Arto Moilanen

Combining value investing with gross profitability:

Empirical evidence from the Finnish stock market

School of Accounting and Finance
Master's thesis
Master's Degree Programme in Finance

Vaasa 2022

UNIVERSITY OF VAASA
School of Accounting and Finance
Author: Arto Moilanen
Title of the thesis: Combining value investing with gross profitability: Empirical evidence from the Finnish stock market
Degree: Master of Science in Economics and Business Administration
Programme: Master's Degree Programme in Finance
Supervisor: Janne Äijö
Year: 2022 **Pages:** 78

ABSTRACT:

Value investment strategy is age-old and one of the most well-known investment strategies that is widely employed in the financial markets. Considerable amount of literature has documented the existence of value premium worldwide, but in the recent decades the returns of value investment strategies have started to deteriorate. Value anomalies have been in the center of fruitful debate among academic researchers and practitioners since the existence of value premium challenges the efficient market theory. Despite value investment strategies have been scrutinized compendiously, academic literature has not reached consensus on the reasons for value premium.

This study revisits the performance of value investment strategies and quality investment strategy based on gross profitability in the Finnish stock market. The results of Novy Marx (2013) and Lalwani and Chakraborty (2018) show that gross profitability as a standalone investment strategy generates superior results. Moreover, the performance of combined strategies is examined to see whether it is beneficial for value investors to screen stocks on value and quality notions. Promising findings of Novy Marx (2014) show that quality, measured as gross profitability, can improve the performance of value investment strategies. The purpose of this thesis is to examine the performance of standalone value and quality portfolios in addition to combined portfolios with extensive set of risk-adjusted performance measures to get comprehensive view of the overall performance of portfolios.

Results show that combining P/E, P/B, and EV/EBIT with gross profitability enhances the overall performance of portfolios in the period 2016-2021. With one exception, all investigated portfolios outperformed the market portfolio during the sample period when tested against CAPM, Fama and French's (1993) three-factor, and Carhart's (1997) four-factor model. Two of the best performing standalone strategies were EV/EBIT and gross profitability. Best performing portfolio was achieved with a strategy that combined EV/EBIT and gross profitability. Overall, the results suggest that accounting for both value and quality can be beneficial for equity investors.

KEYWORDS: Value investing, Quality investing, Gross profitability, Investment performance

VAASAN YLIOPISTO
Laskentatoimen ja rahoituksen yksikkö
Tekijä: Arto Moilanen
Tutkielman nimi: Combining value investing with gross profitability: Empirical evidence from the Finnish stock market
Tutkinto: Master of Science in Economics and Business Administration
Oppiaine: Master's Degree Programme in Finance
Työn ohjaaja: Janne Äijö
Valmistumisvuosi: 2022 **Sivumäärä:** 78

TIIVISTELMÄ:

Arvosijoittaminen on ikivanha ja yksi tunnetuimmista sijoitusstrategioista, jota käytetään laajalti rahoitusmarkkinoilla. Useat akateemiset tutkimukset ovat dokumentoineet arvopreemion olemassaolon maailmanlaajuisesti, mutta viimeisten vuosikymmenien aikana arvosijoitusstrategioiden tuotot ovat alkaneet heikentyä. Arvo-anomaliat ovat olleet tutkijoiden ja sijoitusammattilaisten hedelmällisen keskustelun ytimessä, koska arvopreemion olemassaolo haastaa tehokkaiden markkinoiden teorian. Huolimatta mittavasta tutkimustiedosta, akateeminen yhteisö ei ole päässyt yksimielisyyteen arvopreemion syistä.

Tässä tutkielmassa tutkitaan sekä arvosijoitusstrategioiden että laatustrategian suorituskykyä Suomen osakemarkkinoilla. Novy Marxin (2013) sekä Lalwanin ja Chakrabortyn (2018) tutkimustulosten perusteella bruttokannattavuus itsenäisenä sijoitusstrategiana tuottaa erinomaisia tuloksia. Tutkielmassa tarkastellaan myös yhdistelmästrategioiden tuottaja sen selvittämiseksi, että onko arvosijoittajan kannattavaa seuloa osakkeita sekä arvon että laadun perusteella. Novy Marxin (2014) tutkimustulosten perusteella näyttää, että arvoportfolioiden suorituskykyä onnistutaan parantamaan, kun yhdistetään arvostrategia bruttokannattavuuteen. Tämän tutkielman tarkoituksena on tarkastella sekä itsenäisten arvo- ja laatuportfolioiden että yhdistelmäportfolioiden suorituskykyä useiden riskipainotettujen tunnuslukujen avulla kokonaisvaltaisen kuvan saamiseksi sijoitusstrategioista.

Tämän tutkielman tulokset osoittavat, että bruttokannattavuuden yhdistäminen P/E-, P/B- ja EV/EBIT-luvun kanssa parantaa portfolioiden suorituskykyä Suomen osakemarkkinoilla vuosina 2016–2021. Yhtä poikkeusta lukuun ottamatta kaikkien osakeportfolioiden suorituskyky oli tutkimusajanjaksolla parempi kuin markkinaportfolion arvioitaessa tuottoja CAPM, Fama ja French (1993) kolmifaktori ja Carhart (1997) neljäfaktorimallin avulla. Itsenäisistä sijoitusstrategioista kaksi parhaiten tuottanutta olivat EV/EBIT ja bruttokannattavuus. Tämän tutkielman parhaan suorituskyvyn omaava portfolio perustui yhdistelmästrategiaan, jossa yhdistyivät EV/EBIT ja bruttokannattavuus. Tutkielman tulokset viittaavat siihen, että arvo- ja laatusijoittamisen yhdisteleminen on hyödyllistä osakesijoittajalle.

AVAINSANAT: Arvosijoittaminen, Laatusijoittaminen, Bruttokannattavuus, Osakkeiden suorituskyky

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Abbreviations

CAPM	Capital Asset Pricing Model
COGS	Costs of Goods Sold
EMH	Efficient Market Hypothesis
ESG	Environmental, Social, and Governance
NYSE	New York Stock Exchange
MPT	Modern Portfolio Theory
OMXH	OMX Helsinki CAP GI

1 Introduction

Can you beat the market? The answer to this question is open-ended and answers typically depend on who you ask. For this purpose, variety of investment strategies has been developed, each claiming to generate better returns and reduce risk. Value investing is age-old and one of the most well-known investment strategies, and it is still employed extensively in today's equity markets despite being developed in 1920s (Lee, 2006). The objective of value investing is to purchase stocks that trade below their intrinsic value, i.e., purchase stocks that appear to be undervalued comparative to some fundamental factor. Although value investment strategies have evolved remarkably over the time, the fundamental principle of value investing have remained unchanged. The existence of value premium is empirical fact based on long-term historical data from U.S., over 30-years of out-of-sample evidence, and findings from tens of different countries (Asness, Frazzini, Israelsen, & Moskowitz, 2015).

From the perspective of academic research, value premium debate has been one of the most debated subjects in the last several decades as many studies has shown differential returns between value investment portfolios and growth investment portfolios. Value premium refers to the tendency of value stocks to outperform growth stocks and the empirical evidence of presence for value premium across different stock markets and sample periods is tremendous (see e.g., Chan & Lakonishok, 2004; Fama & French 2012).

In order to identify value stocks in academic research, value stocks are categorized based on some accounting ratios, such as Price/Earnings (P/E), Price-to-Book (P/B), and EBIT/EV. Inverse ratios are also used in the academic literature. Stocks with low values in the above-mentioned ratios are classified as value stocks and conversely stocks with high values are considered as growth stocks in the academic literature. Fama (1970) states that the prices of securities incorporate the expectations of the company's future results, and thus stocks with high value on P/E and P/B for example would imply that investors expect the company to show a strong growth in the coming years, implicating the classification of its securities as growth stocks.

Value investment strategies have received significant amount of attention because the existence of value premium would challenge the semi-strong form of efficient market theory which states that security prices incorporate all publicly known and available information, and therefore it should be impossible to make consistently abnormal returns (Fama 1970; Bodie, Kane, & Marcus, 2011, pp. 388–389). Under this assumption, the fundamental analysis to determine stock's intrinsic value is futile because prices reflect all public information. Pätäri and Leivo (2015) note that value anomaly has been persistent although pricing anomalies should disappear in efficient markets.

Building on recent academic research, several studies have reported deteriorating returns of value investment strategies and showing that growth investing has trounced value investing. (see e.g., Asness et al., 2015; Kok, Ribando, & Sloan, 2017). For instance, Lev and Srivastava (2019) argue that value investing has lost its edge in the past 10-12 years due to systematic misidentifications in the accounting numbers and fundamental economic developments. Fama and French (2020) and Miller and Prondzinski (2020) have also reported that value premium has weakened. Due to weakening success of formulaic based value investing, practitioners and academics have incorporated quality metrics to value strategies. For instance, Pietroski (2000) shows that the investing strategy that attaches value and quality metrics yields higher returns than standalone value strategy. Moreover, Joel Greenblatt's (2006) *"Little Book that Beats the Market"* has influenced investors to pay attention in value and quality aspects to eliminate poor performing and deteriorating companies from the portfolio as value investment strategy relies much on the performance of a few companies (Pietroski, 2000).

Where value factor is easily identified, quality is not unambiguous concept because it is somewhat subjective, and investors are defining quality in various ways. Asness, Frazzini and Pedersen (2013, p. 2) define quality as "characteristics that an investor should be willing to pay a higher price for" while Grantham (2004) defines stocks with high profitability, low leverage, and low earnings volatility as quality stocks. Due to numerous

fundamental characteristics, quality is an ambiguous concept and combination of different quality metrics makes it somewhat hard to state what quality stands for.

1.1 Purpose of the study

The purpose of this study is to examine the performance of different value investment strategies in the Finnish stock market, and to shed light on the relative efficiency of different valuation ratios that are typically being used to categorize value stocks. Moreover, the performance of standalone quality portfolio based on gross profitability strategy is examined abreast four value investment strategies. This thesis investigates whether a combination of value investment strategy and gross profitability strategy generates robust returns compared to the market portfolio, and whether the performance for combined portfolios is better than standalone strategies. The findings will indicate whether investors can achieve higher returns by combining value investment strategy with quality investment strategy. Secondary objective is to examine the risk dimension of portfolios by evaluating the performance of portfolios with multiple risk-adjusted performance metrics.

1.2 Development of hypotheses

Significant evidence against efficient market theory has been presented in numerous studies, showing the tendency of value stocks to outperform growth stocks for most of the time (see e.g., Fama & French, 2006A; Loughran & Wellman, 2011; Cakici, Fabozzi, & Tan, 2013). However, it is not self-evident that value investment strategies generate superior returns in all stock markets as characteristics of stock markets vary. Davydov, Tikkanen, and Äijö (2016) mention that characteristics of Finnish stock market are rather low liquidity and comparatively high volatility which might affect both the size of premiums and risk-adjusted performance of value investment strategies. They note that periphery syndrome could be exemplified due to moderately small number of quoted companies. Additionally, Leivo and Pätäri (2011) state that during market turmoil institutional investors cash their positions from the furthest stock markets, and thus the

Finnish stock market is exposed to an intermittent periphery syndrome caused by the herding behavior. Therefore, it is possible that occasional pricing errors occurs in the Finnish stock market which could be the reason for value premium.

In contrast to value investing, quality investment strategies are relative new phenomena and have not been comprehensively studied in the previous literature or in the Finnish stock market. Inspired by the findings of Novy Marx (2013), this thesis examines the performance of gross profitability strategy in the Finnish stock market. Following Novy Marx (2013), gross profitability is defined as revenues minus costs of goods sold, scaled by assets. Stocks with high gross profitability are considered to be quality stocks. Novy Marx (2013) studied a large sample of NYSE equities between July 1963 and December 2010, and the results show that portfolio of stocks with the highest gross profitability generated 0,31% average excess return per month compared to portfolio of stocks with lowest gross profitability. Concerning the standalone performance of gross profitability strategy, the findings of Lalwani and Chakraborty (2018) are consistent with the Novy Marx (2014) while the findings of Tikkanen and Äijö (2018) are contradictory.

The performance of value investment strategies has been extensively studied in the prior literature and academics have focused on the return spread between value and growth portfolios to see whether value premium exists. Numerous studies have found evidence of value premium (see e.g., Fama & French, 2006A: Fama and French, 2012; Cakici, Fabozzi, & Tan, 2013), suggesting that value investment strategies outperform growth strategies. However, in a recent study conducted by Fama and French (2020), the existence of value premium was assessed based on the return spread between value portfolios and market portfolio. Following Fama and French (2020), the returns of value and quality portfolios are evaluated against the market portfolio. The first hypothesis can be formulated as follows:

H_1: The returns of standalone portfolios are higher than the returns of benchmark market portfolio in the Finnish stock market during the 2016-2021 period

The empirical results of this study are expected to show that standalone portfolios produce abnormal returns in contrast to benchmark index and be consistent with prior literature (see e.g., Fama & French, 1998; Pätäri & Leivo, 2009). Empirical results of this study will also present the risk-adjusted performance of standalone portfolios which will also be used to benchmark the performance of standalone value and quality strategies.

Lack of evidence concerning the performance of quality investment strategies in the Finnish stock market together with the findings of Novy Marx (2013; 2014) motivated the author of this thesis to examine the quality aspect more thoroughly. Second objective of this thesis is to examine the performance of combined quality and value portfolios in the Finnish stock market. Novy Marx (2014) states that quality investment strategy based on gross profitability is advantageous to value investors because such strategy is negatively correlated with value investment strategies, and thus providing hedge. Value investors should pay attention to gross profitability according to Novy Marx (2013) as it enhances the performance of value investment strategies. Screening stocks with both value measures and gross profitability helps value investors to identify value traps, meaning that integrating gross profitability to screening process helps value investor to identify stocks that are undervalued from stocks that are undervalued for good reasons (Novy Marx, 2014). Moreover, the results of Novy Marx (2014) show that combining gross profitability strategy to an existing value investment strategy reduces the overall volatility of portfolio. On the other hand, the results of Lalwani and Chakraborty (2018) contradict with the results of Novy Marx (2014). Hence, the second hypothesis is the following:

H_2: The overall performance of combined value and quality portfolios has been unequal to the standalone portfolios and market index during the period 2016-2021

1.3 Contribution

This thesis contributes to the existing large literature stream on value investing and expands it by taking into account the quality dimension. The empirical analysis of this study covers the period 2016-2021 that is within the same time period as Fama and French (2020) and Miller and Prondzinski (2020), and therefore, the results of this study could provide evidence of weakening performance of value investment strategies in the Finnish stock market. Several studies concerning the performance of value investment strategies and quality investment strategies have been conducted in the Finnish stock market (see e.g., Leivo & Pätäri, 2009; Davydov et al., 2016; Tikkanen & Äijö, 2018). As far as the author of this thesis is aware, there are no notable academic studies examining purely the joint performance of value investment strategies and gross profitability. Prior literature has also been more focused on the spread between value and growth portfolios while this study examines the spread between standalone portfolios and benchmark market portfolio.

This thesis extends the previous literature by examining the joint performance of different value investment strategies with gross profitability in a smaller market. Due to performance variation of value investment strategies demonstrated by Gray and Vogel (2012), four different value investment strategies are investigated. Additionally, this thesis tests whether claimed improvement in performance by using gross profitability together with value investment strategy applies to the Finnish stock market. The results of this thesis provide evidence whether gross profitability can improve the performance of investigated value investment strategies. Gross profitability was chosen to serve as a quality metric in this study as it has shown to be one of the best performing quality investment strategies (see e.g., Novy Marx, 2013, 2014; Lalwani & Chakraborty, 2018).

Secondly, the performance of portfolios is evaluated by using multiple risk-adjusted performance measures since Davydov et al. (2016) note that in a smaller market value premiums are potentially exposed to improper risk adjustment. The performance of both value and quality portfolios is evaluated based on risk-adjusted performance

measures such as Sharpe ratio, Sortino ratio, Treynor ratio, CAPM, three-factor model, and four-factor model.

1.4 The structure of the study

The remainder of the paper is structured as follows. Second chapter describes theoretical framework of this study to provide a reader better understanding of the underlying concepts. Chapter three provides brief history lesson to value investing and prior literature is also presented in the area of value investing. Performance of value investment strategies are reviewed and possible explanations for value premium are also discussed in chapter three. Quality investing is discussed more closely in chapter four. Valuation multiples and risk-adjusted performance measures are introduced in the chapter five. Moreover, the process of portfolios constructing, data, and methodology is illustrated in the chapter five. Results obtained from the empirical analysis are discussed and analyzed in the chapter six. Lastly, in the chapter seven, concluding remarks and summary of the empirical findings of this study are presented.

2 Theoretical background

2.1 Efficient capital markets

Value and quality investment strategies challenge efficient market theory which is a dominant paradigm of modern financial theory. Efficient market theory argues that systematic alpha generation is impossible because market participants are rational and stock prices fully reflect all fundamental information. (Fama, 1970). Hence, in theory, it should be impossible to purchase undervalued stocks or sell overvalued stock as markets always provide correct price. However, observed market anomalies have challenged above-mentioned and provide evidence that efficient market theory does not always hold which results from mispricing, implying that relevant information is not incorporated immediately or fully in stocks prices.

2.1.1 Three forms of market efficiency

Fama (1970) presented a notable paper which has become a landmark in the context of examining market behavior. Market efficiency is an important factor when examining the performance of different investment strategies and it is also underlying assumption in some of financial models. Fama (1970) separates three degrees of market efficiency: weak-form, semi-strong, and strong-form based on information set that is being reflected in stock prices.

In a weak-form market efficiency, all historical data concerning trading volumes and prices have been reflected in the current market prices. Malkiel (1989) notes that technical analysis is useless in a weak-form market because all historical information is already being contained in market prices. Thus, according to weak-form market efficiency, future stock prices cannot be estimated by analyzing historical data since stock prices follow random walk. Random walk theory posits that noticeable price patterns do not occur in the market as the prices of securities move randomly. The random walk theory assumes that future stock prices are impossible to predict, and therefore no

investor can outperform the market in the long run without increased risk level. (Fama, 1970).

In contrast to a weak-form market, in a semi-strong market both historical stock price data and publicly available information, such as earnings announcements or mergers and acquisitions are incorporated in stock prices. Many studies support the semi-strong form of market efficiency, and that information quickly and on average fully reflected in stock prices (see e.g., Fama, Fischer, Jensen, & Roll, 1969; Keown & Pinkerton, 1981; Patell & Wolfson, 1984). Both technical analysis and fundamental analysis is useless in a semi-strong market since information from historical data and publicly available sources are currently included in the stock prices.

Lastly, in a strong market, stock prices contain all historical data and publicly available information in addition to private information. Strong degree of market efficiency claims that even insider information is immediately reflected in stock prices. Malkiel (1989) states that the strongest form of market efficiency is “clearly refuted” although there is evidence showing that market comes moderately close to strong-form efficiency (see e.g., Jensen, 1969).

One should note that theories might not work in the real-world due to underlying constraints or assumptions. When it comes to efficient market theory, Fama (1970) makes three different assumptions of market efficiency. First assumption states that trading securities does not require transaction costs but in the real-world transaction costs affect portfolio constructing. Second assumption states that all available information is costless to all market participants and every participant has identical access to it. Additionally, third assumption implies that market participants agree how available information affects the current and future stock prices. (Fama, 1970).

Long-standing debate whether markets are efficient continues, but it is quite evident that Fama’s (1970) assumptions do not hold in the real-world. Several studies have

discovered anomalies which challenge the validity of efficient market theory. For instance, numerous studies show that value investment strategies outperform the market (see e.g., Bauman, Connover, & Miller, 1998) which should not be possible according to efficient market theory. As stated previously, studies that support some form of market efficiency are also documented. Pätäri and Leivo (2015) note that if markets are efficient, pricing anomalies should disappear after their discovery but value anomaly for instance has prevailed. Moreover, the results of Silvasti, Grobys and Äijö (2020) challenge the efficient market theory in the Nordic stock markets. Consequently, the abnormal returns of investigated investment strategies in this study would challenge the semi-form of market efficiency.

The efficient market theory states that is impossible to generate abnormal returns by screening for mispriced stocks without increased level of risk. The implications of the efficient market theory with regards to this thesis would imply that if any of the investigated investment strategies produce abnormal return related to the CAPM, three-factor model or four-factor model alpha, the portfolio should carry more risk. This risk would be depicted by higher standard deviation and/or higher market loading to the risk factors incorporated in the asset pricing models. Subjecting portfolios to risk-factors can indicate whether the results are in-line with EMH. Moreover, several risk-adjusted performance measures are also calculated to investigate the risk-return trade-off between portfolios.

2.2 Modern portfolio theory

Harry Markowitz's (1952) Nobel Price-winning paper "*Portfolio Selection*" created a framework for investment analysis and guidelines for optimal portfolio formation which is now referred as modern portfolio theory (MPT). Tradeoff between risk and return is the cornerstone of modern portfolio theory and the objective is to maximize the return while minimizing the risk. Theory assumes that investors are risk-averse, meaning investors prefer a portfolio with a lower risk for a given level of expected return or conversely.

Diversification is another core tenet of modern portfolio theory that is related to trade-off between risk and return. Conventional idiom dictates not to put all eggs in the same basket, defining the idea behind diversification. According to MPT, looking just at the expected return and risk of a specific stock is not sufficient. Increasing the number of stocks in the portfolio allows investor to achieve benefits of diversification, i.e., reduce the volatility of the overall portfolio without altering the expected return (Markowitz, 1952). As a rule, diversification is beneficial if stocks are not perfectly positively correlated. In this study, the correlations of investment strategies are also calculated to see how strategies move parallel to each other.

In MPT, the overall risk of a portfolio consists of two components: systematic risk and unsystematic risk. Systematic risk is a part of the overall risk that affects all stocks in the market and is not diversifiable. On the other hand, unsystematic risk is diversifiable and increasing the number of stocks in the portfolio decreases the risk of the portfolio, i.e. both the unsystematic risk and the overall risk. Evans and Archer (1968) conclude that approximately ten stocks will be enough to obtain adequate diversification while Statman (1987) states that at least 30 stocks are needed to form a diversified portfolio.

The fundamental idea behind MPT is to seek optimization between return and risk. Efficient frontier refers to a trade-off graph between return and risk which is presented below in the figure 1. Horizontal axis represents the risk and vertical axis the expected return. If a portfolio maximizes the expected return for a given level of risk, portfolio lays in the efficient frontier which is the upper section of the trade-off graph. Portfolios under the graph are pointless because portfolio could obtain a higher return for the same level of risk.

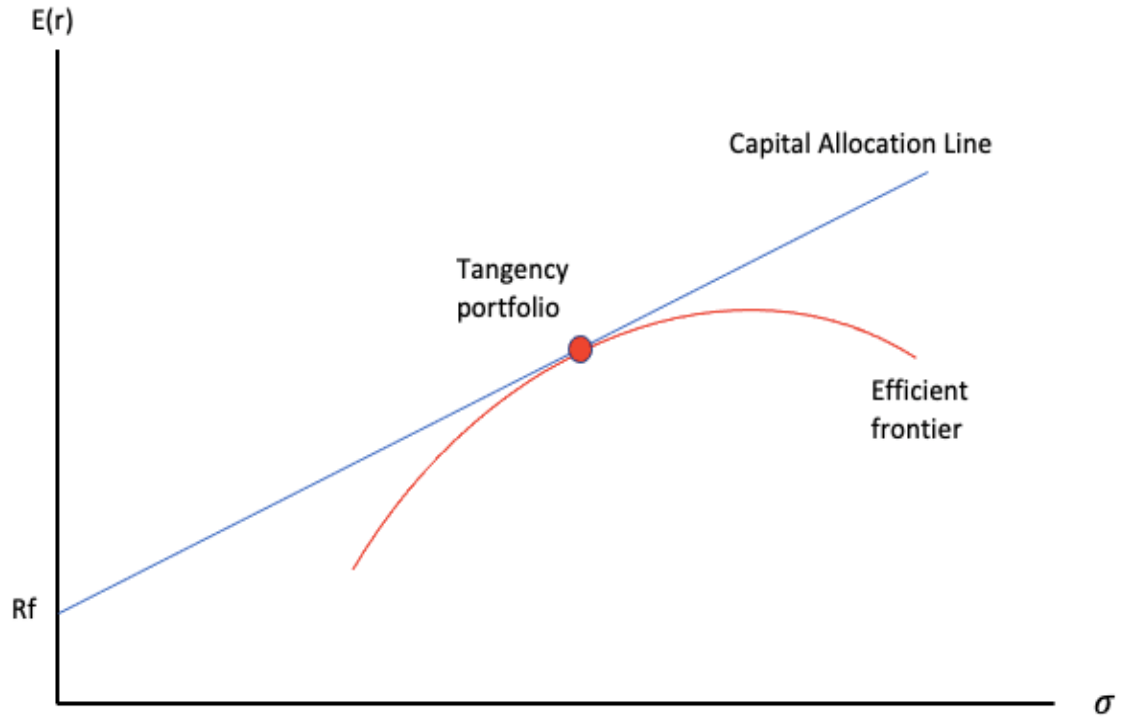

Figure 1. Efficient frontier (Adapted from Markowitz, 1952)

Especially value investment strategies and modern portfolio theory conflict substantially since MPT is built on the assumption that markets are efficient while value investors deem that markets are not always fully efficient. In other words, value investors believe that occasional mispricings occurs in the market that can be capitalized. It should be noted that MPT is normative theory that defines standard behavior or norms that investors are supposed to follow (Fabozzi, Gupta, & Markowitz, 2002). However, in the real-world investors are subject to irrational behavior that affect the decision-making process. Section 3.4 discusses more about the possible reasons for value premium. Abnormal returns of the examined investment strategies of this study would challenge both efficient market and modern portfolio theory.

2.3 Capital asset pricing model

Capital asset pricing model (CAPM) is widely used product of a financial investment theory which foundations lie on the modern portfolio theory. The model was developed by Sharpe (1964), Lintner (1965), and Mossin (1966) and it expects investors to choose

portfolio by using the Markowitz's (1952) mean-variance criterion (Merton, 1973). CAPM is based on several restrictive assumptions and not all of them are realized in the real-world. However, the model is useful tool to reflect the relationship between expected return and risk when the following assumptions hold (Bodie et al., 2011, p. 309):

1. Investors are rational and base their choices based on the expected return and risk
2. Investors make their choice for one period
3. Every investor has homogeneous expectations
4. All capital assets can be traded
5. Information is publicly available for all market participants
6. No taxes
7. No transaction costs

In the CAPM, the expected return consists of the risk-free rate and the risk premium, indicating what the return on a stock should be considering the risk level. With CAPM it is possible to find the expected return on stocks that have different risk-levels. (Kallunki, Martikainen, & Niemelä, 2002). Under the assumptions mentioned above, the prices of stocks are determined at the equilibrium according to the CAPM, where the expected return of a stock can be presented in the following form:

$$E(r) = r_f + \beta(r_m - r_f), \quad (1)$$

where: $E(r) =$ expected return on stock

$r_f =$ risk-free rate

β = stock's beta

r_m = expected return on the market

Despite widespread of use, CAPM can be criticized for limited empirical record and unrealistic assumptions which makes real-world application of the model difficult.

However, it provides useful benchmark for expected returns that can be used in the decision making. CAPM is also used in this study to regress the portfolio returns only on market risk. The model proposes linear relationship between risk and return, indicating that as risk increases the return should also. Nevertheless, several studies have shown that linear relationship between risk and return does not hold, and beta as a single risk factor is unable to explain all the differences in the expected returns (see e.g., Roll, 1977; Banz, 1981; Stattman, 1980; Jegadeesh, 1992).

2.4 Fama-French three-factor model

Fama and French (1993) three-factor asset pricing model was developed as a response to a capital asset pricing model (CAPM) because it was not efficient explaining stock market returns (Elbannan, 2015). Whereas capital asset pricing model is a single factor model, three-factor model expands CAPM by incorporating two additional risk factors to explain stock returns better (Eraslan, 2013). Fama and French (1992) noticed stocks with high book-to-market ratio have higher average return, and that negative relationship between firm size and average returns exists. The formula of three-factor model is as follows:

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + e_{it}\,, \qquad (2)$$

where:

R_{it} = Return on a portfolio *i*

R_{Ft} = Risk-free rate

$R_{it} - R_{Ft}$ = Excess return of a portfolio

$R_{Mt} - R_{Ft}$ = Excess return of a market portfolio

α_i = The intercept

SMB_t = Size factor (return spread of small minus large stocks)

HML_t = Value factor (return spread of cheap minus expensive stocks)

b_i, s_i, h_i = Factor coefficient's

Small minus big (SMB) factor in the Fama and French (1993) three-factor model describes the difference between small-stock portfolios and large-stock portfolios. Value factor (HML) represents the value premium, and it illustrates the difference between return on a portfolio of high book-to-market stocks and the return on a portfolio of low book-to-market stocks.

2.5 Carhart's four-factor model

Mark Carhart (1997) reinforced the Fama and French (1993) three-factor model by fitting fourth factor called momentum factor in the model. Momentum factor captured is Jegadeesh and Titman's (1993) one-year momentum effect. The regression equation for the Carhart 4-factor model is as follows:

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + p_i WML_t + e_{it}\,, \quad (3)$$

where: $WML_t =$ one-year momentum factor

$p_i =$ factor coefficient

The momentum factor represents the difference in returns between winner stock portfolios and loser stock portfolios (Carhart, 1997). Jegadeesh and Titman (2012) found a momentum effect that is well known anomaly in today's financial markets, and it refers to the tendency of stocks to show persistence in performance, meaning that well performing stocks tend to perform well in the following periods and conversely for stocks with poor performance.

3 Value investing

This chapter briefly introduces the history of value investing. Secondly, this chapter will go through previous literature around value investing to gain a comprehensive view of value measures and to see whether value premium is existent. Thirdly, value investing literature focusing on the Finnish stock market is reviewed. Fourthly, possible reasons behind value premium are discussed.

3.1 History of value investing

Value investing philosophy dates to late 1920s and it was developed by Benjamin Graham and David Dodd. Graham and Dodd were co-authors of the classic "*Security Analysis"* (1934) and are considered as the pioneers of value investing. Value investing is one of the widely followed strategic concepts of stock picking and the idea is to purchase stocks that are trading below their intrinsic value. Graham and Dodd (1934) were advocates of this kind of a strategy that purchased stocks trading at discount to their intrinsic value. However, they did not suggest buying stocks solely on the basis of financial ratios. Value anomalies and value premium are widely discussed in the financial literature and new evidence against efficient market theory is constantly published in academic research.

Value investing strategies have had a long history in the financial markets and academic research. Traditionally, Graham and Dodd's (1934) value investing strategy referred to a strategy that aimed to find discrepancies between stock's intrinsic value and price. For about the next 50 years or so, Graham and Dodd's manner of an approach prevailed. During 1980s, value investing strategies and especially pricing multiples started to receive growing amount of attention from researchers which somewhat molded the view of value investing. The rise of affordable computers for the public in addition to the development of financial databases reinterpreted value investing philosophy and the reversion of pricing multiples started to gain adhesion. (Kok et al., 2017). Miller and Prondzinski (2020) note that proliferation of computers and the concurrent

development of database of the Center of Research in Security Prices (CRSP) established in 1960 was an immense contribution because it provided stock market data which could be used to investigate the behavior of stock markets or specific investing strategies, such as value strategy.

By the 1990s, the term value investing had been reinterpreted and it was closely associated with mechanical stock screening strategies that compared financial ratios and stock prices parallel. In contrast to Graham and Dodd's (1934) value philosophy which avoided formulaic approach, academics had redefined the term value investing to describe mechanical ratio-based investing. (Kok et al., 2017). Nowadays, academic literature identifies value investing as a formulaic investment strategy that mechanically screen stocks based on chosen value factor. Although, value investing strategies have progressed into different practices, the fundamental principles have remained unchanged: stocks should be purchased when intrinsic value is higher than current market price. This thesis follows academic literature in this manner by defining value investing as a formulaic process of seeking and purchasing stocks that appear to be undervalued by selected valuation ratios.

3.2 International evidence of performance of value strategies

Value approach is a stock screening method that uses fundamental ratios relative to price to determine whether stock is undervalued or overvalued. Among individual value measures, early academic literature focused to use valuation ratios such as price-to-book (P/B) or price-to-earnings (P/E) (see e.g., Basu 1977; Rosenberg, Reid, & Lanstein 1985; Chan, Hamao, & Lakonishok 1991; Fama & French 1992; Lakonishok, Schleifer, & Vishny, 1994; Fama & French 1998) to identify value stocks. Other commonly used value measures to categorize value stocks are dividend-to-price (D/P) (see e.g., Fama & French, 1998; Bauman et al., 1998**)**, earnings before income and taxes to enterprise value (EBIT/EV) and cash flow to price (CF/P) ratio (see e.g., Chan et al., 1991; Fama & French, 1998).

Value investing is one of the most well-known investment strategies and it challenges the efficient market theory and there is extensive amount of research where value strategies results in higher returns than growth strategies (see e.g., Chan, Jegadeesh, & Lakonishok, 1995). Early evidence concerning the value premium was documented by Basu (1977) who examined the performance of value stocks in the U.S stock market in the period 1956-1971. Findings of Basu (1977) show that low P/E stocks generate higher returns than high P/E stocks, implying that stock price behavior is not consistent with efficient market theory. The parallel results are also reported by Rosenberg et al. (1985) and La Porta, Lakonishok, Schleifer, and Vishny (1997) who report that price-to-book ratio (P/B) strategy yields superior results, suggesting that prices in stock markets might not be accurate, and thus providing evidence against efficient market theory.

In addition to U.S stock markets, many studies have found value premium to be existent internationally (see e.g., Chan et al., 1991). Fama and French (1998) conducted a comprehensive study of different value strategies (B/M, E/P, C/P, and D/P) for the period 1975 through 1995 and documented strong evidence of a pervasive value premium in international markets. Their study covered thirteen stock markets around the world and their results show that criteria for greatest performing portfolio vary across countries. According to their study, CF/P value strategy resulted to the greatest and most significant value premium in Italy, Hong Kong, Australia, and Germany. B/P value measure generated the most significant value premium in U.S., Belgium, United Kingdom, Singapore, Switzerland, and Japan. In Sweden and Netherland E/P criterion resulted in the greatest value premium while D/P strategy generated highest value premium only in France. They also concluded that value premium exists in emerging markets.

To extend empirical research around value effect, Cakici et al. (2013) investigated the performance of B/M value strategy in emerging markets and found strong evidence relating to value premium on emerging markets. Their results are in-line with the findings of Fama and French (1998) and Bauman et al. (1998). From January 1990 through December 2011 Cakici et al. (2013) studied 18 emerging stock markets and the

results show strong evidence of value effect when constructing portfolios with book-to-market ratio (B/M).

Many studies have shown value premium to exists all over the world, but the results differ from each other depending on what value measure has been used to categorize stocks. For instance, Chan et al. (1991) studied the performance of book-to-price (B/P), earnings-to-price (E/P), and cash-flow-to-price (CF/P) in the Japanese stock market and find positive relation between stock returns and fundamental variables. According to their results, book-to-market ratio (B/P) and cash-flow-to-price (CF/P) had positive impact on expected returns while earnings yield effect was not documented. On the other hand, the results of Suzuki (1998) show superior performance of sales-to-price (S/P) strategy in the same stock market between 1983 and 1996.

Similar results are also reported in the U.S. as Fama and French (1992) find that book-to-market ratios explain U.S. stock returns better than earnings-to-price ratios. Findings of Dhatt et al. (1999) are consistent with previous studies showing that market-to-book ratio is better indicator of value than price-to-earnings ratio. In contrast to Fama and French (1992), Barbee, Mukherji, and Raines (1996) document that sales-to-price ratio captures value premium better than book-to-market ratio during the 1979-1991 period. Dhatt et al. (1999) also find that price-to-sales ratio captures value better than market-to-book ratio. More recently, Dhatt, Kim, and Mukherji (2004) show that during the 1980-1999 period, the best performing individual valuation multiples in the U.S. were CF/P and S/P.

As stated previously, academic literature measures value in various ways and as a result portfolio can be constructed based on different criteria. Pätäri and Leivo (2015) state that best criterion to form a portfolio varies across markets and over time. Moreover, they note that depending on chosen methodological approach, several authors have found evidence of persistent value premium that is statistically significant (see e.g., Fama & French, 1992; Lakonishok et al., 1994; Davis, Faman & French, 2000). Existence of value

premium have been documented worldwide ranging from developed and emerging markets (see e.g., Chan et al., 1991; Fama & French, 1992; Brouwer, Van der put, & Veld 1997; Van der hart, deZwart, & van Dijk, 2003; Gregory, Harris, & Michou 2001; Cakici et al., 2013)

Despite the popularity of value investment strategies and compelling evidence concerning the value premium, the recent evidence about the performance of standalone formulaic value investment strategies has raised questions. Loughran (1997) concluded 25 years ago while investigating the performance of B/M-ratio in the 1963-1995 period that book-to-market ratio has no explanatory power in the largest size quintile of firms on the cross-section of realized returns during the investigated period. During 1926 and 2018 the average value premium in the U.S. when measured by high-minus-low factor (HML) of Fama and French (1993), was 4,7% per annum. However, during a shorter time period from 2008 to 2018, the average value premium turned out to be 2,3% negative per year. (Loeffler, 2020). Due to poor results for at least a decade now, some researchers have questioned the validity of value investing strategy that has been performing great in the prior literature. Asness et al., (2015) have documented corresponding results. In addition to Loughran (1997) and Asness et al., (2015), Fama and French (2020) examined the value premium between two time periods and the first time period ranged from July 1963 to June 1991 and the second period from July 1991 to June 2019. They also point out their observations concerning the full July 1963-June 2019 period.

Overall findings of Fama and French (2020) show that value stocks generate higher returns on average than market portfolio in the full period between 1963 and 2019. When time period is divided into two subperiods, the findings are in-line with Loeffler (2020). The first subsection 1963-1991 value premium for bigger firms was 0,36% per month and 0,58% per month for portfolio consisting of small value firms. Correspondingly, the value premium in the latter period was 0,05% and 0,33%, respectively. Without size screen the average monthly return of value portfolio declines

in the second half to 0,11% per month from the 0,42% per month in the first half. Average value premiums were higher for 1963-1991 than 1991-2018 time period. However, they cannot reject that the value premium is as large as it has been earlier, and that value premium has been zero in more recent years.

Miller and Prondzinski (2020) have also examined the recent performance of value investing in the period 2002-2019. They reached similar results as Fama and French (2020) and Loeffler (2020) about the value premium. During the investigated time period the performance of value stocks was weaker than growth stocks, but on a risk-adjusted basis the findings were not statistically significant. According to Liu and Wang (2010), value strategy outperforms growth strategy in the long-term in terms of risks and returns, but the results of Loeffler (2020), Fama and French (2020), and Miller and Prondzinski (2020) foreshadow the previous results of superior performance of value investment strategies.

In addition to single value measure, investors can exploit a combination of several value measures to form a more comprehensive view of a stock's value. Asness, Ilmanen, and Moskowitz (2015) note that different value measures can be used and applied simultaneously to form a comprehensive view of a stock's value. In fact, based on the empirical results of Israel and Moskowitz (2013), combined investment strategies generate robust returns and produce more stable value portfolios. The findings of Leivo and Pätäri (2009) are similar to Dhatt et al. (2004) and Asness et al. (2015), and thus it seems that value portfolio constructed by using the composite value measure could somewhat improve the performance of value strategies compared to value strategies that are merely based on individual value multiples.

3.3 Finnish evidence of the value premium

Performance of value investment strategies have been examined in the Finnish stock market thoroughly. Studies concerning the Finnish stock market have reported consistent results with international evidence (see e.g., Leivo et al., (2009); Leivo & Pätäri,

2009). The results of Pätäri and Leivo (2009) confirm the existence of value premium in the Finnish stock market.

Pätäri and Leivo (2009) examined the performance of several value strategies (i.e. B/P, CF/P, E/P, EBITDA/EV, D/P and S/P) during different economic cycles in the Finnish stock market between 1993 and 2008. All value strategies provide strong evidence of the value premium in a small financial market while the best performing strategy was dividend-to-price (D/P). Their research contributes to the existing literature by documenting value premium in the Finnish stock market and showing that risk or size effect cannot explain the results. Their results suggest that value investment strategies tend to perform better in bearish market conditions and depending on value measure, large differences in risk and return exist. Moreover, the existence of value premium in the Finnish stock market cannot be explained by higher risk because both volatilities and betas are lower compared to growth portfolios (Pätäri & Leivo, 2009).

The recent findings of Davydov et al. (2016) are consistent with the Leivo and Pätäri (2009). Davydov et. al. (2016) examined the performance of multiple value investment strategies in the Finnish stock market in the period 1993-2013, and value portfolios were constructed on the following value measures: B/P, E/P, CF/P and EBIT/EV. In their study, value portfolios consist of the top 30% equally weighted stocks constructed of above-mentioned ratios. The findings indicate that value premium exists in the Finnish stock market as all investigated value strategies beat the market. Value investment strategy based on EBIT/EV generated highest risk-adjusted returns in the sample period. According to modern portfolio theory, trade-off between risk and return exists, the higher the risk, the higher return – and vice versa, but based on the findings of Davydov et. al. (2016) value stocks do not appear to be any riskier than growth stocks when comparing the betas and standard deviations in the Finnish stock market.

One particular value measure might not be the best criterion to construct portfolio in all markets which Pätäri and Leivo (2015) note in their comprehensive review of value

premium. While performance of portfolios varies depending on value measure, they conclude that dividend yield (D/P), with some exceptions, has been the worst performing criterion to construct a value portfolio, especially in the U.S. markets, although some European studies have documented it to be best criterion. It is important to note that all academic evidence concerning the superiority of D/P as a value measure is from small European stock markets. All things considered, it will be interesting to see what value investment strategy performs best in this study and whether value portfolios generate higher returns than market portfolio.

3.4 What drives value premium?

For decades, academic literature has provided accumulated amount of evidence that show the tendency of value stocks to outperform growth stocks, sometimes referred as glamour stocks. Despite broad consensus of the existence of value premium, and that value investment strategies, on average, generate higher returns than growth investment strategies, academic literature is not united when it comes to the source of value premium. (Ling & Koo, 2012). As a matter of fact, value anomaly appears to be troublesome within the framework of MPT that presumes rational expectations because growth options depend on future economic conditions that are uncertain, and thus must contain more risk than assets in place (Zhang, 2005). Growth stocks are pricey due to expectations of fast growth of future cashflows (Miller & Prondzinski, 2020). A rational explanation is that value stocks are riskier than growth stocks, and therefore yield higher returns. Some studies (see e.g., Fama & French, 1992; Fama & French, 1996) argue that greater fundamental risk associated to value stocks results to value premiums while some studies (see e.g., Chan & Lakonishok 2004; Campbell, Hilscher, & Szilagyi, 2008) argue the source of value premium is associated to mispricing due to the irrational behavior of investors. Existence of value premium has also been argued to be a result of data snooping (Conrad & Kaul, 1993; Kothari, Shanken, & Sloan, 1995) and usually explanatory studies are divided into these three categories.

Fama and French (1998) argue that higher return to value stocks is a compensation for their greater risks. In the academic literature, the explanation for the higher risk of value stocks in contrast to growth stock is that high B/M stocks are more leveraged, less profitable, have higher probability of default, have more distressed risk, and response more negatively to economic shocks (Tikkanen & Äijö, 2018). For instance, Fama and French (1995) show that poor earnings are a common characteristic in the high B/M stock universe while the results of Vassalou and Xing (2004) indicate that value stocks, in other words high B/M stocks, have higher probability of default in comparison to growth stocks. Moreover, Fama and French (1996) argue that high B/M stocks are more prone to financial distress. Due to higher underlying risks, value stocks should be priced with a higher risk premium. However, value stocks are not necessarily as risky as theory suggests or riskier when risk measures such as betas and standard deviations of value and growth strategies are compared (see e.g., Chan et al. 1991; Chan et al., 1995).

However, there is a possibility that beta and standard deviation are imperfect risk factors that do not capture all the relevant risks of value and growth portfolios (Chan & Lakonishok, 2004). Lakonishok et al. (1994) examined the performance of value and growth portfolios in the U.S. economy during undesirable economic states and their findings challenge the risk-based argument that abnormal returns generated by the value stocks reflect their higher fundamental risk. Indeed, they state that beta is not adequate risk measure of exposure to the market. Contrary to the arguments of Fama and French (1998), the findings of Lakonishok et. al (1994) show that value investment strategies perform better in economic downturns, have less downside risk and are not fundamentally riskier compared to growth stocks. Recent results of Hwang and Rubesam (2013) support the findings of Lakonishok et al. (1994) as they found that correction of underpricing is faster for value stocks than growth stocks during bear markets.

Academic literature also provides competing view for value premium that rests on the investor behavior. Studies in the psychology suggest that individuals tend to use simple heuristics in the decision-making process which could reflect investors' judgmental

biases (Chan, Karceski, & Lakonishok, 2003). Lakonishok et al. (1994) argue that judgmental biases underlying investor behavior and extrapolating past growth are reason for higher returns of value stocks. Several studies show that investors are prone to judgmental biases, and, for instance, La Porta (1996) argues that investors extrapolate historical performance too far into the future. Extrapolation implies that investors are overly optimistic about the growth stocks that have performed well in the past and overly pessimistic about the value stocks as they expect future to be like the past. Furthermore, La Porta et al. (1997) examined the returns during earnings announcement periods for value and growth portfolios and their findings suggest that expectational errors are partly a reason for the value premium. Due to judgmental biases in decision making, behavioral explanation is that value stocks are undervalued, and value premium is an indication of correction of mispricings (Jaffe, Jindra, Pedersen, & Voetmann, 2020).

Lakonishok et. al. (1994) surmise that best explanation for the superior returns of value investment strategies is the preference of growth stocks over value stocks among both individual and institutional investors. They suggest that individual investors make judgment errors by focusing excessively on recent past, and by equating well-managed companies with good investments without considering the stock price. On the other hand, discussed in Lakonishok, Schleifer, and Vishny (1992), institutional investors might favor growth stocks as they are easier to justify to sponsors. Moreover, they argue that incentive to attract customers and personal career concerns may affect money managers to be more inclined to growth stocks. Money managers also must show results period to period since they cannot afford to underperform the index or their peers, and thus they tilt towards growth stocks. In conclusion, Lakonishok et. al. (1994) note that it might be easier from institutional investor's standpoint to favor glamour stocks and the return differences between value and growth investment strategies are essentially explained by the judgment errors of investors. (Lakonishok et. al., 1994).

4 Quality investing

In this chapter, we will focus closely on the quality stocks and how quality is defined. This chapter also presents the gross profitability which is used as a quality measure in this thesis. In addition, academic literature regarding the performance of combined value and quality portfolios is scrutinized to understand whether prior literature has documented performance enhancements by incorporating quality measures in the value investment strategies.

4.1 Definition of quality investing

Unlike more established factors, such as value and momentum, widely accepted definition for quality investing does not exist as subjectivity somewhat drives the definition. Although, quality investment strategy lacks a generally accepted definition, academic literature together with practitioners have come forward with a number of quality measures. Asness, Frazzini, and Pedersen (2013) state that quality stocks are stable, profitable, and well managed which justifies a higher stock price. However, a company with stable earnings might not have high profitability or professional management, and therefore quality portfolios might be constructed differently depending on a provider. (Hsu, Kalesnik, & Kose, 2019)

Academic literature on the area of “quality investing” have focused on the backward-looking financial data and quantitative measures the past two decades. Hanson and Dhanuka (2015) mention that it is pivotal to evaluate qualitative non-financial indicators, also known as ESG (environmental, social, and governance), in the investment process as it supports investors to identify high-quality companies that are likely to maintain high quality attributes. It can be argued that the definition of quality investment is vague, and definitions are wide-ranging, in some cases, even conflicting (Hanson & Dhanuka, 2015).

Despite numerous definitions of quality investing, this thesis follows Novy Marx’s (2014) definition of quality. Novy Marx (2014, p. 2) states: “Quality can be viewed as an

alternative implementation of value – buying high quality assets without paying premium prices is just as much value investing as buying average quality assets at a discount". Novy Marx (2014) compared the returns of seven different quality investment strategies in a remarkable paper. The seven widely used notions of quality were Graham G-score, Grantham's notion of quality, return on invested capital (ROIC), Sloan's accruals, Pietroski's F-score, defensive equity strategy, and gross profitability. This thesis focuses more closely on the gross profitability as Novy Marx (2013) finds that gross profitability is a powerful predictor of cross-section of average returns. Gross profitability is being discussed more in the next section.

4.2 Gross profitability

Novy Marx (2013) addresses the quality theme by showing that profitability, measured by gross profits-to-assets, has almost the same explanatory power as book-to-market value investment strategy. Novy Marx (2013) argues that profitability ratios become more polluted when moving down in the income statement, making profitability ratios less related to economic profitability.

Several first-class articles have studied profitability strategies (Fama & French 2006B; Fama & French, 2008; Fama & French, 2016; Novy Marx, 2013; Novy Marx, 2014; Hou, Xue, & Zhang 2015; Ball, Gerakos, Linnainmaa, & Nikolaev, 2015) with consistent findings. All results indicate that there is positive premium associated with the profitability characteristics. Novy Marx (2013) finds that gross profitability predicts the cross-section of average returns and is also negatively correlated with value premium. Negative correlation with value investment strategies makes it attractive to value investors because it provides insurance for value (Novy Marx, 2013). Additionally, gross profitability enhances the performance of value investment strategies (Novy Marx, 2014).

The choice of quality measure is inspired by Novy Marx (2014) and Lalwani and Chakraborty (2018). Novy Marx (2014) analyzed the performance of seven different

quality strategies and only gross profitability as a standalone strategy generated a significant abnormal return with a spread of 2.70 percent per annum. Moreover, the performance of seven quality investment strategies were evaluated against three-factor model with superior results. Of the seven quality strategies, gross profitability achieved highest three-factor alpha of 5.21 percent per annum. Especially among the large cap stocks, gross profitability generates significant excess returns. (Novy Marx, 2014).

Most studies concerning quality investment strategies have been focusing on the developed markets. Lalwani and Chakraborty (2018) conducted a study that shed light on the performance of four different quality investment strategies in the Indian stock market and the results are somewhat similar to Novy Marx (2014). The authors find that gross profitability is the best performing quality investment strategy with an average outperformance of 4.38 per cent per annum over the market. When evaluating against the CAPM and four-factor model, gross profitability strategy obtained the largest alpha. Based on their findings, gross profitability strategy is the best performing quality investment strategy in the Indian stock market. (Lalwani & Chakraborty, 2018.) On the other hand, the results of Tikkanen and Äijö (2018) contradict with Novy Marx (2014) and Lalwani and Chakraborty (2018) as they find that gross profitability strategy generated the lowest returns in the Europe during the period 1992-2014.

4.3 Combining quality with value

Several studies have been examining the joint performance of quality and value investment strategies and in this strategy the objective is to construct a portfolio that scores high on both quality and value dimensions (Lalwani & Chakraborty, 2018). Piotroski (2000) developed the F-score screening method to exclude poor performing stocks to end up to a value portfolio. F-score is composed on nine accounting factors that measure three different areas of a company's financial condition: operating efficiency, financial leverage/liquidity, and profitability. The results of Piotroski (2000) show that 44 per cent of stocks with high B/M generate negative market adjusted returns in a two-year holding period after a portfolio construction. However, Piotroski (2000) finds that

by selecting financially strong companies from the high B/M stock universe, the returns of high B/M stock portfolio can be enhanced by 7.5 per cent.

While Piotroski (2000) F-score captures quality dimension by measuring a company's financial condition, magic formula proposed by Greenblatt (2006) ranks companies based on two factors: return on invested capital (ROIC) and earnings yield. EBIT/EV ratio is a value measure and it represent the earnings yield in the magic formula while quality dimension is captured by ROIC. Greenblatt's (2006) *"Little book that beats the market"* brought magic formula to the attention of academics and practitioners and it is a measure that is being used to screen companies that score high on both the aforementioned factors. Portfolio with such stocks yielded annual return of 15.2 per cent while the average annual of the market, S&P 500, was 9.5 per cent per annum.

In addition, to test validity of magic formula in a smaller developed market, Davydov et al. (2016) analyzed the performance of magic formula and cash-flow augmented magic formula in contrast to commonly used value measures in the Finnish stock market in the period 1991-2013. Cash-flow augmented magic formula uses cash-flow-to-price (CF/P) as a supplementary factor in the portfolio construction. Average annual return of magic formula was 19.3 per cent and 20.2 per cent for cash-flow augmented magic formula. Average annual return for the benchmark index, OMXH GAP GI, was 13.6 per cent which all investigated strategies outperformed. During the sample period, EBIT/EV and E/P were two of the best performing strategies, respectively, and cash-flow augmented magic formula achieved third highest average annual returns.

Study conducted by Novy Marx (2013) focused on the performance of traditional value investment strategies and gross profitability strategy. Combining tried-and-true value measure like book-to-market with gross profitability, Novy Marx (2013) finds that returns of value investment strategy can be improved. On the other hand, relative to standalone quality investment strategies, Lalwani et. al. (2018) does not find significant performance

improvement in returns when combining value investment strategies with quality investment strategies.

5 Data and methodology

In this chapter, data from the Finnish stock market and methodology applied are presented. Firstly, the financial multiples that are being used to construct standalone and combined portfolios are presented. Secondly, the risk-adjusted performance measures that are used to investigate the risks of portfolios are illustrated. Thirdly, portfolio construction of value and quality portfolios is described in detail. In addition, transaction costs and factor data are discussed briefly.

5.1 Valuation multiples

The aim of value investment strategy is to identify undervalued stocks that look cheap relative to some fundamental factor. Academic research has investigated the performance of several value measures with contradicting results as the best criterion for portfolio construction varies across markets and sample periods as Pätäri and Leivo (2015) state. Based on the prior literature and to gain broad view of the performance of different value investment strategies in the Finnish stock market, this thesis uses P/E, P/B, and EV/EBIT as value measures.

Inspired by the prominent findings of Novy Marx (2013) this thesis uses gross profitability to construct quality portfolios. Novy Marx (2013) argues that controlling profitability significantly enhances the returns of value investment strategies and it will be interesting to see whether this applies for the abovementioned value investment strategies in the Finnish stock market. Moreover, lack of evidence concerning the performance of standalone gross profitability in the Finnish stock market motivated to investigate the gross profitability strategy more closely. Next subsections present the formulas of valuation multiples that are being used to construct portfolios

5.1.1 Value measures

Academic research and practitioners have relied on a variety of valuation measures and price-to-earnings ratio is a traditional value measure that many authors, including Basu (1977), have examined. Price-to-earnings ratio is widely quoted in today's equity markets by both analyst and investors as a stock picking tool for its simplicity, and it is calculated as follows:

$$\frac{P}{E} = \frac{Market\ value\ per\ share}{Earnings\ per\ share} \tag{4}$$

P/E-ratio can be interpreted in various ways but typically it is used to identify overvalued or undervalued stocks. A low P/E-ratio signals that the market value of the stock is low relative to company's financial fundament. Academic literature often uses earnings yield (E/P) which is the inverse ratio of price-to-earnings ratio. Stocks with low P/E ratio or conversely high E/P ratio are referred as a value stocks.

Another regularly used valuation multiple to identify value stocks is price-to-book or book-to-price (inverse ratio of P/B) ratio. Formula for price-to-book is the following:

$$\frac{P}{B} = \frac{Market\ value\ per\ share}{Book\ value\ per\ share} \tag{5}$$

P/B-ratio is also commonly used valuation tool among practitioners to identify whether a company is overvalued or undervalued by comparing the market price of a stock with the book value of a share. Book value of a share is calculated by subtracting the total liabilities from the assets and dividing the difference by the total number of shares outstanding. Stocks with low P/B-ratio are considered to be value stocks.

In addition to traditional value multiples, this thesis uses enterprise value-based multiple to construct value portfolio that is presented below. Enterprise value multiple has not been frequently used as a basis for value investment strategies, but the popularity is increasing because enterprise value takes into account the net value of the company's debt (Pätäri & Leivo, 2015). Enterprise value multiple is calculated as follows:

$$\frac{EBIT}{EV} = \frac{Earnings\ before\ interest\ and\ taxes}{Enterprise\ value} \tag{6}$$

Chan and Lui (2011) argue that EBIT is more informative figure than EBITDA (earnings before interest, taxes, depreciation, & amortization) for investors and can give better guidance on future sustainability and profit growth, and thus EBIT/EV ratios is used in this study rather than EBITDA. EBIT-to-enterprise-value strategy has been tested in the Finnish stock market with promising results, and in the study by Pätäri, Karell, and Luukka (2016) the best performing portfolio was constructed by using EBIT/EV multiple. Recent results of Davydov et al. (2016) also confirm the superior performance of EBIT/EV-strategy.

Enterprise value multiple is examined in this thesis because, price-based valuation multiples do not account the debt of a company, and therefore, they might not cope with the problem of undervaluation deriving from the characteristic of these multiples (Pätäri & Leivo, 2009). Indeed, Bird and Casavecchia (2007) state that the problem with price-based valuation metrics is that the relative valuation of value stocks can be a reflection of perilous financial health which price-based valuation metrics do not consider contrary to enterprise value multiples.

5.1.2 Quality measure

Gross profitability is calculated as follows:

$$Gross\ profitability = \frac{Total\ revenues - Cost\ of\ goods\ sold\ (COGS)}{Total\ assets} \tag{7}$$

One of the objectives of this study is to examine the performance of quality strategy in the Finnish stocks market which motivated the author to form quality portfolios based on gross profitability which has been one of the best performing quality strategies (see e.g., Novy Marx, 2014; Lalwani and Chakraborty, 2018). Findings of Novy Marx (2013) indicate that combining value and quality strategies is beneficial for investors and therefore joint portfolios that combine both investment strategies are created.

5.2 Risk-adjusted performance measures

The performance of portfolios is evaluated based on extensive set of risk-adjusted performance measures. Sharpe (1966) ratio is a traditional risk-adjusted performance measure that gauges the performance of an investment relative to its risk. The higher the ratio, the greater risk compensation the stock or portfolio provides. Sharpe ratio is a measure of excess return above the risk-free return relative to its standard deviation. Sharpe ratio is calculated as follows:

$$S_p = \frac{R_p - R_f}{\sigma_p} \tag{8}$$

Where: S_p is the Sharpe ratio of a portfolio

$R_p - R_f$ is the excess return of the portfolio

σ_p is the standard deviation of the portfolio

Sharpe ratio has received criticism due to penalizing very high positive returns as they also increase the standard deviation (Goetzmann, Ingersoll, Spiegel, & Welch, 2007). Therefore, Sortino ratio is calculated as it only considers the downside risk. Following Davydov et al. (2016) and Tikkanen and Äijö (2018) risk-free rate in this thesis is used as a minimum acceptable return. Sortino ratio is represented in the following formula:

$$SR_P = \frac{R_p - MAR}{\sqrt{\frac{1}{n}\sum R_{p<MAR}(R_p - MAR)^2}} \quad (9)$$

Where: SR_P is the Sortino ratio of the portfolio

R_P is the return of a portfolio

MAR is minimum acceptable return

In order to get more in-depth view of portfolio performance, in addition to Sharpe ratio and Sortino ratio, Treynor ratio is also calculated which is quite similar to Sharpe ratio. The difference between Sharpe ratio and Treynor ratio lies in the numerator as Treynor ratio uses portfolio's beta while Sharpe ratio uses portfolios standard deviation. Portfolio's ability to generate abnormal returns is also tested by using Fama and French (1993) three-factor and Carhart's (1997) four-factor model to account for different factors, i.e., market, size, value, and momentum.

5.3 Data

The portfolios of this thesis are composed of public Finnish companies quoted in the Helsinki stock exchange in the period 2016-2021. Index values, stock prices, and financial variable data is obtained from the Thomson Reuters Datastream database that was provided by the University of Vaasa. Financial variable data from Thomson Reuters Datastream is used to calculate P/E, P/B, EV/EBIT, and gross profitability ratios for each year and the data is gathered on annual basis. Additionally, 1-month Euribor is used as a risk-free rate for Finland. The monthly data of risk-free rate is retrieved from the European Banking Federation. OMX Helsinki CAP GI index is used in this thesis to represent the market portfolio. OMX Helsinki CAP GI includes dividends, and the index is also capped which means that the maximum weight of a single stock is 10%. This eliminates very large companies to have an overly large influence on the index. OMX Helsinki CAP GI index is illustrated below in the figure 2:

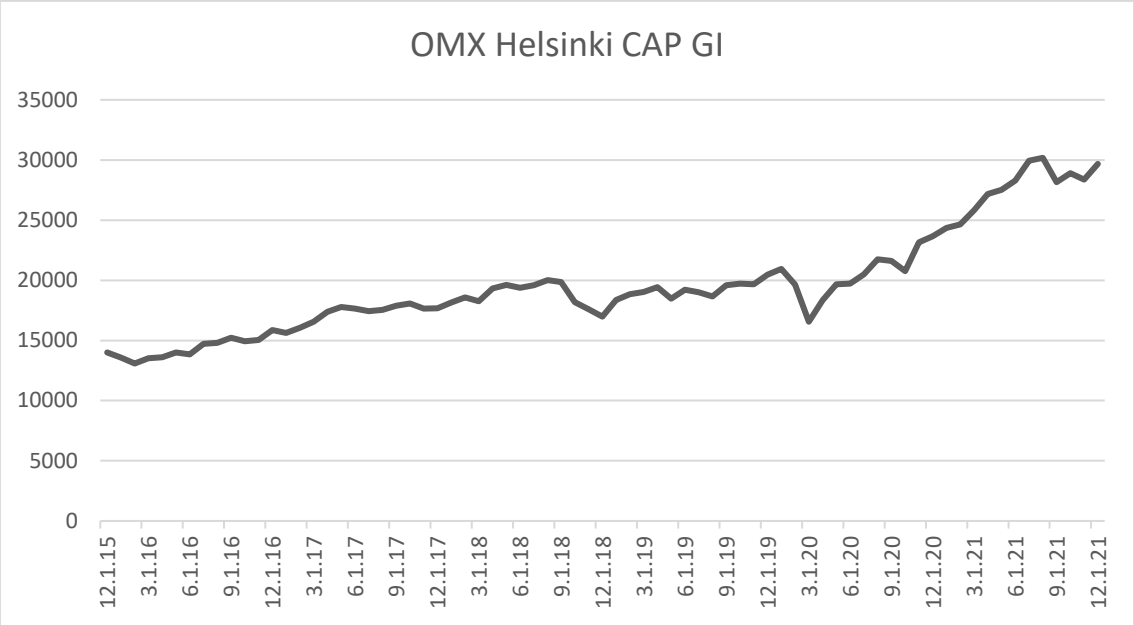

Figure 2. OMX Helsinki CAP GI

After financial crisis, stock markets around the world have mostly soared and pulled off a record-long bull-runs. Above in the figure 2 is presented a sub-period of this bull-run, and from the figure 2 we can observe that stock market has performed exceptionally well during the sample period. Coronavirus disease temporarily plummeted stock markets all over the world in beginning of 2020. However, market has rebounded rapidly from the crash and climbed despite market turmoil.

The data was limited to the companies quoted in the Helsinki Stock Exchange, and all portfolios are formed based on the data that covers the period 2016-2021. Following Fama and French (1992), Davydov et al. (2016), and Asness et al. (2018) financial companies of Helsinki Stock Exchange are excluded from the sample because of different interpretations of their financial statements. In case of missing financial data to construct financial variables, the company has been excluded from the analysis. Sample period is six years and portfolios are constructed every year. In total, 42 portfolios are formed during the sample period. The value portfolios are P/E, P/B, and EV/EBIT. Quality portfolio is based on the gross profitability. Combined value and quality portfolios are P/E and gross profitability, P/B and gross profitability, and EV/EBIT and gross profitability.

5.4 Portfolio construction

5.4.1 Construction of value portfolios

Value portfolios are constructed based on the following ratios: P/B, P/E, and EV/EBIT. Every year OMX Helsinki companies are screened based on the above-mentioned ratios. P/B, P/E, and EV/EBIT value portfolios are formed by ranking stocks from lowest to highest and top 30 percent of stocks with the lowest values are selected to value portfolios. It should be noted that companies with the negative ratios are excluded from the sample. Portfolios are equally weighted which means that every stock selected to portfolio has equal weight in the constructed value portfolio. Depending on how many stocks were selected to portfolio, the weight of one share varied annually. Holding period of each value portfolio is one year, and rebalancing of the portfolio is completed annually over the six-year period. Selected stocks are assumed to be held until the end of the holding period. Moreover, value portfolios are constructed by using long only strategies.

Consequently, the first value portfolio consists of 30 per cent of stocks with the lowest price-to-book ratio, the second value portfolio includes 30 per cent of stocks with the lowest price-to-earnings ratio, and third value portfolio 30 per cent of stocks with the lowest EV/EBIT ratio. Prior academic literature, for instance Fama and French (1998), have applied the 30 percent selection method to construct portfolios.

5.4.2 Construction of quality portfolio

Quality portfolio is constructed similar basis as value portfolios. Quality portfolio is based on the gross profitability (scaled by total assets) ratio and 30 percent of stocks with the highest values are selected to quality portfolio. Quality portfolio is also equally weighted, and the holding period is one year. Rebalancing process is repeated annually during the six-year period. Gross profitability strategy was chosen due to recent evidence by Novy Marx (2014) and Lalwani and Chakraborty (2018) that show the superiority of gross profitability strategy over other quality strategies.

If historical prices or financial variable data is missing, the company is excluded from the sample. OMX Helsinki companies with the negative gross profitability ratios are excluded. Similar to value portfolio, long only quality portfolios are formed. Selected shares of quality portfolio are assumed to be held until the end of the holding period. After the holding period, the shares are sold, and the returns or losses are realized.

5.4.3 Construction of combined value and quality portfolios

The construction of combined value and quality portfolios differ slightly from individual portfolios. Combined portfolios are also long only, equally weighted, and the holding period of each portfolio is one year. Companies with negative ratios are excluded from the sample. Each year three combined portfolios are constructed. Three-step construction process of combined portfolios is similar to Davydov et al. (2016):

1. In the first step, OMX Helsinki companies are ranked based on P/B, P/E, and EV/EBIT. Companies with the lowest values on P/B and P/E, and EV/EBIT are assigned in the first place.
2. The second step of the construction process includes OMX Helsinki companies ranked on their gross profitability ratio. Company with the highest gross profitability ratio is assigned first.
3. In the last step of the process, the rankings of companies are averaged which means that if company is ranked fifth on the value metric and fourth on the quality metric, its average ranking will be 4.5. Afterwards, OMX Helsinki companies are put in order based on average rankings and assigned to portfolios.

During the observation period, in total 18 combined value and quality portfolios was constructed. The number of companies for combined portfolios is mite smaller than for standalone strategies. However, this is explained by the fact that to be selected in the combined portfolio both value and quality multiple must be found.

5.5 Transaction costs

This thesis does not consider the transaction costs that are related to portfolio construction and rebalancing. Berkowitz, Logue, and Noser (1988) suggest one way transaction cost of 0,23% while Jegadeesh and Titman (1993) suggest one way transaction cost to be 0.50%. Davydov et al. (2016) estimated in their paper transaction cost to vary between 0.50% and 0.58%. It should be noted that not taking into account transaction costs might have an effect on the practicality and robustness of the results. The aim of this thesis was to be more theoretical, and thus transaction costs are not applied to strategies.

5.6 Factor data

This thesis uses three-factor model and four-factor to investigate portfolios' ability to generate abnormal returns. The values for three-factor and four-factor model are downloaded from the Kenneth French online library. This thesis uses European factors. As a market return, this thesis uses OMX Helsinki Gap GI index, and the risk-free rate is 1-month Euribor.

5.7 Methodology

When it comes to value and quality investment strategies, the first objective of this thesis is to examine the performance of standalone strategies. Several studies (see e.g., Basu, 1977; Lakonishok et al., 1994) have investigated the return spread between value and growth portfolios to identify whether value premium exists. However, in this study the performance of value and quality portfolios are compared against market portfolio, following Fama and French (2020).

Fama and French (2020) define value premium in their recent paper as a difference between value investment portfolio returns and market return. They argue that it is more reasonable in investment and asset pricing applications to investigate value

premium this way rather than focusing on the returns of value and growth portfolios. Therefore, standalone portfolio performance in this thesis is compared against the market return.

As discussed earlier in this paper, both value and quality investment strategies have performed well in the prior academic literature. Contradicting results can also be found which indicates that investment strategies are not persistent continuously. It should be noted that past performance is no guide to future performance. For instance, the results of Fama and French (2020) indicate that value premium has become remarkably weaker in the period 1991-2019 while prior literature has documented widely the existence of value premium. Despite the results of Fama and French (2020), recent academic literature has found standalone portfolios to perform well in comparison to market portfolio. Gross profitability strategy has also performed well in the light of recent studies (see e.g., Novy Marx, 2013; Lalwani and Chakraborty, 2018). Building on the prior literature, the first research question and hypothesis are as follows:

1. *Do standalone portfolios outperform the benchmark market portfolio in the Finnish stock market between 2016-2021?*

H0: The returns of standalone portfolios are equal to the returns of benchmark market portfolio in the Finnish stock market during the 2016-2021 period

H1: The returns of standalone portfolios are higher than the returns of benchmark market portfolio in the Finnish stock market during the 2016-2021 period

The second goal of this study is to examine the performance of combined value and quality portfolios. Quality investing themes have received more and more attention among academic research during the past decade, but the evidence is somewhat scarce in the Finnish stock market when compared to value investing literature. The results of Novy Marx (2014) suggest that combining value and quality in U.S. stock market

improves the overall portfolio performance. The findings of Lalwani and Chakraborty (2018) contradict with Novy Marx (2014). Researchers have examined the joint performance of combined portfolios with auspicious results. However, lack of evidence concerning the joint performance of different combinations of value and quality portfolios is evident. For example, performance of combined enterprise multiple and different quality metrics is rather obscure. Considering the recent body of research and mixed results, the second research question and hypotheses are formulated as follows:

2. *Has the overall performance of combined portfolios deviated from the performance of standalone portfolios and market index during the period 2016-2021?*

H0: The overall performance of combined value and quality portfolios has been equal to the standalone portfolios and market index during the period 2016-2021

H1: The overall performance of combined value and quality portfolios has been unequal to the standalone portfolios and market index during the period 2016-2021

6 Empirical results

This section presents all the empirical results of this thesis.

6.1 Descriptive statistics

6.1.1 Standalone value and quality portfolios

Table 1. The table reports the descriptive statistics for standalone value and quality portfolios. The mean, standard deviation, skewness, and kurtosis are calculated based on monthly return time-series. The reported figures of mean and standard deviation are annualized.

Summary statistics	P/B	P/E	EV/EBIT	Gross profitability	Market
Mean	13.78%	18.39%	20.60%	20.85%	13.65%
Standard deviation	18.39%	17.53%	17.94%	18.72%	14.48%
Skewness	-0.167	-0.402	-0.547	-0.539	-0.746
Kurtosis	2.961	1.335	1.597	1.282	3.106
Return spread (portfolio – market)	0.13%	4.74%	6.95%	7.20%	-

Summary statistics of value and quality portfolios are presented in the table 1 over the 6-year sample period. The comparison of the returns of value portfolios shows that EV/EBIT was best criterion for selection of value portfolio. Over the sample period, quality portfolio produced an average annualized return of 20.85%, followed by EV/EBIT value portfolio (20.60%), P/E (18.39%), and P/B (13.78%) while the average annualized return for OMX Helsinki CAP GI was 13.65%. In terms of average annual returns, P/E, EV/EBIT, and gross profitability seem to exceed market portfolio significantly. Return spread is the largest for quality portfolio (7.20%) while the largest return spread for value strategy is EV/EBIT (6.95%). P/B value portfolio marginally outperforms the market portfolio in terms of average annualized returns. As per the results, the results suggest that first hypothesis should be accepted. However, the returns are also tested with CAPM, three-factor model, and four-factor model to see whether the results are statistically

significant. The results obtained from the overall analysis of asset pricing models and risk-adjusted performance measures will show whether the first hypothesis can be accepted.

Table 1 also reports the level of risk in terms of standard deviation which varies between different portfolios. Based on the results, quality portfolio formed on gross profitability seems to be most volatile while market portfolio least volatile. Due to variation in the volatility, it might be more reasonable for an investor to look at the risk-adjusted performance measures of standalone portfolios that will be presented in the table 4.

6.1.2 Combined value and quality portfolios

Table 2. The table reports the descriptive statistics for combined value and quality portfolios. The mean, standard deviation, skewness, and kurtosis are calculated based on monthly return time-series. The reported figures of mean and standard deviation are annualized.

Summary statistics	P/B & Gross profitability	P/E & Gross profitability	EV/EBIT & Gross profitability	Market
Mean	18.58%	26.39%	26.13%	13.65%
Standard deviation	17.87%	18.49%	18.44%	14.48%
Skewness	-0.465	-0.373	-0.286	-0.746
Kurtosis	1.218	0.991	0.935	3.106
Return spread (portfolio – market)	4.93%	12.74%	12.48%	-

The results of combined value and quality portfolios show that all portfolios outperform the market portfolio. Gross profitability seems to enhance the returns of all value portfolios in comparison to market while best performing portfolios are P/E & gross profitability (26.39%), EV/EBIT & gross profitability (26.13%), and P/B & gross profitability (18.58%), respectively. The best improvement in return compared to standalone portfolios was obtained with P/E & gross profitability. The standard deviation of each

portfolio is higher than the standard deviation of market portfolio, indicating that combined portfolios are exposed to a higher risk. MPT states that the higher return the higher the risk, but from the tables 1 and 2 we can observe that Markowitz's (1952) theory seems not to always hold because combined P/B & gross profitability portfolio generates higher return with lower standard deviation than standalone P/B value portfolio. Risk-adjusted performance measures for combined portfolios are presented in the table 5. Table 5 provides better overview of how combined portfolios compare relative to their level of risk.

When comparing the returns between portfolios based on individual ratios and combined portfolios, the average annualized returns and return spreads for combined portfolios are higher, implying that gross profitability can enhance the returns of value portfolios when evaluated against market benchmark. Based on the results of table 1 and 2, it appears that accounting for gross profitability is attractive for value investors. Overall, the results show that both individual and combined portfolios outperform the market portfolio. Moreover, the return spreads of combined portfolios are much higher over the market benchmark than the return spreads of individual portfolios. To find whether the results support the second hypothesis, the portfolios are also evaluated against risk-adjusted performance measures to get a complete picture of the performance. However, similar to standalone portfolios, risk-adjusted performance measures for combined portfolios are calculated to examine whether the hypotheses can be accepted.

6.2 Correlations of portfolios

Table 3. Correlations of portfolios.

	Market	P/B	P/E	EV/EBIT
Market	1.00			
P/B	0.80	1.00		
P/E	0.84	0.85	1.00	
EV/EBIT	0.83	0.88	0.97	1.00
Gross profitability	0.85	0.88	0.90	0.92

Table 3 shows correlations of value portfolios, quality portfolio and market portfolio. Correlations are calculated based on monthly returns and all values are highly positive, implying that portfolios tend to move in the same direction. Negative correlation on the other hand would imply that portfolios move to opposite directions and portfolios that are perfectly negatively correlated would have a correlation value of -1. Correlation value of 0 would indicate that the portfolios are uncorrelated. One can assume correlation value to be within +/- 1 interval. According to MPT, correlation is a key factor when it comes to efficient diversification. Some of the investigated strategies are significantly positively correlated, suggesting that combining value and quality strategies together might not improve drastically the risk-adjusted performance. In a study conducted by Lalwani and Chakraborty (2018), they found that quality strategies were significantly positively correlated with the market portfolio and similar observation can be made from the table 3, although the positive correlation is not as high as in their study. Novy Marx (2014) found that B/P strategy is negatively correlated with the gross profitability, but similar finding is not found in this study as the correlation is positive. MPT addresses that investor should look for the stocks that are uncorrelated.

6.3 Risk-adjusted performance

6.3.1 Risk-adjusted performance ratios for standalone portfolios

Table 4. The table shows the risk-adjusted performance ratios for standalone value and quality portfolios. The reported values of CAPM alpha are annualized and *, **, and * indicate statistical significance at 10%, 5%, and 1% level, respectively. The performance ratios have been calculated based on the monthly returns, but the reported figures are annualized.**

Performance ratios	P/B	P/E	EV/EBIT	Gross profitability	Market
CAPM alpha	-0.32%	4.42%	6.31%	5.38%	-
Sharpe ratio	1.016	1.327	1.419	1.372	1.282
Sharpe ratio (portfolio - market	-0.267	0.044	0.136	0.090	-
Sortino ratio	0.914	1.322	1.380	1.465	1.204
Sortino (portfolio – market)	-0.290	0.117	0.176	0.261	-
Treynor ratio	0.183	0.230	0.247	0.235	0.186
Treynor (portfolio – market)	-0.003	0.043	0.061	0.049	-

Table 4 presents the CAPM alphas, Sharpe ratios, Sortino ratios, and Treynor ratios for standalone portfolios. Variety of risk-performance measures are taken into account to investigate risk characteristics because it allows to get a comprehensive view of the portfolio performance and make the results more practical. Spread between standalone portfolios and market portfolio is also calculated. As per CAPM alpha, only P/B value portfolio is underperforming the market portfolio. The CAPM alphas obtained by regressions provide evidence of the superiority of the strategies. Highest annualized CAPM alpha was achieved by EV/EBIT (6.31%), gross profitability (5.38%), and P/E (4.42%) strategies, respectively. The obtained results for CAPM are not statistically significant.

When it comes to Sharpe ratios, the results suggest that EV/EBIT portfolio performs best, followed by quality portfolio, and P/E value portfolio. Only P/B value portfolios has a lower Sharpe ratio than market portfolio. However, Sharpe ratio is not acknowledging the difference between upside and downside risk as both risks are treated equally. Therefore, to get better picture of overall risks of portfolios, Sortino and Treynor ratio are calculated.

To get overview of the downside risk of portfolios, Sortino ratio is applied. Generally, the higher the Sortino ratio the better. Similar to Sharpe ratio, P/B portfolio is only portfolio that is underperforming the market portfolio. The highest Sortino ratios are found with gross profitability, EV/EBIT, and P/E, respectively. Gross profitability portfolio is preferred over other portfolios when considering Sortino ratio.

In addition to Sharpe and Sortino ratio, Treynor ratio is calculated to adjust the investigated portfolios to systematic risk. All else equal, higher Treynor ratio is usually better and if we look at the investigated portfolios, EV/EBIT value portfolio is preferred as it results to the highest value, followed by gross profitability, and P/E. Similar to other risk-adjusted performance measures, P/B portfolio is underperforming the market portfolio again in terms of Treynor ratio.

The analysis of the table 4 show that all standalone portfolios except P/B value portfolio outperform the market portfolio in terms of CAPM alpha, but the results are not statistically significant. The portfolios are also tested against three-factor and four-factor model to see whether contradicting findings can be found. Risk-adjusted performance measures for standalone portfolios suggest that P/B value portfolio is the only portfolio that underperforms the market benchmark. This indicates that investor should prefer market portfolio and other portfolios over P/B value portfolio. Other portfolios on the other hand outperform the market portfolio based on CAPM alpha, Sharpe, Sortino, and Treynor ratio, implying that these portfolios are preferable.

6.3.2 Risk-adjusted performance ratios for combined portfolios

Table 5. The table shows the risk-adjusted performance ratios for combined value and quality portfolios. The reported values of CAPM alpha are annualized and *, **, and * indicate statistical significance at 10%, 5%, and 1% level, respectively. The performance ratios have been calculated based on the monthly return, but the reported figures are annualized**

Performance ratios	P/B & Gross profitability	P/E & Gross profitability	EV/EBIT & Gross profitability	Market
CAPM alpha	4.75%	12.26%**	11.89%**	-
Sharpe ratio	1.312	1.687	1.677	1.282
Sharpe ratio (Portfolio - market	0.030	0.405	0.395	-
Sortino ratio	1.316	1.788	1.779	1.204
Sortino (portfolio – market)	0.112	0.584	0.574	-
Treynor ratio	0.233	0.306	0.301	0.186
Treynor (portfolio – market)	0.047	0.120	0.115	

From the table 5 we can observe that combining value and quality has resulted to positive CAPM alpha for all portfolios. Combining P/B value strategy with gross profitability has generated positive CAPM alpha while individual portfolio constructed with P/B resulted to a negative alpha. The CAPM alpha values are statistically significant at 5% level for P/E & gross profitability and EV/EBIT & gross profitability portfolios.

When comparing the spreads of combined portfolios and standalone strategies to market portfolio, we can observe that the Sharpe ratios of all investment strategies have improved. Combined portfolio of P/E & gross profitability has the highest Sharpe ratio of 1.687, and the second highest Sharpe ratio was based on the EV/EBIT & gross profitability (1.677). P/B & gross profitability strategy resulted to the lowest Sharpe ratio out of the three combined portfolios but had slightly better Sharpe ratio than the market. In terms of Sharpe ratios, the results of combined portfolios imply that combining value

strategies with gross profitability can enhance the risk-adjusted performance. As per this analysis, the results suggest that the risk-adjusted performance of combined portfolios is better than it is for standalone portfolios, and thus supporting the second hypothesis.

In order to account for downside risk that Sharpe ratio does not factor in, Sortino ratio is employed. All combined portfolios have higher Sortino ratios than market portfolio which indicates that combined portfolios perform better than market portfolio on risk-adjusted basis. In comparison to standalone portfolios, the performance of all value portfolios has improved when portfolios are combined with quality dimension. Sortino ratio is the highest for P/E & gross profitability portfolio, followed by EV/EBIT & gross profitability, and P/B & gross profitability. The spreads of Sortino ratio are higher for all combined portfolios than for standalone portfolios, implying that combined portfolios perform better on risk-adjusted basis.

The results for Treynor ratio are similar to Sharpe and Sortino ratio and suggest that gross profitability can enhance the risk-adjusted performance of value portfolios. EV/EBIT & gross profitability results to the highest Treynor ratio. All combined portfolios are also outperforming the market portfolio which was not the case for all standalone portfolios. Altogether, combined portfolios offer higher excess return with respect to the risk than market portfolio. Screening stocks with both value and quality dimensions resulted to the higher spreads between investigated portfolios and benchmark index. With regards to the second hypothesis, the combined portfolios have yielded higher risk-adjusted returns compared to spreads between standalone portfolios, and thus the results support the second hypothesis. As per the results of table 5, it can be concluded that investment strategy combining P/E & gross profitability has the best performance in terms of CAPM alphas and risk-adjusted basis.

6.4 Results for standalone value and quality portfolios

6.4.1 Results for three-factor model

Table 6. The table shows factor loadings of three-factor model for standalone value and quality portfolios. The reported alpha values have been calculated based on the monthly returns, but the reported figures are annualized. P-values are reported in the brackets. *, **, and * indicate statistical significance at 10%, 5%, and 1% levels, respectively.**

Three-factor model	P/B	P/E	EV/EBIT	Gross profitability
Alpha	1.18%	4.66%	6.24%	5.30%
	(0.801)	(0.253)	(0.154)	(0.225)
Market	0.907***	0.914***	0.958***	1.020***
	(0.000)	(0.000)	(0.000)	(0.000)
SMB	0.560**	0.669***	0.539**	0.549**
	(0.024)	(0.002)	(0.019)	(0.017)
HML	0.269**	0.029	-0.028	-0.029
	(0.039)	(0.797)	(0.811)	(0.806)
Adjusted R2	0.674	0.731	0.707	0.731

Table 6 shows the empirical findings of all standalone strategies against three-factor model for the period 2016-2021. Despite positive alphas, none of the alpha values are statistically significant. From the table we can see that EV/EVIT value strategy generated the highest annualized alpha of 6.24%, outperforming other value investment strategies and quality strategy as well. Quality portfolio based on gross profitability produced the second highest annualized alpha (5.30%) of all portfolios, followed by P/E (4.66%), and P/B (1.18%). Pätäri et al. (2016) show the superiority of EBIT/EV strategy over other value investment strategies in the Finnish stock market, and from the table 6 we can observe that it was best performing strategy among investigated strategies, although three-factor alpha was statistically insignificant. When it comes to the first hypothesis *"The returns of standalone portfolios are higher than the returns of benchmark market portfolio in the Finnish stock market during the period 2016-2021",* the results are not statistically

significant at any conventional levels and do not advocate of accepting the first hypothesis. Interpretations and results of CAPM alpha are similar.

Table 6 also reports the estimated beta values for the market factor for all individual portfolios and only quality investment strategy has higher beta than 1, implying that quality strategy is more subject to systematic risk than investigated value investment strategies. Value investment strategies on the other hand are less subject to systematic risk because beta values vary between 0.907 and 0.958. Beta values below 1 indicate that value investment strategies fluctuate less than market on average. Beta values of all portfolios are statistically significant at 1 % level.

When it comes to SMB and HML factors, all SMB factors are statistically significant. However, negative value factor is consistent with the results of Novy Marx (2014). Only P/E portfolios is producing statistically significant results at 1 % level while other portfolios are statistically significant results at 5 % level. All portfolios have positive loading on the SMB factor which implies that portfolios consist of small stocks. Furthermore, only P/B portfolio has statistically significant at 5 % level on HML factor.

Adjusted R-squared measure at the bottom of the table 6 is a determination coefficient of the regression and demonstrates how the underlying model manages to explain the results of each portfolio. The explanatory power of three factor model is quite high as R-squared value are varying between 0.674 and 0.731.

6.4.2 Results for Carhart's four-factor model

Table 7. The table shows factor loadings of four-factor model for standalone value and quality portfolios. The reported alpha values have been calculated based on the monthly returns, but the reported figures are annualized. P-values are reported in the brackets. *, **, and * indicate statistical significance at 10%, 5%, and 1% levels, respectively.**

Four-factor model	P/B	P/E	EV/EBIT	Gross profitability
Alpha	2.12%	3.56%	5.62%	5.77%
	(0.659)	(0.393)	(0.211)	(0.200)
Market	0.878***	0.949***	0.977***	1.005***
	(0.000)	(0.000)	(0.000)	(0.000)
SMB	0.578**	0.647***	0.527**	0.558**
	(0.021)	(0.003)	(0.023)	(0.016)
HML	0.182	0.131	0.028	-0.073
	(0.266)	(0.351)	(0.851)	(0.628)
WML	-0.128	0.151	0.083	-0.065
	(0.383)	(0.236)	(0.542)	(0.635)
Adjusted R2	0.673	0.733	0.704	0.728

In addition to three-factor model, Carhart's (1997) four-factor model is employed to ensure that results are not driven by a specific asset pricing model. For the sample employed, none of the portfolios produced statistically significant alpha when compared against Carhart's (1997) four-factor model. Observing the alphas of CAPM, three-factor, and four-factor models, the results are similar and do not support the first hypothesis because statistical significance is not found. Adjusted r-squared values of four-factor model are almost identical to three-factor model despite one additional factor (WML), implying that both models are somewhat equal to explain the returns of portfolios for the sample period. The best performance is obtained by gross profitability strategy and EV/EBIT strategy with the returns of 5.77% and 5.62%, respectively. Inversely, three-factor model found that EV/EBIT produced the highest alpha, followed by gross profitability. Lowest alpha value was produced with P/B value portfolio.

Loadings for market factor are statistically significant at 1 % level for all portfolios. Market factor is below one for all value portfolios which indicates that value portfolios are less sensitive to market risk. Market loading for quality portfolio was 1.005, implying that portfolio fluctuates more than benchmark index but only marginally. P/B value portfolio has the lowest loading for market factor, indicating that it is least volatile, but on the other hand the alpha value is not statistically significant and is lowest of all portfolios.

All investigated portfolios have positive loadings for SMB factor in four-factor model, indicating that portfolios consist of small cap companies. SMB factor for P/E value portfolio is statistically significant at 1 % level while loadings for other portfolios are statistically significant at 5 % level. Results are consistent with the three-factor model.

Results for HML and WML factors are statistically insignificant. Negative HML factor is in line with Novy Marx (2014). P/B and gross profitability strategies are negatively associated with the momentum factor while P/E and EV/EBIT strategies are positively associated. Both Four-factor and three-factor model are able to explain the abnormal results by market and size factors. With one exception, HML factors are statistically insignificant for three-factor and four-factor models.

The results from regressions of CAPM, three-factor, and four-factor models suggest that investigated investment strategies do not produce statistically significant alpha despite alpha values were positive with one exception. As per the first research question and hypotheses, the first hypothesis *"the returns of standalone portfolios are higher than the returns of benchmark market portfolio in the Finnish stock market during the 2016-2021 period"* is rejected. Although the first hypothesis is rejected, the results give an indication that certain investment strategies are more preferable and can provide better performance in contrast to the market portfolio.

6.5 Results for combined portfolios

6.5.1 Results for three-factor model

Table 8. The table shows the factor loadings of three-factor model for combined value and quality portfolios. The reported alpha values have been calculated based on the monthly returns, but the reported figures are annualized. P-values are reported in the brackets. *, **, and * indicate statistical significance at 10%, 5%, and 1% levels, respectively.**

Three factor model	P/B & Gross profitability	P/E & Gross profitability	EV/EBIT & Gross profitability
Alpha	5.26%	11.89%**	12.30%**
	(0.017)	(0.017)	(0.010)
Market	0.928***	0.957***	0.916***
	(0.000)	(0.000)	(0.000)
SMB	0.474**	0.532**	0.729***
	(0.049)	(0.038)	(0.004)
HML	0.083	-0.083	0.059
	(0.507)	(0.534)	(0.646)
Adjusted R2	0.672	0.654	0.680

The empirical results for combined value and quality portfolios are presented above in the table 8. Most Importantly, applying gross profitability with value strategies has enhanced the returns for all investigated portfolios. The comparison of combined strategies show that two of the three combined portfolios produced statistically significant alpha at 5 % level. EV/EBIT & gross profitability criterion resulted to the greatest annualized alpha of 12.30%, followed by P/E & gross profitability criterion (11.89%). P/B & gross profitability portfolio generated the lowest annualized alpha of 5.26% and the result was statistically insignificant. The results suggest that added value can be achieved by screening stocks with value and quality multiples. With respect to the second hypothesis, the results suggest that the performance of combined portfolios is better compared to market index than it is for standalone portfolios.

Table 8 also reports the factor loadings for all combined portfolios on the three-factor model. All of the strategies have estimated beta values lower than 1, ranging from 0.916 on EV/EBIT & gross profitability to 0.957 on P/E & gross profitability. The results are highly statistically significant at 1 % level. The results indicate that combined portfolios tend to be less volatile on average than market.

Looking at the size (SMB) factor, SMB is a significant explanatory factor for combined value and quality portfolios. All loadings are positive but only combined EV/EBIT & gross profitability criterion is producing highly statistically significant results at 1 % level. The SMB loading for portfolios based on P/B & gross profitability and P/E & gross profitability are statistically significant at 5 % level. The results concerning SMB factor indicate that combined strategies tilt towards small cap stocks.

Furthermore, HML loadings for combined portfolios are statistically insignificant. Although, the results are not statistically significant, portfolios constructed based on P/B & gross profitability and EV/EBIT & gross profitability tilt towards value while P/E & gross profitability tilts towards growth. Adjusted R-squared values are rather equal for all portfolios, varying between 0.654 and 0.680.

6.5.2 Results for Carhart's four-factor model

Table 9. The table shows factor loadings of four-factor model for combined value and quality portfolios. The reported alpha values have been calculated based on the monthly returns, but the reported figures are annualized. P-values are reported in the brackets. *, **, and * indicate statistical significance at 10%, 5%, and 1% levels, respectively.**

Four-factor model	P/B & Gross profitability	P/E & Gross profitability	EV/EBIT & Gross profitability
Alpha	5.95%	11.01%**	12.35%**
	(0.209)	(0.031)	(0.012)
Market	0.907***	0.985***	0.915***
	(0.000)	(0.000)	(0.000)
SMB	0.488**	0.514**	0.730***
	(0.044)	(0.046)	0.004)
HML	0.019	-0.001	0.054
	(0.905)	(0.995)	(0.741)
WML	-0.094	0.120	-0.007
	(0.512)	(0.432)	(0.962)
Adjusted R2	0.670	0.652	0.676

Results for Carhart's four-factor model show that greatest annualized alpha is obtained by EV/EBIT & gross profitability strategy (12.35%), followed by P/E & gross profitability (11.01%), and P/B & gross profitability (5.95%). However, the alpha value is statistically insignificant for P/B & gross profitability while results are statistically significant at 5 % level for other two combined portfolios. Compared to standalone portfolios, the returns of each portfolio have improved when accounting for gross profitability. Moreover, similar results were found with CAPM and three-factor model.

The results for market and size factor persist the same as in the three-factor model. Yet again, loadings for market factor are highly statistically significant at 1 % level for each portfolio examined. The beta values vary between 0.907 and 0.985 for combined

portfolios. The results imply that combined portfolios consist of small stocks as the loadings are positive for each portfolio and are statistically significant at 5 % level for P/B & gross profitability and P/E & gross profitability portfolios. For combined EV/EBIT & gross profitability portfolio, the size factor is statistically significance at 1 % level.

As per the overall results concerning CAPM, three-factor, and four-factor model, P/E & gross profitability and EV/EBIT & gross profitability yielded statistically significant alpha at 5% level in all asset pricing models. The findings suggest that the performance of combined strategies is better in contrast to market index and standalone portfolios. Considering the second hypothesis "*The performance of combined portfolios has been unequal to the standalone portfolios and market index"*, is accepted. Tables 5, 8, and 9 provide support that the performance of combined portfolios is positively unequal because investigated joint strategies are able to beat the benchmark index. Moreover, the risk-adjusted performance measures for combined portfolios are better than for standalone portfolios.

6.6 Discussion

The results of investigated portfolios were examined against CAPM, three-factor and four-factor model in addition to extensive set of risk-adjusted performance measures. The results for asset pricing models were obtained by running OLS regressions. Adjusted r-squared values did not significantly improve when additional risk factor was added to three-factor model. Generally, all models produced almost identical results with couple of exceptions. Therefore, it seems that there are other factors that used asset pricing models do not account for.

First objective of this study was to examine whether standalone portfolios can outperform the market portfolio in a smaller market setting. The first research question was motivated by several findings that suggest weakening performance of value investing and superior results of gross profitability. For this reason, the author of this thesis wanted to examine whether value investment strategies and quality portfolio

constructed on the basis of gross profitability can beat the market portfolio. The results of Gray and Vogel (2012), Novy Marx (2014), and Lalwani and Chakraborty (2018) show that gross profitability is one of the best performing investment strategies. Indeed, the empirical results of this study show that gross profitability is one of the best performing investment strategies during the 2016-2021 sample period in the Finnish stock market.

Investigated value investment strategies of this study were P/B, P/E, and EV/EBIT. In terms of average annualized returns, all value portfolios beat the market while EV/EBIT value strategy is obviously the best performing. Supporting the findings of Davydov et al. (2016), EV/EBIT value portfolio yielded the highest returns on a risk-adjusted basis when comparing the value portfolios. On the other hand, we can observe that P/B value strategy is the only portfolio that underperforms the market portfolio after analyzing the returns against risk-adjusted performance measures. Portfolio constructed based on P/B was the worst performing portfolio in this study. In fact, consistent with the prior literature from the Finnish stock market, Leivo and Pätäri (2009) and Davydov et al. (2016) also found that P/B was the worst performing portfolio. The alpha values for standalone portfolios were statistically insignificant. Three out of the four value portfolios beat the market portfolio in terms of CAPM alphas and risk-adjusted performance measures, and thus supporting the first hypothesis. Three-factor and four-factor alphas were positive for all portfolios.

Quality portfolio produced statistically insignificant alpha when tested against CAPM, three-factor and four-factor models. On risk-adjusted basis, gross profitability strategy outperformed market portfolio and value portfolios only in terms of Sortino ratio. EV/EBIT value strategy was able to outperform gross profitability strategy against Sharpe and Treynor ratio. However, gross profitability strategy is a worthy alternative for traditional value investment strategies because it was able to outperform P/E and P/B value strategies on return and risk-adjusted basis.

Analyzing the results with regards to the second hypothesis "*The performance of combined portfolios has been unequal to the standalone portfolios and market index",* the findings suggest that combined portfolios are able to outperform market index, implying superiority of these strategies. Combined portfolios perform better in risk-evaluation than standalone portfolios as well as in return comparison. The findings indicate that applying value and quality investing principles in stock selection is beneficial for value investors. Novy Marx (2014) also found that combining value and quality together offers a better risk-return relationship. The findings challenge efficient market theory. To conclude, the second hypothesis is accepted.

6.7 Limitations

There are several limitations in this thesis that should be noted. These limitations offer room for future research and improvement for similar studies to make results more practical for equity investors. Limitations of this study concern transaction costs and data.

The data for this study was obtained from the Thomson Reuters Datastream and due to unavailable data for some companies, several companies had to be excluded from the study for this reason. Nevertheless, the amount of excluded was not high but given the small size of Finnish stock market, excluding companies from the data might have an impact on the empirical results. In addition, the sample period is rather short to make far-reaching inferences about the results.

Second limitation of this study concerns the factor data that was obtained from the Kenneth French website to test portfolios against three-factor and four-factor models. The factors retrieved from the website for asset pricing models were European factors which are suboptimal for the Finnish stock market, and thus one should consider creating factors that are only based on Finnish data. Creating domestic factors would make the results more practical as the investigated subject of this thesis was portfolio performance of different strategies in the Finnish stock market.

Thirdly, this thesis has not excluded the smallest companies from the sample. For instance, Tikkanen and Äijö (2018) excluded the smallest 10% of the companies to account for possible illiquidity issues. This is one of the potential issues that might impact the results of this study. In addition, the transaction costs are not considered which might affect the robustness of the results. Including transactions as a part of the investigated strategies would make the results more reasonable for practitioners since costs are essential part of portfolio construction.

6.8 Practical implications

The results of this study provide support on how practitioners can utilize value and quality investment strategies in the stock selection and portfolio construction. New ideas for portfolio construction could be adapted from the method used in this study because the results of combined portfolios are rather promising. Screening for stocks with another side of the quality, such as non-financial indicators, could eliminate weak companies as investors are increasingly addressing such factors in the investment process. For instance, in the period of 2016-2018 the assets under professional management of socially responsible funds grew 38% to $12.0 trillion, representing 26% of the total U.S. assets under professional management (Ussif, 2018). The performance of these assets has high societal impact as large institutional investors, e.g. pension funds, assets management firms etc., have to attach these factors increasingly in the investment process. Therefore, understanding the diverse notions of quality on portfolio performance can assist equity investors to make better investment decisions.

7 Conclusions

The first purpose of this study was to examine the performance of standalone strategies. Examined standalone strategies were P/B, P/E, EV/EBIT and gross quality that was chosen based on the prior literature. Results of recent literature suggest that value premium has weakened (see e.g., Fama & French, 2020; Miller & Prondzinski, 2020) but at the same time quality investing has received growing interest with promising results (see e.g., Novy Marx, 2014), implying that value investors should combine both value and quality characteristics in the portfolio construction process. Firstly, the performance of standalone portfolios was evaluated against market portfolio in the period 2016-2021. Two of the best performing standalone strategies of this study were EV/EBIT and quality portfolio formed on the basis of gross profitability. CAPM, three-factor, and four-factor alphas for standalone portfolios were statistically insignificant although the results were positive with one exception.

The second objective of this thesis was to examine whether it is advantageous to combine value investment strategies with gross profitability. The results of combined portfolios were benchmarked against standalone portfolios and market portfolio. Joint portfolios combining value and gross profitability resulted to a higher returns and better risk-adjusted performance. Lalwani and Chakraborty (2018) find no evidence that combining value and quality strategies improve the performance while the results of Novy Marx (2014) are contradictory. In a relatively small market, the results of this study indicate that screening portfolios for gross profitability enhances the returns of all investigated value portfolios in the Finnish stock market. Best performance is obtained when applying gross profitability to EV/EBIT value strategy. Screening on both value and quality dimensions increases the returns but improvement is not due to higher risk. Overall, the results of this study suggest that gross profitability improves the risk-adjusted performance of value portfolios, and therefore value investors should pay attention to both dimensions as it accrues improvements to equity investors.

To conclude, given the current global environment, it is important for equity investors to emphasize high quality companies that can perform well in a volatile market. Russia-Ukraine war, Covid-19 pandemic, supply-chain imbalances, inflation, and rate-hikes are bombarding stock market from different directions and creating enormous uncertainty for investors to handle. In the future, integrating quality factors to investment process is vital for investors. For instance, during the last two decades investors have increasingly started to incorporate social and environmental factors in the investment process (Wagemans & Koppen, 2013). Current definition of quality is more focused on financial factors, but quality could similarly be attached to non-financial factors because investors are nowadays seeking to obtain social and financial objectives simultaneously.

Given the rise of socially responsible investing, future research could be targeted to examine the performance of investment strategies that combine financial and non-financial indicators together. Similar to quality investing, academics use various definitions to describe investment strategies that combine environmental, social, and governance factors in the decision-making process. Eccles and Viviers (2011) examined 190 academic papers in a period of 35 years and found that several different names are being used to refer as socially responsible investing. It is quite evident that in a real-world non-financial factors, such as work environment and employee satisfaction, affect the companies. For instance, the results of Edmans (2011) suggest that there is positive relationship between employee satisfaction and long-run stock returns. Moreover, Edmans' (2011) results show that buying companies on the Fortune 100 list *"Best Firms to Work"* outperform companies that do not make it on the list. Academic literature has been more focused on the quality dimension that accounts for financial indicators while non-financial indicators has been somewhat unacknowledged. Therefore, new avenues for future research and innovations can be found from combining financial and non-financial indicators to value strategies.

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