,) which can be calculated with the following formulas:

$$W_e = \frac{E}{D + E}$$

$$W_d = \frac{D}{D + E}$$

D – Debt (millions)

E – Equity (millions)

(Cortright, 2023)

The cost of debt and cost of equity also have a crucial role when calculating WACC for a company. The cost of debt can be obtained by dividing interest expense with debt. The interest expense can be found in the annual income statement. The cost of equity can be calculated by multiplying the Beta of a company with average market risk premium. The average market risk premium that has been used for the purpose of the current research has been obtained from statista.com.

For calculating the Beta, the author has gathered the daily return for both the S&P500 index, and for every company individually. The Beta value is determined through a process of analyzing the linear regression line that represents the relationship between the price returns of a given stock and the benchmark index. In order to do this, the author has used the “SLOPE” function in MS Excel. The known y’s in the function are daily stock returns, whereas the known x’s in the function are daily S&P500 returns.

4 Results

The current chapter reveals the results for the hypotheses by using the data collected from annual balance sheets for the companies and combining it with the methodologies presented in the previous chapter. The data has been converted into variables and the variables have been input to IBM SPSS.

4.1 Descriptive statistics and correlations

The dependent variables in the current study that are required to test the hypotheses have been analyzed in SPSS and can be found in table 1 below.

		EVA (millions)	ROA	ROE	Beta	Annualized Return	Annualized Risk (SD)	Effective Tax Rate
N	Valid	150	150	150	150	150	150	150
	Missing	1	1	1	1	1	1	1
Mean		3434,67	0,09	0,58	1,07	0,26	0,24	0,24
Std. Deviation		8402,57	0,08	2,46	0,44	0,34	0,10	1,29
Minimum		-18462,79	-0,15	-2,42	0,04	-0,55	0,10	-6,16
Maximum		55124,19	0,33	25,50	2,63	2,10	0,63	13,66

Table 1 - Descriptive statistics for the dependent variables.

The given table displays statistical information for seven financial metrics, namely EVA in millions, ROA, ROE, Beta, Annualized Return, Annualized Risk (SD) and Effective Tax Rate. The table includes 150 valid data points for each of the metrics except for one missing data point.

The mean EVA, which represents the amount of value generated by a company in surplus of its cost of capital, is reported to be 3434.67 million dollars. The standard deviation of EVA, which measures the dispersion of data from the mean, is relatively high at 8402.57 million dollars, indicating significant variation in the EVA values across the dataset.

The ROA, which measures the profitability of a company relative to its assets, has a mean of 0.09. This implies that the average company in the sample generated a return of 9 cents for every dollar of assets it owned. The standard deviation of ROA is 0.08, indicating relatively low variability in the ROA values across the dataset.

The ROE, which measures the return a company generates on the equity invested in it, has a mean of 0.58. This suggests that the average company in the dataset earned a return of 58 cents for every dollar of equity invested in it. The standard deviation of ROE is 2.46, which is substantially bigger than that of ROA, indicating greater variability in the ROE values across the dataset.

The Beta, which measures the sensitivity of a company's stock price to changes in the overall market, has a mean of 1.07. This indicates that the average company's stock price has a tendency

to move in similar direction with the market, but slightly more rapidly. The standard deviation of Beta is 0.44, indicating moderate variability in the Beta values across the dataset.

The Annualized Return, which represents the average percentage return earned by an investment over a certain period of time, has a mean of 0.26. This implies that the average investment in the sample earned a return of 26% per year. The standard deviation of Annualized Return is 0.34, indicating moderate variability in the returns earned by investments across the dataset.

The Annualized Risk (SD), which measures the volatility of an investment's returns over time, has a mean of 0.24. This suggests that the average investment in the sample had a relatively low level of risk. The standard deviation of Annualized Risk is 0.10, indicating low variability in the risk levels of investments across the dataset.

The Effective Tax Rate, which represents the proportion of a company's income that is paid in taxes, has a mean of 0.24. This implies that the average company in the sample paid 24 cents in taxes for every dollar of income earned. The standard deviation of Effective Tax Rate is relatively high at 1.29, indicating significant variability in the tax rates paid by companies in the dataset.

Below in table 2 is the correlation matrix between all of the different variables used in the current research.

Correlations

		EVA (millions)	ROA	ROE	Beta	Annualized Return	Annualized Risk (SD)	Effective Tax Rate	Debt	Equity	R&D (millions)	Sales	R&D/Sales	Intangibe Assets	Total Assets	Intangible Assets/Total Assets	MarketCap	D/E
EVA (millions)	Pearson Correlation	1	,306**	0,064	-0,046	0,043	0,020	0,027	,250**	,236**	,423**	,383**	0,091	-0,022	,267**	-0,138	,480**	-0,012
	Sig. (2-tailed)		0,000	0,437	0,573	0,604	0,806	0,742	0,002	0,004	0,000	0,000	0,270	0,792	0,001	0,093	0,000	0,881
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
ROA	Pearson Correlation	,306**	1	0,147	0,078	0,043	0,037	-,257**	-,204*	-0,082	0,012	-0,095	0,068	-,192*	-,196*	-0,086	0,054	0,070
	Sig. (2-tailed)	0,000		0,073	0,342	0,600	0,653	0,001	0,012	0,320	0,888	0,247	0,408	0,019	0,016	0,295	0,512	0,397
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
ROE	Pearson Correlation	0,064	0,147	1	-0,069	-0,041	-0,009	-0,055	-0,092	-0,120	-0,062	0,012	-0,135	-0,085	-0,057	-0,086	-0,038	,821**
	Sig. (2-tailed)	0,437	0,073		0,398	0,623	0,914	0,501	0,261	0,142	0,452	0,882	0,100	0,301	0,488	0,298	0,644	0,000
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Beta	Pearson Correlation	-0,046	0,078	-0,069	1	,552**	,686**	-0,073	-,264**	-0,133	0,104	-0,147	,363**	-,303**	-,221**	-,264**	-,178*	-0,130
	Sig. (2-tailed)	0,573	0,342	0,398		0,000	0,000	0,372	0,001	0,105	0,204	0,072	0,000	0,000	0,007	0,001	0,029	0,113
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Annualized Return	Pearson Correlation	0,043	0,043	-0,041	,552**	1	,210**	-0,083	-,228**	-,170*	0,041	-0,145	,255**	-,218**	-,229**	-0,136	-0,013	-0,081
	Sig. (2-tailed)	0,604	0,600	0,623	0,000		0,010	0,315	0,005	0,038	0,615	0,076	0,002	0,007	0,005	0,098	0,879	0,325
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Annualized Risk (SD)	Pearson Correlation	0,020	0,037	-0,009	,686**	,210**	1	-0,033	-0,156	-,197*	-0,023	-,161*	,269**	-,235**	-,194*	-,264**	-,349**	-0,008
	Sig. (2-tailed)	0,806	0,653	0,914	0,000	0,010		0,689	0,057	0,016	0,782	0,049	0,001	0,004	0,017	0,001	0,000	0,922
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Effective Tax Rate	Pearson Correlation	0,027	-,257**	-0,055	-0,073	-0,083	-0,033	1	0,008	-0,039	0,041	-0,007	0,069	-0,045	-0,020	-0,067	0,013	0,058
	Sig. (2-tailed)	0,742	0,001	0,501	0,372	0,315	0,689		0,925	0,639	0,621	0,935	0,404	0,584	0,811	0,414	0,875	0,484
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Debt	Pearson Correlation	,250**	-,204*	-0,092	-,264**	-,228**	-0,156	0,008	1	,489**	,183*	,544**	-,203*	,732**	,817**	0,043	,410**	-0,061
	Sig. (2-tailed)	0,002	0,012	0,261	0,001	0,005	0,057	0,925		0,000	0,025	0,000	0,013	0,000	0,000	0,605	0,000	0,460
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Equity	Pearson Correlation	,236**	-0,082	-0,120	-0,133	-,170*	-,197*	-0,039	,489**	1	,383**	,770**	-0,142	,422**	,858**	-,211**	,652**	-0,123
	Sig. (2-tailed)	0,004	0,320	0,142	0,105	0,038	0,016	0,639	0,000		0,000	0,000	0,083	0,000	0,000	0,009	0,000	0,134
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
R&D (millions)	Pearson Correlation	,423**	0,012	-0,062	0,104	0,041	-0,023	0,041	,183*	,383**	1	,549**	,366**	0,060	,378**	-,222**	,720**	-0,083
	Sig. (2-tailed)	0,000	0,888	0,452	0,204	0,615	0,782	0,621	0,025	0,000		0,000	0,000	0,467	0,000	0,006	0,000	0,310
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Sales	Pearson Correlation	,383**	-0,095	0,012	-0,147	-0,145	-,161*	-0,007	,544**	,770**	,549**	1	-,282**	,240**	,850**	-,373**	,723**	-0,049
	Sig. (2-tailed)	0,000	0,247	0,882	0,072	0,076	0,049	0,935	0,000	0,000	0,000		0,000	0,003	0,000	0,000	0,000	0,550
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
R&D/Sales	Pearson Correlation	0,091	0,068	-0,135	,363**	,255**	,269**	0,069	-,203*	-0,142	,366**	-,282**	1	-0,125	-,254**	0,026	-0,017	-0,112
	Sig. (2-tailed)	0,270	0,408	0,100	0,000	0,002	0,001	0,404	0,013	0,083	0,000	0,000		0,129	0,002	0,749	0,835	0,172
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Intangibe Assets	Pearson Correlation	-0,022	-,192*	-0,085	-,303**	-,218**	-,235**	-0,045	,732**	,422**	0,060	,240**	-0,125	1	,599**	,431**	,261**	-0,063
	Sig. (2-tailed)	0,792	0,019	0,301	0,000	0,007	0,004	0,584	0,000	0,000	0,467	0,003	0,129		0,000	0,000	0,001	0,441
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Total Assets	Pearson Correlation	,267**	-,196*	-0,057	-,221**	-,229**	-,194*	-0,020	,817**	,858**	,378**	,850**	-,254**	,599**	1	-,197*	,651**	-0,079
	Sig. (2-tailed)	0,001	0,016	0,488	0,007	0,005	0,017	0,811	0,000	0,000	0,000	0,000	0,002	0,000		0,016	0,000	0,339
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
Intangible Assets/Total Assets	Pearson Correlation	-0,138	-0,086	-0,086	-,264**	-0,136	-,264**	-0,067	0,043	-,211**	-,222**	-,373**	0,026	,431**	-,197*	1	-0,143	-0,023
	Sig. (2-tailed)	0,093	0,295	0,298	0,001	0,098	0,001	0,414	0,605	0,009	0,006	0,000	0,749	0,000	0,016		0,081	0,777
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
MarketCap	Pearson Correlation	,480**	0,054	-0,038	-,178*	-0,013	-,349**	0,013	,410**	,652**	,720**	,723**	-0,017	,261**	,651**	-0,143	1	-0,123
	Sig. (2-tailed)	0,000	0,512	0,644	0,029	0,879	0,000	0,875	0,000	0,000	0,000	0,000	0,835	0,001	0,000	0,081		0,134
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	151	150
D/E	Pearson Correlation	-0,012	0,070	,821**	-0,130	-0,081	-0,008	0,058	-0,061	-0,123	-0,083	-0,049	-0,112	-0,063	-0,079	-0,023	-0,123	1
	Sig. (2-tailed)	0,881	0,397	0,000	0,113	0,325	0,922	0,484	0,460	0,134	0,310	0,550	0,172	0,441	0,339	0,777	0,134	
	N	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2 - Correlation matrix of the variables used in the study

The table shows a correlation matrix for several financial ratios of a company. The ratios include EVA, ROA, ROE, Beta, Annualized Return, Annualized Risk (SD), Effective Tax Rate, Debt, Equity, R&D expenses, Sales, R&D/Sales, Intangible Assets, Total Assets, Intangible Assets/Total Assets, MarketCap, and D/E (debt-to-equity ratio).

Each cell in the table shows the Pearson correlation coefficient between two ratios. The Pearson correlation model is a widely used statistical tool in finance, especially in correlation trading strategies. It can be used to calculate the degree of trending for indices or stocks and to derive the value of multi-asset options. (Meissner, 2015) The measurement of the strength and direction of the linear relationship between two variables is performed by the Pearson correlation coefficient.

If the correlation coefficient has a value of 1, it shows a perfect correlation in a positive way. Likewise, if the value is -1, this would show a perfect negative correlation. A value of 0 would indicate no correlation.

As the table suggests, EVA has a positive correlation with ROA, ROE, Annualized return, Annualized risk (SD), Effective tax rate, Debt, Equity, R&D (millions), Sales,R&D/Sales, Total Assets, and MarketCap. The strongest positive correlation is between EVA and MarketCap (0.480). EVA has a negative correlation with Beta, Intangible Assets, Intangible Assets/Total Assets, and D/E. The strongest negative correlation is between EVA and Intangible Assets/Total Assets (-0.138).

The results will have to pass the Durbin-Watson test for them to be relevant for the purpose of the study. The Durbin-Watson test is a statistical test used to detect autocorrelation in a dataset. Autocorrelation occurs when there is a correlation between the values of a variable at different time points, which violates the assumption of independence of observations. The test is based on the residuals from a regression model and calculates a test statistic that measures the degree of autocorrelation. The test is widely used in econometrics and other fields, and it is particularly useful for detecting first-order autocorrelation, which is common in time series data. According to White (1990), the test is easy to use and interpret, but its effectiveness depends on the assumptions made about the nature of the autocorrelation. The Durbin-Watson test results with the dependent variables in the current study ranged from 1.694 to 2.301, which means that the results can be used for the research purposes. The significance level used in the current research is .10 due to the sample size.

4.2 Annualized return as the dependent variable

Annualized return has been compared to the other variables in the regression model with a Durbin-Watson test of 1.694. Therefore, the researcher can use the results as they are relevant enough for the purpose of the study. Variables that pass the significance (under .10) when annualized return is the dependent variable are Beta and Annualized risk.

The regression analysis results indicate that beta and annualized risk (SD) have a significant impact on annualized return. Beta has a positive and significant effect on annualized return ($B = 0.602$, $p < 0.001$), which means that a higher beta is associated with a higher annualized return. On the other

hand, annualized risk (SD) has a negative and significant effect on annualized return (B = -1.281, p < 0.001), indicating that higher annualized risk is associated with lower annualized return.

However, the other variables, including EVA (millions), ROA, ROE, effective tax rate, D/E, R&D/Sales, intangible assets/total assets, and market cap, do not have a significant impact on annualized return, as their p-values are above the 0.1 significance level.

4.3 EVA as the dependent variable

The researcher can use the results for EVA as a dependent variable with confidence, since EVA has provided a Durbin-Watson test score of 2.015. The statistical analysis shows that several variables have a significant effect on EVA at a 90% confidence level. EVA has had a positive correlation with ROA, Annualized risk, and Market cap. EVA has a negative correlation with Beta.

The standardized beta coefficient of ROA is 0.296, indicating a positive relationship with EVA. If there is a one-unit increase in ROA, there is a 0.296 unit increase in EVA. The standardized beta coefficient of Beta is -0.317, indicating an inverse relationship with EVA. A one-unit increase in Beta is associated with a 0.317 unit decrease in EVA. The standardized beta coefficient of Annualized Risk is 0.379, indicating a positive relationship with EVA. A one-unit increase in Annualized Risk is associated with a 0.379 unit increase in EVA. Lastly, the standardized beta coefficient of MarketCap is 0.537, indicating a positive relationship with EVA. A one-unit increase in MarketCap is associated with a 0.537 unit increase in EVA. Therefore, the results in the current research suggest that Market cap has a positive effect on EVA, which makes it easier for bigger companies to create more EVA.

Other variables such as ROE, D/E, R&D/Sales, Intangible Assets/Total Assets, and Annualized Return do not have a significant impact on EVA. These findings suggest that companies can improve their EVA by increasing their ROA, MarketCap, and Annualized Risk and lowering their Beta.

4.4 ROA and ROE as the dependent variables

ROA passes the Durbin-Watson test in the current research with a score of 2.301. Several independent variables in the regression model have a significance level of less than 0.10, indicating that they have a statistically significant impact on the dependent variable, ROA.

Effective Tax Rate has a significant negative effect on ROA. This means that as Effective Tax Rate increases, ROA decreases, holding other variables constant. The standardized coefficient for Effective Tax Rate is -0.269, indicating that a one-unit increase in ETR is associated with a 0.269 standard deviation decrease in ROA. This finding suggests that companies with higher tax burdens are less profitable, which is a common observation in the business world.

EVA has a significant positive effect on ROA. This means that as EVA increases, ROA also increases, holding other variables constant. The standardized coefficient for EVA is 0.384, indicating that a one-standard deviation increase in EVA is associated with a 0.384 standard deviation increase in ROA. This finding implies that companies that generate more economic value for their shareholders are more profitable.

MarketCap (Market Capitalization) has a significant negative effect on ROA. This means that as MarketCap increases, ROA decreases, holding other variables constant. The standardized coefficient for MarketCap is -0.166, indicating that a one-standard deviation increase in MarketCap is associated with a 0.166 standard deviation decrease in ROA. This finding implies that larger companies tend to have lower profitability than smaller ones.

ROE can be used as a dependent variable in the current research, as it has a Durbin-Watson score of 1,939. The regression analysis results reveal that two independent variables have an impact on ROE at a significance level of less than 0.10. The independent variable, D/E, has the strongest positive impact on ROE with a beta coefficient of 0.829, indicating that an increase in D/E positively affects the ROE. The variable Effective Tax Rate has a negative impact on ROE, as indicated by its negative beta coefficient of -0.090.

The results for the current research suggest that an increase in the effective tax rate leads to a decrease in ROE. A with ROA, ROE also decreases when a company has a higher tax burden. D/E

having a positive correlation suggests that levered companies have a higher ROE than companies that use less leverage. Other variables do not show enough significance in the current research when ROE is used as a dependent variable.

4.5 Beta as the dependent variable

Beta passes the Durbin-Watson test in the current research with a score of 1.923. The researcher finds that Beta shows significance as the dependent variable with Annualized risk, D/E, R&D/sales, Annualized return, and EVA. Beta and Annualized risk have a positive correlation with a standardized coefficient of 0.588 and a p-value of 0.000. This result suggests that companies with higher levels of risk tend to have higher Betas, which means they are more sensitive to market fluctuations.

Beta has a negative correlation with D/E, which means that less leveraged companies are less prone to market risk. The R&D/Sales ratio shows a significant positive effect on Beta, with a standardized coefficient of 0.114 and a p-value of 0.030. This finding implies that companies that allocate a larger proportion of their sales revenue to research and development activities tend to have higher Betas, indicating a greater sensitivity to market movements. This relationship could be due to various factors, such as the riskiness of R&D investments or the potential for higher returns from successful innovations.

The regression analysis shows that annualized return has a significant positive effect on Beta. This indicates that as annualized return increases, so does the Beta, which further implies that the risk and return have a positive correlation.

EVA (millions) variable has a significant negative impact on Beta, with a standardized coefficient of -0.163 and a p-value of 0.007. This result suggests that companies with higher levels of Economic Value Added tend to have lower Betas, indicating less sensitivity to market fluctuations. Companies that generate higher economic profits tend to have lower stock price volatility compared to the overall market. This relationship could be due to various factors, such as the stability of the company's operations or the lower risk associated with profitable companies.

4.6 Annualized risk as the dependent variable

The multiple regression analysis with Annualised Risk (SD) as the dependent variable and the significant independent variables, with a p-value less than 0.10 shows that there are five independent variables that show correlation with the Annualized Risk (SD).

Among the significant independent variables, Beta has the highest standardized coefficient with a value of 0.717, indicating that it has the strongest effect on Annualised Risk compared to other variables. A one-unit increase in Beta is associated with a 0.717 unit increase in Annualised Risk, while holding all other independent variables constant.

Moreover, the regression analysis shows that EVA (millions) has a significant positive effect on Annualised Risk with a standardized coefficient of 0.238. A one-unit increase in EVA (millions) is associated with a 0.238 unit increase in Annualised Risk, while holding all other independent variables constant.

In contrast, the regression analysis shows that Intangible Assets/Total Assets, MarketCap, and Annualised Return have significant negative effects on Annualised Risk. Intangible Assets/Total Assets has a negative effect with a standardized coefficient of -0.138, implying that a one-unit increase in Intangible Assets/Total Assets is associated with a 0.138 unit decrease in Annualised Risk. Similarly, MarketCap has a negative effect with a standardized coefficient of -0.343, indicating that a one-unit increase in MarketCap is associated with a 0.343 unit decrease in Annualised Risk. Annualised Return also has a negative effect with a standardized coefficient of -0.228, implying that a one-unit increase in Annualised Return is associated with a 0.228 unit decrease in Annualised Risk.

The results of this analysis suggest that firms with a higher Beta and EVA (millions) tend to have higher Annualised Risk, while firms with higher levels of Intangible Assets/Total Assets, MarketCap, and Annualised Return tend to have lower Annualised Risk.

5 Analysis, limitations and conclusions

The purpose of this chapter is to interpret and evaluate the results and determine the correlation in contrast with the hypotheses. The limitations of the current research are also discussed in this chapter.

5.1 Hypothesis H_1

Hypothesis H_1 suggests that ROE and ROA have a positive relationship with EVA. However, the regression model suggests that only ROA and EVA have a positive correlation with a significance level of <0.10, which only partly supports the hypothesis. When EVA is used as the dependent variable and ROE as the independent variable and vice versa, the significance level exceeds the limit, therefore making the results insignificant for the purpose of the current research.

Although the current research may not entirely support the hypothesis that traditional accounting measures (ROA, ROE) positively affect EVA, the research provides valuable insights into the fact that there is a positive link with EVA and ROA. As EVA increases, so does the ROA. When thinking about EVA as a firm performance measure, it is important to consider the findings of Stewart (1995), which argue that while EVA has its limitations and may not always produce accurate results, it remains a valuable metric for measuring a company's true economic profitability and identifying areas for improvement in management decision-making. It is also possible that investors use other measures or factors when making investment decisions, such as market conditions, economic indicators, or industry trends.

5.2 Hypothesis H_2

Hypothesis H_2 proposes that stock market measures (annualized return, annualized risk, beta, effective tax rate, and market capitalization) positively influence a firm's EVA. Hypothesis H_2 is partly supported by the evidence presented in the empirical part of the research. Beta, annualized risk and market capitalization all show significant results when EVA is used as the dependent variable. Beta has a negative correlation with EVA, which means that less market risk provides a chance to create more economic value for the companies. Annualized risk has a positive correlation with EVA, which translates to firms having a high-risk high-reward situation as value creation is concerned. Market capitalization has a positive correlation with EVA which means that

bigger companies may be able to create more EVA. Annualized return and effective tax rate do not show significant results when EVA is used as the dependent variable.

Overall, the study also provides some evidence to support the idea that companies may manipulate their financial performance, highlighting the importance of careful and critical analysis of financial statements and performance indicators.

5.3 Hypothesis H_3

Hypothesis H_3 proposes that companies' spending on R&D positively influences their EVA since R&D expenditure is considered a significant factor in driving innovation and growth, leading to higher earnings and creating value for the firm. The regression analysis results in the current study suggest that R&D expenditure does not have a significant impact on EVA, as its p-value is above the 0.10 significance level. This finding contradicts Hypothesis H_3, indicating that R&D expenditure may not be a reliable predictor of a firm's ability to create value and generate economic profit. However, it is important to note that the study only examines a limited number of variables, and other factors may influence the relationship between R&D expenditure and EVA, such as the nature and quality of the R&D activities or the competitive landscape of the industry.

5.4 Research limitations

Although the current study provides valuable insights into the relationship between various independent variables and the dependent variables, there are several limitations to consider. Firstly, the study has focused solely on US-based companies and their financial data. Hence, the results may not be generalizable to other regions or countries. Additionally, the study has not considered the impact of external factors, such as economic conditions or market trends, which can also affect how the companies are performing financially. Moreover, the current research has used only secondary data, which may have limitations in terms of data quality and accuracy. Therefore, caution should be exercised when interpreting and applying the results of this study.

5.5 Conclusions

The purpose of this subchapter is to conclude the research. The main purpose of the current research was to answer the research questions provided in the first chapter and to test out

whether the data collected supported the hypotheses introduced in the literature review. Based on the data and the results received from the calculations, the sample companies did not prove all hypotheses true in the given time frame of 2017-2019. However, the current research provides a lot of valuable data concerning the variables. The hypotheses are partly supported by the regression model, but the researcher is not able to say with confidence that all the assumptions made at the end of the literature review prove to be true. In conclusion, the results of this study provide valuable insights into the factors that impact a company's financial performance and ability to create EVA. However, further research is needed to confirm these findings and explore other potential factors that impact how a company is performing financially, and which factors are crucial in the process of EVA creation.

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Appendices

Appendix 1. List of case companies.

3M Co.	Abbott Laboratories	Abbvie, Inc.	Accenture Plc.	Activision Blizzard
Adobe	Advanced Micro Devices, Inc.	Alphabet, Inc.	Altria Group, Inc.	Amazon
Amgen, Inc.	Apple, Inc.	AT&T, Inc.	Automatic Data Processing, Inc.	Boeing Co.
Broadcom, Inc.	Caterpillar, Inc.	Chevron Corp.	Cisco Systems, Inc.	Colgate-Palmolive Co.
Eli Lilly and Co.	Exxon Mobil Corp.	General Electric Co.	Gilead Sciences, Inc.	Honeywell International, Inc.
Intel Corp.	International Business Machines	Intuit, Inc.	Johnson & Johnson	Lockheed Martin Corp.
Medtronic Plc.	Merck & Co., Inc.	Meta Platforms, Inc.	Micron Technology, Inc.	Microsoft Corp.
Mondelez International, Inc.	Netflix, Inc.	Nvidia Corp.	Oracle Corp.	PayPal Holdings, Inc.
PepsiCo, Inc.	Pfizer, Inc.	Philip Morris International, Inc.	Procter & Gamble Co.	Qualcomm, Inc.
Salesforce.com, Inc.	Stryker Corp.	Tesla, Inc.	Texas Instruments, Inc.	Thermo Fisher Scientific, Inc.