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Value investment strategies inspired by ''The Dogs of the Dow''

Empirical evidence from the Helsinki Stock Exchange 2004-2023

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ABSTRACT:
The main purpose of this study is to determine whether dividend yield investment strategies are effective in the Finnish stock market. In addition, extending the DoD10-strategy approach in two value portfolios enables a framework to evaluate whether a value exposure generates abnormal returns. Two additional portfolios will be constructed, inspired by the DoD, using P/E-ratio and ROE as stock picking criteria.

The sample will cover the years from 2004 to 2023 of every stock listed on the Helsinki Stock Exchange. This thesis aims to analyze the performance on a raw and risk-adjusted basis, using the standard portfolio performance measurement presented by Sharpe (1966) and Treynor (1965). In this study, the results of the t-statistic testing for raw returns, OMXHCAP, market-adjusted, and CAPM-adjusted returns will be presented.

The results indicate that these three strategies are beating the benchmark index in terms of raw and risk-adjusted returns. The DoD-10 portfolio provides the highest risk-adjusted return in terms of systematic and total risk. In addition, all of the investment strategies tested generate abnormal returns, taking into account risk-adjustments, transaction costs, and taxes. Moreover, the results suggest convincing evidence of the outperformance against the reference index of Value investment strategies inspired by ''The Dogs of the Dow''

KEYWORDS: Value investing, Dogs of the Dow, Price-to-Earnings, Return on equity, Market efficiency

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TIIVISTELMÄ:
Tämän tutkimuksen päätavoitteena on selvittää, ovatko osinkotuottosijoitusstrategiat tehokkaita Suomen osakemarkkinoilla. Lisäksi DoD10-strategialähestymistavan laajentaminen kahteen arvoportfolioon mahdollistaa viitekehyksen sen arvioimiseksi, tuottaako arvopositio ylituottoja. Alkuperäisen ’’Dogs of the Dow’’ strategian inspiroimana rakennetaan kaksi lisäportfoliota käyttäen P/E-lukua ja ROE:ta osakevalintakriteereinä.

Otos kattaa vuoden 2004–2023 kaikista Helsingin pörssissä listatuista osakkeista. Tämän opinnäytetyön tavoitteena on analysoida raaka- ja riskikorjattua tuottoa käyttämällä Sharpen (1966) ja Treynorin (1965) esittämää salkun tuoton vakiomittausta. Lisäksi tässä tutkimuksessa esitetään tilastollisen testauksen tulokset raaka-, OMXHCAP-, markkinakorjatuille ja CAPM-korjatuille tuotoille.

Tulokset osoittavat, että nämä kolme strategiaa ylittävät vertailuindeksin raaka- ja riskikorjattujen tuottojen osalta. Osinkotuotto portfolio tarjoaa korkeimman riskikorjatun tuoton systemaattisen ja kokonaisriskin osalta. Lisäksi kaikki testatut sijoitusstrategiat tuottavat ylituottoja ottaen huomioon riskikorjaukset, transaktiokulut ja verot.

AVAINSANAT: Arvosijoittaminen, osinkotuotto, tehokkaat markkinat, P/E-luku, ROE

Contents

1 Introduction 7

1.1 Background 7

1.2 The purpose of the study 9

1.3 Hypotheses 9

1.4 Structure of the study 10

2 Literature review 11

2.1 Evidence of the ‘’Dogs of the Dow’’ Strategy 11

2.2 Evidence of the Value Investing 15

2.2.1 P/E effect 17

2.2.2 ROE 18

3 Theory 19

3.1 Random Walk- Theory 19

3.2 Efficient Market Hypothesis 20

3.2.1 Weak 21

3.2.2 Semi-strong 22

3.2.3 Strong 22

3.3 Modern Portfolio Theory 22

3.4 Behavioral Finance 24

3.5 Valuation models 25

3.5.1 DDM 25

3.5.2 DCF 26

3.6 Risk-adjustments 27

3.6.1 Capital Asset Pricing Model 28

3.6.2 Arbitrage Pricing Model 30

3.6.3 Fama-French Three-Factor Model 31

4 Data and methodology 33

4.1 The collection of data 34

4.2 Methodology 35

4.3 Risk-adjustments 36

4.3.1 Market-adjusted 36

4.3.2 Capital Asset Pricing Model 37

4.3.3 Treynor Index 38

4.3.4 Sharpe Ratio 38

5 Results 40

5.1 DOD-10 Strategy 41

5.2 PE-10 Strategy 48

5.3 ROE-10 Strategy 55

6 Conclusions 62

References 65

Figures

Figure 1. Optimal portfolio selection. (Bodie et al. 2014:219). 23
Figure 2. Security market line. (Brealey et al. 2011:192). 29
Figure 3. Cumulative Returns on the DoD-10 portfolio and OMXHCAP. 43
Figure 4. Cumulative Returns on the PE-10 portfolio and OMXHCAP. 50
Figure 5. Cumulative Returns on the ROE-10 portfolio and OMXHCAP. 57
Figure 6. Cumulative returns of the DoD, price-to-earnings, return on equity, and OMXHCAP. 62

Tables

Table 1. List of companies in the DoD-10 portfolio during 2004-2023. 42
Table 2. Annual Retuns of the DoD-10 portfolio. 45
Table 3. Treynor Index results for the DoD-10 portfolio and the benchmark index. 46
Table 4. Sharpe Ratio results for the DoD-10 portfolio and the benchmark index. 47
Table 5. List of companies in the PE-10 portfolio during 2004-2023. 49
Table 6. Annual Retuns of the PE-10 portfolio. 52
Table 7. Treynor Index results for the PE-10 portfolio and the benchmark index. 53
Table 8. Sharpe Ratio results for the PE-10 portfolio and the benchmark index. 54
Table 9. List of companies in the ROE-10 portfolio during 2004-2023. 56
Table 10. Annual Retuns for the ROE-10 portfolio. 59
Table 11. Treynor Index results for the ROE-10 portfolio and the benchmark index. 60
Table 12. Sharpe Ratio results for the ROE-10 portfolio and the benchmark index. 61

1 Introduction

It can be said that the investor who passively invests in the market index, for example, owning an ETF or its portfolio that consists of every stock in the stock exchange with the same weight as they are in the market index, is successful. As a result, the initial capital invested in the portfolio at the beginning has doubled in eight years on average. The index investor is a risk-averse investor who wants to invest passively and does not tolerate risk a lot. However, the index investor's portfolio consists of value stocks, as well as junk stocks that are chronic underperformers or on the edge of bankruptcy. Consequently, the profits of the investor's portfolio will be lower. What if the investor chooses to clear the portfolio of junk companies and pick only outperformer value stocks instead? As a result, the investor would not have to wait eight years anymore to double the value of the portfolio.

Value investing strategies tend to answer these questions, and academics have evaluated the possible outperformance of these strategies for many decades. Asness, Frazzini & Pedersen (2019) studied value investing strategy using a quality-minus-junk factor that refers to investing long into high-value stocks and short into low-value stocks. The study showed the outperformance of the strategy, and in addition, several studies indicate that value investing strategies generate outperformance in the US stock market as well: (Basu 1977; Lakonishok, Shleifer & Vishny, 1994; Chan, Jegadeesh, & Lakonishok, 1995.). The outperformance has been seen in other markets: (Fama & French 2012; Asness, Moskowitz & Pedersen 2013; Davyclov, Tikkanen & Äijö 2016; Sakemoto 2023).

1.1 Background

Examining how to beat the market by testing different investment strategies has been a popular topic among investors and academics. In fundamental analysis, publicly available information is used to find securities that generate abnormal risk-adjusted returns. The efficient market theory has challenges in reconciling empirical observations, sometimes referred to as market anomalies. Numerous academic studies have provided evidence about the ability of simply observable factors to forecast market outcomes. The simply observable factors refer to different ratios, such as the price-earnings (P/E) ratio and dividend yield. (Bodie, Kane & Marcus 2014, p. 365-367).

The dividend yield strategy has been examined widely in recent decades, and more accurately, as a measurement to predict stock returns. The first to introduce the Dogs of the Dow strategy was John Slatter (1988), who investigated the U.S. stock market from 1972 to 1988, observing an excess return of 7.59%. Other studies that examined the U.S. stock market were for example O'Higgings & Downes (1991), Knowles & Petty (1992), McQueen, Shields & Thorley (1997), Grant (1995), Hirschey (2000), Filbeck, Holzhauer & Zhao, (2017), Lin (2017), and Kim (2024).

The performance of the DoD strategies has been tested in other markets as well. In 1997, Fillbeck and Visscher released a study focusing on the UK markets, which revealed the outperformance of the market index compared to the DoD strategy (Fillbeck & Visscher, 1997). Da Silva (2001) tested the efficiency of the DoD strategy in South American countries, and the outperformance of the strategy was discovered in most of the countries. Le Saout (2006) examined the DoD strategy in European countries, and the outperformance of the strategy was discovered in most of the countries as well. In addition, the DoD strategy was tested in the Finnish stock market from the period from 1988 to 2008, indicating an excess return of 4.5% (Rinne & Vähämaa, 2011).

Even if the main focus of this study is to evaluate the performance of the DoD-10 strategy in the Finnish stock market, two separate portfolios will be constructed inspired by the DoD using P/E-ratio and ROE as stock picking criteria. It is fascinating to evaluate the performance of these simple investment strategies, and more interesting to test the latest years' time series where a couple of market downturns have occurred.

1.2 The purpose of the study

The main purpose of this study is to determine whether dividend yield investment strategies are effective in the Finnish stock market. In addition, extending the DoD10-strategy approach in two value portfolios enables a framework to evaluate whether a value exposure generates abnormal returns. Two additional portfolios will be constructed, inspired by the DoD using P/E-ratio and ROE as stock picking criteria. This thesis aims to analyze the performance on a raw and risk-adjusted basis, using the standard portfolio performance measurement presented by Sharpe (1966) and Treynor (1965). In this study, the results of the t-statistic testing for raw returns, OMXHCAP, market-adjusted, and CAPM-adjusted returns will be presented.

The data collection, which will span the years 2004–2023, offers a very appealing environment for the research as it involves a range of market events and business cycles. Empirical testing comprises three different bear market events, which give a fascinating period to test the performance of value strategies in the Helsinki stock exchange. The market was considered to appear as a bull market at the beginning of 2004, and subsequently, the bear market was about to start at the beginning of 2008. After the market downturn, the next 11 years turned out to be bullish. The definition of a bull market reflects an index price increase of no less than 20 %, whereas the definition of a bear market reflects an index price decrease of no less than 20 %. The following bear market started in 2020 when the COVID-19 pandemic took place. The last three years of this research period were considered to be bullish. (Vanguard Asset Management, 2025).

1.3 Hypotheses

The main purpose of this study is to determine whether the DoD, price-to-earnings, and return on equity investment strategies are effective in the Finnish stock market. The aim is to test the performance of these portfolios using raw and risk-adjusted returns, and taking into account transaction costs and taxes. The regression analysis is used to test the effectiveness of these three strategies. Three research hypotheses will be presented in the following :

H_1: The raw returns of the three portfolios outperform the benchmark market reference index.

H_2: The three portfolios outperform the market return on risk-adjusted returns.

H_3: The three portfolios outperform the market return on transaction costs and tax-adjusted returns.

1.4 Structure of the study

The structure of the study begins with an introduction that consists of a background and a glimpse of a scientific contribution. Following the background section, the purpose of the study will be covered. The introduction section will additionally cover the hypotheses and study questions. This last sub-header will cover the whole structure of the thesis.
In the second chapter, the most relevant literature related to the ''Dogs of the Dow'' and value investing investment strategies will be covered. Afterward, the third chapter consists of the primary objective of the theory section, such as the Random Walk and the Efficient Market Hypothesis, covering three forms of it. The behavioral finance aspect and a variety of different stock valuation methods will be explained later in the theory section. The data and methodology section begins with a description of the data set and the presentation of the portfolio construction. Additionally, different measurements of portfolio performance will be covered. The empirical part consists of the statistical results of the three different portfolios. The comparison between the benchmark and value strategies will be evaluated. The last chapter covers the conclusions and possible further research.

2 Literature review

This chapter consists of prior research related to the ''Dogs of the Dow'' strategy and value investing. This thesis concentrates on the efficiency of the DoD-10 strategy, which refers to the idea of constructing an investment portfolio of the top ten firms with the highest dividend yield each year. Given the significance of the DoD-10 investment strategy in this thesis, the development of the P/E portfolio and ROE portfolio is adapted from the DoD-10 investment strategy. In addition, the evidence of value investing strategies will be covered in this chapter.

2.1 Evidence of the ''Dogs of the Dow'' Strategy

The dividend yield investment strategies have been investigated for almost 70 years, and Walter (1956) questioned whether stock returns can be forecasted using dividend yields. In 1974, Black and Scholes concluded that demonstrating high-yield common stocks' expected returns differentiation between low-yield common stocks' expected returns is not feasible. The results of studies have been mixed, and in contrast, Litzenberger and Ramaswamy (1979) suggested a strong positive relation between expected return and dividend yield for NYSE stocks. The difference between these two studies is that Black and Scholes used the long-term dividend yield, while Litzenberger and Ramaswamy used the short-term dividend yield.

Benjamin Graham, known as the father of value investing, also studied dividend yield as an investment criterion. Graham compared stocks with dividend yields higher than three-quarters of the average yield on AAA bonds from 1925 to 1975 with the DJIA. With greater returns, the latter set of equities beat the DJIA. As a result, Graham included this as one of his ten well-known investment guidelines because of the study's success. (Rea, 1977).

John Slatter presented the DoD-10 strategy in the final years of the 1980s and developed an approach that selects the top 10 firms with the highest dividend yields from the DJIA based on the previous year's performance from the 30-stock index. During that time, high-dividend stocks were commonly seen as conservative, stable, and a bit tedious. According to Slatter's findings covering the 15-year investment horizon from 1972 to 1987, the implementation of the DoD-10 strategy generated an average yearly return of 18.4%. While the overall market witnessed a decrease of 23.4% in 1973, the DoD-10 stocks decreased by 2.9% including dividends. The excess return of the portfolio was 7.59% which makes the DoD-10 portfolio the winner of the testing period compared to the index. (Dorfman, 1988)

O'Higgins and Downes (1991) wrote the best seller *''Beating the Dow''* and applied and popularized Slatter's investment strategy in the US stock markets. They stated that within the time frame spanning from 1973 to 1991, the strategy would generate an average yearly return of 16.61 percent and an average annual excess return of 6.18 percent. However, the measurement of return is determined by an annual deduction of three percent for commissions, while disregarding tax considerations. The returns represent a large standard deviation, which poses challenges in determining the statistical significance of the changes in means when adjusted for risk.

The positive excess return of the U.S. market has been documented for a longer period, from 1957 to 1990, as well. The reported average annual return of the portfolio was 14.2%, and therefore, the outperformance was 3.8% while the market average annual return was 10.4%. In addition, the study measured the performance of the five highest dividend yield stocks (i.e., DoD5- strategy), indicating a higher average annual return of 15.4% compared to the DoD-10 portfolio. (Knowles & Petty, 1992)

While earlier studies from the US stock market provided more than 3% and even more than 7% average annual excess return, the study that investigated the period from 1961 to 1998 indicated a lower excess return of 1.77%. Consequently, the so-called ''Dow

Dogs'' anomaly cannot be robustly found in the study when transaction costs and taxes are included in the calculation of returns. Therefore, the threat to market efficiency cannot be found in this study. (Hirschey, 2000)

In the UK markets, there are varying results among studies about the effectiveness of the dividend yield investment strategy. Filbeck & Visscher (1997) examined the performance of equally weighted portfolios from 1985 to 1994. An annually rebalanced portfolio consisted of the top ten companies with the highest dividend yields from the FTSE-100 index. As a result, this simple investment strategy is not an effective approach to beat the market. Both raw return and risk-adjusted portfolios using the Treynor index and Sharpe ratio did not exceed the market return for more than 4 years. However, the potential reason for the results lies in the contrast between the two indices. The FTSE-100 covers more industries than the DJIA, especially 18 financial stocks, whereas the DJIA does not include any such stocks. Moreover, the FT-SE 100 is a value-weighted index, whereas the DJIA is price-weighted, and therefore, the high dividend yield DJIA stocks are likely underpriced, and their price fluctuations have minimal impact on the index value.

According to Da Silva (2001), the DoD strategy would be valuable in the stock market of Latin American countries excluding Brazil; however, the results indicated no statistical significance in both absolute and risk-adjusted returns in the investment horizon of 5 years from 1994 to 1999. Regardless of evidence about the outperformance of the DoD strategy, the strategy cannot be supported due to the absence of robust statistical significance. Gwilym, Seaton, and Thomas (2005) investigated data between 1980 and 2011 from the UK after including risk-adjustment and transaction costs; most outperformance vanished except for the FT 30, a group of large stocks that is often compared to the DJIA. To conclude, the high-dividend yield strategies lack of generate abnormal returns.

Nonetheless, there is evidence of the existence of statistical significance in terms of the DoD strategy. Brzeszczyński and Gajdka (2008) examined the dividend yield investment strategy on the Warsaw Stock Market, and the study indicated that the 10 highest dividend yield stocks outperformed the market return. Similar results were also witnessed when Park and Kim (2010) examined the Korean Stock Market from 2000 to 2008, and as a result, they found a positive relation between stock returns and dividend yield existence in the Korean Market. They also tested the zero-yield portfolio performance, which they found to have significantly negative returns.

There is existing research on the performance of the top 10 highest dividend yield stocks of the OMXH25 index listed on the Helsinki Stock Exchange (HSE) that this thesis will examine. Rinne & Vähämaa (2011) found that the investment strategy outperforms the benchmark index, offering an average annual excess return of 4.5%, notably in times of market downturns. Nevertheless, the DoD strategy may be inadequate in covering transaction costs and tax expenses, and the superior performance of the strategy should not be seen only as a means of compensating for increased risk.

According to Lemmon and Nguyen's (2015) paper, a significant dividend yield effect was documented in the Hong Kong stock market. The study examined the years from 1981 to 2010, and a positive correlation is indicated by the regression analysis between risk-adjusted returns and dividend yields. An increase of one percent in dividend yield indicates a related rise of one percent in risk-adjusted returns; in other words, dividend yield and risk-adjusted return are directly proportional to each other. However, the observed substantial yield effect can be explained by non-tax factors; in other words, income from dividends and capital gains is both free from taxes in Hong Kong.

The following study combines Fortune's most admired companies (MAC) and the DoD strategy, and as a result, the construction of the portfolio is defined as *''A new breed of Dogs''* or, in other words, the highest 10% dividend yield MAC portfolio (MAC Dogs). The performance of the MAC Dogs portfolio is benchmarked to the performance of the DOW, the traditional DoD strategy, the S&P500, and the overall MAC portfolio. Based on the findings of the study, the risk-adjusted and absolute returns of the MAC Dogs portfolio provided robust, greater earnings in comparison to either the DOW or the traditional DoD strategy. Furthermore, the MAC Dogs portfolio beats the overall MAC portfolio for a duration of one year when taxes and transaction costs are taken into account. (Filbeck, Holzhauer & Zhao, 2017)

Lin (2017) examined evidence from the DoD anomaly over the period 1996-2016 in the US markets. There were three different portfolios constructed that included the top ten highest-yielding stocks, the five highest-yielding stocks, and the small dogs of the Dow portfolio. The small dogs of the Dow portfolio consists of the five lowest-yielding stocks in the DoD-10 portfolio. The results of the paper support the existence of the DoD anomaly, indicating the outperformance of the DoD portfolio sixteen out of twenty-one times compared to the market index. However, mixed results of the efficiency of the DoD strategy among academics occur. Kim (2019) examined the performance of the strategy in the US markets and the results indicate that even if the DoD strategy is an appropriate investment strategy altogether, the effectiveness of the strategy's results appeared to be low.

2.2 Evidence of the Value Investing

According to Graham (1973), the investor should focus on the valuation, or more accurately finding the intrinsic value of a company. In order to implement the value investment strategy, the price development of the company's stock should not be confused with the development of the company's business. Additionally, Graham created the margin of safety, which states that if a stock can be purchased for less than its current intrinsic value, an investor should do so. Following Graham's analysis, it is possible to beat the market.

The P/B ratio was used as a stock picking criterion in the following research, and as a result, lower P/B ratio stocks generated excess return in even risk-adjusted return measurement (Stattman, 1980). Jaffe, Keim & Westerfield (1989) reported the outperformance of the portfolios that are created using different valuation ratios, such as P/B and

P/E together. The study indicates the portfolio's ability to beat the market by evaluating raw and risk-adjusted returns. Lakonishok, Shleifer & Vishny (1994) examined the value anomaly in the U.S stock market for a long period from 1968 to 1990. Their study indicates that actually P/CF ratio actually generated higher returns than the P/B ratio. In other words, the stock portfolio was constructed using P/CF ratios and P/B ratios, and it is also crucial to mention that the longer investigation period suggests robustness.

Grantham (2004) published its investment strategy, which defines quality companies in three different ways. Firstly, companies should have a low level of debt, substantial profits, and minimal fluctuation of earnings. They also made the decision to concentrate on large-cap US stocks, and as they mentioned, the high risk of a financial crisis in the upcoming years, the advantage of having a large-cap portfolio has an idea since the government is considerably more interested in supporting big businesses with thousands of employees than tiny firms. Additionally, the ability to distinguish between "good" and "bad" growth is another advantage of this stock selection strategy: only businesses that can generate returns higher than their cost of capital ought to be praised for growing.

Greenblatt (2010) introduced the Magic Formula, referring to a stock-picking practice that filters stocks using EBIT/EV and ROIC. In this investment method, an investor picks approximately 20-30 stocks with the highest ratios. Unlike the Dogs of the Dow strategy, the stocks at the top of the list receive a greater weight in the portfolio than the stocks at the bottom of the list. However, stocks are held in the portfolio for a year, and the new list of companies with the highest ratios will be done after one year, and the method is repeated. The average return of the portfolio was 30, 8% from the years 1988 to 2004, the investment method, whereas the average market return remained at 12,3%, resulting in the average outperformance of the portfolio at 18.5%.

Fama & French (2006) found a connection between low P/B-ratio stocks and excess return compared to market and higher P/B stocks. In addition, their study examined 23 countries spanning from 1989 to 2011, and reported value anomalies (Fama & French, 2012). In addition, the following study found a strong positive correlation between value and momentum, and the study examines value and momentum portfolios covering the U.S., U.K., continental Europe, and Japan (Clifford, Moskowitz & Pedersen, 2013).

Value strategies have been tested in the Finnish market, while Davydov, Tikkanen & Äijö (2016) evaluated Greenblatt's magic formula that brings the most popular value investing techniques together. As a result, the value strategy outperformed the market from 1991 to 2013. The highest outperformance turned out to appear in bull periods, which suggests that abnormal returns do not offset the greater level of risk.

Value investing strategies have been tested in the 2020s, and this paper covered 23 countries using the B/M ratio to filter companies by size. Globally, it was discovered that there is a positive correlation between value premium and expected returns. However, value, momentum, and expected returns did not result in a positive correlation. In addition, the findings point to a long-term decline in the value premium following COVID-19. (Sakemoto, 2023)

2.2.1 P/E effect

Nicholson (1960) and Basu (1977) investigated in their research whether undervalued stocks would generate abnormal returns using the P/E ratio as a measure. Nicholson observed that undervalued stocks generated abnormal returns between 1939 to 1959 in the US stock market. However, the study used raw returns as a measurement of stock returns, and risk adjustments were not applied. Unlike Nicholson, Basu tested the performance in a risk-adjusted manner and found that the risk-adjusted return decreased and the P/E ratio rose, which refers to the success of the P/E effect.

Cook & Rozeff (1984) examined the outperformance of low P/E ratio stocks annually between 1968 and 1982. The findings indicated that the results of the P/E anomaly stocks were almost significant. In addition, firm size had an impact on the significance of the results of the P/E anomaly. Bauman, Conocer & Miller (1998) researched various developed countries' markets and indicated that low P/E stocks beat the market return. However, the study suggested that by using the P/B ratio as a measure instead of P/E, the significance of the results was stronger.

Anderson & Brooks (2006) applied a value investing strategy in their study, constructing portfolios by picking the lowest P/E ratios. Notably, P/E was calculated using long-term net income instead of using net income of the previous year since therefore the value premium will be higher. Therefore, the study indicated that the highest returns can be gained using long-term net income in the P/E formula. Athanassakos (2011) tested whether a lower P/E ratio stock constructed portfolio is able to outperform a higher P/E stock portfolio. As a result, the P/E constructed portfolio outperformed the market index, and in addition, the minimum return of the P/E portfolio was higher than the market index portfolio, which indicates the P/E portfolio's ability to survive in market downturns better than the market index.

2.2.2 ROE

Fuller, Giovinazzo, and Tung (2014) introduced an investment strategy where the trailing 20-quarter mean ROE of the stocks was used to rank them. Every year, the top 50% of stocks were chosen. Using minimum variance optimization, stock weights were established with an emphasis on ROE stability as opposed to price return stability. As a result, compared to similar strategies, it maintains a lower risk while achieving larger excess returns, Sharpe ratios, and alpha. The findings imply that high and stable ROE stocks are undervalued by investors, which makes SRP an attractive investment approach.

In 2022, the study released by Waang, Wu & Zhang, optimized and described the earnings persistence measure as an indicator of ROE, dividend payout ratio, and other variables. The findings conclude that, whereas the dividend payout ratio has minimal impact on profits persistence, ROE has a significant impact. The data series consists of 872 Chinese listed companies between 2011 and 2020. (Wang, Wu, & Zhang, 2022)

3 Theory

This chapter will cover the most popular theories in finance, and additionally, the legality of these theories. The theoretical background will be presented in order to support my research topic. Firstly, I will present the Random Walk theory and the efficient market hypothesis, as well as their three different forms. Later, the basics of modern portfolio theory will be presented. In addition, the criticism towards efficient markets is presented, i.e., the school of behavioral finance, where the financial market theories presented earlier are critically discussed by pointing out that there are other factors involved than just theoretical models.

Later, different stock valuation models are presented, which support my research topic. Three stock valuation models relevant to this study are the dividend discount model and the discounted cash flow model. The different methods to calculate risk-adjusted return will be presented later in the chapter, such as the capital asset pricing model, the arbitrage pricing theory, and the Fama-French three-factor model.

3.1 Random Walk- Theory

Random walk- theory stands for the idea that stock prices follow a random walk, which refers to the argument of unforeseeable and random stock price changes. In other words, future stock prices cannot be predicted using past stock prices. According to Fama (1965), the random walk theory consists of two hypotheses:

1. Price fluctuations are independent of one another.
2. The price fluctuations follow a distribution of probability.

In this connection, Independence refers to the argument that fluctuations of stock prices during time period *t* are unaffected by the stock price fluctuations of earlier periods. Therefore, estimating the probability distribution of stock prices and future stock price fluctuations, past stock prices do not offer useful information, i.e., prices do not have memory. (Fama 1965)

Bachelier (1900) established the idea of the random walk of stock prices. However, Pearson (1905) introduced the notion of ''random walk'' and came up with the formula for it (Pearson 1905, 342). In 1953, Kendall refined the concept of ''random walking'' when he published a contentious paper about examining weekly movements of stock and commodity prices. The assumption of constant stock and commodity price cycles was tested, and he found that the serial correlation between lagged commodity prices and current commodity prices did not exist. Kendall stated that each of the series made an appearance to be a wandering one, and therefore it is concluded that stock prices follow a ''random walk'' (Kendall 1953). In other words, when considering stocks that you aim to add to a stock portfolio, it is suggested to research the stocks and receive as much profit as stock portfolios made by professionals.

3.2 Efficient Market Hypothesis

The value investing strategies tend to challenge the existence of the efficient market hypothesis. However, the efficient market hypothesis is a crucial concept in finance, and therefore an important concept when evaluating the performance of the investment strategies. The existence of market efficiency in capital markets is important in terms of its main function is to allocate capital from the surplus sector to the deficit sector in an efficient way. If capital markets do not operate efficiently, it is possible for investors to generate abnormal returns. (Knüpfer & Puttonen 2018, p. 171)

It is commonly accepted that Fama (1970) first introduced the efficient market hypothesis. According to Fama (1970), prices perfectly reflect all information that is generally available in an ideal efficient market. In an efficient market, companies can make investment decisions and investors can choose among companies' securities whose prices perfectly illustrate all available information at any time. In other words, only new information will have an impact on the price of the investment according to the efficient market hypothesis. Furthermore, in an informatic efficient market, security prices react immediately and correctly to new information (Fama 1970; Knüpfer & Puttonen 2018, p. 166)

Fama (1970) defined three different stages of market efficiency, and different stages reflect the amount of information that is included in security prices. The three different stages of market efficiency are weak, semi-strong, and strong form. That is to say, these forms differ in their interpretations of the phrase ''all available information'' (Bodie et al. 2014, p. 353). In the upcoming sub-chapters, I will cover different forms of market efficiency.

3.2.1 Weak

According to the weak-form hypothesis in capital markets, security prices already represent all information, which leads to the conclusion that it is not possible to predict security prices by looking at historical market trade, such as price history, trading volume, or short interest. Technical analysis, which is searching for recurring and predictable patterns in security prices, is therefore useless. (Fama 1970; Bodie et al. 2014, p. 353-355)

There is a criticism of the weak form hypothesis, which states that there is a commonly used procedure to predict future security prices using past prices in finance. Tsoukalas (2000) examined stocks' volatility and predictability in the US, UK, and Japanese stock markets. According to Tsoukalas, stock returns and even securities' volatility could be predicted, and common sources of information consist of attributed persistence and predictability. Therefore, the weak-form hypothesis could be rejected, which states that it cannot be proved that it is not possible to predict future stock prices using past stock prices. (Kihn, 2015, p. 53; Tsoukalas 2000)

3.2.2 Semi-strong

The semi-strong form of market efficiency states that all publicly available information is already reflected in security prices. In this context, all publicly available information refers to both past prices and as well as accounting procedures, stock splits, balance sheet composition, and competence in management. In this case, it is reasonable to assume the price effect on the stock prices is instant. Therefore, using technical analysis and fundamental analysis (i.e., using publicly available information in order to earn abnormal returns) has been set to fail. (Fama 1970; Bodie et al. 2014, p. 354-356)

3.2.3 Strong

The strong form of market efficiency states that all relevant information is reflected in security prices, which includes information that is only available to company insiders, i.e., corporate officers and large institutional investors. The strong form of market efficiency contains the semi-strong and weak forms of the market efficiency hypothesis. Therefore, the market must first meet the requirements of the weak form market efficiency hypothesis in order to be able to fulfill the requirements of the semi-strong market efficiency hypothesis. Correspondingly, the strong form of market efficiency cannot be reached without fulfilling the requirements of the semi-strong market efficiency hypothesis. (Fama 1970; Bodie et al. 2014, p. 354)

3.3 Modern Portfolio Theory

Harry Markowitz is known to be the father of the modern portfolio theory since he presented the first theory of the relationship between commodities' risk and return. The idea of the modern portfolio theory is based on the hypothesis related to the portfolio that consists of different capital classes, such as stocks, bonds, real estate, and raw materials. Markowitz states that an ideal portfolio consists of different assets where the perfect correlation between the assets of the portfolio does not exist. Consequently, if the efficient market hypothesis holds and investors are maximizing expected returns and minimizing risk while decreasing the variance of returns, it allows investors to decrease the variance of the whole portfolio's returns without decreasing the expected return of the portfolio. Constructing the portfolio using multiple assets is called diversification. (Markowitz 1952)

Markowitz (1959) states that from an investor's point of view, it is important to adjust expected returns with risk factors instead of looking at the raw returns of the portfolio. Markowitz illustrates the situation as the efficient frontier that provides the highest possible expected return within the risk of any range. A rational investor prefers to pick the ideal portfolio from the efficient frontier depending on the level of willingness to take risks. It is also notable that the comparison of the variance of returns in individual assets with other asset classes of the portfolio.

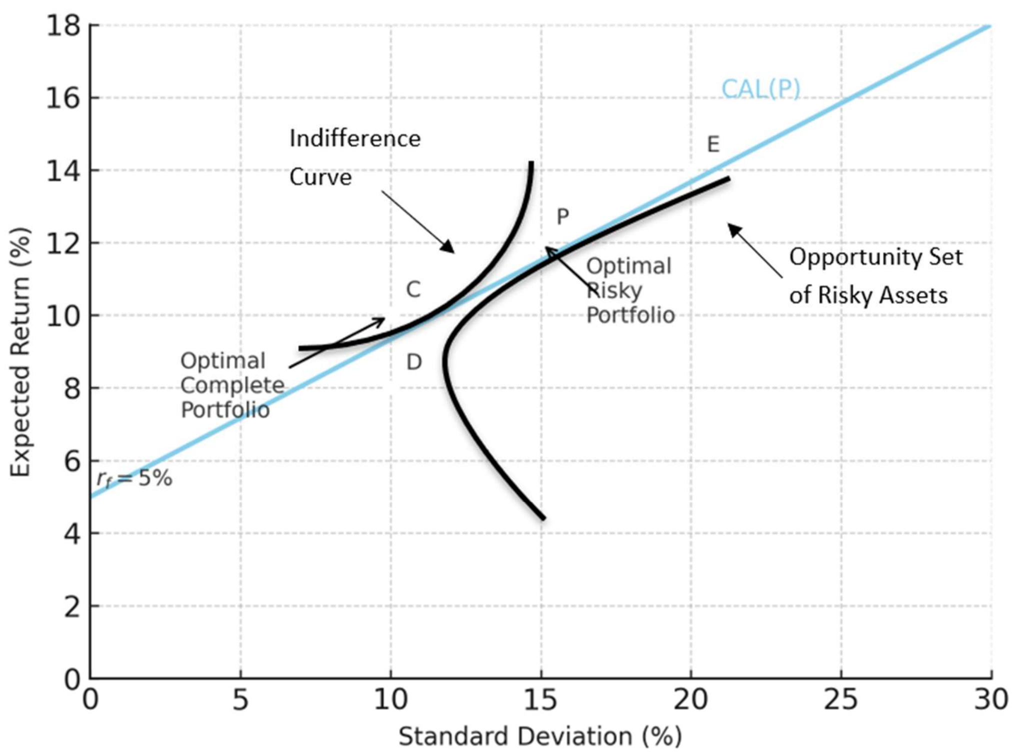

Figure 1. Optimal portfolio selection. (Bodie et al. 2014:219).

According to Figure 1, the lowest standard deviation of the portfolio can be found at the very left edge of the effective front curve. If we move downward along the curve from here, the investor has to settle for investments with a higher standard deviation and a lower return expectation. These investments are not supposed to belong to the effective front. On the other hand, the effective front includes the weightings of investments that are placed upwards on the curve from the lowest point of the standard deviation, because they increase the return expectation, together with the increasing risk.

3.4 Behavioral Finance

During the 1990s, the criticism of efficient markets and related academic research gained mainstream attention, and it has been used to explain market movements in one direction or another. This discipline is called behavioral finance. According to Ricciardi & Simon (2000), psychology, sociology, and finance are the three different aspects that tie behavioral finance together. The reason why psychology refers to behavioral finance is that behavior and processes in the human mind have an impact on the decisions the investor makes in the market. Sociology is presented as a one aspect because social relationships are believed to have an impact on the attitude and behavior of the investor.

According to Sewell (2007), the criticism of the efficient market hypothesis refers to human irrational behavior. Sewell has stated that behavioral finance challenges the efficient market hypothesis by providing visibility into why and how markets can be inefficient due to investors’ irrational behavior. In addition, Forbes (2009) defined behavioral finance as the science of how psychology influences financial markets. This view emphasizes that psychological factors, such as cognitive biases, influence individuals rather than rational, wealth-maximizing behavior.

Daniel Kahneman is known as one of the pioneers of behavioral finance. Kahneman wrote about the illusion of stock picking skill, and that most people operating in the industry have an illusion of skill. Investors tend to buy a stock if the name of a company is easy to spell or if a company has been in the news lately more than others. Kahneman had an opportunity to test the hypothesis of illusion on skills to evaluate the performance of investment advisors in a financial advisory firm. He examined whether advisors' results were consistent year after year, which would indicate that there were employers who owned real investing skills. The correlation coefficient of the rankings between every pair of years was 0. The result suggests the illusion of stock-picking skills hypothesis, and therefore, it is the same if the investor advisors of the firm rolled a dice instead. (Kahneman, 2011)

3.5 Valuation models

This sub-chapter represents two different valuation models. The idea behind using different stock valuation models is to define the intrinsic value of a stock. Intrinsic value is defined as the estimation of future cash flows that can be defined in several ways depending on the company's industry. If the market price is lower than the intrinsic value, the stock is undervalued and therefore an attractive investment opportunity. (Bodie et al. 2014: 594) In this thesis, three stock valuation methods have been selected to illustrate the most commonly used methods to define intrinsic value, such as dividends, free cash flow, and residual income.

3.5.1 DDM

The dividend discount model (DDM) is an equity valuation model that seeks to measure a company's intrinsic value. (Bodie et al. 2014, p. 591). DMM was proposed originally by Williams (1938), who suggested that the present value of estimated future payouts of dividends is equivalent to a company's stock price. The formula is presented in the following:

$$(1) \qquad P_0 = \sum_{t=0}^{n} \frac{DIV_t}{(1+r)^t}$$

where:

P_0 = the price of a stock at time t

DIV_t= dividends at time t

r = required rate of return

Even if DDM is using estimated future payouts of dividends as the only cash flows that will be discounted in the formula, it cannot be concluded that the model ignores capital gains. The model assumes that when the stock is sold, capital gains will be adjusted to represent dividend projections. However, the previously presented formula is not practical in terms of the assumption that a company will be operating year after year in perpetuity. To simplify the DDM formula by adding a perpetuity component, the constant-growth model was introduced by Myron J. Gordon. The model assumes that dividends continue to rise at a steady growth rate. In addition, the formula is applicable if r is more than g. (Bodie et al. 2014, p. 596-598) The constant growth model formula is presented in the following:

$$(2) \qquad P_0 = \frac{DIV_t}{r - g}$$

where:

P_0 = the price of a stock at time t

DIV_t = dividends at time t

r = required rate of return

g = dividend growth rate

3.5.2 DCF

The substitute for valuing equity instead of applying DDM is the discounted cash flow analysis (DCF). DCF is a more relevant approach to valuing a company when it does not pay dividends, where the DDM model cannot be applied. However, DCF applies to almost any company to calculate the intrinsic value beyond the dividend discount model. The commonly used way to calculate free cash flow is to deduct taxes from the company's EBIT, add depreciation, and deduct capital expenditures and change in net working capital (if NWC has increased in the fiscal year). In the DCF model, the terminal value is calculated to determine the estimation of the growth rate in terms of perpetuity. (Bodie et al. 2014, p. 617-618) (Brealey et al. 2011, p. 90) The DCF formula is presented mathematically in the following:

$$(3) \qquad P_0 = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+W\quad)^t} + \frac{V_t}{(1+WACC)^t}$$

where: FCF_t= the company's free cash flow at time t

V_t= estimated terminal value

$WACC$= weighted average cost of capital

The weighted average cost of capital (WACC) is a discount rate used in the model. D and E represents the prevailing market values of the company's debt and equity, and R_D and R_E represents the expected rates of return that investors are demanding in the company's debt and equity. (Brealey et al. 2011, p. 492) The WACC formula is presented mathematically in the following:

$$(4) \qquad WACC = R_E * \frac{E}{E+D} + R_D * \frac{D}{E+D}$$

where: E= equity

D= debt

R_E= required return on equity

R_D= required return on debt

3.6 Risk-adjustments

This sub-chapter presents the most common models to determine risk-adjustments for asset pricing. Firstly, the Capital Asset Pricing Model (CAPM) will be presented, which is a continuation of Markowitz's modern portfolio theory, which was presented earlier. Arbitrage pricing theory (APT), like the CAPM, forecasts a security market line that connects expected returns to risk, but the path it takes to the SML is significantly different. The Fama and French three-factor model, which has come to predominate in empirical research and industry applications, is an illustration of this strategy. (Bodie et al. 2014, p. 327-340)

3.6.1 Capital Asset Pricing Model

The Capital Asset Pricing model was introduced by Jack Treynor (1962), William F. Sharpe (1964), John Lintner (1965), and Jan Moss (1966). The foundation of the capital assets pricing model refers to the value of diversification that allows for the elimination of the non-systematic risk of the portfolio. On the other hand, the portfolio faces systematic risk, and therefore, investors want to get a refund because of the risk they took. (Elton, Gruber, Brown & Goetzmann 2010, p. 280-283)

The CAPM makes a prediction about how an asset's risk and expected return will interact. It offers a reference rate of return for assessing potential investments. Additionally, it provides a rough estimate of the anticipated return on assets that haven't been exchanged on the market yet. The model is widely used because of the insight it provides and because its accuracy is thought to be adequate for critical applications, even if it does not totally survive empirical tests. (Bodie et al. 2014, p. 291)

The systematic risk is called the beta coefficient, which is the covariance between the asset returns and the market returns divided by the variance of the market return. If the beta of the stock doubles, the risk premium should move in the same coefficient that the relationship between the expected return and market risk would stay the same. According to the CAPM, every security should be placed on the slope (SML). (Brealey et al. 2011, p. 192-193) The following Figure 2 will illustrate the relationship between stock returns' probability and market risk:

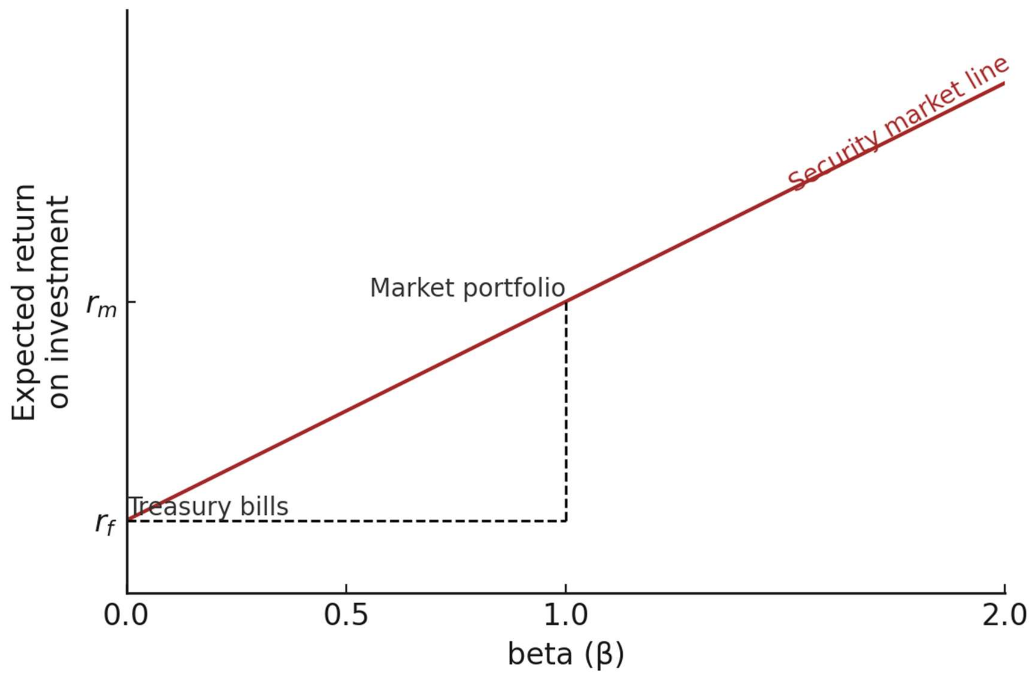

Figure 2. Security market line. (Brealey et al. 2011, p. 192).

The expected return of the stock can be evaluated by testing the CAPM, which follows the modern portfolio theory. The message of the CAPM is that the expected risk premium is straight proportional to its beta. In the CAPM formula, the risk premium is calculated by multiplying the beta of the security by the difference between the estimated market return and the risk-free rate. The CAPM follows the formula, which is provided below (Brealey et al. 2011, p. 193):

$$E(R_i) = R_f + \beta_i(R_m - R_f) \quad (5)$$

where:

R_i = security return

R_m = market return

R_f = risk-free rate

β_p= Beta of a security

There are several assumptions when it comes to the CAPM. The first one is the assumption of the existence of the risk-free rate. Even if there is hardly chance of the default of treasury bills, the investment is not risk-free. In addition, the CAPM model assumes that interest rates are equivalent whether the investor borrows or lends money. In reality, borrowing interest rates exceed lending interest rates. The CAPM also faces criticism because it states that beta alone could affect stock returns. Empirical testing proves that small-cap and value stocks outperform large-cap and growth stocks observing the long time period. (Brealey et al. 2011, p. 196-200)

3.6.2 Arbitrage Pricing Model

In 1976, Stephen Ross presented the arbitrage pricing model that estimates, as well as the CAPM, the returns of a security on a risk-adjusted basis. (Ross, 1976). Whereas CAPM is the pricing model for securities explaining returns of securities adjusting for risk using the beta coefficient, the point of view of the APT is different. The APT consists of three different expectations: (1) A factor model could be used to illustrate asset returns. (2) Idiosyncratic risk could be eliminated using diversification in a particular security. (3) The efficient markets hypothesis rules out the existence of arbitrage opportunities. The Law of One Price, which states that the price of two securities should be equal if securities are equivalent, is a crucial concept of the APT. An example of the violation of the law is a situation where the same stock trades at a different price on two different stock exchanges. (Bodie et al. 2014, p. 327-328)

Whereas the CAPM focuses on the analysis of the construction of an efficient portfolio, the APT states that every stock’s returns depend on macroeconomic factors, such as interest rate or oil price factors. The APT suggests that a stock's expected risk premium should be determined by the sensitivity of the stock to each of the factors. The APT formula is as follows (Brealey et al. 2011, p. 200):

$$(6) \quad R_i = E(R_i) + \beta_1 R_{factor1} + \beta_2 R_{factor2} + \beta_3 R_{factor3} + \cdots + noise$$

where:

R_i = security return

$R_{factor\ n}$ = return on factor n

β_n= Beta of a factor n

Two key ideas are behind the APT, and the first one is the assumption of zero risk premium. Zero risk premium refers to the statement that the risk-free rate should be earned by a diversified portfolio that is not exposed to macroeconomic influences. In case of a higher or lower return than the risk-free rate, investors would be willing to take advantage of arbitrage opportunities. In addition, the model states that a portfolio that offers two times the risk premium will be twice as sensitive to a return factor. The comparison between the APT and the CAPM states that both models assume that the estimated stock return is linked to systematic risk. However, the APT does not define specific macroeconomic factors, while the CAPM specifies market return as a factor. (Brealey et al. 2011, p. 200-201)

3.6.3 Fama-French Three-Factor Model

Whereas CAPM is the pricing model for securities explaining returns of securities adjusting for risk using the beta coefficient, the Fama-French three-factor model is called to challenge the traditional capital asset pricing model. The three-factor model has a different point of view on the pricing model of securities. According to Fama and French (1992), the relationship between expected return and the beta coefficient of the stock is not the only explanatory variable. In 1993, Fama and French found that investors are not actually concerned about one risk; in fact, they are interested in three different risks instead of one, and overall, investors care about a lot of different risks in the real world. They suggested that the prices of securities related to systematic risk are explained through the three different factors. The formula of the Fama-French three-factor model is provided below (Bodie et al., 2014, p. 340):

(7) $R_{it} = \alpha_i + \beta_{iM}R_{Mt} + \beta_{iSMB}SMB_t + \beta_{iHML}HML_t + e_{it}$

where:

α_i = intercept of the regression

β_{im}= Beta of a factor on the market premium

SMB = Small minus Big premium

HML = High minus Low premium

e_{it} = unsystematic risk of an asset

The formula above includes three different risk factors. The first component is $\beta_{iM}R_{Mt}$ which is the market risk premium where R_{Mt} is equivalent to the market return minus the risk-free rate. SMB factor is the difference between small and large cap portfolio returns. The companies are sorted from largest to smallest, and companies below the median are considered small, and above the median will be large-cap companies. HML factor is the difference between high and low B/M ratio portfolio returns. High B/M ratio stocks will be labelled as the top 30% of the companies, and low B/M ratio stocks are the lowest 30%.

4 Data and methodology

The purpose of this thesis is to test the Dogs of the Dow investment strategy in the Helsinki stock exchange. In addition to examining the dividend yield strategy, the Dogs of the Dow investment strategy's research method has been applied to the PE and ROE portfolio construction. The aim is to determine whether it is possible to earn abnormal returns when applying the DoD strategy to portfolio construction, filtering the top ten dividend yield, P/E, and ROE ratio stocks annually. This thesis used the OMXHCAP index as a benchmark index, and three different portfolios' excess returns were calculated using the returns of the OMXHCAP index. In addition, the statistical significance of these portfolios is tested.

The thesis aims to lightly imitate the DoD strategy founded by John Slatter. In order to outperform the Dow Jones Industrial Average stock index over an extended period of time, Slatter developed a technique. There are 30 companies in the DJIA index, and he recommended building a portfolio with 10 of them. These businesses ought to be chosen based on their best dividend yields from the prior year. Slatter's analysis covered the period from 1972 to the end of 1987, or 15 years. In the same time span, his technique outperformed the overall index by more than seven percentage points, with an annual return of 18.4 percent. (Dorfman, 1988)

In this chapter, the data and methodology part of the thesis will be presented. This chapter consists of three different parts. Firstly, this chapter presents the description of the data and the explanation of the selected benchmark index. In addition, the research methodology applied to the study will be examined later in the chapter. Referring to Chapter 3, which presented different variations of the stock valuation, the latest subchapter examines the different return risk-adjustment approaches to analyzing the effectiveness of portfolios.

4.1 The collection of data

The data set of the study consists of the monthly total return index of stocks included in the Helsinki Stock Exchange. The total return index illustrates the potential increase in value of a shareholding over a certain time frame, presuming that dividends are reinvested to buy more equity or unit trust units at the closing price in effect on the ex-dividend date. The equation of the total return index will be expressed as follows:

$$(8) \quad RI_t = RI_{t-1} * \frac{RI_t}{PI_{t-1}} * (1 + \frac{DY_t}{100} * \frac{1}{N})$$

where:

RI_t = return index on day t

RI_{t-1} = return index on the previous day

The sample will cover the years from 2004 to 2023 of every stock consisting of the Helsinki Stock Exchange. The data is collected from the database of the University of Vaasa. The risk-free rates are collected from the website of the Bank of Finland. The Finnish government's 10-year bond rate was selected as the risk-free rate. The Finnish government's 10-year bond is selected as a risk-free rate due to the financial stability of the state of Finland, and therefore its assurance of repayment capacity. The maturity of 10 years is applicable since the study evaluates the long-term outperformance of the portfolio. In addition, the obligations of the Finnish government illustrate the expectations of economic development, inflation, and monetary policy.

Originally, the DOD strategy used the Dow Jones Industrial Average as a population to filter the best-performed stocks, and the DJIA included 30 of the most highly traded stocks. In this study, the OMXH25 index stocks are used as a population to select the top ten stocks for each portfolio. The OMXH25 stock market index monitors the performance of the top 25 traded and representative firms on the Helsinki Stock Exchange, whereas the OMXH and OMXHCAP indexes contain numerous stocks. Therefore, OMXH and OMXHCAP indexes do not apply to this study for stock-picking purposes since the goal is to imitate the original DOD strategy that was mentioned earlier in this chapter.

While the OMXH25 and OMXHCAP indexes stock’s maximum weight is 10%, OMXH indicates that the index is derived from stocks that are exchanged on the Helsinki market. When choosing the applicable benchmark index for evaluating the performance of portfolios, instead of picking the OMXH as a benchmark index, the best option is the OMXCAP since it avoids the impact of some of the OMXH index's dominant firms.

4.2 Methodology

In order to mimic the DoD strategy's portfolio creation, this master's thesis aims to examine value strategies in the Finnish stock market. As a result, the method that has been applied used equal weights while building the portfolios. Furthermore, there is no need to build long-short portfolios because we only decide to invest in the top ten firms for each strategy.

For the high dividend yield portfolio, the construction of the high-dividend yield portfolio is a simple process. First, on the final trading day of the year, the OMXH25 index's stocks are ranked from highest to lowest in terms of their dividend yields. Each of the top ten firms with the greatest dividend yields has an equal amount invested, and the portfolio is kept for a year. The portfolio is rebalanced using the same criterion after a year, and this process is repeated annually. The same criterion is used to rebalance the portfolio after a year, and this process is repeated annually.

For the P/E ratio portfolio, the construction of the P/E ratio portfolio is straightforward as well. First, on the final trading day of the year, the OMXH25 index's stocks are ranked from lowest to highest in terms of their P/E ratio. Thereafter, each of the top ten firms with the lowest P/E ratio has an equal amount invested, and the portfolio is kept for a year. The portfolio is rebalanced using the same criterion after a year, and this process is repeated annually. The same criterion is used to rebalance the portfolio after a year, and this process is repeated annually.

The ROE portfolio is constructed by filtering companies' ROE ratios. First, on the final trading day of the year, the OMXH25 index's stocks are ranked from highest to lowest in terms of their return on equity. Each of the top ten firms with the greatest ROE has an equal amount invested, and the portfolio is kept for a year. The portfolio is rebalanced using the same criterion after a year, and this process is repeated annually. The same criterion is used to rebalance the portfolio after a year, and this process is repeated annually.

4.3 Risk-adjustments

Idiosyncratic risk affects the portfolio’s total return when there are ten stocks chosen every year. Thus, the risk adjustments for the portfolio’s profits are reasonable to complete. The performance of the risk-adjusted returns is more meaningful to test against a reference index or other strategies than raw returns. Different risk-adjustments used in the empirical section will be presented next. The basic market-adjusted formula is one of the methods applied in the empirical section, and it will be presented first. In addition, this thesis will apply the Sharpe ratio and the Treynor index as well as the capital asset pricing model to adjust portfolio returns.

4.3.1 Market-adjusted

This basic market-adjusted formula is one of the methods applied in the empirical section. The formula is simple and measures the excess return of the portfolio, deducting the market return from the portfolio return. The formula illustrates the abnormal returns of the portfolio, indicating how attractive an investment is. This formula does not take into account systematic risk, that later presented Treynor index, the Sharpe ratio, and the CAPM model. The market-adjusted formula will be presented mathematically as follows:

$$(9) \quad (Market - adjusted)R_p = R_p - R_m$$

where:

R_p = portfolio return

R_m = market return

4.3.2 Capital Asset Pricing Model

The Capital Asset Pricing model was introduced by Jack Treynor (1962), William F. Sharpe (1964), John Lintner (1965), and Jan Moss (1966). It is also influenced by Markowitz's (1952) portfolio theory, which was presented earlier in the theory section. The CAPM describes how the portfolio's estimated return and systematic risk are related. The formula is mathematically presented as follows:

$$(10) \quad (CAPM)R_p = R_p - R_f - \beta_p(R_m - R_f)$$

where:

R_p = portfolio return

R_m = market return

R_f = risk-free rate

β_p= beta of a portfolio

where:

$$\beta_p = \frac{COV(R_{i,}R_{m)}}{\sigma_m^2}$$

The systematic risk formula (beta) is presented above, which is the measure of risk in the Treynor index as well. The beta coefficient for a security $R_{i,}$ is calculated by taking the covariance of the return of a security and the market divided by the variance of the market return. Beta illustrates the security's sensitivity to fluctuations in contrast to the market. Therefore, companies that operate in a cyclical industry usually have a bigger sensitivity to the market, resulting in more systematic risk. (Bodie et al. 2014, p. 259)

4.3.3 Treynor Index

Treynor (1965) presented a measurement (beta) for systematic risk for the calculation of the risk-adjusted returns. Similarly, the CAPM applies beta as a risk measurement. In the Treynor index formula, the risk premium $R_p - R_f$ of the portfolio will be divided by the total risk β_p. The higher Treynor index illustrates that the abnormal returns are bigger produced per unit added of market risk. The formula is mathematically presented as follows:

$$(11) \quad Treynor\ index = \frac{R_p - R_f}{\beta_p}$$

where:

R_p = portfolio return
R_f = risk-free rate
β_p= beta of a portfolio

4.3.4 Sharpe Ratio

Whereas the Treynor index applies beta as a measurement of total risk, the Sharpe ratio uses standard deviation as a measure. Therefore, it is not the CAPM-based model, unlike the Treynor index. Sharpe (1966) introduced the risk-adjusted measurement. The Sharpe ratio utilizes standard deviation as the risk metric. The standard deviation is the measure of total risk, whereas beta is only a measure of systematic risk. The Sharpe ratio can be interpreted in a way that the risk-adjusted abnormal returns are better when the value is higher. (Sharpe, 1994).

(12) $$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

where:

R_p = portfolio return

R_f = risk-free rate

σ_p= standard deviation of a portfolio

5 Results

In this chapter, the final empirical results of the study will be presented. The empirical results section consists of three different sub-chapters. The findings of the ''DOD-10'' strategy will be covered in the first sub-chapter. The DOD-10 refers to the portfolio construction that picks the highest ten dividend-yielding stocks for one year every previous latest trading day of the year. The ''PE-10'' and the ''ROE-10'' portfolios' construction is inspired by the Dogs of the Dow investment strategies. Similarly, PE-10 refers to an investment strategy that invests the ten lowest P/E ratios stocks on the last trading day of the previous year for the next year's portfolio. The ROE-10 strategy is operated similarly, by picking the highest ten ROE ratios stocks on the last trading day of the previous year for the next year's portfolio. Furthermore, the last two chapters test the ''PE-10'' and ''ROE-10'' strategies.

These sub-chapters will go through the constituents list for each portfolio, and the results of the t-statistic testing for raw returns, OMXHCAP, market-adjusted, and CAPM-adjusted. The comparison of the benchmark index and each investment strategy's raw returns will be evaluated, and Treynor and Sharpe's performance measures will be covered in each section.

5.1 DOD-10 Strategy

The constituent list of the DOD-10 strategy will be presented in the following Table 1. The constituent list refers to the overview of the stocks that were included in the strategy's portfolio construction for a 20-year investment period. Over the past 20 years, at least 33 different companies have been included once in the yearly portfolio construction. Seven (21%) of the total number of companies were included once, whereas 18 (55%) of the companies appeared over than five times. Eight (24%) of the total number of companies were included ten times or more.

The five companies that were included in the portfolio over ten times are Fortum, Telia, Sampo, Nordea, and UPM. Fortum appeared at least 16 times, which makes it the dividend yield winner of the investment period. Fortum operates in the energy sector, where it offers electricity distribution services, and also several technical solutions for its customers to optimize consumption, applications for energy consumption monitoring, and charging stations for electric cars. The second-best Telia company, which operates in the telecommunications industry, appeared 14 times on the list. The stock was picked 11 times in a row in the portfolio from 2013 to 2023, and the company is known for its consistent dividend payout policy.

Sampo, known as a dividend aristocrat, turned out to be the 13 times on the list. Sampo is a Nordic non-life insurance group including its parent company Sampo Oyj and subsidiaries If, Topdanmark, and Hastings, and it operates in Great Britain and the Baltics. Nordea operates in the financial sector and offers different corporate, customer, and private banking services, offering a variety of services from asset management to retirement savings. Since its inclusion on the top ten list from 2015 to 2023, appearing there nine times in a row, Nordea has been attracting dividend-yield investors with its shares. Sampo, Nordea, and Fortum appeared on the PE-10 top ten list over than 10 times, which made them attractive due to their undervaluation. Whereas Nordea has been included on the top ten list for the last nine years in a row, UPM-Kymmene was included on the top ten list from the year 2004 to 2014, excluding years 2005 and 2009. The total number of appearances on the list was 12 times, which still makes it the top five dividend payout stocks in the 20-year investment period. UPM-Kymmene operates in the forest industry, developing wood biomass and biofuels.

Table 1. List of companies in the DoD-10 portfolio during 2004-2023.

Company	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
CARGOTEC B						X															1
ELISA			X					X	X	X	X	X		X	X			X	X		10
FORTUM			X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
KEMIRA											X	X	X		X			X	X		6
KESKO B	X	X	X		X						X	X	X	X	X	X					10
KONE B			X					X			X								X	X	5
KONECRANES				X			X		X				X				X			X	6
METSO												X									1
NELES					X					X	X		X	X		X		X			7
NESTE						X	X														2
NOKIA							X	X	X	X				X	X		X				7
NOKIAN RENKAAT			X									X	X	X	X	X	X		X	X	9
NORDEA					X	X	X					X	X	X	X	X	X	X	X	X	12
ORION B	X	X					X		X	X	X	X			X	X			X		10
OUTOKUMPU A			X		X	X										X	X				5
POHJOLA PANKKI	X	X						X													3
RAMIRENT						X															1
RAUTARUUKKI K			X	X	X	X			X	X											6
SAMPO A	X	X			X		X	X	X				X	X	X	X	X	X	X		13
SANOMA			X	X	X	X	X	X	X	X											8
SSAB B																				X	1
STORA ENSO R	X		X	X	X					X											5
TELIA		X		X				X		X	X	X	X	X	X	X	X	X	X	X	14
TIETOEVRY								X					X	X			X	X		X	6
TOKMANNI																				X	1
UPM-KYMMENE	X		X	X	X		X	X	X	X	X					X		X	X		12
UPONOR	X	X				X															3
VALMET	X																			X	2
WARTSILA	X	X		X		X	X		X								X	X			8
YIT		X		X	X	X					X	X									6
AMER SPORTS		X																			1
METSA BOARD	X	X																			2
OKO PANKKI				X																	1
Total	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	200
Number of companies	33																				

The value strategies' superior performance over the market index in terms of raw annual returns is one of the study's primary hypotheses. In the figure below, the cumulative returns on the DoD-10 portfolio and OMXHCAP annual returns are presented. For each of the 20 years under study, Figure 3 illustrates a time-series comparison between the

DOD-10 and OMXHCAP annual results. When the difference is positive, it means that the DOD-10 performed better than the benchmark index. The DOD-10 portfolio shows a strong upward trend over time, with especially significant growth starting from 2012, and the most dramatic increase occurs from 2019, starting from 2500 index points to reaching over 4000 in 2023. Whereas the DOD-10 portfolio shows a sharp acceleration in growth, the performance of OMXHCAP remains quite flat.

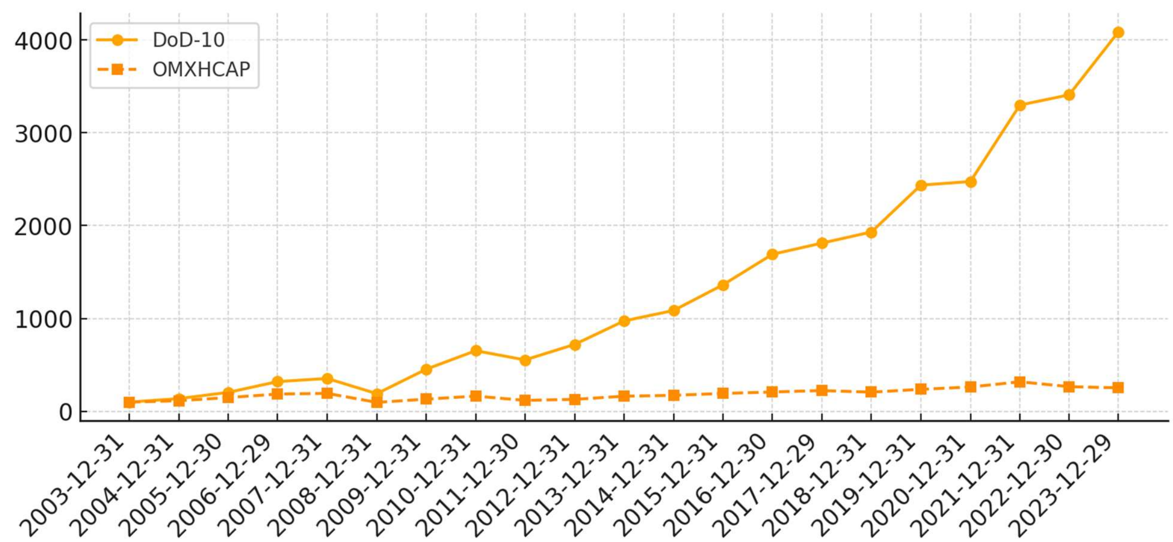

Figure 3. Cumulative Returns on the DoD-10 portfolio and OMXHCAP.

The one-year performance for the DOD-10 portfolio and in in-contrast performance for the OMXHCAP index are shown in Table 2. According to Table 2, the mean annual raw return of the DOD-10 portfolio is 24,9% whereas the mean annual returns (7,1%) of the OMXHCAP turned out to be significantly less. The DoD-10 portfolios' raw returns have the highest variance compared to the OMXHCAP, which implies more volatility. Standard deviation also implies a higher risk compared to the benchmark index. The value of skewness suggests that the DoD-10 raw returns are highly right-skewed, and the value of kurtosis (5.398) suggests more extreme values that occur frequently. Taking into account tax and transaction costs, the DoD-10 portfolio outperforms the benchmark index.

In addition, the table reports the performance of the DOD-10 strategy in market-adjusted returns and CAPM returns. The mean of the market-adjusted returns annually is considerably higher than the benchmark index, generating a mean excess return of 17,8%. Market-adjusted results are statistically significant, and there are fat tails and positive skew observed in the distribution. Using the CAPM as a risk adjustment, the percentage of mean return is 18,3%. The standard deviation is less volatile than raw returns, but in fact, marginally more volatile than the market-adjusted returns. The abnormal returns of the market-adjusted and the CAPM-adjusted results are statistically significant, taking into account taxes and transaction costs.

The traditional t-test, which is used to determine statistical significance in this study, indicates that the DOD-10 return deviates from zero at the 0.05 level. The returns of the OMXHCAP index appear to be insignificant in terms of the results of the t-test. Correspondingly, the raw annual returns of the DOD-10 portfolio are significant according to the test, and the numbers of minimum and maximum performance presented in the table suggest the outperformance of the DOD-10 compared to the benchmark index. During the years that market index returns were negative, the excess returns of the D OD-10 portfolio were respectively 3.8% in 2008, 12.8% in 2011, 14.3 % in 2018, 19.7% in 2022, and 24.8% in 2023. As a result, the observation that refers to the DOD-10 portfolio's outperformance in a market downturn compared to the market index is legitimate.

Table 2. Annual Returns of the DoD-10 portfolio.

	DoD-10	*OMXHCAP*	*Market-adjusted*	*CAPM*
2004	0.376	0.146	0.230	0.324
2005	0.489	0.301	0.187	0.413
2006	0.566	0.252	0.314	0.429
2007	0.104	0.038	0.066	0.064
2008	-0.462	-0.501	0.039	-0.083
2009	1.383	0.362	1.021	0.934
2010	0.438	0.248	0.190	0.196
2011	-0.152	-0.280	0.128	0.045
2012	0.301	0.096	0.205	0.209
2013	0.351	0.260	0.091	0.083
2014	0.115	0.057	0.059	0.072
2015	0.254	0.117	0.137	0.158
2016	0.241	0.082	0.159	0.164
2017	0.071	0.073	-0.002	0.005
2018	0.066	-0.077	0.143	0.130
2019	0.261	0.148	0.114	0.107
2020	0.016	0.104	-0.089	-0.108
2021	0.333	0.214	0.118	0.111
2022	0.033	-0.164	0.197	0.153
2023	0.199	-0.049	0.248	0.262
Mean	0.249	0.071	0.178	0.183
Variance	0.126	0.043	0.048	0.051
Observations	20	20	20	20
t-statistics	(3,143)**	1.541	(3,637)**	(3,640)**
p-value	0.005	0.140	0.002	0.002
Median	0.248	0.100	0.140	0.141
Standard Deviation	0.355	0.207	0.219	0.225
Sample Variance	0.126	0.043	0.048	0.051
Kurtosis	5.398	1.935	12.649	5.986
Skewness	1.376	-1.248	3.190	2.030
Range	1.844	0.863	1.109	1.043
Minimum	-0.462	-0.501	-0.089	-0.108
Maximum	1.383	0.362	1.021	0.934
Count	20	20	20	20
Tax and transaction cost adjusted return	0.229	0.066	0.158	0.163
t-statistics	(2,891)**	1.433	(3,228)**	(3,243)**

*Statistically significant at the 0,1 confidence level.
**Statistically significant at the 0,05 confidence level.

Table 3 below shows Treynor Index results for the DOD-10 portfolio and OMXHCAP market index. The beta is used as a measurement of systematic risk. In contrast to standard deviation, which takes into account each systematic and idiosyncratic risk, beta only takes into account market risk. Yet again, it appears that the DOD-10 portfolio has outperformed, as evidenced by the Treynor index, which has been in 18 of 20 years. This indicates that the DOD-10 portfolio outperformed the market index for these years in terms of returns per unit of added risk. The performance of the market index seems better during a couple of periods of market decline, such as 2008 and 2020. As a result, an investor who invests in the market index is completely diversified and not really subject to idiosyncratic risk, which appears to be advantageous in a volatile market.

Table 3. Treynor Index results for the DoD-10 portfolio and the benchmark index.

	DOD-10	OMXHCAP	Winner
2004	2.283	0.111	DoD-10
2005	2.811	0.269	DoD-10
2006	1.147	0.212	DoD-10
2007	0.110	-0.006	DoD-10
2008	-0.704	-0.535	OMXHCAP
2009	1.066	0.327	DoD-10
2010	0.417	0.216	DoD-10
2011	-0.241	-0.303	DoD-10
2012	0.303	0.081	DoD-10
2013	0.319	0.238	DoD-10
2014	0.148	0.050	DoD-10
2015	0.304	0.109	DoD-10
2016	0.254	0.079	DoD-10
2017	0.072	0.067	DoD-10
2018	0.072	-0.082	DoD-10
2019	0.249	0.147	DoD-10
2020	0.017	0.109	OMXHCAP
2021	0.321	0.214	DoD-10
2022	0.003	-0.195	DoD-10
2023	0.146	-0.074	DoD-10
Mean	0.455	0.052	
Median	0.251	0.095	
Minimum	-0.704	-0.535	
Maximum	2.811	0.327	
Count	20	20	

Table 4 below shows Sharpe ratio performance results for the DOD-10 portfolio and OMXHCAP market index. Yet again, it appears that the DOD-10 portfolio has outperformed, as evidenced by the Sharpe Ratio, which has been in 17 out of 20 years. Otherwise, the performance of the market index seems better during a couple of periods of market decline, such as years 2008, 2011, and 2020. The DoD-10 Sharpe ratio values present higher volatility compared to the benchmark.

Table 4. Sharpe Ratio results for the DoD-10 portfolio and the benchmark index.

	DOD-10	OMXHCAP	Winner
2004	2.876	0.954	DoD-10
2005	3.215	2.526	DoD-10
2006	3.865	1.330	DoD-10
2007	0.390	-0.034	DoD-10
2008	-1.900	-1.573	OMXHCAP
2009	3.889	1.189	DoD-10
2010	2.190	1.092	DoD-10
2011	-1.335	-1.079	OMXHCAP
2012	1.510	0.389	DoD-10
2013	2.000	1.678	DoD-10
2014	0.831	0.353	DoD-10
2015	1.389	0.563	DoD-10
2016	2.125	0.412	DoD-10
2017	0.751	0.695	DoD-10
2018	0.655	-1.857	DoD-10
2019	1.963	1.135	DoD-10
2020	0.060	0.399	OMXHCAP
2021	3.992	1.592	DoD-10
2022	0.019	-0.896	DoD-10
2023	0.978	-0.562	DoD-10
Mean	1.473	0.415	
Median	1.449	0.487	
Minimum	-1.900	-1.857	
Maximum	3.992	2.526	
Count	20	20	

5.2 PE-10 Strategy

The constituent list of the PE-10 strategy will be presented in the following Table 5. The constituent list refers to the overview of the stocks that were included in the strategy's portfolio construction for a 20-year investment period. Over the course of 20 years, at least 34 different companies were included in the yearly portfolio construction. Four (11.7%) of the total number of companies were included once, whereas 16 (47%) of the total number of companies appeared more than five times. Seven (20%) of the total number of companies appeared on the top ten list ten times or more.

Five companies were included in the portfolio more than ten times, and three out of five companies were also in the top five list in the DOD-10 portfolio. Nordea, which was in the top five list in the DOD-10 portfolio and the PE-10 portfolio and the most often picked stock of the investment period in the PE-portfolio, operates in the financial sector and offers different corporate, customer, and private banking services offering a variety of different services from asset management to retirement savings. Therefore, Nordea has been attracting investors with its high dividend yield and fair valuation.

The second often-picked company was Outokumpu, which was included in the portfolio 15 times and 14 times in a row from 2010 to 2023. Outokumpu operates in the industrial sector, and the company is a stainless steel manufacturer that offers specialized solutions for various industrial purposes. Sampo, known as a dividend aristocrat, turned out to be the 15 times on the list. Sampo is a Nordic non-life insurance group including its parent company Sampo Oyj and subsidiaries If, Topdanmark, and Hastings, and it operates in Great Britain and the Baltics. Sampo has been attracting investors with its high dividend yield and fair valuation.

Fortum was included 12 times on the PE-10 portfolio. Fortum operates in the energy sector, where it offers electricity distribution services, and also several technical solutions for its customers to optimize consumption, applications for energy consumption monitoring, and charging stations for electric cars. Rautaruukki was included on the list

11 times in a row from 2004 to 2014. Rautaruukki was a specialized manufacturing of steel and steel construction. Later, Rautaruukki was delisted from the Helsinki stock exchange in 2014 due to its merger with SSAB Corporation.

53% of the companies appeared in the PE-10 portfolio five times or less often, and due to a sharp drop in share price without a brief shift in earnings, many companies only made five or less than five appearances on the list. In addition, value companies typically have lower growth rates because investors are less likely to pay a bigger premium for future earnings when they are priced low relative to their earnings per share (Koller et al., 2015).

Table 5. List of companies in the PE-10 portfolio during 2004-2023.

Company	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
AMER SPORTS	X	X																			2
CARGOTEC B					X	X				X			X	X			X		X		7
ELISA	X		X				X					X		X	X						6
FORTUM	X	X	X				X	X	X	X	X	X	X				X	X			12
FORTUM ESPOO	X	X																			2
HUHTAMAKI																				X	1
KEMIRA											X						X	X	X		4
KESKO B		X	X		X													X		X	5
KOJAMO																		X	X	X	3
KONECRANES						X	X								X						3
METSA BOARD B		X	X	X	X											X	X		X		7
METSO						X					X					X					3
NELES				X	X	X				X			X					X			6
NESTE				X	X				X		X			X	X						6
NOKIA				X		X				X	X	X			X	X	X				8
NOKIAN RENKAAT	X					X							X			X	X			X	6
NORDEA		X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	17
ORION B								X				X				X					3
OUTOKUMPU A			X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
PERLOS		X																			1
POHJOLA GROUP	X	X																			2
POHJOLA PANKKI				X			X	X	X												4
RAMIRENT						X															1
RAUTARUUKKI K	X	X	X	X	X	X	X	X	X	X	X										11
SAMPO A	X	X	X	X	X			X	X	X		X	X	X	X	X		X		X	15
SANOMA			X	X				X													3
SSAB B																				X	1
STORA ENSO R	X						X	X	X					X		X	X	X	X	X	10
TELIA	X						X	X		X	X	X	X		X				X		9
TIETOEVRY					X									X	X				X		4
UPM-KYMMENE			X					X	X			X	X	X	X	X	X		X		10
VALMET																	X	X			2
WARTSILA				X			X													X	3
YIT					X	X			X	X	X	X	X	X							8
Total	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	200
Number of companies	34																				

The value strategies' superior performance over the market index in terms of raw annual returns is one of the study's primary hypotheses. For each of the 20 years under study, the figure illustrates a time-series comparison between the PE-10 and OMXHCAP annual results. When the difference is positive, it means that the PE-10 performed better than the benchmark index. The PE-10 portfolio shows a strong upward trend over time, with especially significant growth starting from 2015, and the most dramatic increase occurs after 2020, starting from 2000 index points to reaching approximately 3500 in 2023. Whereas the PE-10 portfolio shows a sharp acceleration in growth, the performance of OMXHCAP remains quite flat over time. The illustrative Figure 4 is presented as follows:

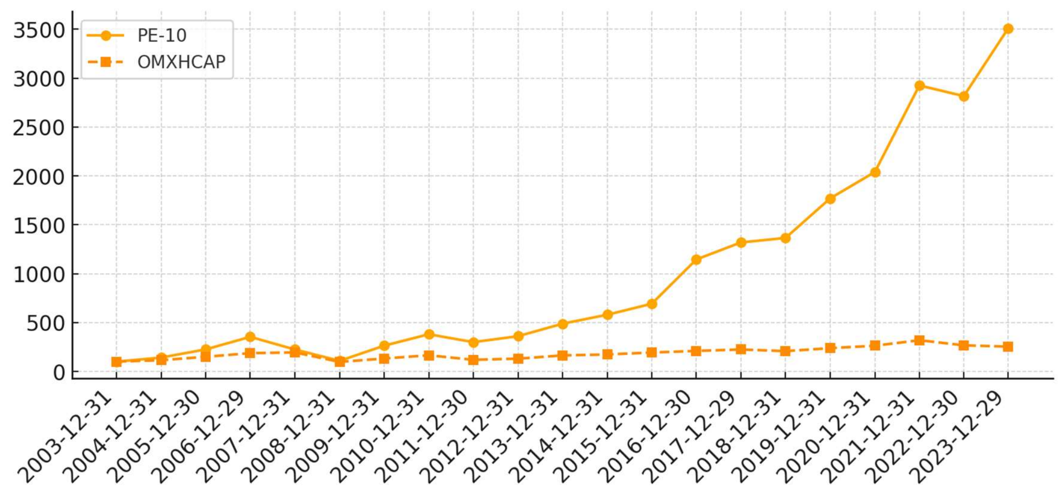

Figure 4. Cumulative Returns on the PE-10 portfolio and OMXHCAP.

The one-year performance for the PE-10 portfolio and in contrast performance for the OMXHCAP index are shown in Table 6. According to Table 6, the mean annual raw return of the PE-10 portfolio is 26.2% whereas the mean annual returns (7.1%) of the OMXHCAP turned out to be significantly less. The variance (0.171) is higher than the OMXHCAP and the DoD-10 portfolio's variance, suggesting higher volatility. Standard deviation (0.414) is higher than the OMXHCAP and the DoD-10 portfolio's variance, indicating higher total risk. The kurtosis (2.815) is slightly platykurtic, which suggests a lower amount of extreme values compared to the normal distribution. According to Figure 4, the PE-10 portfolio outperformed compared to the benchmark index, indicating statistically significant results.

The table reports the performance of the PE-10 strategy in market-adjusted returns and CAPM returns. The mean of the market-adjusted returns annually is considerably higher than the benchmark index, generating a mean excess return of 19%, and using CAPM as a risk adjustment, the percentage is 19.3%. Taking into account tax and transaction costs, the PE-10 strategy is generating market-adjusted excess returns.

The traditional t-test, which is used to determine statistical significance in this study, indicates that the PE-10 return deviates from zero at the 0.05 level. The returns of the OMXHCAP index appear to be insignificant in terms of the results of the t-test. Correspondingly, the raw annual returns of the PE-10 portfolio are significant according to the test, and the numbers of minimum and maximum performance presented in the table suggest the outperformance of the PE-10 compared to the benchmark index. When comparing the DoD-10 mean return (0.249) against the PE-10 portfolio’s mean return (0.262), the PE-10 portfolio is generating a slightly higher mean return. However, standard deviations are respectively 0.355 and 0.414. As a result, the total risk of the PE-10 portfolio is higher than the DoD-10 portfolio. In fact, the results of the Sharpe ratios are respectively 1.473 and 1.407, indicating a higher value for the DoD-10 portfolio.

Table 6. Annual Returns of the PE-10 portfolio.

	PE-10	*OMXHCAP*	*Market-adjusted return*	*CAPM*
2004	0.416	0.146	0.269	0.354
2005	0.590	0.301	0.288	0.491
2006	0.569	0.252	0.317	0.421
2007	-0.367	0.038	-0.405	-0.406
2008	-0.518	-0.501	-0.017	-0.054
2009	1.443	0.362	1.081	0.965
2010	0.443	0.248	0.195	0.183
2011	-0.212	-0.280	0.068	0.034
2012	0.203	0.096	0.106	0.100
2013	0.356	0.260	0.096	0.062
2014	0.188	0.057	0.131	0.119
2015	0.194	0.117	0.076	0.081
2016	0.655	0.082	0.573	0.557
2017	0.152	0.073	0.079	0.077
2018	0.035	-0.077	0.112	0.109
2019	0.296	0.148	0.149	0.078
2020	0.152	0.104	0.048	0.025
2021	0.434	0.214	0.220	0.191
2022	-0.037	-0.164	0.127	0.158
2023	0.247	-0.049	0.296	0.310
Mean	0.262	0.071	0.190	0.193
Variance	0.171	0.043	0.078	0.077
Observations	20	20	20	20
t-statistics	(2,829)**	1.541	(3,058)**	(3,107)**
p-value	0.011	0.140	0.006	0.006
Median	0.225	0.100	0.129	0.114
Standard Deviation	0.414	0.207	0.279	0.277
Sample Variance	0.171	0.043	0.078	0.077
Kurtosis	2.815	1.935	5.828	2.808
Skewness	0.757	-1.248	1.453	0.841
Range	1.961	0.863	1.486	1.371
Minimum	-0.518	-0.501	-0.405	-0.406
Maximum	1.443	0.362	1.081	0.965
Count	20	20	20	20
Tax and transaction cost adjusted return	0.242	0.066	0.170	0.173
t-statistics	(2,613)**	1.433	(2,737)**	(2,784)**

*Statistically significant at the 0,1 confidence level.
**Statistically significant at the 0,05 confidence level.

Table 7 below shows Treynor Index results for the PE-10 portfolio and the OMXHCAP market index. The beta is used by the Treynor index as a measurement of systematic risk. In contrast to standard deviation, which takes into account each systematic and idiosyncratic risk, beta only takes into account market risk. Yet again, it appears that the PE-10 portfolio has outperformed, as evidenced by the Treynor index, which has been in 18 of 20 years. This indicates that the PE-10 portfolio outperformed the market index for these years in terms of returns per unit of added risk. The performance of the market index seems better during a couple of periods of market decline, such as years 2007 and 2008.

As a result, an investor who invests in the market index is completely diversified and not really subject to idiosyncratic risk, which appears to be advantageous in a volatile market.

Table 7. Treynor Index results for the PE-10 portfolio and the benchmark index.

	PE-10	OMXHCAP	Winner
2004	1.576	0.111	PE-10
2005	2.256	0.269	PE-10
2006	1.039	0.212	PE-10
2007	-0.476	-0.006	OMXHCAP
2008	-0.594	-0.535	OMXHCAP
2009	1.039	0.327	PE-10
2010	0.389	0.216	PE-10
2011	-0.265	-0.303	PE-10
2012	0.174	0.081	PE-10
2013	0.292	0.238	PE-10
2014	0.147	0.050	PE-10
2015	0.193	0.109	PE-10
2016	0.540	0.079	PE-10
2017	0.142	0.067	PE-10
2018	0.031	-0.082	PE-10
2019	0.200	0.147	PE-10
2020	0.130	0.109	PE-10
2021	0.382	0.214	PE-10
2022	-0.059	-0.195	PE-10
2023	0.185	-0.074	PE-10
Mean	0.366	0.052	
Median	0.189	0.095	
Minimum	-0.594	-0.535	
Maximum	2.256	0.327	
Count	20	20	

Table 8 below shows Sharpe ratio performance results for the PE-10 portfolio and OMXHCAP market index. Yet again, it appears that the PE-10 portfolio has outperformed, as evidenced by the Sharpe Ratio, which has been in 17 of 20 years. Otherwise, the performance of the market index seems better during a couple of periods of market decline, such as the years 2007, 2008, and 2011. In fact, the results of the Sharpe ratios are respectively 1.473 for the DoD-10 portfolio and 1.407 for the PE-10 portfolio, indicating a higher value for the DoD-10 portfolio. The higher standard deviation of the PE-10 portfolio is lowering the risk-adjusted return of the PE-10 strategy.

Table 8. Sharpe Ratio results for the PE-10 portfolio and the benchmark index.

	PE-10	OMXHCAP	Winner
2004	4.501	0.954	PE-10
2005	4.021	2.526	PE-10
2006	3.449	1.330	PE-10
2007	-2.963	-0.034	OMXHCAP
2008	-1.772	-1.573	OMXHCAP
2009	4.292	1.189	PE-10
2010	2.145	1.092	PE-10
2011	-1.481	-1.079	OMXHCAP
2012	0.945	0.389	PE-10
2013	2.297	1.678	PE-10
2014	1.520	0.353	PE-10
2015	1.081	0.563	PE-10
2016	3.477	0.412	PE-10
2017	1.674	0.695	PE-10
2018	0.261	-1.857	PE-10
2019	1.257	1.135	PE-10
2020	0.517	0.399	PE-10
2021	3.192	1.592	PE-10
2022	-0.283	-0.896	PE-10
2023	0.014	-0.562	PE-10
Mean	1.407	0.415	
Median	1.389	0.487	
Minimum	-2.963	-1.857	
Maximum	4.501	2.526	
Count	20	20	

‘

5.3 ROE-10 Strategy

The constituent list of the ROE-10 strategy will be presented in the following Table 9. The constituent list refers to the overview of the stocks that were included in the strategy's portfolio construction for a 20-year investment period. Over the course of 20 years, at least 36 different companies were included in the yearly portfolio construction. Nine (25%) of the total number of companies were included once, whereas 15 (41.6%) of the total number of companies appeared more than five times. Seven (19.4%) of the total number of companies appeared on the top ten list more than 10 times.

Seven companies were included in the portfolio more than ten times, and three out of seven companies were also in the top five list in the DOD-10 portfolio. Nordea, which was in the top five list in the DOD-10 portfolio and the PE-10 portfolio and the most often picked stock of the investment period in the PE-portfolio, operates in the financial sector and offers different corporate, customer, and private banking services offering a variety of different services from asset management to retirement savings. Therefore, Nordea has been attracting investors with its high dividend yield and fair valuation.

The second often-picked company was Outokumpu, which was included in the portfolio 15 times and 14 times in a row from 2010 to 2023. Outokumpu operates in the industrial sector, and the company is a stainless steel manufacturer that offers specialized solutions for various industrial purposes. Sampo, known as a dividend aristocrat, turned out to be the 15 times on the list. Sampo is a Nordic non-life insurance group including its parent company Sampo Oyj and subsidiaries If, Topdanmark, and Hastings, and it operates in Great Britain and the Baltics. Sampo has been attracting investors with its high dividend yield and fair valuation.

Fortum was included 12 times on the PE-10 portfolio. Fortum operates in the energy sector, where it offers electricity distribution services, and also several technical solutions for its customers to optimize consumption, applications for energy consumption monitoring, and charging stations for electric cars. Rautaruukki was included on the list 11 times in a row from 2004 to 2014. Rautaruukki was a specialized manufacturer of steel and steel construction. Later, Rautaruukki was delisted from the Helsinki stock exchange in 2014 due to its merger with SSAB Corporation.

Table 9. List of companies in the ROE-10 portfolio during 2004-2023.

Company	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
AMER SPORTS	X													X							2
DNA																X					1
ELISA							X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
FORTUM	X					X	X		X			X	X					X			7
FORTUM ESPOO	X																				1
HUHTAMAKI												X		X	X		X	X			5
KEMIRA								X													1
KESKO B																	X	X	X	X	4
KOJAMO																			X		1
KONE B	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	19
KONECRANES				X	X	X	X	X	X	X		X			X						9
METSA BOARD B																X		X			2
METSO					X	X	X		X	X	X							X			7
NELES			X	X	X	X			X	X	X		X			X	X	X			11
NESTE			X	X	X						X		X	X	X	X	X		X	X	11
NOKIA	X	X	X	X	X	X						X	X							X	9
NOKIAN RENKAAT	X	X	X		X	X		X	X	X		X	X	X		X	X				13
NORDEA	X						X														2
ORION B			X				X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
OUTOKUMPU A				X											X				X	X	4
PERLOS		X																			1
POHJOLA GROUP	X	X																			2
POHJOLA PANKKI											X										1
QT GROUP																			X	X	2
RAUTARUUKKI K		X	X	X		X															4
SAMPO A	X	X	X		X						X	X		X	X				X		9
SANOMA			X					X													2
STORA ENSO R																	X				1
TELIA							X	X	X	X											4
TIETOEVRY	X	X	X	X			X						X	X	X						8
TOKMANNI																				X	1
UPM-KYMMENE																X					1
UPONOR					X	X															2
VALMET																X	X	X	X	X	5
WARTSILA		X		X		X	X	X	X	X	X	X	X	X	X						12
YIT		X	X	X	X			X		X	X										7
Total	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	200
Number of companies	36																				

The value strategies' superior performance over the market index in terms of raw annual returns is one of the study's primary hypotheses. In the following Figure 5, the cumulative results are presented for the ROE-10 and OMXHCAP annual returns. For each of the 20 years under study, the figure illustrates a time-series comparison between the ROE-10 and OMXHCAP annual results. When the difference is positive, it means that the ROE-10 performed better than the benchmark index. The ROE-10 portfolio shows a strong upward trend over time, with especially significant growth starting from 2018, starting from 1500 index points to reaching approximately 3500 in 2023. Whereas the ROE-10 portfolio shows a sharp acceleration in growth, the performance of OMXHCAP remains quite flat over time.

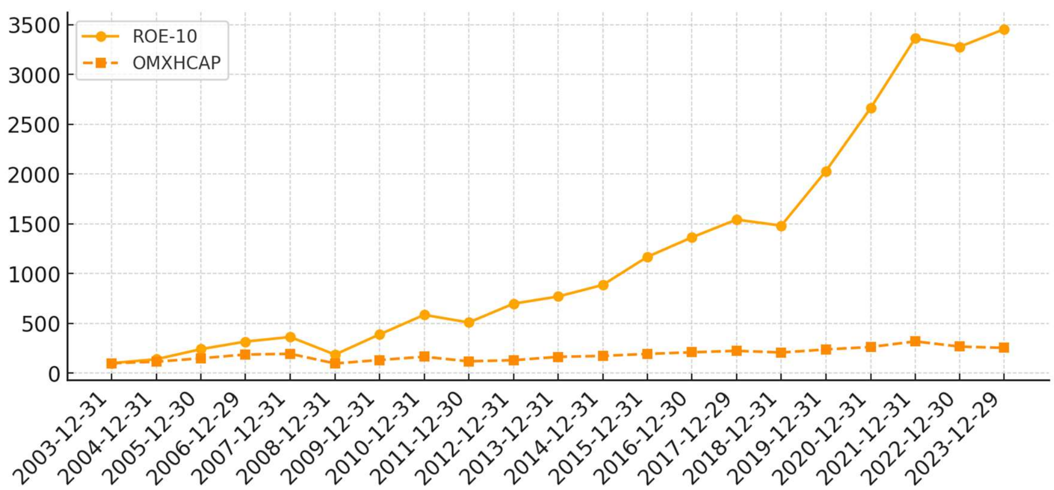

Figure 5. Cumulative Returns on the ROE-10 portfolio and OMXHCAP.

Table 10 below presents the statistical results of the ROE-10 strategy. The mean raw return is 0.237, which is higher than the benchmark 0.071. Variance for the ROE-10 raw return is higher than the benchmark, indicating higher volatility for ROE-10, even though it is lower than in the PE-10 and DoD-10 portfolios. Standard deviation is higher than the market standard deviation, which indicates higher total risk. The level of kurtosis indicates it is slightly platykurtic, which suggests a lower amount of extreme values compared to the normal distribution. According to Table x, the ROE-10 portfolio outperformed compared to the benchmark index, indicating statistically significant results.

The table reports the performance of the ROE-10 strategy in market-adjusted returns and CAPM returns. The mean of the market-adjusted returns annually is considerably higher than the benchmark index, generating a mean excess return of 16.5%. Using CAPM as a risk adjustment, the percentage is higher, 18.1%. Taking into account tax and transaction costs, the ROE-10 strategy is generating market-adjusted excess returns.

The traditional t-test, which is used to determine statistical significance in this study, indicates that the ROE-10 return deviates from zero at the 0.05 level. The returns of the OMXHCAP index appear to be insignificant in terms of the results of the t-test. Correspondingly, the raw annual returns of the ROE-10 portfolio are significant according to the test, and the numbers of minimum and maximum performance presented in the table suggest the outperformance of the ROE-10 compared to the benchmark index. The ROE-10 portfolio has the lowest mean return compared to the other two strategies. However, the standard deviation of the ROE-10 portfolio is 0.325, whereas the standard deviation is higher for the other two strategies. As a result, the total risk of the ROE-10 portfolio is lower than the DoD-10 and PE-10 portfolios. In fact, the results of the Sharpe ratios are respectively 1.473 for the DoD-10 portfolio, 1.407 for the PE-10 portfolio, and 1.439 for the ROE-10 portfolio, indicating the highest value for the DoD-10 portfolio.

Table 10. Annual Returns for the ROE-10 portfolio.

	ROE-10	*OMXHCAP*	*Market-adjusted return*	*CAPM*
2004	0.398	0.146	0.251	0.329
2005	0.724	0.301	0.422	0.568
2006	0.315	0.252	0.063	0.138
2007	0.145	0.038	0.107	0.106
2008	-0.487	-0.501	0.013	0.039
2009	1.092	0.362	0.729	0.650
2010	0.504	0.248	0.257	0.267
2011	-0.131	-0.280	0.149	0.094
2012	0.372	0.096	0.276	0.279
2013	0.103	0.260	-0.157	-0.100
2014	0.151	0.057	0.095	0.104
2015	0.319	0.117	0.202	0.216
2016	0.168	0.082	0.085	0.092
2017	0.131	0.073	0.058	0.070
2018	-0.039	-0.077	0.038	0.027
2019	0.370	0.148	0.223	0.223
2020	0.312	0.104	0.207	0.233
2021	0.264	0.214	0.049	0.061
2022	-0.026	-0.164	0.138	0.105
2023	0.054	-0.049	0.103	0.109
Mean	0.237	0.071	0.165	0.181
Variance	0.106	0.043	0.032	0.032
Observations	20	20	20	20
t-statistics	(3,257)**	1.541	(4,104)**	(4,530)**
p-value	0.004	0.140	0.001	0.000
Median	0.216	0.100	0.123	0.108
Standard Deviation	0.325	0.207	0.180	0.178
Sample Variance	0.106	0.043	0.032	0.032
Kurtosis	2.292	1.935	4.542	2.151
Skewness	0.492	-1.248	1.550	1.366
Range	1.579	0.863	0.886	0.749
Minimum	-0.487	-0.501	-0.157	-0.100
Maximum	1.092	0.362	0.729	0.650
Count	20	20	20	20
Tax and transaction cost adjusted returns	0.2168	0.0664	0.1454	0.1606
t-statistics	(2,982)**	1.4334	(3,608)**	(4,029)**

*Statistically significant at the 0,1 confidence level.
**Statistically significant at the 0,05 confidence level.

Table 11 below shows Treynor Index results for the ROE-10 portfolio and the OMXHCAP market index. The beta is used by the Treynor index as a measurement of systematic risk. In contrast to standard deviation, which takes into account each systematic and idiosyncratic risk, beta only takes into account market risk. Yet again, it appears that the ROE-

10 portfolio has outperformed, as evidenced by the Treynor index, which has been in 19 out of 20 years. This indicates that the ROE-10 portfolio outperformed the market index for these years in terms of returns per unit of added risk. The performance of the market index seems better only in one period in 2013. The minimum amount is less negative than for the benchmark index, which indicates that the strategy is valuable in market downturns.

Table 11. Treynor Index results for the ROE-10 portfolio and the benchmark index.

	ROE-10	OMXHCAP	Winner
2004	1.207	0.111	ROE-10
2005	1.514	0.269	ROE-10
2006	0.425	0.212	ROE-10
2007	0.118	-0.006	ROE-10
2008	-0.498	-0.535	ROE-10
2009	0.849	0.327	ROE-10
2010	0.496	0.216	ROE-10
2011	-0.189	-0.303	ROE-10
2012	0.374	0.081	ROE-10
2013	0.107	0.238	OMXHCAP
2014	0.178	0.050	ROE-10
2015	0.357	0.109	ROE-10
2016	0.179	0.079	ROE-10
2017	0.153	0.067	ROE-10
2018	-0.051	-0.082	ROE-10
2019	0.370	0.147	ROE-10
2020	0.415	0.109	ROE-10
2021	0.279	0.214	ROE-10
2022	-0.068	-0.195	ROE-10
2023	0.027	-0.074	ROE-10
Mean	0.312	0.052	
Median	0.229	0.095	
Minimum	-0.498	-0.535	
Maximum	1.514	0.327	
Count	20	20	

Table 12 below shows Sharpe ratio performance results for the ROE-10 portfolio and OMXHCAP market index. Yet again, it appears that the PE-10 portfolio has outperformed, as evidenced by the Sharpe Ratio, which has been in 18 of 20 years. Otherwise, the performance of the market index is better during a couple of periods of market decline, such as years 2008 and 2013.

Table 12. Sharpe Ratio results for the ROE-10 portfolio and the benchmark index.

	ROE-10	OMXHCAP	Winner
2004	4.265	0.954	ROE-10
2005	3.381	2.526	ROE-10
2006	1.341	1.330	ROE-10
2007	0.603	-0.034	ROE-10
2008	-1.580	-1.573	OMXHCAP
2009	3.796	1.189	ROE-10
2010	3.134	1.092	ROE-10
2011	-0.891	-1.079	ROE-10
2012	1.812	0.389	ROE-10
2013	0.696	1.678	OMXHCAP
2014	1.523	0.353	ROE-10
2015	1.728	0.563	ROE-10
2016	1.684	0.412	ROE-10
2017	1.802	0.695	ROE-10
2018	-0.404	-1.857	ROE-10
2019	2.515	1.135	ROE-10
2020	1.464	0.399	ROE-10
2021	2.045	1.592	ROE-10
2022	-0.305	-0.896	ROE-10
2023	0.177	-0.562	ROE-10
Mean	1.439	0.415	
Median	1.604	0.487	
Minimum	-1.580	-1.857	
Maximum	4.265	2.526	
Count	20	20	

6 Conclusions

This study has covered an analysis of the effectiveness of the dividend yield strategy and two other alternative investment strategies: price-to-earnings and return on equity strategies in the Helsinki stock exchange. In s theFigure 6 below, the three strategies and the benchmark index are presented as cumulative returns annually. The DoD-10 strategy reached over 4000 index points by the end of 2023, making it the winner, whereas two strategies reached approximately 3500 by the end of 2023. However, these three strategies are beating the benchmark index in terms of raw returns, making it possible to support the first hypothesis H_1. The PE-10 portfolio provided the highest annual mean return of 26.2%, whereas values for the DoD-10 and ROE-10 portfolios are, respectively, 24.9% and 23.7%.

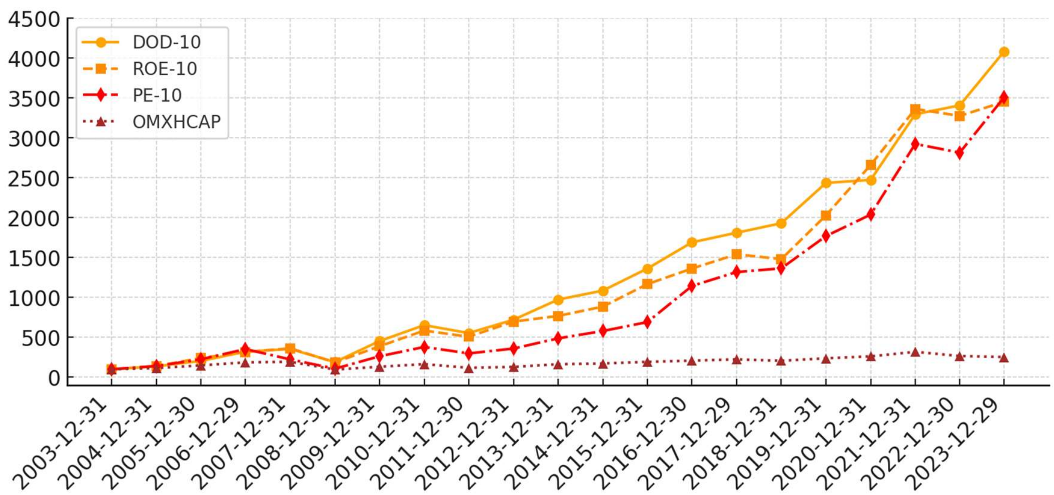

Figure 6. Cumulative returns of the DoD, price-to-earnings, return on equity, and OMXHCAP.

Further, the second hypothesis H_2suggested that the three portfolios outperform the market return on risk-adjusted returns. The PE-10 portfolio provides the highest return, applying the market adjustment and the CAPM adjustment. However, the DoD-10 portfolio provides the highest risk-adjusted return, applying the Treynor index and the

Sharpe ratio. To conclude, the DoD-10 portfolio provides the highest risk-adjusted return in terms of systematic and total risk. These results support the hypothesis of the H_2, making these three investment strategies generate abnormal returns, taking into account risk-adjustments.

The third hypothesis H_3 suggested that the three portfolios outperform the market return on transaction costs and tax-adjusted returns. In terms of transaction costs and tax-adjusted returns, and even using the market adjustment and the CAPM adjustments, these three investment strategies provided abnormal returns compared to the reference index. These results support the hypothesis of the H_3, making these three investment strategies generate abnormal returns, taking into account risk-adjustments, transaction costs, and taxes.

In this study, there are several limitations in terms of investment strategies presented in this study. In terms of the ROE strategy, the low ROE ratio does not always mean that the company is not profitable because of stock buyouts. For an investor, the suggestion is that a comprehensive analysis of the financials is reasonable. In addition, investors should always ask whether the high-dividend-yield company would be an attractive investment. This may raise questions about whether the company is investing enough and funding its business efficiently.

In terms of the methodology of this study, more extensive risk-adjustments have not been applied in empirical testing. It is worth mentioning that if other risk-adjustment (for example, Fama-French three-factor or Carhart four-factor models) had been applied, the results would differ, and some of these hypotheses would have been rejected.

In this study, the portfolio selection process was applied using value weights instead of original equal weights. In the original process developed by Slatter, equal weights are used to measure portfolio return. (Dorfman, 1988) Using this method to measure portfolio returns, tax and transaction costs are lower, which suggests a better return for these strategies.

Fama and French (2001) stated that companies are no longer paying dividends as much as before, and companies may distribute profits using stock repurchases or other methods. As a result, this leaves room for further research to screen stocks differently taking into account to other profit distribution methods.

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