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The ROIC Over WACC Measurement

A study of the association between the ROIC over WACC measurement and stock returns on the OMX Stockholm Large Cap

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Abstract

McKinsey and Koller et al. (2020) argue that value creation in a company stems from earning a Return on Invested Capital (ROIC) above the Weighted Average Cost of Capital (WACC). This study investigates whether a high ROIC minus WACC measurement is associated with abnormal returns on the OMX Stockholm Large Cap. The companies were sorted into five portfolios in the test, depending on their ROIC over WACC percentage points (referred to as SPREAD in this thesis). Then, the monthly return on the portfolios between the years 2004-2020 were analyzed through regression analysis. The findings are suggestive but not conclusive that applying the measurement to stock picking does not yield a higher return. This is in line with the theories of efficient capital markets. The study also suggests no correlation between the SPREAD and the Sharpe-ratio. However, a significant negative correlation between SPREAD and the standard deviation of returns was found.

Tutor: Henrik Andersson

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1. Introduction

For an equity investor, earning long-lasting high returns with low risk is something aspiring for most. A common saying is that there exist as many investment strategies as there are investors. A key factor to a successful strategy is to find variables that can explain future stock performance. Although, in theory, there are no arbitrage opportunities in perfect capital markets, so when strategies claim to have found a key indicator of long-term stock performance, one can not help to become skeptical about this. Hence, it is of common interest to test these hypotheses out. One such indicator is the excess earnings on capital over the cost of capital.

1.1 Relevance of topic

There have been several influential papers studying how profitability metrics impact stock returns, "A five-factor asset pricing model by Fama French (2015), and The other side of value: The gross profitability premium by Robert Novy-Marx (2013), being two of the most prominent. In the book "*Valuation: Measuring and managing the value of companies"* by Tim Koller, Marc Goedhart, and David Wessel (2020), all from Mckinsey, it is stated that "Companies create value when they earn a return on invested capital (ROIC) greater than their opportunity cost of capital." For the cost of capital, the weighted average cost of capital is used throughout the book. Thus, it does not suffice to make an accounting profit to create value. In addition to including the cost of capital aspect, they also use the profitability metric ROIC instead of return on equity and gross-profit to assets which are used by Fama French and Novy-Marx, respectively. According to Koller et al. (2020), the ROIC metric is better suited for measuring the operating profitability of a company than any other metric.

1.2 Theoretical background

In addition to Fama French and Novy-Marx, there have been several previous studies trying to capture the variables that influence the stock returns. The capital asset pricing model (CAPM), mainly developed by Sharpe (1964) and Lintner (1965), is one of the most influential and most used models in practice. The model tries to determine the required rate of return of an asset by taking into account the risk-free rate, the asset's sensitivity to the market risk, and a premium component. The model has given rise to other similar significant studies such as Fama-French three-factor model (1992), the Fama-French five-factor model (2015), and the Carhart four-factor model (1997).

Stern Stewart & Co. have developed a measurement that essentially is almost identical to the value creation concept developed by Mckinsey. They call it Economic Value Added (EVA) and Stern argue that EVA® is a key driver for stock performance according to Biddle et al. (1997). Several companies have also adopted EVA as a performance measurement or in relation to compensation, which Coca-Cola is an example of. Additionally, in 2018 ISS (Institutional Shareholder Services) published in its 2019 Benchmark Policy Changes that EVA will be featured in ISS research reports. They also stated that in 2020, ISS would include EVA-based measurements as part of the financial performance assessment methodology for its pay-for-performance model. Furthermore, Wallace, J.'s study from 1997 suggests that managers compensated based on EVA (instead of earnings) act in line with EVA-based incentives.

Some smaller studies on how EVA correlates with stock returns have been conducted with different results. The paper "*Relationship between EVA(economic value added) and share prices of select companies in bse-sensex- An empirical study"* by Mathangi Aravind and K Ramya (2015), found no correlation between EVA and share price and actually saw an inverse relationship in some companies. With the result of their study, they concluded that investors are not always rational and that a company's EVA does not influence these investors' investment decisions. This study looked at six companies in different key sectors in India on the BSE-SENSEX market over a six-year period between 2008 to 2013. To analyze the relationship, the study used trend percentages and correlation.

Another study, *"The relationship between stock return and economic value added (EVA): A review of KSE-100 index"* by Muhammad Asad Khan, Naveed Hussain Shah, and Atta ur Rehman (2012) studied the relationship between stock returns and EVA and compared their results with the relationship between stock returns and other variables such as net income and operating cash flow. They found that the operating cash flow had the highest explanatory power of the stock returns. Using the Pearson correlation test, they found that both operating cash flow and net income had a positive correlation with the stock returns while economic value added had a negative correlation. This study looked at 60 firms on the Karachi stock exchange during the years 2004 to 2010

A third study on the topic *"The Effect Of Economic Value Added On Stock Return: Evidence From Selected Companies Of Karachi Stock Exchange"* by Dr. Abdul Ghafoor Awan, Kalsoom Siddique, and Ghulam Sarwar (2014) used a sample of 59 companies on the KSE 100-index and found that the stock value is influenced by the economic value added at a significance level of 10%.

1.3 Motivation for study

These papers have some weaknesses, such as a short time horizon and a non-peer-reviewed methodology. They are not as extensive as larger and more influential papers, meaning that there still is a research gap in the literature area. It is therefore of interest to conduct this study and complement its results to the already well-researched area of variables impacting stock returns. This study will build on the value-creating concept associated with Mckinsey and their "*Valuation"* book, where the focus is to test how the difference between ROIC and WACC (referred to as SPREAD in this thesis) affects stock returns. On the one hand, there are theories that state that the market is efficient and that all information is discounted into the price, and that alpha, therefore, can not be created. On the other hand, Mckinsey claims that it is the best measurement of value creation, and Stern and co states that EVA drives stock prices better than other profitability metrics. The results of this thesis will equip equity investors with knowledge related to how the difference between ROIC and WACC (SPREAD) impacts stock returns on the swedish stock market.

1.4 Research question and hypotheses

The research question for this thesis is:
How are the dependent variables, stock returns, standard deviation of returns and the Sharpe-ratio affected by different levels of the dependent variable, the SPREAD?

To answer this question, regression analyses will be conducted with the following hypotheses:
H_0:There is no significant correlation between the independent and dependent variable on a 5 percent significance level

H_1: There is a significance correlation between the independent and dependent variable on a 5 percent significance level

1.5 Limitations of study

Specifically, this study will look at the Swedish market since papers on how excess profits metrics influence stock returns in Sweden are limited. To limit the study, companies on the OMX large-cap will be analyzed in a period of fifteen years between 2006-2020. By conducting this analysis, valuable knowledge for equity investors will be provided. Apart from looking at how the SPREAD impacts stock returns, focus will also be put on how the SPREAD impacts the standard deviation of returns as well as the Sharpe ratio. By expanding the study to include these two variables, the risk aspect often measured in volatility will also be considered.

2. Literature Review and Theory

2.1 The CAPM Model

There have been several papers trying to find variables that capture the stock return. Some of the most influential papers in the area have been those of William Sharpe's paper (1964), John Virgil Lintner (1965), and Fisher Black (1972), developing the work of Harry M. Markowitz (1952) and his modern portfolio theory. In Markowitz's paper, he develops a mathematical framework maximizing the expected return of a portfolio given different amounts of risks taken. The study builds on the assumption that an investor does maximize the discounted expected return and finds it desirable to do so. The investor should also find the risk through variance in return undesirable. This means that an investor will require a higher rate of return for taking on additional risk. According to Markowitz, an investor can reduce the risk of a portfolio by investing in stocks that are not positively correlated, and in that way, diversifying the portfolio.

The above mentioned papers have all contributed to the capital asset pricing model (CAPM) frequently used today in practice. The main takeaways from these studies are that there exists a linear function between the expected return of a security and the beta value calculated by doing a regression analysis between the security's returns and the market returns. By assuming that company-specific risk can be removed by diversification, the market risk is what is left in a well-diversified portfolio. According to the capital asset pricing model, market risk is thus the risk that the investor should be compensated for through higher return.

However, there are studies that find contradictory results. Black (1972) evaluates the assumptions made in Litner's study and claims that the assumption of an investor being able to "take long and short positions of any size in any asset, including the riskless asset," is not a good approximation for investors. Black also says that many studies of securities returns show results that contradict the returns expected by the CAPM.

Rolf W Banz (1981) asserts that the CAPM is misspecified and that the size (market cap) of a firm has explanatory value to the stock returns. Firms with low market caps have, on average larger risk-adjusted returns than large firms, and the paper concludes that studies based on CAPM "might be at least contaminated by the size effect." Although it should be noted that

Banz can not conclude that the size effect is empirically robust, the size variable could be a proxy of another unknown variable that is correlated with size.

The Fama French paper (1993) argues that the returns of US stocks have little or no relation to the CAPM. Analyzing data between 1964-1991, they instead found that market cap and book-to-market strongly capture the variation in stock returns. The reason for choosing these two variables is their close relationship with economic fundamentals. Firms with a low market cap to book value of equity usually have a low return on assets, and this tendency seems to hold for at least ten years. Firms with a high market cap to book value of equity instead tend to have high returns on assets. Looking at the size variable, firms with a low market cap have a lower return on assets than larger firms. However, this difference mostly stems from the 1980s where small firms were not able to recover after the recession at the beginning of the decade the way larger firms did. In other words, up until 1981, the size variable was not significant. The conclusion Fama and French draw from this is that the size variable can be related to a risk factor. Furthermore, by using the factors excess market return, market cap, and book-to-market as variables, they receive an intercept of close to 0.

2.2 Three Factor Model

The asset pricing model Fama and French developed in 1993 is called the three factor model. As indicated above it was constructed to test if there was any relation between average return and market capitalisation and to capture a potential relation between average return and price ratios like book to market. When this paper was published it was influenced by the papers of Sharpe (1964) and Lintner (1965). According to Fama and French these were the factors that the CAPM did not capture. Bellow is the three-factor model regression:

$$R_{it} - R_{Ft} = a_i + b_i\,(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + e_{it}.$$

R_{it} = Return on security or portfolio i for period t,

R_{Ft}= Riskfree return,

R_{Mt}= Return on the value-weight (VW) market portfolio

SMB_t = The difference between the returns on diversified portfolios of small stocks and the return on a diversified portfolio of big stocks
HML_t = The difference between the returns on diversified portfolios of high and low B/M stocks
e_{it} = a zero-mean residual.

2.3 Revising the Three Factor Model

This publication from Fama and French, in turn, influenced others to perform more tests on the model. Studies from, for example, Titman, Wei, and Xie (2004) and Novy-Marx (2013) indicated that the three-factor model was incomplete. More specifically, it misses some of the variations in average return from the factors; investments and profitability.

Titman, Wei, and Xie (2004) test the correlation between stock returns and capital investments. In their study, they conclude that capital expenditures have an impact on stock performance and that there are several reasons for both positive and negative returns. For example, more investments may signal that the company has found many investments with a high net present value. Additionally, Titman, Wei, and Xie (2004) argue that increased capital can indicate that the capital markets, which provide the capital, have confidence in the management. Combined with their own and other studies on the matter, they conclude that stock prices tend to perform quite well when capital expenditures increase. On the other hand, there are reasons for viewing these results more skeptically. For example, the companies may be selective about when they announce increased capital expenditures. If they only announce the ones which they believe will be viewed favorably, that could impact the study. Moreover, higher stock valuation further enables increased capital expenditures. In other words, higher investment expenditures during a period of higher stock prices will not necessarily mean that the market perceived the investments favorably.

However, there are also some reasons for the market to perceive increased investment expenditures negatively. For example, Titman, Wei, and Xie (2004) lifted up a study from Jensen (1986) about empire building relating to this. The risk is that managers acquire companies and increase investments only for their own personal gain. In some cases they might have incentives to run a larger company even though it is not beneficial for the shareholders. In short, Titman, Wei, and Xie find that investments do have an association with stock returns and that was noted by Fama and French.

Robert Novy-Marx (2013) defines the profitability-measurement as gross profit divided by assets and found a correlation between profitable firms and higher stock returns, despite profitable firms having higher valuation ratios. This result contradicts the results from Fama and French (1993) that conclude that there is no positive relation between returns and profitability. Novy-Marx used non-financial companies from NYSE and measured the data between July 1963 and December 2010. The test was conducted by sorting companies into portfolios based on gross profit to assets and book to market. By looking at the average return spread between the portfolios, they could find what variable generated the most significant result. The profitability variable had an average spread of 0,68 percent per month across the portfolios, while book-to-market had an average spread of 0,54 percent. Novy-Marx also constructed a strategy based on his results. By ranking the stocks based on profitability and book-to-market and each year buying the stocks with the highest combined rank and shorting the stocks with the lowest combined rank, he generated an average excess return of almost 8 percent.

They also observed that the most profitable firms earned returns of 0,31% higher per month than the least profitable portfolio. Fama French (2015) found that portfolios with extremely high profitability have higher returns than portfolios with extremely low profitability. The difference was between 0,28-0,37% based on how many portfolios were used for division of the firms. Although, a conclusion of the portfolios in between the highest and lowest profitability portfolios can not be drawn; these portfolios had similar returns.

Prior to this, Fama and French published a study in 2006 in which they tested the effects of profitability, investments and book-to-market on expected return. Deriving from the dividend discount model (1) the authors end up with the formula (3).

$$M_t = \sum_{\tau=1}^{\infty} \mathrm{E}(D_{t+\tau})/(1+r)^{\tau}, \tag{1}$$

M_t = The price at time t,

$E(D_t+_\tau)$ = The expected dividend in period t+τ

r = The long-term average expected stock return

By then applying the clean surplus accounting method, which is a forecasting model that yields price as a function of earnings, expected returns, and change in book value), the dividend discount model is as follows:

$$M_t = \sum_{\tau=1}^{\infty} \mathrm{E}(Y_{t+\tau} - dB_{t+\tau})/(1+r)^{\tau} \tag{2}$$

The time t dividend, D_t = equity earnings per share, Y_t, subtracted by the change in book equity per share, $dB_t = B_t - B_{t-1}$.

And dividing it by book equity at time t:

$$\frac{M_t}{B_t} = \frac{\sum_{\tau=1}^{\infty} \mathrm{E}(Y_{t+\tau} - dB_{t+\tau})/(1+r)^{\tau}}{B_t}. \tag{3}$$

The above formula implies three predictions about the stock return. Firstly, a higher Bt/Mt (book to market equity ratio) would lead to a higher expected stock return. Secondly, firms with higher expected earnings relative to current book equity would get a higher return. Thirdly, firms with higher expected growth in book to equity because of reinvestments of earnings are expected to have a lower stock return.

Fama and French (2006) argue that their test can be considered a combination of the perspectives from several papers linked to average stock returns relating to profitability, investments, and book-to-market equity. What is tested by equation (3) is a slightly new method but derives from many other papers.

In 2013, Aharoni, Grundy, and Zeng, also published a study that follows up on the 2006 paper from Fama and French, which in turn follows up on Fama and French (1993). Aharoni et al. points out the limited empirical success of Fama and French and argues it is related to the measurement of expected profitability and investments. The valuation formula used in Fama and French (2006), which originally stems from Miller Modigliani (1961), applies at the firm level but, according to Aharoni et al., not at the per-share level. The reason behind this claim is that when the amount of shares changes, it is likely that the expected change in investment per share in relation to expected returns also changes. This can occur either from repurchasing of shares or new share issuances. To give an example, a firm that does a share issuance. Then a potential expected increase in book equity does not necessarily imply an expected increase in book equity per share.

The 2006 study by Fama and French discusses some possible explanations for the limited empirical evidence of the Miller Modigliani valuation formula used. The main explanation they consider is potential measurement errors for the expected profitability and expected investment. In Fama and French (2008), however, the explanation is that the book-to-market ratio also includes predictions about expected discount rates and cash flows. To avoid this issue, the variables net issuance of equity and the development of book-to-market are used. The issue with Fama and French (2008) that Aharoni et al. recognize is that it only examines the relationship between current investments and expected future returns and not with expected future investments. The Aharoni et al. (2013) study instead looks at the firm level and analyses the performance of the valuation formula directly.

2.4 The Five Factor Model

To adjust to the above, at the time, new information from Titman, Wei, and Xie (2004) and Novy-Marx (2013), among others, Fama and French (2015) published a new revised three-factor model, the five-factor model. The two new factors are profitability and investment factors. The profitability factor in the model consists of the difference between the return on a portfolio of firms with robust and weak operating profitability (RMW). In the study, the profitability measure is annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses, all divided by book equity. In short, according to Fama and French (2015), profitability among other factors has explanatory power when it comes to stock returns. However, when Fama and French analyze profitability, they look at raw returns and not excess returns, meaning they do not adjust for the cost of capital, which this study will do. Since this study will deduct the cost of capital when looking at profitability, only the excess return will be analyzed. This gives a slightly new edge to the Fama and French study and acts as further motivation for this study.

Fama French (2015) also looked at standard deviation and found that the difference in standard deviation between a high profitable portfolio and a low profitable portfolio was between 2,13%-2,88% based on the number of portfolios used.

2.5 The Four Factor Model

After the three-factor model was first published, another extension of the model was developed by Carhart (1997). The model is called the four-factor model and has an added momentum factor to the three-factor model. The model was presented in Carhart's study from 1997 as a way to test the performance of mutual funds. Carhart was, in turn, influenced by the studies from Jegadeesh and Titman (1993), who identified that stocks that have performed well in the past have a tendency to continue to do so in the following period. The same effect was discovered for low-performing stocks, in short, a momentum effect. In the paper, the authors conclude that over a 3-12 months holding period, strategies that invest in stocks that have performed well in the past and sell stocks that have performed poorly achieve abnormal returns. Carhart linked this discovery with the Fama French model by adding the momentum factor to the model. The four-factor model is as follows:

$$r_i - r_f = \alpha + \beta_1(r_m - r_f) + \beta_{2i}(SMB) + \beta_{3i}(HML) + \beta_{4i}(WML) + \varepsilon_i$$

r_i = The return on asset i

r_f= The risk-free rate, one‑month T‑bill return

α = Intercept of the regression line

r_m = Return on the value-weight (VW) market portfolio

SMB = The difference between the returns on diversified portfolios of small stocks and the return on a diversified portfolio of big stocks

HML = The difference between the returns on diversified portfolios of high and low B/M stocks

WML = Return of the momentum factor

ε_i = residuals of the regression model

$\beta_{1\text{-}2\text{-}3\text{-}4}$ = Beta values of the three independent variables rm-rf, SMB, HML and WML. The WML factor stands for winners minus losers, the winner stocks is the top 30% percentile of the data and losers is the bottom 30% percentile of data.

2.6 Economic Value Added

The economic value added is something that has been known for a long time, argues Peter F. Drucker in Harvard Business Review (1998). In his book from 1964, *Managing for Results*, the concept was discussed, but similar conclusions had already been made in the late 1890s by the classical economists Alfred Marshall in England and Eugen Böhm-Bawerk in Austria. The general concept is summarized by Druckner (1998) as: “What we generally call profits, the money left to service equity, is usually not profit at all. Until a business returns a profit that is greater than its cost of capital, it operates at a loss.” The enterprise still pays taxes on the profit even though it still consumes more resources than it returns to the economy. As long as the profit does not exceed the firm's total cost of capital, it destroys wealth instead of creating it. According to Drucker, EVA measures the total productivity of all factors of productivity. It should be used as an indicator of what works and where to take immediate action. It does not explicitly show why a certain division or project is successful but it shows which activities that add unusual high value.

On the concept of EVA, a study was made by Biddle et al. in 1999, where the potential connection between EVA and stock return was tested. More specifically, the study tested whether economic value added had a higher correlation with stock returns than accrual earnings. The results from the study showed that EVA only had a marginal impact on stock returns beyond accrual earnings. The study concluded that earnings have better explanatory value to stock returns than economic value added.

2.7 Greenblatt's Magic Formula

There have been several previous attempts to identify high-yielding stocks via a formula. Joel Greenblatt’s magic formula is one example of that. Greenblatt, who is an american hedge fund manager, developed the formula (Greenblatt, 2006). The formula is based on identifying the companies with the metrics; ROIC and Earnings Yield (EY). EY is measured as the EBIT divided by Enterprise Value, meaning a high EY should imply that the company makes large profits in relation to its valuation. The rationale behind the strategy is buying high quality companies (represented by a high ROIC) at relatively low price (represented by a high EY).

2.8 ROIC and valuation multiples

Research from Mckinsey and Koller et al (2020), shows that industries with higher valuation multiples (market value/capital and market value/earnings) have higher ROIC and or growth. The same can be said about individual companies. However, Koller et al do say that the correlation with EV/EBITDA is not as clear since investors expect the earnings growth to converge in the long run to individual companies. For 2018, life science and technology companies had the highest multiples and also the highest ROIC combined with high growth. On the other end, utility companies in metals and mining had lower multiples due to lower ROIC and lower expected growth.

2.9 The Efficient Market Hypothesis

In academics, individual stock returns are often considered difficult to predict. This idea goes back to Bachelier (1900) and Mandelbrot (1963), who analyzed variation in speculative prices. Later, Eugine Fama (1965) continued to develop this hypothesis, which now is referred to as the efficient-market hypothesis (EMH). EMH briefly states that the valuation of the stock market at any given time is a result of all information available to the market participants at that time. Subsequently, it should not be possible to achieve abnormal stock returns by using historical information, according to the EMH. EMH has, together with the CAPM (Sharpe 1964) and the Irrelevance Proposition theory (Modigliani & Miller 1958), been a fundamental part of shaping the modern financial world. However, all of these theories assume perfect capital markets. Berk et al. (2017) define perfect capitals according to the following criteria:

1. "Investors and firms can trade the same set of securities at competitive market prices equal to the present value of their future cash flows.
2. There are no taxes, transaction costs, or issuance costs associated with security trading.
3. A firm's financing decisions do not change the cash flows generated by its investments, nor do they reveal new information about them

Although today's markets do not entirely fulfill these criteria, there is still evidence that the EMH, in a broad sense, tends to hold. For example, active stock picking does not necessarily beat an index fund. This is indicated by Cremers et al. (2016), who find that funds that frequently trade generally underperform their benchmark index. However, their research also suggests that patient funds, with a holding period of over two years, tend to outperform. Indicating there might still be ways for active investors to achieve alpha. In 1991 Fama published the *Efficient Markets II,* where he concluded that the extreme version of the EMH is false. This is mainly due to the fact that there, in reality, are trading costs and positive information. Despite the difficulty of testing exactly whether the efficient market hypothesis holds or not, it still has educational value. Fama concludes that it is perhaps impossible to test the degree of efficient markets, but the fact that it has improved the broader understanding of security return makes the theory one of the most successful empirical economic concepts.

2.10 Hypothesis

According to the efficient market hypothesis, all information relevant to a stock's valuation should already be priced in (Fama, 1965). Hence, creating excess return by analyzing differences in ROIC and WACC (SPREAD) should, in theory, not be possible. Based on the theories of efficient markets, the hypothesis of the study is that this technique should not work in practice. On the other hand, Biddle et al.'s (1997) study suggests that EVA marginally adds information content when they studied the measurments's association with stock returns. With that in mind the hypothesis of this study will still tilt towards the more traditional economic theories of efficient markets. To conclude, the hypothesis states; there is no positive association between the SPREAD and stock returns.

3. Method

3.1 Sample

The sample in this study will consist of a maximum of 68 stocks listed on the OMX Stockholm Large cap, excluding investment, financial, and real estate companies. The number of stocks will not be the same for every year since all of the stocks on the list today have not been there since 2006. Financial data between the years 2004-2020 for these companies were downloaded from Capital IQ. Data on monthly stock returns adjusted for dividends for 2006-2020 was also downloaded from Capital IQ. The data were then put into an excel sheet, and a three-year average ROIC for the years 2005-2019 was calculated. The calculation of ROIC and WACC will follow the guidelines in *Valuation* by Koller et al. (2020).

According to Fama French (1992), financial companies are excluded due to the high leverage that is common for these firms and which for non-financial firms would be unreasonably high. The exclusion of investment companies is because of their business type, which differs from non-investment companies. The stock price of an investment firm is built on the underlying firms and the net asset value which the investment firm has invested in, not on the profit the investment firm presents. Similarly, real estate firms are excluded since the stock price of these firms, to a great deal, depends on the net asset value of the owned properties. These three industries are also excluded in *Valuation* by Koller et al. (2020) when they present research about ROIC.

Table 1: Number of stocks used in creating portfolios each year

Panel A:

Year	Number of stocks
2006	49
2007	49
2008	49
2009	51
2010	51
2011	51
2012	51
2013	51
2014	52
2015	56
2016	60
2017	64
2018	65
2019	68
2020	68

Panel B: Number of stocks in each portfolio

Portfolios	1	2	3	4	5
Year					
2006	10	9	10	10	10
2007	10	10	10	10	9
2008	10	10	10	10	9
2009	11	10	10	10	10
2010	10	10	11	10	10
2011	11	10	10	10	10
2012	10	10	11	10	10
2013	10	10	10	10	11
2014	10	11	10	11	10
2015	11	11	11	12	11
2016	12	12	12	12	12
2017	13	13	13	13	12
2018	13	13	13	13	13
2019	14	14	13	14	13
2020	14	13	14	14	13

3.3 Portfolio construction

Each year between 2006-2020, the companies are ranked based on their historical three-year average difference between ROIC and WACC (SPREAD). For example, for portfolio 2020, the SPREAD for the years 2017, 2018, and 2019 are considered, and the average is the number that the company will be based on. The companies are divided into five equally large portfolios, with portfolio 1 being the portfolio with the highest SPREAD and portfolio 5 being the one with the lowest. The same procedure is done every year. To each firm and for every year, the monthly average stock returns are linked.

3.4 Independent variables

The independent variables to be used in the analysis are ROIC, WACC, and the SPREAD. They will be described below.

The ROIC measurement was calculated by dividing NOPLAT with invested capital. The invested capital was calculated by subtracting operating liabilities from operating assets. While Koller et al. in *Valuation* (2020) does a detailed review of each item on the balance sheet to separate operating from non-operating items, some simplifications were made for this study to be able to standardize the process of gathering data. No separation between operating and non-operating deferred taxes is made; both deferred tax assets and deferred tax liabilities are treated as non-operating items. All cash and equivalents are also treated as non-operating assets and therefore not included in invested capital. The calculation of NOPLAT does also deviate from the guidelines in *Valuation. Instead* of deducting (1-tax rate) from the operating earnings, the reported taxes are deducted, resulting in a smaller NOPLAT.

For the WACC, the cost of equity for each firm was calculated through the CAPM approach. $R_f + \beta_i * R_{MRP} = R_i$. In this calculation, the risk free rate and market risk premium will be constants. While it can be argued that letting the factors vary according to the market values of these factors will generate more precise calculations for specific years, some problems will arise with that method. Having the market return vary for each year on a ten-year basis will for some years give a negative market premium or close to zero market premium. This would generate an unreasonably low cost of equity for some years. Instead, returns based on the years 1900-2018 are used, and according to Koller et al. (2020), a market risk premium of 5% is proposed to use. Regarding the risk-free rate, Koller et al. (2020) argue that the current low interest rate is inappropriate to use and advocates using a constant number calculated from the long term real interest rate and inflation, 3,7%. The cost of equity calculation for all the stocks will therefore have the form, $R_i = 3,7\% + \beta_i * 5\%$

The beta factor will be central in the calculation of the SPREAD since it is the only item together with capital structure that will differ between the companies in the WACC calculation. For the calculation of beta, Koller et al. (2020) argue that company individual betas can be influenced by non-recurring events and that an industry beta is better to use. The equity beta consists of two types of risk, operating and financial risk. Because companies in the same industry face similar operational risks, they should have similar operating betas. However, the financial risk will differ between companies and will therefore have to be specified for each company. The method for doing this is the following:

1. The equity beta for five peer companies is calculated using historical regression analysis. The peer companies are selected by Capital IQ.

2. The equity beta for the peer companies is unlevered by Capital IQ by removing the leverage effect
3. The average unlevered beta of the peer companies is calculated. Added to this is the leverage effect of the selected company.

The beta for each peer company is calculated using 60 months of historical data and measured against the S&P 500 index. Although, according to Koller et al. (2020), a European index or world index is commonly used outside of the US, the S&P 500 index is more accessible and is used by Capital IQ for the calculation of WACC. The correlation between S&P 500 and MSCI world index is 97%, and the choice of the index will therefore have a negligible impact on the beta.

Although there are other models with better explanatory value when calculating the required rate of return, such as the Fama French three and five factor model (1992) (2015), the CAPM is advocated by Koller et al. (2020) and is the most used method in practice for calculating the WACC. To also make this study more relevant from a practical perspective, the CAPM method will therefore be used. As mentioned in the introduction, one of the aims of the study is to provide equity investors with additional knowledge regarding the SPREAD when investing. Since calculating the required rate of return through the Fama French models is more complicated and more to standardize, the CAPM approach is more suitable for this paper.

Having both the ROIC and WACC for each company and for each year, the SPREAD between the two metrics can be calculated. ROIC is for each year based on a three-year average which is to make the metric more stable and long-term. Although ROIC usually is sticky, according to Koller et al. (2020), there are instances of the metric significantly deviating from its sustainable level. Another reason for this approach is that this metric is long-term and, to a large part, stems from competitive advantage over a long time horizon. It could also be argued that a longer time frame for calculating the average should be used. Instead of three years, five or ten years could be used. However, with the limited time frame of fifteen years and a limited number of companies on which this study focuses, the number of observations would be fewer, and the risk of not capturing changes in ROIC would arise since the metric would fluctuate less. Regarding the WACC, the number is calculated in intervals of five years due to the beta calculation being based on five years. A three-year average could be used for WACC but for simplicity reasons, as well as the fact that the WACC is even more sticky than ROIC and does not deviate much, the current method should be plausible.

3.5 Dependent variables

The following dependent variables will be used in the regression analyses:

- Monthly average portfolio returns for one year
- Standard deviation of the portfolio returns
- Sharpe-ratio for the portfolios.

3.6 Regression formulas

The following regression formulas will be used to answer the research question:

$$r_i = a_i + \beta_i * SPREAD + \varepsilon_i$$

$$std = a_i + \beta_i * SPREAD + \varepsilon_i$$

$$Sharpe = a_i + \beta_i * SPREAD + \varepsilon_i$$

where
r_i = The monthly average return of the portfolio
β_i=Coefficient of the regression line
α = Intercept of the regression line
ε_i = residuals of the regression model
$SPREAD$=ROIC minus WACC for the portfolio
std= Standard deviation of monthly average returns of portfolio
$Sharpe$=Sharpe ratio of portfolio with ten year government bond as risk free rate

The independent variable of each portfolio will be regressed against the dependent variable for each portfolio during one year at a time. This will generate five observations per year and a total of 75 observations for each regression analysis.

In table 3, the correlation between ROIC and WACC is considered and it is found that a negative correlation of -0,6189 exists on a 1% significance level.

Table 3

Correlation

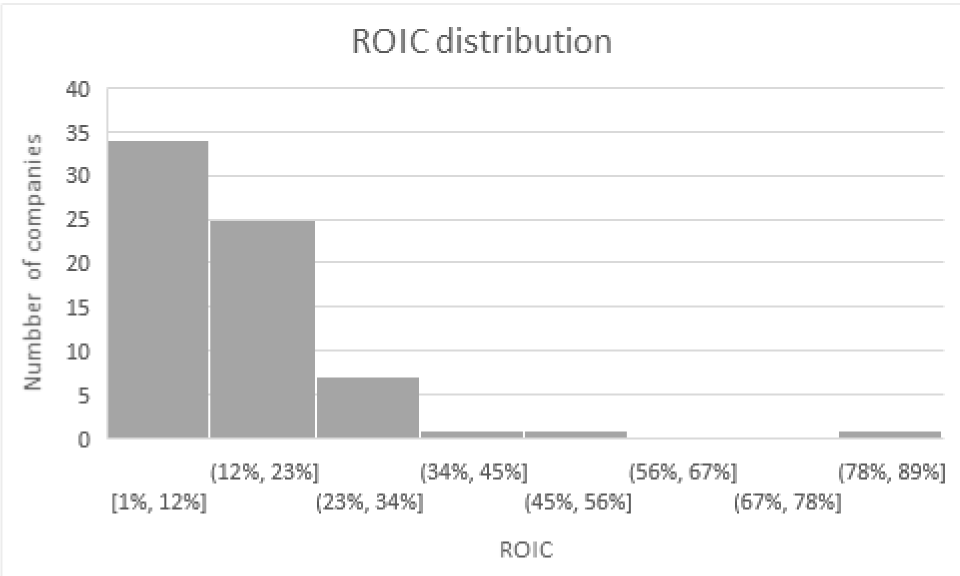
	roic	wacc
roic	1.0000	
wacc	-0.6189* 0.0000	1.0000

*.Correlation is significant at the 0,01 level

4. Analysis

In this section, first, the descriptive statistics for the variables and collected data will be presented. Secondly, the results from the regression analyzes are presented. The main question for this study is to answer how the SPREAD influences the stock returns for Swedish companies on the OMX large cap list. The focus will be on the actual monthly stock returns of the portfolios, the standard deviation of the returns, as well as the Sharpe ratio of the portfolios.

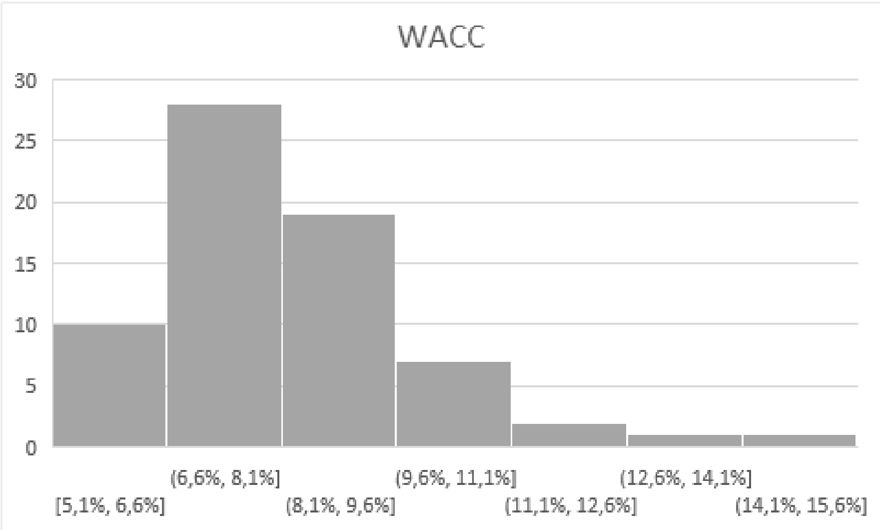
Graph 1



In graph 1 and 2 the SPREAD metric has been disaggregated into the ROIC and WACC metric. From graph 1 it can be seen that half of the observed companies have an average ROIC between 1% and 12%, with one company significantly outperforming the other and having a ROIC of 85%.

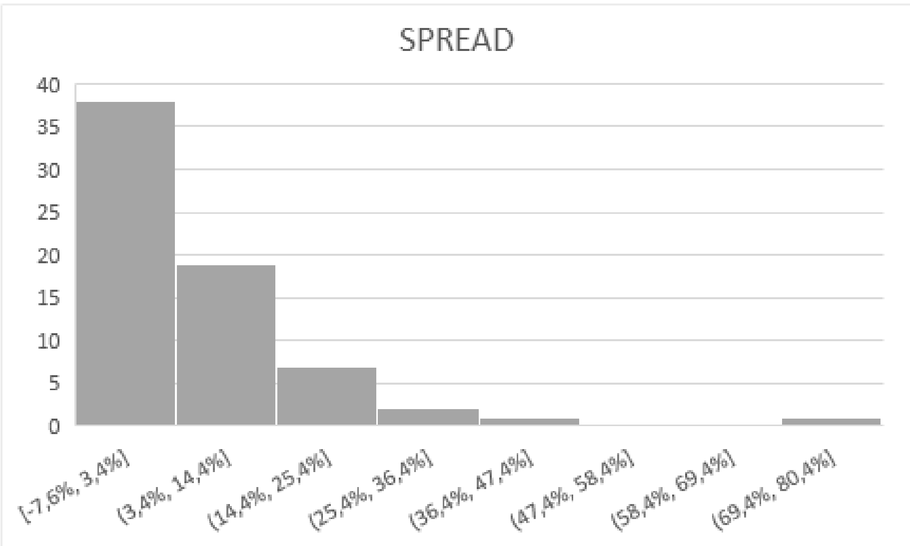
Research from Koller et al. (2020) shows that U.S. based companies have had an average ROIC in the 21th century of around 10%. Earlier observations from the same authors, of ROIC being sticky is also confirmed in this study as the average variance in ROIC is 0,6%.

Graph 2



In graph 2 the WACC distribution is shown and most of the companies have a WACC between 6,6-8,1% and 8,1-9,6%, with three companies having a WACC above 10,7%. The average is 8,2%. As the market return in the calculation is 8,7% the results are in line with what can be expected.

Graph 3



Graph 3 then shows the SPREAD, meaning the difference between ROIC and WACC. More than half of the companies are in the span of -7,6% to 3,4%. The average is 6,5% and median

2,6%. Looking at the graphs above, ROIC varies more than WACC and will therefore have a bigger impact on the SPREAD.

Table 4

Portfolios	Monthly avg	Standard deviation returns	Avg sharpe-ratio
1	1,617%	4,2%	5,778
2	1,673%	5,2%	4,890
3	1,255%	5,1%	3,954
4	1,496%	5,5%	3,938
5	1,540%	6,5%	3,640

From table 4, a compilation of the average monthly returns, standard deviation on returns and average Sharpe-ratio for the portfolios can be seen. The second portfolio has the highest average monthly return while the third portfolio has the lowest.

Regarding the standard deviation of returns, it is generally lower for the more profitable portfolios, with the difference between the most and least profitable portfolio being 2,3%.

For the Sharpe-ratio, a linear connection between SPREAD and Sharpe-ratio is found which is mainly due to standard deviation of return significantly correlated negatively with SPREAD as stock returns did not significantly correlate.

4.1 Hypothesis Testing

To answer the research question, the following hypothesis will be tested on the regression analysis.

H_0: P-value is not significantly different from zero on a five significance level

H_1: P-value is significantly different from zero on a five significance level

Table 5

Source	SS	df	MS			
Model	.002857915	1	.002857915	Number of obs	=	75
Residual	.098746439	73	.001352691	F(1, 73)	=	2.11
				Prob > F	=	0.1504
Total	.101604354	74	.001373032	R-squared	=	0.0281
				Adj R-squared	=	0.0148
				Root MSE	=	.03678

Monthlyave~n	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spread	.0532818	.0366567	1.45	0.150	-.0197749	.1263384
_cons	.0131659	.0048515	2.71	0.008	.0034969	.022835

From the regression analysis it can be observed that the SPREAD does not significantly correlate with the stock return since p=0,150≥ 0,05 and the null hypothesis can not be rejected. The SPREAD as a variable has a small power in explaining the stock returns on a portfolio level due to R-squared being 0,0281. The coefficient in the regression model is 0,0532818 and the intercept is 0,131659.

To test the influence of the SPREAD on standard deviation, the following regression formula was used $std = a_i + b_i * SPREAD + e_i$

Table 6

Source	SS	df	MS			
Model	.003471133	1	.003471133	Number of obs	=	75
Residual	.036745728	73	.000503366	F(1, 73)	=	6.90
				Prob > F	=	0.0105
Total	.04021686	74	.000543471	R-squared	=	0.0863
				Adj R-squared	=	0.0738
				Root MSE	=	.02244

STD	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spread	-.0593303	.0225935	-2.63	0.011	-.1043589	-.0143016
_cons	.0563063	.0029537	19.06	0.000	.0504196	.062193

The analysis shows that the SPREAD has a significant influence on the standard deviation of monthly stock returns since p≤0,05. The SPREAD as an independent variable can explain the standard deviation with 8,63%. The coefficient in the regression model is -0,0593303 and the intercept is 0,0563063.

The third test is to see if the SPREAD correlates positively with the Sharpe-ratio using the following regression formula

$Sharpe = a_i + b_i * SPREAD + e_i$

Table 7

Source	SS	df	MS			
				Number of obs	=	75
				F(1, 73)	=	0.78
Model	23.1625015	1	23.1625015	Prob > F	=	0.3814
Residual	2180.01524	73	29.8632224	R-squared	=	0.0105
				Adj R-squared	=	-0.0030
Total	2203.17774	74	29.7726722	Root MSE	=	5.4647

Sharpe	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spread	4.796745	5.446559	0.88	0.381	-6.058232	15.65172
_cons	4.201693	.7208548	5.83	0.000	2.765032	5.638355

From the above analysis it can be observed that the SPREAD does not significantly correlate positively with the Sharpe-ratio since P=0,381≥ 0,05. SPREAD as an independent variable explains the Sharpe-ratio with 0,0105%. The coefficient in the regression model is 4,796745 and the intercept is 4,201693

Disaggregating the SPREAD metric into ROIC and WACC gives the following regression formula: $r_{monthly\ avg} = a_i + \beta_i * ROIC - b_j * WACC + e_{ij}$

Table 8

Source	SS	df	MS			
Model	.000325599	2	.0001628	Number of obs	=	75
Residual	.044529592	72	.000618467	F(2, 72)	=	0.26
				Prob > F	=	0.7693
Total	.044855191	74	.000606151	R-squared	=	0.0073
				Adj R-squared	=	-0.0203
				Root MSE	=	.02487

return	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
roic	-.0092763	.0335743	-0.28	0.783	-.0762053	.0576528
wacc	-.2418672	.3465207	-0.70	0.487	-.9326436	.4489092
_cons	.0357528	.0320477	1.12	0.268	-.0281332	.0996387

As can be seen in table 8, both the ROIC and WACC variables have a negative sign. While it was predicted that the wacc variable would have a negative sign, it was predicted that the ROIC variable would be positive.

To further control for the correlation between SPREAD and the return and standard deviation variables, analyses on portfolios updated every third year were also conducted. The same method as previous is applied, but instead of sorting the companies based on their SPREAD every year, the sorting is done every third year to get a longer time horizon. As can be seen in Tables 9 and 10, the results do not differ from analyses where the sorting of companies is done every year. The null hypothesis with monthly returns as a dependent variable can not be rejected since p=0,502≥ 0,05. The null hypothesis with standard deviation as a dependent variable can be rejected since p=0,05≤ 0,05

Table 9

Firms is sorted into portfolios based on SPREAD every third year instead of every year

Dependent variable	t	P>|t|
Monthly returns	0,68	0,502
Standard deviation	-2,07	0,05*

***=Significant on a 5% significance level**

4.3 Summary of Analysis

To summarize the results found, the null hypothesis that the difference between ROIC and WACC (SPREAD) does not significantly correlate with stock returns, can not be rejected. Neither is there a significant positive correlation between the SPREAD and the Sharpe-ratio. However, a significant negative correlation between SPREAD and the standard deviation of returns was found. Conducting regression analysis on stock returns with ROIC and WACC as independent variables, ROIC had a negative sign which differs from earlier research that has looked at profitability metrics and found that it has a positive sign. Sorting firms into portfolios every third year instead of every did not change any prior drawn conclusions.

5. Discussion

Due to the market hypothesis that all markets are effective and that all information available is discounted into the stock price, it comes as no surprise that higher SPREAD does not significantly generate higher stock returns. However, as is shown by Koller et al in *Valuation* (2020), the theoretical way of creating value is by achieving returns on capital above the cost of capital. If this excess value creation does not come in higher stock returns, it should already have been reflected in higher multiples. Evidence from Mckinsey supports this reasoning as companies with higher ROIC and or growth have higher enterprise value over invested capital. The same goes for EV/EBITDA, although the relationship is not as strong.
Because both ROIC and WACC are sticky, which is confirmed both by this study and by earlier studies from Mckinsey, the highly profitable companies in 2006 when the first portfolios were created for this study, did probably already have a high SPREAD prior to 2006 and thereby high valuation multiples. The information that a company was successful in creating profits above its cost of capital was already discounted into the stock price, and additional stock price appreciation was therefore limited. A potential explanation for the lack of significant correlation between SPREAD and monthly returns can thus be that the highly profitable companies had high valuation multiples before the first year of creation of portfolios. Disaggregating SPREAD into ROIC and WACC showed no significant correlations with stock returns for either of the variables, but ROIC had a negative sign in the regression formula, which could be interpreted as ROIC being a worse indicator of stock performance than WACC.

Comparing the results in this study with Fama french five-factor model study (2015) and Novy-Marx (2013), both similarities and differences can be found. Contrary to this study, Novy-Marx (2013) found a linear connection between profitability and stock returns. This study saw a difference in monthly average stock return between the most profitable portfolio and the least profitable portfolio of 0,077% compared to 0,31% for Novy-Marx. The same number for Fama french (2015) was between 0,28%-0,37%. For standard deviation, the results in this study are in line with what was found by Fama French (2015), which had a difference in the standard deviation of 2,13-2,88% between the most and least profitable portfolio compared to this study’s number of 2,3%.

While it was predicted that the WACC variable would have a negative sign, it was predicted that the ROIC variable would be positive which was not the case. Compared with other studies where a profitability metric has been used, such as Fama french (1992, 2003), Novy Marx (2013), the profitability metric has had a positive sign in the regression analysis.

Although no correlation was found between the SPREAD, stock returns and Sparpe ratio, the standard deviation showed a correlation with SPREAD. One potential reason can be that firms with higher ROIC operate in a more mature industry where profits are more predictable and thereby the stock price movements less volatile.

Since firms with a lot of personnel expenses generally do have small balance sheets with small needs of investment, the ROIC metric may be less of an indicator for profitability. The sample was therefore screened for firms with an outlying price to book value. One firm was recognized as having a value far above the other firms. However, excluding this company did not change any results.

The following section will take a closer look at Novy-Marx’s study and why the results differ. There are some differences in methodology. They use data from July 1963 to December 2010, a span of forty-seven years compared with this study that covers fifteen years. They look at stocks from the New York Stock Exchange as compared to OMX's large cap for this study. Lastly, they use gross-profits to assets as the profitability metric. Having a longer time horizon could generate more precise results as unusual events that have a huge influence on stock prices impact the result to a lesser extent. Another factor could be that a profitability metric such as ROIC or gross-profit to assets requires a longer time horizon to show significant impacts on stock returns. Gross profit to assets could also be a better stock performance indicator than ROIC. It is difficult to answer what the reason for that could be. Gross profits is a metric closer to cash flow than NOPLAT and is less sensitive to accounting adjustments such as depreciation, amortizations, impairments, taxes, or other ways in which the NOPLAT metric could be manipulated.

The results in this study are not in line with the statements of Stern Stewart & CO who argue that EVA is a key driver for stock performance. On the other hand, the studies by Muhamma Asad Khan et al, as well as the study by Mathangi Aravind and K Ramya suggested that no positive correlation between EVA and stock performance would be found. At the same time, these particular studies should be viewed with some scepticism, inter alia since they are not peer-reviewed, which is discussed in the introduction.

The monthly average returns as well as the Sharpe-ratios may seem unrealistically high. One potential reason for this could be that the dataset only includes stocks on the OMX large cap as of February 2021. Stocks that have been on the Large Cap prior to February 2021 but been removed will not be included in the data. The dataset is therefore biased towards stocks that have performed well and earned its spot in the OMX large cap. Stocks with a very poor performance are in a way excluded since the market cap of these companies have depreciated below the market cap level required for being included in the OMX large cap. Another aspect to point out is the fact that the returns are adjusted for dividends which will give higher returns for the firms in this study than what appears on Avanza or other sources presenting stock performance.

6. Conclusion

This study tested McKinsey's and Koller et al.'s (2020) concept for value creation. In short, they argue that the theory idea of value creation stems from earning a Return on Invested Capital (ROIC) above the Weighted Average Cost of Capital (WACC). A similar measurement called the Economic Value Added (EVA), created by Stern Stewart has gained much attention for being a good measurement for internal control in companies. Stern Stewart and co asserts that EVA is a key driver for stock performance. Based on these statements from McKinsey and Stern Stewart and co, it would be interesting to examine how the difference between ROIC and WACC (SPREAD) impacts stock return. Since the classical theories of efficient markets (Fama, 1965) states that the prices of the securities on the market reflect all available information, these stock-picking measurements should, in theory, not yield abnormal returns. Hence it is of common interest for investors to test these claims out.

Furthermore, this study also follows up on influential studies such as Fama and French's (2015) and Novy-Marx (2013), who also have looked at a profitability measurement in their studies. However, Fama French used profitability metrics defined as annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses, all divided by book equity. In comparison, Novy-Marx used gross-profits to assets as the profitability metric. These two studies neglect the cost of capital aspect of producing profits and use profitability metrics that, according to Koller et al. (2020), are inferior to the ROIC metric, which they assert is the best way to measure a firm's ability to create value from its invested capital. Going with the approach of deducting the cost of capital from return on capital gives a new edge to Fama and French and Novy-Marx studies and acts as an additional motivation for this study.

This thesis used companies listed on OMX large cap list as of February 2021, excluding financial, investment, and real estate companies. The companies were analyzed between the years 2020-2004. The firms in the study were annually divided into five portfolios based on the SPREAD. The portfolio with the highest SPREAD is portfolio one, and the portfolio with the lowest SPREAD is portfolio five. The monthly return for each firm was calculated to generate an average monthly portfolio return that could be compared with the SPREAD.

With the above information in mind, the research question of this study was formulated as the following: How are the dependent variables, stock returns, standard deviation of returns and the Sharpe ratio affected by different levels of the dependent variable, the SPREAD? To test this, the null hypothesis was constructed as: There is no significant correlation between the independent and dependent variable on a 5 percent significance level. The null hypothesis was tested using regression analyses.

The results showed that the second portfolio had the highest monthly return and the third portfolio the lowest, and no significant correlation between SPREAD and monthly returns could be found. This is in line with the effective market hypothesis, which states that all known information about a company is already discounted into the stock price, no abnormal stock returns can therefore be achieved. To compare this with previous research on profitability metrics, Novy-Marx (2013) and Fama french (2014) found that increased profitability was associated with higher monthly returns. However, these studies have used profitability as operating profit minus interest expense to book equity respective. These results can therefore not be directly compared with the results found in this study but should be seen as an indicator. The result of no association between SPREAD and monthly returns is also confirmed by two smaller studies that have looked at EVA and stock performance. However, one smaller study also found that EVA did have explanatory value for stock performance.

The standard deviation of returns did have a significant negative correlation with SPREAD Investors looking for a low volatility portfolio could therefore benefit from investing in stocks with a ROIC significantly exceeding its WACC.

6.1 Other contributions

In terms of other contributions, this study does not guarantee that the ROIC minus WACC (SPREAD) measurement is not an effective tool. However, it can potentially serve as an indication for investors and other stakeholders that this measurement might not always yield the highest returns. Similar to the EVA measurement, there is a possibility that companies may adopt these types of tools as performance measurements or in relation to compensation, for example. To this, this study will again not conclude but rather suggest that the company will not be guaranteed any abnormal stock returns if implementing this measurement.

6.2 Limitations

The results of this study are merely suggestive and should not be viewed as conclusive. This is due to the many limitations that can be discussed. Firstly, the scope of the study is a limitation. This study is only made on the Swedish stock exchange and can hence not fully explain how the results would be on other markets. The ideal would be if the study was undertaken with a larger number of companies, which would have given the study more data. Studying all the companies in Europe or globally for example. Furthermore, the collection of data can not be excluded completely as a limitation. Although the study was conducted as carefully as possible, some errors in the process can theoretically have occurred. In this study, the companies were divided into five portfolios, and if there are too few companies in one portfolio, the diversifiable risk will take over. This could be a potential limitation, and further studies could perhaps be made with different portfolio setups. The number of years used for the collection of data is also a limitation. A more extensive study with a longer time horizon could potentially find another result. Another limitation of the study is the simplification regarding the calculation of ROIC, which is described in the methodology. Although the simplification should be marginal, the result could potentially be different if another method for calculation was used.

6.3 Future Studies

Apart from the fact that our limitations in the above section serve as excellent opportunities for future research, there are some other ideas that can be tested as well. Since Koller et al. states in "*Valuation*" that value is based on earning a profit above the cost of capital and having growth, an additional variable to include is the growth factor. It would be interesting to see if the inclusion of the growth factor as an independent variable would lead to a significant correlation with stock returns. Another idea for future studies could be to look at industries instead of individual companies and analyze whether a correlation between SPREAD and stock returns could be found.

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8. Appendix

Firms sorted into portfolios every third year. STD as dependent variable

Source	SS	df	MS			
Model	.001392715	1	.001392715			
Residual	.007488512	23	.000325587			
Total	.008881226	24	.000370051			

Number of obs	=	25
F(1, 23)	=	4.28
Prob > F	=	0.0500
R-squared	=	0.1568
Adj R-squared	=	0.1202
Root MSE	=	.01804

STD	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spread	-.0653632	.0316036	-2.07	0.050	-.1307402	.0000138
_cons	.0593916	.0041082	14.46	0.000	.0508931	.0678902

Firms sorted into portfolios every third year, monthly return as dependent variable

Source	SS	df	MS
Model	.000073887	1	.000073887
Residual	.003648635	23	.000158636
Total	.003722522	24	.000155105

Number of obs	=	25
F(1, 23)	=	0.47
Prob > F	=	0.5018
R-squared	=	0.0198
Adj R-squared	=	-0.0228
Root MSE	=	.0126

return	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Spread	.0150552	.0220599	0.68	0.502	-.0305792	.0606895
_cons	.014769	.0028676	5.15	0.000	.0088368	.0207011

Swedish ten year government bond rate used in calculating sharpe-ratio

Year	Risk-free rate
2006	3,75%
2007	4,18%
2008	2,62%
2009	3,42%
2010	3,23%
2011	1,69%
2012	1,72%
2013	2,42%
2014	0,84%
2015	1,00%
2016	0,61%
2017	0,75%
2018	0,59%
2019	0,12%
2020	-0,08%

Source: Avanza

Excerpt of the portfolio with the highest SPREAD for year 2020.

				Stock returns												
1	**Spread**	ROIC	WACC	Jan	feb	march	april	may	june	july	aug	sep	oct	nov	dec	Full year
Evolution gaming	95,9%	103,9%	8,04%	5,7%	17,8%	-3,7%	31,6%	24,9%	0,8%	7,7%	8,3%	-8,2%	11,1%	10,9%	13,9%	198%
Swedish match	53,4%	59,9%	6,48%	13,0%	2,6%	1,5%	9,0%	7,9%	0,2%	2,7%	-2,4%	11,6%	-8,5%	3,0%	-7,7%	35%
Mycronic	37,8%	45,2%	7,41%	1,4%	-27,9%	-10,5%	35,6%	0,7%	7,5%	-5,3%	18,1%	7,5%	-11,0%	21,0%	7,8%	34%
Kindred	28,3%	37,0%	8,73%	-14,5%	-4,5%	-20,8%	25,7%	10,5%	8,3%	9,8%	9,7%	-2,9%	4,1%	5,8%	12,3%	40%
Axfood	25,5%	30,1%	4,59%	-4,1%	-10,4%	15,1%	2,5%	1,8%	-3,6%	-2,9%	-3,2%	9,3%	0,8%	-5,8%	-1,6%	-5%
Vitrolife	23,0%	30,7%	7,77%	2,4%	-19,1%	-12,4%	24,6%	8,1%	8,0%	1,7%	9,6%	5,7%	-11,7%	-3,9%	3,6%	9%
NENT	20,2%	28,8%	8,69%	-3,4%	-1,1%	-27,6%	11,3%	21,5%	0,7%	28,4%	-1,4%	5,2%	-16,3%	34,2%	7,6%	51%
Nolato	18,3%	27,0%	8,69%	1,6%	-9,9%	-10,7%	14,2%	24,0%	-1,3%	16,0%	15,7%	3,6%	-15,2%	4,1%	8,0%	51%
Epiroc	18,3%	27,8%	9,54%	-2,3%	-1,0%	-10,9%	-0,3%	7,8%	11,0%	5,3%	5,3%	1,1%	2,2%	8,0%	5,0%	34%
Atlas copcp	18,2%	26,3%	8,19%	-8,5%	-0,8%	-1,5%	2,6%	8,8%	6,9%	-2,0%	3,4%	7,2%	-8,4%	10,9%	-2,6%	15%
Fenix	17,7%	25,5%	7,83%	-11,8%	-15,1%	-28,3%	24,9%	5,1%	1,8%	16,3%	-2,6%	4,6%	-7,0%	7,1%	3,6%	-12%
SOBI	16,3%	23,1%	6,75%	11,4%	-5,0%	3,3%	12,4%	7,8%	5,1%	-14,8%	5,7%	11,8%	-29,1%	3,8%	4,1%	8%
Hennes& Mauritz	10,6%	20,9%	10,34%	11,1%	-18,1%	-26,2%	6,4%	4,4%	-5,0%	0,6%	1,5%	12,2%	-6,6%	25,6%	-5,3%	-10%
Sinch	9,5%	18,6%	9,15%	8%	30%	-3%	30%	23%	27%	-14%	28%	-17%	16%	33%	19%	368%
																avg month
Average	28,059%	36,074%	8,01%	0,703%	-4,451%	-9,677%	16,436%	11,198%	4,804%	3,542%	6,858%	3,733%	-5,709%	11,241%	4,848%	3,627%

Monthly average return for each of the portfolios for every year

Monthly average return																	
Portfolios	Year	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	Average
1		3,6%	4,1%	-0,1%	1,7%	0,4%	3,1%	2,0%	2,1%	1,2%	0,9%	1,3%	4,2%	-2,9%	1,8%	1,4%	1,650%
2		1,8%	3,1%	0,7%	0,8%	2,0%	3,4%	1,1%	2,8%	1,6%	-0,6%	3,1%	6,5%	-4,0%	-0,2%	3,2%	1,682%
3		1,3%	2,9%	0,0%	1,4%	0,2%	1,2%	2,5%	2,0%	1,7%	-0,7%	2,5%	4,6%	-3,1%	-1,6%	3,9%	1,242%
4		1,8%	2,7%	-0,1%	1,9%	1,6%	1,6%	0,9%	2,9%	2,0%	-0,8%	2,2%	0,0%	-4,4%	0,6%	2,0%	0,991%
5		2,7%	2,8%	-1,0%	1,9%	2,8%	0,7%	2,4%	2,4%	2,4%	-1,6%	3,7%	6,7%	-6,2%	-6,2%	3,3%	1,100%

Average SPREAD for each portfolio for every year

SPREAD																	
Portfolios	Year	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	average
1		28,1%	27,6%	27,4%	27,2%	29,1%	27,3%	24,7%	25,4%	29,6%	28,0%	29,0%	27,1%	27,1%	23,6%	20,2%	26,8%
2		6,3%	6,9%	7,0%	6,5%	7,3%	9,5%	8,4%	8,4%	9,5%	8,8%	9,8%	9,7%	10,8%	11,6%	10,0%	8,7%
3		3,5%	2,8%	2,9%	2,4%	2,7%	3,3%	3,4%	3,6%	3,2%	2,8%	2,6%	3,6%	5,0%	11,6%	1,6%	2,9%
4		0,3%	0,1%	0,7%	0,2%	-0,2%	-0,3%	0,3%	0,1%	-0,5%	-2,4%	-2,8%	-2,4%	-0,9%	5,2%	-1,9%	-0,7%
5		-6,0%	-5,3%	-5,3%	-5,8%	-6,3%	-6,4%	-7,1%	-7,1%	-8,4%	-10,5%	-12,3%	-9,1%	-6,5%	0,2%	-6,5%	-6,8%