The performance of an optimised blend of quality metrics against the JSE Allshare index.

21818429

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Abstract

A quality investing strategy using Piotrosky's F-score was followed to see if this investment style would produce returns in excess of the JSE All Share Index and if the returns were statistically significant. The factors were weighed based on their impact and five portfolios were created based on the level of quality. A F-score was found to significantly outperform the JSE-All Share Index.

Keywords

Quality Investing – the process of allocating investment funds according to a style

Portfolio Time Series – the presentation of portfolio performance over a period of time

Johannesburg Stock Exchange

Plagiarism Declaration

I declare that this research is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Abbreviations:

MPT: Market Portfolio Theory

EMH: Efficient Market Hypothesis

FF5FM: Fama and French Five Factor Model

FF3FM. Fama and French Three Factor Model

CAPM: Capital asset Pricing Model

JSE: Johannesburg Stock Exchange

APT: Arbitrage Pricing Theory

Chapter 1: Introduction to the Research Problem

1.1 Research Title

The performance of an optimised blend of quality metrics against the JSE All-Share Index

1.2 Research Problem

This research paper seeks to establish if firms with an optimised blend of quality metrics will outperform the JSE Allshare Index. Facets of quality as well as its relevance and appropriateness as an investment strategy will be explored in the literature review. The optimal blend of quality metrics will then be distilled into an optimised blend whose performance will be measured against the All-Share Index to understand if this investment style can produce excess returns. This research has global relevance but will be presented in the South African context.

1.1 Background to the Research

The apex goal for investors is to accurately predict which shares to buy and sell to maximise returns. Over the years' many models and strategies have been developed in pursuit of this exceptionally elusive goal. Investors: aided by the findings of academics have expended significant resources and time in their quest for market beating returns.

The Efficient Market Hypothesis (EMH) as characterised by (Fama, Effecient Markets: A Review of Theory and Empirical Work , 1970); one of the most prominent market theories rules out this possibility in its strong form. EMH states that the price of a share already takes all publicly and privately available information into account meaning that it is impossible to generate excess returns to those of the market. The implication therefore is that stock prices are as likely to increase as they are to decrease. Over the years, however, several anomalies to EMH have been observed (Banz, 1981) (Jensen, 1978).

These anomalies have given rise to several other investment strategies and styles such as the Capital Asset Pricing Model (CAPM); Value; Growth; Fama and French

Three and Five Factor Models, Arbitrage Pricing Theory, momentum; and Quality to name a few.

The theories developed in pursuit of predicting excess returns on stock exchanges have difficulty in capturing the actual behaviour of asset prices because several patterns in stock returns conflict with the theories (Basiewicz & Auret, 2010).

An investment style is an investment belief held by investors who believe that pursuing it will yield positive results (Muller & Ward,2013). Investors use a style-based approach to with the objective of outperforming the market (Muller & Ward, 2013).

Investors that had put investment portfolios together along the lines of Value and Growth were disappointed by the results due to the inability of growth portfolios to generate consistent returns and a lack of diversification. This resulted in the concept of quality investing as a diversification to value stocks or as a standalone style. Benjamin Graham, considered the father of value investing is famous for selecting stocks on the basis of valuation metrics however he did not believe in buying cheap stocks instead ascribing to the notion that one must buy high quality stocks for a low price (Novy-Marx, 2014).

1.3 Business Rationale for the Study

Founded in 1887; The Johannesburg Stock Exchange (JSE) is the largest stock exchange on the African continent with approximately 400 listed companies. It is the engine room of the South African economy because it directs cash resources into industrious economic activities while creating jobs and wealth (Chen, 2023).

The JSE is also subject to the political environment as was seen when the Minister of Finance was replaced without warning in 2015 and again in 2017 which negatively impacted the stock exchange. The outbreak of the coronavirus and subsequent lockdowns of 2020 also wreaked havoc on global markets and the JSE was not spared. By the middle of April 2020, a mere two weeks after the lockdown was implemented; the All-Share Index had lost R2.3 trillion in value (Muthu & Wesson, 2023).

Investors and fund managers use procedures or styles in the pursuit of maximum returns that outstrip the market (Muller & Ward, 2013). Style variables were found to have a significant correlation with cross-sectional equity returns and could be used to accurately predict returns (Cronje, 2019).

Quality is a coherent investment style because high quality companies are those that are strong, profitable, and consistent. They are firms that have weathered many storms and demonstrated that they can survive tough periods and grow during bountiful periods (NASDAQ, 2023). Warren Buffett (1990); the most famous quality investor of all time; is quoted as saying: “It is better to buy a good company at a fair price than a fair company at a good price.”

Quality companies are more likely to experience positive corporate occurances and are able to maintain superior profitability for protracted periods relative to the market. This was demonstrated during the dot com bust of the early 2000’s where the traditional growth stocks performed terribly (Novy-Marx, 2014).

Quality is a more methodical and predictable investment approach that avoids the disappointment associated with glamorous growth stocks because quality stocks generate a return that surpasses the market with lower relative risk (Schroders QEP, 2023). The advantage of a Quality investment style is that it is multi-faceted, and its elements can be found in every sector is both developed and developing markets. This style offers the promise of higher returns paired with lower risk because quality companies carry lower absolute volatility which generates compounding benefits over multiple periods with lower risk of loss.

Ultimately, the argument for quality is about value for money. If two shares have the same relative price but one has a higher quality earnings; the one with higher earnings is likely to give you higher returns in the future (Smart, 2023). Because quality firms generate more cash; they can maintain higher dividend growth whilst servicing their debts. This arms them with cash for investments in projects that deliver substantial returns fuelling sustainable growth.

Investors have a tendency to overpay for Growth stocks as part of the “lottery effect” where they take on additional risk with the expectation a high future payout. This can

cause Growth stocks to outperform companies with stronger fundamentals in the short term however this does not often endure in the long term (Tuscaldo, 2022). In contrast, quality investing promises sustained performance across different market conditions in the long term.

Quality companies outperform the market in good times but lead when the market is falling; there is a skew in the performance because they do not lose the outperformance when the market is rising. Quality companies perform at the same level as the market when Value stocks are leading but outperform the market 75% of the time when Growth stocks are leading. An investment portfolio based on quality exhibits lower beta and volatility than the market (Schroders QEP, 2023).

Banz (1981) found that CAPM was susceptible to size effects in that it underestimates the returns on small stocks and overestimates those on large stocks. Fama and French (1992) observed that CAPM had limited ability in explaining the cross-sectional variation in equity returns. Khathutshelo (2021) posits that numerous subsequent studies have confirmed that the performance record of CAPM is weak enough to invalidate its current use.

1.4 Theoretical Relevance for the Study

This study will analyse the literature on Quality as an investment style; define the most appropriate quality metrics are and then analyse historical JSE Data to confirm if firms with superior quality metrics indeed outperform the JSE.

The traditional equity factors are all well-defined and have commonly accepted definitions that are agreed upon by academics and practitioners. Income, equity, assets, cash flow and accruals are based on stock market data and are intuitive by nature. Slight variations may exist; however, there is consensus. Quality however does not enjoy the same universality because it is not rooted in financial statements. Academic researchers have tried to whittle quality down into a single systematic metric to avoid the interactions from combinations of factors. (Sloan, 1996) defined it based on accruals, (Novy-Marx, 2014) used gross profitability and (Xing, 2008) based his definition on investment growth.

Previous studies by Muller & Ward (2013) studied style effects on the JSE looking at the performance of shares based on momentum; earnings; price to book; cash flow to price; liquidity; return on capital (ROC); return on equity (ROE) and interest cover. Viljoen (2016) studied investor sentiment and residual momentum as an investment style. Khathutshelo (2021) and du Pisanie, (2018) observed the effect of the Fama and French five factor asset pricing model on the JSE. Cronje (2019) investigated if it was possible to generate excess returns when using tax evasion as an investment style on the JSE.

To date, no research on the specific parameter of quality has been conducted on the JSE. This research will highlight the literature around style investing, asset pricing models and the concept of quality as an investment style. It will then outline the research methodology and conduct a statistical analysis to confirm if quality indeed outperforms the JSE All Share Index.

1.5 Purpose Statement

This research aims to ascertain if an optimised set of quality metrics of JSE (Johannesburg Stock exchange) listed companies will outperform the All - Share Index.

1.6 Contribution of the Study

It is well established that the past behaviour of stocks is not a predictor of future performance and that stock markets are inherently volatile and complex. The premise of this is that none of the existing asset pricing models can perfectly discern the drivers of share performance however as we gain more understanding, we can make better informed decisions.

This research will document the relationship between quality and portfolio performance and contribute to understanding of quality metrics in investment making decisions. The research findings are relevant in both a local and global context as it relates to academic research on effective investment styles.

The study will contribute to the body of knowledge attempting to explain and predict the performance of the JSE.

Chapter 2: Literature Review

2.1 Introduction

Fama and French's (1970) Efficient Market Hypothesis (EMH) sets out that a market is efficient when share prices are reflective of all the available data and that it is impossible to produce returns excess to that of the market (Jensen, 1978). EMH became the pre-eminent market theory of its day; however, as the years went by, anomalies to EMH were found to exist (Banz, 1981; Jensen 1978)

To understand the anomalies; one must understand the different forms of EMH:

- Strong form efficiency is when the prices respond efficiently to information; even that which is not publicly available.
- Semi strong form efficiency is when all publicly available information is reflected in the market price.
- Weak form efficiency is when only historical price information is reflected in the share price.

The convolution with the testing of the market anomalies is the joint hypothesis problem wherein market efficiency can only be determined using models that also test for the Capital Asset Pricing Model (CAPM) and it is not possible to tell whether it is CAPM or EMH that has been disproved (Khathutshelo, 2021). Further to this, Viljoen (2016) argues that evidence of anolomous behaviour could point to the market model being incomplete and not neccesarily market ineffeciency. The existence of the anomalies to the market therefore provide opportunities for investors to generate profits that are greater then the markets.

The presence of strong form EMH means that no excess profits can be generated through any means. Semi-strong EMH means that excess profits can only be generated if an investor is privy to material non-public information. Weak form EMH means that investors can easily generate excess returns. The practicality of anomalies in financial markets is that they provide opportunities for investors to generate excess profits. Understanding market effeciency and market anomalies is therefore important to any active investor.

A great amount if intellectual effort has gone into the developmetnt of asset pricing models that can generate market beating returns however to date none has found to be accurate. Although asset pricing models have improved; it is to be noted that market performance is affected by many variables such as geopolitical matters, macroeconomic conditions, market behaviour, investor sentiment and many others. Anderson, Chowdhury, & Uddin (2021) posit that macroeconomic conditions affect firm prices through changes in liquidity, effeciency, financing and capital structures and cash flow.

2.2 The performance of the JSE

Plentiful previous studies have been conducted on the performance JSE and how its performance is affected by external factors. Heymans & Santana (2018) used the Chow Denning joint variance ratio, an automatic variance ratio test, and the joint sign test and established that the JSE is weak form efficient. They found that the indices in the JSE moved from periods of efficiency to periods of relative unpredictability. The indices with older companies displayed greater efficiency than those with younger less established companies.

Msindo (2015) used a Granger causality, impluse response function and variance decomposition to study the effects of the interest rate on the JSE. The findings were that the interest rate did not have a significant influence on the returns of the JSE and that interest rates were not an precise indicator of returns on the JSE. In the same vein; Mpofu (2011) investigated the presence of a relationship between the JSE and macroeconomic conditions in South Africa. In the era of globalisation; exchange rates have come to be more significant in influencing stock prices. The macroeconomic variables considered were industrial and mining indices, the prime interest rate, the exchange rate of the Rand to the US Dollar and total returns on the JSE. The findings were that the correlation between the variables is statistically significant. The mining index was discovered to have a non-significant positive correlation to the JSE.

Oberholzer & von Boetticher (2015) looked to see if the volatility of the South African Rand affected the five main indices on the JSE. The indices studied were the Top 40, Mid-cap, Small-Cap, All-Share and the Fledgling from 2002 to 2014. The data used were daily share closing prices. The outcome of the research was that the the Rand

showed more volatility to market shocks when compared to the All-Share, Top 40 and the Mid-Cap Indices. It showed less volatility than the Small-Cap and the Fledgling Indices.

de Beer, Keyser, & van der Merwe (2015) took it a step further and analysed the impact of political and economic developments have affected returns on the JSE from its founding in 1887 until 1994. They found that macroeconomic and political shifts were reflected on the JSE. Historical events such as the Shareville massacre, Apartheid sanctions and the political developments of the early 1990's that culminated in freedom in 1994 affected the JSE. Before 1994, the JSE was anomalous from other exchanges becayse the country faced restrictions on capital outflows, oil embargoes, investment and trade sanctions and dual exchange rates (Oberholzer & von Boetticher, 2015).

Muller & Ward (2016) studied the implied growth rate on the valuation of JSE listed companies. They reverse engineered the discounted cash flow (DCF) equation to calculate the markets implied terminal growth rate using financial statements and the market capitalisation of the top listed companies from the years 1980 to 2015. The findings of the research were that the values used in textbooks and by practitioners are too low and established that higher values should be employed.

Pillay (2020) explored the optimal autoregressive integrated moving average (ARIMA) for predicting future returns on the JSE and found that the ARIMA 4.1.4 was the most stable and suitable for forecasting stock price indices. This was done using a three-step iterative quantitative approach. In a study by Sigauke (2016) the volatility of the JSE All Share Index was studied from 2002 to 2013. Its inherent risk was estimated using a Bayesian Autoregressive Moving Average Generalised Autoregressive Conditional Heteroskedasticity (BARMA-GARCH). The findings of this research were that the BARMA-GARCH-t model captures the conditional and unconditional volatilities of the All-share Index and provide an improved fit to the data than the ARMA -GARCH-t benchmark model.

Viljoen (2016) studied the effects of residual momentum and investor sentiment and found that significant excess returns could be generated using both residual and conventional momentum. The research also determined the most favourable

formation and holding periods of stock portfolios on the JSE. The data proved that a momentum investment strategy would generate superior performance, but caution is to be applied as it is predisposed to experiencing catastrophic losses. A strategy of residual momentum only slightly reduces that risk. Investor sentiment was also found to affect returns of the residual and conventional momentum investment styles.

Cronje (2019) studied the viability of tax evasion as an investment style and found that from the years 2002 to 2019; firms with higher tax evasion did not produce greater returns. Among the reasons for these findings was that tax avoidance increased financial complexity and firms with low tax liabilities had greater analyst forecast dispersion and forecast errors. The results established that tax avoidance levels do not need to be considered when investing.

Khathutshelo (2021) undertook a study to find out if the Fama and French 5 Factor model (FF5FM) was a better tool for predicting future stock returns than the Fama and French 3 Factor model (FF3FM) and (Capital Asset Pricing Model) CAPM on the JSE. The result of that research was that profitability was a more dependable feature than investment in explaining stock returns and that the FF5FM performed better than the other two models in predicting returns. The caveat to this is that the holding period is shorter than 16 years. The test results went on to reject the hypothesis that the value factor becomes outmoded in explaning stock returns when more factors are included in the calculation of FF5FM.

Basiewicz & Auret (2010) tested the feasibility of FF3FM on the JSE against the CAPM and the two factor Arbitrage Pricing Theory (APT). Their study found that FF3FM captured a large amount of time series variation in most assets and yielded only small pricing errors. When testing ungrouped data; the FF3FM was able to explain the value effect and was moderately successful in explaining the value effect. CAPM and APT were found to be less successful in explaining the impact of size and value effects on the JSE.

Muller & Ward (2013) studied investment styles on the JSE from 2007 to 2011 and found that a momentum based investment strategy bore improved results to the market and outperformed the All-Share Index. They also found that a combination of cash-flow to price, momentum, return on capital (ROC), and earnings yield gave the

best overall outcome. A small size effect was not evident in the presented data.This study will build on past research on the JSE by adding quality as an investment style that can be employed to beat the market.

Hoffman (2012) explored stock market anomalies on the JSE using the variables of market capitalisation, book to market equity ratio, momentum, equity ratio, growth in assets, share issues and, yield to book equity ratio. The study was taken from 1985 to 2010 and the findings were that the anolomous behaviour of the JSE is similar to that found on the NYSE by Fama and French and that even after accounting for risk some anolomous behaviour that cannot be explained is still present.

2.3 Asset Pricing Theories

2.3.1 Introduction

Asset pricing theories pertain to how assets are valued at given risk levels and market conditions. The Capital Asset Pricing Model (CAPM), Fama and French's Five (FF5FM) and Three (FF3FM) factor models and APT (Arbitrage Pricing Theory) are just a few of the most ubiquitous asset pricing models. In a free economy, the forces of demand and supply are a determining factor to the prices of assets (Mpofu 2011

2.3.2 Fama and French Three Factor Model (FF3FM)

Fama and French's three-factor pricing model uses market size, book to market values and excess returns to estimate asset returns. According to Khathutshelo (2021) it was found to be better at explaining return variations than CAPM and adressed the incongruities that arose from size and value factors.

In recent years it has fallen out of favour with investors because the information required is costly to collect and it is not better than CAPM in every instance. The model is also criticized for not having a clear theoretical underpinning in addition to the absence of an answer as to why size and value are representations for risk. FF3FM also fails to explain the momentum effect which is observed in many markets (Khathutshelo, 2021).

Daniel & Titman (1997) further argue that it Is not the covariance structure that explains the cross section of stock returns but characteristics such as behavioural

predispositions and liquidity. This criticism is based on the fact that Fama and French consider size and BE/ME as factors of risk whilst Daniel & Titman (1997) consider them to be mispricing by investors.

Other critics of FF3FM pointed to survivorship bias being the reason for its apparent success (Faff, 2005); a study by (Teh & Lau, 2017) argued that the monthly sampling interval is what gave rise to the size effect and the domination of the impact of beta in cross section tests. These and other findings resulted in the development of the Fama and French five-factor model (FF5FM) in 2015 which extended FF3FM to include profitability and investment patterns.

2.3.3 Fama and French Five Factor Model (FF5FM)

Fama and French went on to develop the five factor model because the previous model did not account for the disparities observed in average returns related to profitability and investment. FF5FM is better than FF3FM at illuminating the reasons for the expected returns based on the fact that when the profitability and investment patters of a firm are included, the value factor becomes redundant (Basiewicz & Auret, 2010). Another key factor was the dividend discount model that indicated that profitability and investment are related to average returns.

Blitz et.al (2018) found that the FF5FM still has significant shortcomings. The primary one is that the it retains the relationship between market returns and beta in spite of enourmous indications that the relationship between beta and returns is flat and sometimes even negative. The robustness of the new factors has also been called into question; it is uncertain whether profitability and investment are effective or if they are clearly defined for some asset classes (DuPisanie, 2018). The economic rationale for including these additional factors is also not clear; profitability and investments imply higher returns however it is not clear if these are due to higher risk or mispricing. The last concern around FF5FM is that it has not settled the asset pricing debate or created consensus amongst investors.

FF5FM still ignores the affect of momentum in favour of profitability. (Azam & Naveed, 2021) found that momentum is too important to ignore and augmented FF5FM with momentum and liquidity to create a seven factor model. The results of their research

that was conducted in Pakistan was that value is not redundant and that momentum and liquidity are essential elements which were found to outperform the FF5FM on its own.

A study by Caciki & Zaremba (2021) found that the value, profitability and investment factors are far less dependable than previously believed and that the outcome relies heavily on the geography and the time horizon in question. Further to this; they found that only the smallest firms drove the biggest factor returns and practically no value or investment effects exist amongst large firms. Given that small firms are typically excluded from the investment horizons of institutional investors; the findings bring to question the pertinence of FF5FM's in international markets.

2.3.4 Capital Asset Pricing Model (CAPM)

CAPM is one of the most extensively employed asset pricing models in the world. Its premise is that riskier stocks generate superior returns. The amount of risk on a stock is represented by beta which is the amount of fluctuation in the price of the stock. Beta is measured against the relative risk in the rest of the market. CAPM assumes a undeviating relationship between the required return on investment and the level of risk (Yu, 2012).

CAPM is based on the following assumptions (Msindo, 2015):

1. Investors are single period risk averse
2. Mean and variance are employed in selecting optimal portfolios
3. Transaction costs and taxes are negligible
4. Investors all have the same view of returns
5. Lending and borrowing are concluded at a specified risk free rate

Roll's critique posists that it is impossible to accurately test CAPM because the market portfolio is never precisely recognised. One of the key variables of CAPM is a truly diversified portfolio however it was argued by Richard Roll that a truly diversified market portfolio is not possible unless it includes every investment in every market and every commodity or item of marketable value (Kenton, 2023).

(Kenton, 2023) states that the assumptions of CAPM are impractical and have been found to not hold up in reality. The inclusion of beta supposes that risk can be computed by the stock's volatility however price movements whether up or down do not hold equal risk. Furthermore; the look-back period for detirmining volatility is not universal because stock yields and risk are not normally distributed. In addition, the calculation for CAPM is very sensitive to small changes to its inputs (Perold, 2006).

Banz (1981) studied the association between stock yields and market value using CAPM and discovered that smaller firms have greater risk-adjusted returns than large ones. They also observed a pronounced effect in small firms. His study found that CAPM is misspecified and that the size effect is triggered by the misspecification of the model and not due to market ineffeciency.

Despite its issues, CAPM is still widely used alongside Modern Portfolio Theory to understand risk and expected returns because it is simple and allows for the easy comparison of investment opportunities (Teh & Lau, 2017).

2.3.5 Arbitrage Pricing Theory (APT)

The APT model was established as an substitute for CAPM. It is based on the premise that a linear association exists between expected stock yields and macroeconomic variables. The underlying assumption of APT is that markets are not efficient and investors are able to take advantage of the deviations from market value before the market has time to correct to fair value.

It Is founded on the below conventions (Yu, 2012):

1. Investors are averse to risk
2. Capital markets are seamlessly competitive
3. Investors all have the same view of the market
4. Returns can be elucidated through a linear blend of variables
5. Investors prefer higher returns

APT also uses beta to estimate risk however unlike CAPM beta is calculated using the linear regression of historical securities returns (Hayes, 2020). APT is a lot more difficult to calculate than CAPM because it considers multiple factors and it is difficult

to calculate how sensitive a stock is to movements in macroeconomic variables. Systematic risk in APT cannot be reduced by diversification (Hayes, 2020).

APT is comprehensive and not prescriptive on the quantity of macroeconomic aspects that can be considered. This means that investors will reach different results depending on the number of factors selected. It is however advised that the calculation should include elements that influence cash flows and discount rates using statistical and structural methods. The statistical methods can produce factors that are interpretable or those that that have no meaning. The structural methods are based on fundamental economic associations (Elshqirat, 2019).

The factors found to produce the most persistent returns are gross national product (GNP), shifts in the yield curve, sudden shifts in inflation and amd corporate bond spreads (Hayes, 2020).

2.3.6 Piotrosky F-Score

Another commonly used model for predicting stock returns of value stocks is Piotrosky's F-Score. The F-score does not consider explicit values but it considers the movement of the fundamentals and the general financial health of firms. It is made up of nine binary variables that are clustered into three dimensions of company strength: profitability, operating effeciency and the health of the balance sheet. (Mohr, 2016). The F-score uses a simple, intuitive construction makes it an ideal asset management tool.

Profitability is measured by the upward trend of return on assets in the current period compared to the last one, positive cash flow from operations, positive net income, and cash flow from operations exceeding net income- also known as positive accruals. This indicates a firm's ability to produce capital internally which is useful during periods when most other stocks are distressed.

Company health is measured by the downward trend of long term debt, a higher current ratio and no new shares having been issued in this period.

Effeciency is measured by the upward trends of the gross margin and asset turnover ratios from the previous period.

The Piotrosky F-Score is efficient at seperating the best value stocks from the rest. Mohr (2016) stated that value stocks with higher F-Scores outperfromed others during times of economic deterioration, this was tested on value stocks during the Great Depression and the post-2007 Global Financial Crisis. His research tested Piotrosky's F-score on stocks in the Eurozone by buying high f-core stocks and shorting those that score lower. The outcome was that this strategy yielded positive results.

Gimeno, Loban, & Vicente (2020) state that the F-score has some limitations: The binary approach to accounting data is too simple to accurately reflect the position of the company. One has to consider the magnitude of the increase or dicrease of the data under review. The second criticism is that no correlation exists between the accounting data under review. They took a neural approach to overcome the limitations and were able to generat reliable portfolios of firms with high Book to Market (BM) ratios in the US and Eurozone.

Walkshausl (2020) states that the F-score has been used in various applications such as being applied to predicting future firm profitability, the demand from institutional investors and, testing how fundamental information is incorporated into the pricing of shares. It has further demonstrated that investors expectation errors are reduced regarding a firms fundamental strength when proxied by the F-score because the value and momentum premiums increase and contribute to clarifying these anomalies. Walkshausl (2020) studied the returns of firms based on their F-scores and found that when used alone the F-score is an economically consequential and statistically significant preditor of cross-sectional returns. The findings were the same in the US and emerging markets and were persistent across large and small firms. The F-score proved significant when benchmarked against the market.

Anderson, Chowdhury, & Uddin (2021) studied the effects of changes in the macroeconomic environment on the F-score and found that macroeconomic conditions have a statistically significant impact on the F-score and that during contractionary periods the macroeconomic operating environment has a greater impact on stock prices than firm-level variables do. Their conclusion was that investors should exercise caution when applying the F-score in differing macroeconomic conditions.

2.4 Style Investing

One of the most pre-eminent elements of human conception is the cataloguing and categorization of similar items together. Humans group each other based on appearance and social standing. The classification of objects is also observed in financial markets. Investors categorise assets into classes based on their characteristics and decide how to allocate their funds across the various classes of assets. These asset classes are sometimes referred to as styles and the process of apportioning funds between the various styles is called style investing (Barberis & Shleifer, 2003).

Style investing is attributed with aiding in the prediction of stock performance and has augmented favourable investor yields (Wahal & Yavuz, 2013). A study of investment styles along the value and growth grids utilising the Fama and Macbeth regressions of future stock returns on size, book to market ratios and past stock returns and past style returns found that between 1965 and 2009 style investment strategies predicted stock returns accurately (Wahal & Yavuz, 2013).

Assets in a particular style exhibit the same characteristics; some are based in origin (e.g., government bonds); capitalisation (e.g., small/large cap stocks); or fundamentals (e.g., Real estate Investment Trusts). Styles can be static like government bonds whilst others come and go as technology changes. New styles appear when innovation happens or when investors perceive the superior performance of a specific group of stocks with some characteristics. Styles that consistently underperform the market cease to exist after some time. The premise behind style investing is that it is possible to classify features of firms that are indicators of financial performance (DuPisanie, 2018).

Modern Portfolio theory (MPT); presented by Harry Markowitz in 1952 offers scientific proof that a differentiated financial portfolio is less volatile than the sum of its individual parts. In his publication he posisted that risk averse investors can create stock portfolios to optimise or maximise returns at a given risk level (Elton & Gruber, 1997). This is based on the premise that higher risk is an inherent part of attaining higher rewards. The takeaway is that an asset's risk and return should not be viewed

independantly but viewed based on its contribution to the general portfolios risks and returns (Fabozzi , Gupta, & Markowitz, 2002).

Creating a portfolio of stocks should theoretically reduce the general risk of any one stock in the portfolio. The more differentiated the stocks in the portfolio, the less risk it should carry. MPT is a framework for the construction of portfolios that attempts to deliver maximum returns at a given level of risk (Elton & Gruber, 1997). It assumes that given the choice between two portfolios offering the same returns they investors would select the one with less risk. MPT is not perfect and has been criticised for assuming that that returns follow a Gaussian distribution; proposing a stable distribution instead. Despite the criticisms; MPT did provide the underpinning for the development of future asset pricing models (Fabozzi, 1998).

Barberis & Shleifer (2003) point out that there are at least two reasons why investors would utilise style investing. The first reason is that categorising stocks simplifies the problems of selection and allows the efficient processing of large amounts of data. Allocating funds across a handful of styles is less intimidating than selecting from hundreds of listed companies. The second reason is that categories allow investors to evaluate the performance of professional money managers because a style automatically creates a peer group of managers. Style investing allows investors to apply methodical rules of portfolio allocation. Institutional investors are particularly attracted to style investing as they are obligated follow systematic portfolio allocation rules and it is perhaps for this reason that as institutional investors have grown, style investing has grown in parallel.

Barberis & Shleifer (2003) highlights that price dependant styles experience a change in their composition. When trader’s kick-off an upswing in the price of small stocks relative to their fundamentals, they purchase the stocks, pushing the price up thereby attracting more traders and so forth. After a period, the price of the small stock has gone up so much that it can no longer be considered a small stock and is removed from that style.

2.5 Quality Investing

The literature on the definition of quality is not unanimous. Lepetit, Cherief, Ly, & Sekine (2021) confirm that out of all the equity factors it has the weakest consensus. The reason for this is that quality is based entirely on financial reporting data where other equity factors rely on a mix of market and financial data. Accounting records contain such a breadth of information that can be combined in any number of ways that the scope of possibilities. They further posit that it is unrealistic to attempt to capture the complexity of quality into a single metric because it is multifaceted and can only be addressed through a multidimensional approach.

Measures of quality have been derived through qualitative measures and from fundamental quantitative approaches. In the early years, quality was measured along the lines of financial metrics, management capability, competitive advantage, and moats; however, modern quality measures include (Environmental, Social and Governance) ESG, sustainability, corporate governance as well as business strategy and execution (NASDAQ, 2023). What is common among measures of quality is that they all broadly track profitability, stability, and financial strength. Asness, Frazzani, & Pederson (2018) defined quality as the characteristics that investors are willing to pay a higher price for in a given set of circumstances.

Lepetit, Cherief, Ly, & Sekine (2021) point out that investors do have consensus on the existence of a quality premium; however, there are two schools of thought in terms of defining it. On one side there is a purely academic approach which focuses on the largest possible universe and the longest historical data. On the other side, quality is divided into different components that are treated independently of each other. The multidimensionality of quality makes it difficult to provide a unified explanation of the quality premium. Furthermore, the researchers believe that the quality premium is a combination of both risk factors and behavioural bias.

S&P Capital IQ has provided a quality ranking based on earnings and dividend referred to as Quality rankings since 1956. This ranking reflects the long-term growth and stability of a company's earnings and dividends. They found that portfolios with the highest ranked stocks underperformed portfolios with middle ranked stocks in a bear market. Between the years 1985 and 2005 high quality stocks outperformed the

S&P 500 and from 2007 to 2009 during a bull market the high-quality stocks underperformed (Tortoriello & Kallu, 2012).

Tortoriello & Kallu's (2012) research found that high quality stocks have greater liquidity, larger market value and higher average price per share and exhibit high stability over time. Demonstrating that a quality investment style can be employed in pursuit of excess returns.

Ng & Shen (2020) explored the performance of quality outside of the US. They constructed share portfolios along the lines of quality using the F-score and gross profitability as indicators of quality. The subjects of the study were the markets of Hong Kong, South Korea, Japan, Taiwan and Singapore. These markets were selected because they attract international professional investors and the markets are mature. The performance of the portfolios was monitored from 2006 to 2016 and the findings were that quality stocks are associated with superior returns.

Gopani (2022) found that higher quality portfolios outperformed the market consistently in India over the long term. Even in periods of extreme volatility quality performed better: US sovereign rating downgrade in 2011, taper tantrum in 2013, the Eurozone debt crisis and economic downturn of China in 2015 and the Covid-19 panedmic in 2020.

The S&P Capital Quality ranking captures both stability of earnings and long term growth. They recognise that a company's perfromance and dividend distribution result form a variety of factors such as demand for the company's products and services, the company's research and development, marketing, industry competiiton, executive skill, competitive advantage and capital investment policies (Tortoriello & Kallu, 2012).

The NASDAQ screens for quality using a using a quality composite which combines return on equity; return on total capital; gross margin; net margin and the consistency of sales and earnings. Blackrock's iShares MSCI USA Quality factor ETF; $SQUAL tracks quality firms along the parameters of: ROE, Stable earnings growth and financial leverage (Smart, 2023).

Schroders QEP (2023) defines quality companies as those exhibiting: High profitability; particularly return on equity, cash flow; profit margins; consistent growth; stability of cash flows; earnings and sales and financial strength.

MSCI measures quality on high return on equity, stable year on year earnings and low financial leverage (Gopani, 2022). Some investors measure quality using qualitative measures such as market positioning, economic moats, business models, management quality and so forth (Gopani, 2022).

Lepetit, Cherief, Ly, & Sekine (2021) state that the choice of metrics in defining quality and constructing portfolios is paramount. Some metrics have been the subject of a vast amount of academic research and repeatedly delivered returns however they may have lost their ability to do so or may not be as relevant in a given market or time period. They go on to say that investors should always keep in mind that in agiven dimension not all metrics are equal and should be carefully selected.

Lepetit, Cherief, Ly, & Sekine (2021) believe that quality is multi-faceted and focused on a number of metrics for quality as selecting only one would exclude a wide array of quality factors. Assessing quality under the paradigm of profitablity alone would be misleading as it would not provide a measure of leverage or the quality of its earnings. They further state that only quality measures that have been subject to extensive academic research proving that they can accurately produce excess returns should be used. Their paper shortlists eight measures of quality in the realms of of profitability, investment, safety and earnings.

Considering the different dimensions of quality into account; profitability produces the highest returns and is the most consistent company characteristics. Stability and financial strength can be more episodic as they are rewarded during economic downturns or periods of increasing risk aversion. Each component of quality is measured by two metrics to lower the possibility of misclassifying the stocks. The metrics were kept to those that show empirical support for producing benefits to investors.

Asness, Frazzani, & Pederson (2018) coined the “quality minus junk’ methodology of betting on quality stocks and shorting “junk” stocks. They based their definition of

quality on profitability, growth over the previous five years, and safety which was based on beta. They found that this strategy earned significant risk-adjusted returns in the US and 24 other territories. van Reenen (2021) tested ‘quality minus junk on the JSE using a Fama Macbeth regression and found that the strategy did provide statistically significant excess returns however small. The findings were that ‘quality minus junk’ captured more returns than other established factor variables on the JSE.

Chapter 3: Research Questions and Hypothesis

The research question will address whether it is possible to generate excess returns by using an investment style based on an optimised blend of quality metrics. The quality metrics were used to rank firms and formulate an average ranking; this was compared to the All-Share Index to see if it would outperform it.

The research questions and hypotheses are as follows:

Question 1: Is there a significant difference in the returns of style-based portfolios that are based on quality metrics and is there persistence in their returns?

Hypothesis 1

H0: There is no significant difference between the performance of the style-based portfolios based on quality at a 5% level of significance.

H1: There is a significant difference between the performance of the style-based portfolios based on quality at a 5% level of significance.

Hypothesis 1 can be expressed as follows:

$H1_{Null}: \mu_{portfolio1, style} = \mu_{Portfolio2\ style} = \mu_{Portfolio3, style} = \mu_{Portfolio4, style} = \mu_{Portfolio5, style}$

$H1_{Alternativel}: \mu_{portfolio1, style} \neq \mu_{Portfolio2\ style} \neq \mu_{Portfolio3, style} \neq \mu_{Portfolio4, style} \neq \mu_{Portfolio5, style}$

H1 suggests that a ranking exists but does not determine the ranking.

Question 2: Is there persistence in returns when comparing returns of the best and worst performing portfolios?

Hypothesis 2

H0: There is no significant difference between the highest ranked portfolio and the lowest ranked portfolio at a 5% level of significance.

H1: There is a significant difference between the highest ranked portfolio and the lowest ranked portfolio at a 5% level of significance.

Hypothesis 2 can be expressed as follows:

$H2_{Null}: \mu_{Highest\ ranked\ portfolio, style} = \mu_{Worst\ ranked, style}$

$H2_{Alternative}: \mu_{Highest\ ranked\ portfolio, style} \neq \mu_{Worst\ ranked, style}$

Question 3: Is there persistence in the returns of the of the best performing portfolio and the returns of the benchmark. Are the results significantly different and would such a style outperform the market? Persistence of returns will be demonstrated by the gradient of the price relative.

Hypothesis 3

H0: There is no significant difference between the highest ranked portfolio and the benchmark at a 5% level of significance.

H1: There is a significant difference between the highest ranked portfolio and the benchmark at a 5% level of significance.

Hypothesis 3 can be expressed as follows:

$H3_{Null}: \mu_{Highest\ ranked\ portfolio, style} = \mu_{Market\ portfolio, style}$

$H3_{Alternative}: \mu_{Highest\ ranked\ portfolio, style} \neq \mu_{Market\ portfolio, style}$

Where:

- Portfolio1; Portfolio2; Portfolio3; Portfolio4 and Portfolio5 represented the style-based portfolios.
- Market Portfolio represented the returns of the All160
- Style represented the level of quality as a style variable.

Chapter 4: Research Methodology

4.1 Introduction

The methodology for this research was based on the research on investment styles previously employed by Muller & Ward (2013). Their paper examined the effects of style-based investment strategies on the performance of listed shares in the prediction of company returns. The portfolio time series methodology applied in their paper was applied for this research as was their StyleEngine software.

4.2 Research Design

Research design is the strategy employed to collect data, subjects and the testing of hypotheses. The research was designed to determine there was an empirical association between quality metrics and returns and if the investment style outperformed the market. The selected methodology for this study was quantitative as financial data from stock markets lends itself to quantitative analysis (Viljoen, 2016).

The methodology was quantitative, deductive, explanatory and quasi experimental. The concepts of quality and the selected quality metrics were well defined and deduced from the literature thereby making a deductive approach appropriate (Saunders & Lewis , 2018).

Quantitative research uses structured tools to generate numerical outputs and then uses descriptive and inferential statistics to interpret, organise and represent the data. This type of research design is widely used in finance and economics and involves a systematic investigation of observable phenomena through surveys, testing and structured content analysis. The results are then derived using statistical or mathematical techniques obtained over multiple time for the same firms.

The form of quantitative analysis will be a deductive positivist approach. Saunders & Lewis (2018) state that positivist research uses unambiguous and unbiased knowledge and yields pure unbiased data that is not open to interpretation. The concepts of ROA, cash flow, equity issue and accruals are all well-defined and will be construed from the literature, thus making a deductive approach suitable (Saunders & Lewis , 2018).

The research design will be descripto - explanatory. Saunders & Lewis (2018) state that descriptive research should not be thought of as the end but that a subsequent method should be used to explain the results. The explanatory portion of the research will seek to explain the findings.

A quasi-experimental approach was followed as it was not possible to do random unti assignment. The unit of analysis was not suitable for traditional experimental analysis. Due to the lack of randomisation, more thought was applied towards the elemination of alternative causes of the results (Shadish, Cook, & Campbell, 2002)

The advantages of a quasi experimental are (Viljoen, 2016):

1. The external validity of quasi experimental designs could exceed that of traditional randomised experiments as the study used field data rather than simulated laboratory data
2. There was no requirement to gather primary data and the inferences were drawn from secondary data. This was a significant advantage. d

Basiewicz & Auret (2010) state that asset pricing models should ideally be tested on individual securities but statistical considerations force groupings. Performing asset pricing tests on portfolios severly reduces the impact of firm specific risk of mean returns and factor loadings. The formulae used to find standard errors could not be applied when the cross section of assets is large compared to the length of the sample period. Therefore grouping the shares into portfolios allowed for a reduction in the amount of test assets and minimised loss of information.

The results were analysed using the StyleEngine and a graphical representation of the perfromance of the portfolios could be observed. The Compound Annual Growth Rate (CAGR) was calculated and used as a metric for each portfolio. This facilitated a comparison of the portfolios with each other and the benchmark (Cronje, 2019).

4.3 Methodological choice

The methodological choice was a mono method of only one technique will be used to collect data. Secondary data will be collected from JSE databases.

4.4 Research Strategy

The study will be quasi-experimental and will include mixed time horizons because it combines longitudinal data with a cross sectional analysis and continual portfolio re-construction in the pursuit of quantifying and measuring the association between quality and company performance (Sanchez, Bonache, Paz-Aparico, & Obetty, 2021). A quasi-experimental approach is the most suitable for this study because inferences are drawn from the secondary data and there is no gathering of primary data (Sanchez, Bonache, Paz-Aparico, & Obetty, 2021).

The data will be stored in the researcher's Google Drive folder for a period of five years.

4.5 Selection of Quality Metrics

The study blended the quality metrics identified by Piotrosky in terms of their quantitative impact on perfromance. The nine Piotrosky factors were put in the StyleEngine and each one's impact was analysed for the period 1988 to 2005. The output from the StyleEngine was the positive and negative of each factor and the difference between the two. The graph showed the return you would get if you put your money on the positive side of the factor and how much you would get if you put your money in firms with negative factor. The difference between the two illustrated how significant the factor was in terms of predicting returns.

The factors were then weighted in terms of the most significant ones and the portfolios were constructed in terms of the shares ranking and juxtapose the performance of the portfolios against the JSE All Share Index. The portfolios were calculated from 2005 to 2023 to test the perfromance of the factors an circumvent look-ahead bias. The metrics were selected objectively to the different sectors and industries on the JSE.

Table 1 below indicates each factor; its perfomance at the end of the period depending on whether you invested on firms with positive or negative factors and the difference between the two. The last column shows how the shares will be weighted in the portfolios.

The factors were ranked in terms of significance because the greater the difference is between the positive and negative, the greater impact the factor has on perfromance. This strategy would provide the greatest possibility of outperforming the market. The portfolios were created but the capital allocation was skewed towards the firms where the the greatest difference between positive and negative were observed. The allocation was commesurately placed based where the biggest difference between positive and negative could be observed. 23.35 % of the allocation was placed on firms with positive Cash flow, 17.02% was placed on firms with negative equiity issue and so forth as can be seen in Table 1.

Table 2: Weighting of Piotrosky Factors

	negative end	positive end	Positive/Negative	[positive/negative] absolute	Weighting	Weighting %
ROA Positive	0,091	0,195	0,104	0,104	0,14	13,72%
Cash Flow	0,026	0,203	0,177	0,177	0,23	23,35%
Equity Issue	0,31	0,181	-0,129	0,129	0,17	17,02%
Accruals	0,23	0,121	-0,109	0,109	0,14	14,38%
Effeciency Trend	0,173	0,212	0,039	0,039	0,05	5,15%
ROA Trend	0,156	0,237	0,081	0,081	0,11	10,69%
Liquidity Trend	0,218	0,177	-0,041	0,041	0,05	5,41%
Margin Trend	0,173	0,222	0,049	0,049	0,06	6,46%
Leverage Trend	0,204	0,175	-0,029	0,029	0,04	3,83%
TOTAL				**0,758**	**1,00**	**100%**

4.5 Time horizon

The study will analyse the performance of firms with a blend of quality metrics against the JSE All-Share Index longitudinally; over 17-years. A longer period was selected because investor sentiment can profoundly affect short term market performance rather than actual firm performance and health (Dobbs & Koller, 2005). The period from December 2005 to October 2023 will provide exceptional analysis because JSE had reached an all-time high in January 2023 and had dropped to historic lows in 2008. The time-period covers significant bear markets and bull markets and will allow us to see how quality performs under different conditions.

4.6 Population

The population of the study was all the firms on the JSE All Share Index. The index contains the 160 largest companies; and represents 99% of the full market capital

value of the ordinary shares listed on the main board of the JSE (JSE, n.d.). The remaining firms are considered too small and illiquid for consideration by institutional investors (Viljoen, 2016). This is important as the JSE has a large number of exceedingly small shares, and their inclusion would have skewed the data.

4.7 Sampling

Saunders & Lewis (2018) define a sample as a subsection of a group. As discussed in previous sectons; the population of this study included all the firms on the JSE AllShare Index. The remaining firms of the JSE were excluded due to the fact that they are too small and illiquid for institutional investors.

This sampling method is known as a non-probability, purposive sample because it is based on market capitalisation, which is a specific selection criteria. Data from the years' 2005 to 2023 was used.

4.8 Unit of analysis

The unit of analysis was based on monthly cumulative share returns of the respective portfolios. CAGR was used to compare the compounded growth rates for the portfolios against each other and the benchmark. CAGR is a metric that measures the performance of investment portfolios over time – the figure does not represent the actual portfolio growth rate but the consistent growth of the portfolio over the time period. The formula for CAGR is shown below:

Equation 1: Compounded Annual Growth Rate

$$CAGR = \left(\frac{FV}{PV}\right)^{\left(\frac{1}{Years}\right)} - 1$$

4.9 Data Collection

Share prices and firm level financial data were collated and analysed using Muller & Ward (2013) StyleEngine with the owners' permission. This included the historical database of company information compiled from the JSE. The measurement tool was the StyleEngine and updated JSE data that was gleaned from ShareNet and IRESS. The data required for this study were:

Table 3: Data required for analysis.

Income	Used alongside assets to calculate Return on Assets,
Assets	Assets are used to calculate return on assets,
Cash Flow	Cash flow is the amount of cash a firm has and is used to measuring liquidity.
Share Price	The share price is used to calculate the returns and market capitalisation.
Dividends Paid	Dividends are a component of share returns.

As in Muller & Ward (2013); The data included new listings and delistings on a quarterly basis to circumvent survivorship bias. Backward adjustments were made for share splits, name changes or consolidations. For firms that unbundled; the returns of the new subsidiary were combined with those of the original holding company for the remainder of that quarter. Share buybacks and shares awarded to managers as compensation were not included. New listings were included in the upcoming quarter and delisted shares were removed in the subsequent quarter. Dividends were included as they constitute a substantial portion of shareholder returns.

The data was lagged by 3 months to circumvent “look ahead bias”. The share price was indexed in the year that it happened however, financial statements are released up to 3 months later as per JSE regulations.

The data gathered were the opening, low; high and close prices of the JSE All Share Index. For the purpose of this study 33 440 observations will be made.

4.10 Data Analysis approach

Muller & Ward's (2013) StyleEngine and its historical database and proprietary software will be used to facilitate the analysis. The software will allow for the formation of portfolios based on the quality metrics and present the cumulative index of each portfolio over the timeframe to facilitate a visual comparison for the resective portfolios.

The data analysis approach employed was bootstrapping. (Muller & Ward, 2013) found that it is superior to t-tests for this application because no assumption was made regarding the normality of the distribution. In this study, the firms in the population will be ranked based on the selected quality metrics and the average score for a 3-month period was taken to create a quintile or portfolio. The average ranking on all the quality metrics was then used to create an overall ranking and the performance of the portfolios was compared to confirm if firms the highest ranked outperformed the All-Share Index.

The advantages of bootstrapping are that it allowed the researcher to calculate various parameters estimates for each sample and use the distribution of these to create a confidence interval. It was useful for non-parametric distributions where it may have been difficult to calculate these otherwise and it was useful because it is incredibly simple to calculate; did not need the researcher to make assumptions about the data. It also provided accurate estimates of confidence intervals or standard errors of the statistic by accounting for sampling variability and the shape of the distribution (Davison, Hinkley, & Young, 2003).

The hypothesis for research questions one was tested through a Friedman test for multiple comparisons and a Wilcoxon Signed Rank Sum paired t-test for the comparison of portfolios. Questions two and three were tested using the Wilcoxon Signed rank test only. A Friedman test is a non-parametric method of testing three or more matched groups and sometimes called Friedman's two-way ANOVA. It is ideal for repeated measures to determine if a factor affects the sample (Scheff, 2016).

The Friedman test was suitable for this analysis as it does not need the data to be normally distributed for the production of dependable results. The Wilcoxon Rank Sum

t-test was performed post-hoc. This test is used to compare related samples in repeated measures design (Marino, 2018).

4.10.1 StyleEngine and Style Analysis

The analysis required for this research had to be done on the StyleEngine of Muller and Ward with permission from the owners. It is a tool based on Microsoft Excel that uses Virtual Basic for Applications code to access JSE databases and engineer it for the purposes of the research. It allows a researcher to define and select individual or a selection of styles to answer research questions related to style investing.

The outputs of the analysis on the StyleEngine are time series graphs for the visual determination of the times in which a particular style was affective. The time series graph allows for visual demonstration of the impacts of small effects on the portfolio.

The inputs were parameterized to facilitate the required modification thereby allowing the use of various styles. The following data parameters were adjusted:

- Number of portfolios
- Holding periods (three months)
- Months of back data
- Start and end dates
- Quantity of portfolios
- Look back period (three months)

The methodology as adopted from Muller & Ward (2013) involved the construction of five portfolios, also referred to as quintiles. The portfolios were ranked according to the selected style. Every quarter they were reconstructed to maintain the ranking of the styles as the shares fluctuated. The returns from the shares in the portfolio were added to the portfolio and calculated daily, this was used to calculate the portfolios vaue from a base of one. The portfolios were analysed cross sectionally daily for based on their returns (Share price and dividends) in accordance with (Muller & Ward, 2013) methodology. Gividends were included in the abnalysis as they constitute a significant benefit to investors.

The approach used in this paper included plotting the cumulative portfolio values over the respective timeframe allowing for the visual comparison of the portfolios with each other and the All Share Index which served as the benchmark.

4.10.2 Analysis towards Research Question One

The assessment of research question one required a visual comparison of the performances of the five quintiles to establish if there was a distinct and linear order in portfolio performance based on quality. A statistical analysis was then undertaken to confirm the statistical significance of the results.

4.10.3 Analysis towards Research Question Two

Research question two was assessed based on a visual comparison of the performances of the highest and lowest ranking portfolios. This analysis also allowed for an examination of periods of outperformance and underperformance based on the price relative between the highest and lowest ranked portfolios. The gradient of the price relative curve informed the relative performance and its persistence.

4.10.4 Analysis towards Research Question Three

Research question three was assessed based on a visual comparison of the performance of the highest ranked portfolio against the benchmark to establish if a significant difference in returns exists. Like the analysis for research question two, the price relative could be observed, and its gradient informed the relative performance and persistence over time.

4.11 Quality Controls

Secondary data of the JSE is measured consistently, over the same timeframe, and the results are dependable considering that all the firms operate in the same environment. The data sets were deemed to be reliable as they were based on audited financial statements. The researcher assumes that no accounting fraud occurred in the compilation of the financial statements. The data is presumed to be valid as the findings can be generalised and are a true representation of what they intend to measure.

Saunders & Lewis (2018) posit that one of the drawbacks of using secondary data is that the definitions and calculations of the data may have changed during the analysis period. The researcher verified that all the data has had the same calculation methods and definitions for the period.

Historical JSE Index and firm level data are collected for the purposes of market analysis to inform investment decisions which is aligned to the purpose of this research.

4.12 Data Limitations

The availability of a complete set of all the required data sets was a limitation for the researcher. As previously discussed, an updated data set alongside Muller and Ward (2013) StyleEngine was used to perform the research. It was discovered that the data lacked the required information from financial statements for some of the firms in the sample. The missing data points accounted for 3 832 points. The missing data was for listed firms where no information was available for extended periods.

The result of the missing data points was that those specific firms could not be included in the quintiles until data was available again. The missing data was also not capable of being captured manually due to the limited time available to the researcher. The sample taken was fortunately still representative of the population and did not impact the richness of the findings.

4.13 Measurement

The annualised cumulative returns for the for each portfolio and the benchmark were presented graphically for the time period of the study (Muller & Ward 2013). CAGR was also used to measure the cumulative growth rate of the portfolios.

4.14 Limitations to the study

According to (Viljoen, 2016); firm size and value are crucial factors contributing to cross-sectional returns on the JSE. The industry in which a firm operates determines how much it Is affected by macroeconomic conditions. The effects of macroeconomic movements are not consistent for firms in resource and non-resource sectors. For this research, the industry that firms operate in was not included as a factor.

The population definition and sampling only considered the top 164 firms on the JSE, this may have posed a threat due to subject selection (Saunders & Lewis , 2018). However, this methodology had been followed by other researchers as small, illiquid stocks could confound the results (Muller & Ward, 2013; Viljoen, 2016).

Transaction costs were ignored as the researcher assumed that they were negligible and the same across all the portfolios that were created.

The measurement instrument analysed monthly returns. The results of the research may have been different if annual results had been taken into account. The portfolios were weighed according to the the sensitivity of the quality metrics on perfromance and different portfolio weightings may have yielded different results.

The study drew from South African and international literature to analyse the JSE however; the conditons elswhere in the world could be completely different. Any extrapolations made only applied to the JSE. The results were be obtained from historical data and the findings should be considered holitstically and not applied to future investment strategies without applying caution. (Mpofu, 2011) noted that the use of aggregated data can be misleading when analysing the performance of individual companies; therefore there is a need for investors to understand the dynamics that influence stock returns.

4.15 Data Integrity and Robustness

The data was tested for robustness as per Muller and Ward (2013) by constructing a market capitilisation weighted index (J203T) was created and the results thereof were compared to the All Share Index (ALS160) . All Share Index total return and constructed portfolios were tracked and it was confirmed that the data was complete and accurate by Muller and Ward (2013).

From the above; it was concluded that the methodology was robust and that the integrity of the data was sound.

Chapter 5: Findings

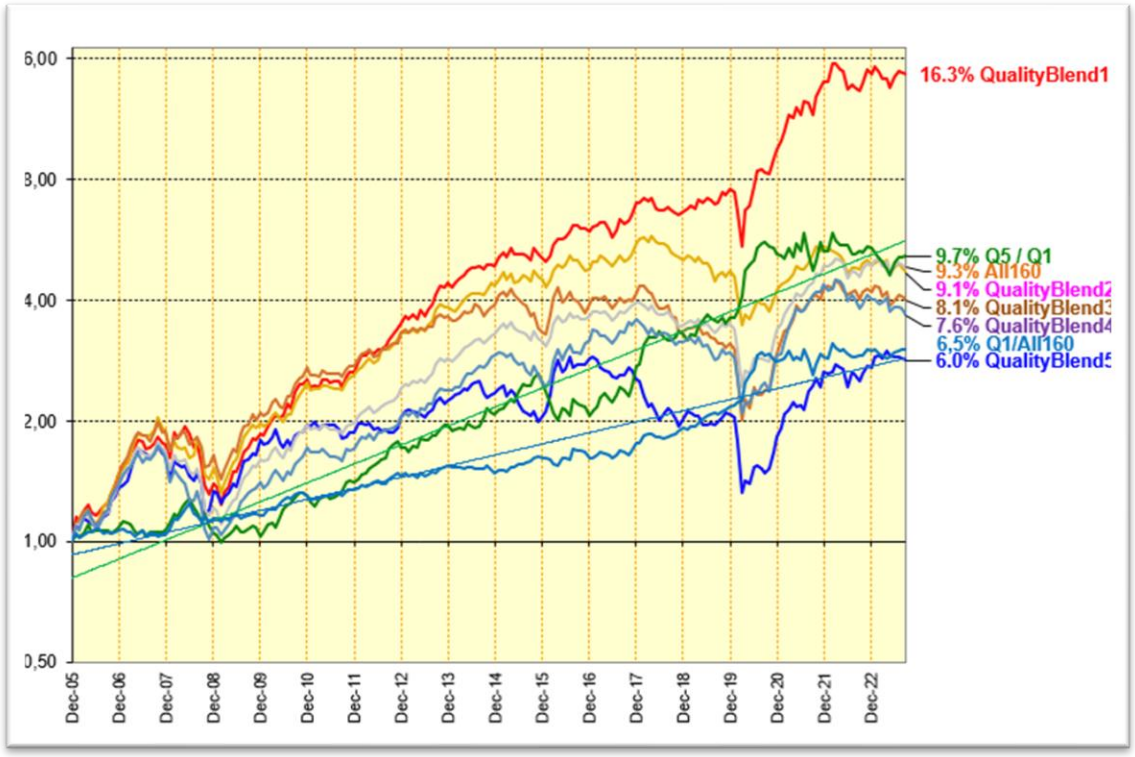
This chapter will present the findings of the study on whether an optimised set of quality metrics outperforms the JSE All Share Index. The sample used for this study will be all the firms on the JSE All-Share Index. These are the top 160 firms by market capitilisation – the remianing firms are considered to small and illiquid for consideration by institutional investors.

5.1 Descriptive Statistics

The data was taken from the largest 160 stocks on the JSE based on market capitalisation. The Piotrosky Quality factors served as the basis of the quality factors The quality metrics were weighted based on their quantitative impact on performance. The portfolios were created with skewed capital allocation commesurate to the factors that showed the biggest difference between positive and negative.

The constructed portfolios were run in the StyleEngine to confirm how they would perform against the JSE All Share Index. The metrics were selected objectively to the different sectors and industries on the JSE. Figure 1 below illustrates the performance of the portfolios:

Figure 1: Results of Quality Blend Style Analysis

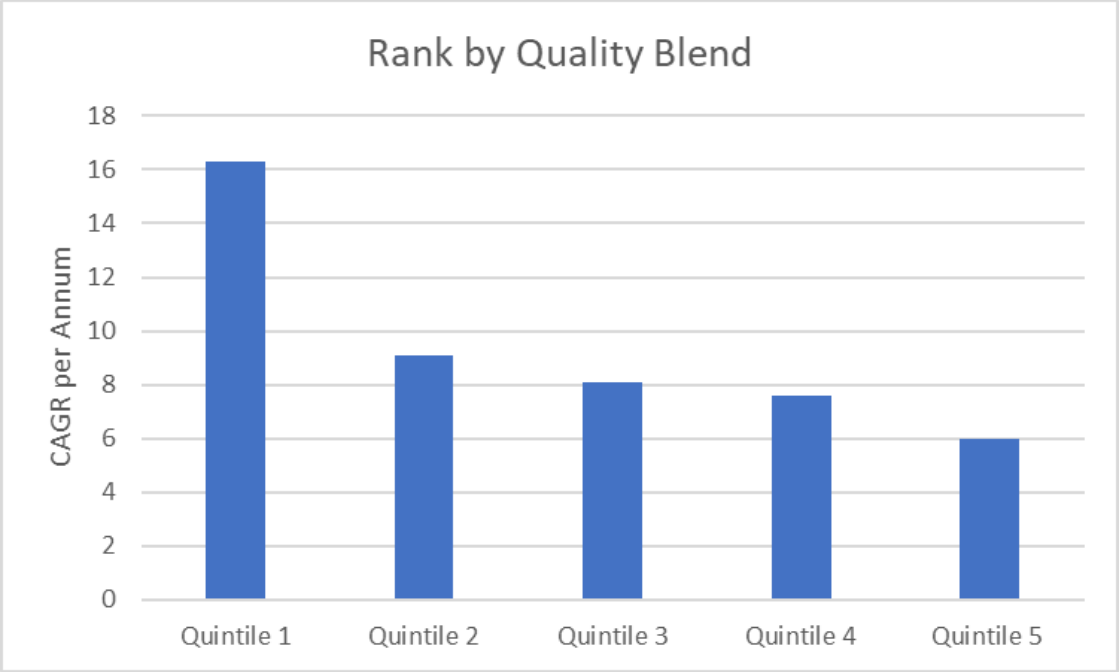


The graph is interpreted by visually comparing the portfolios and the order of their performance. In order to confirm an association between quality and performance the results would have to be in alignment with the quintile ranks. Quintile 1 (Quality Blend 1) would have to be the best with quintile 2 (Quality Blend 2) being second best and so forth or vice versa which would indicate that higher quality portfolios result in poorer performance. The linear relationship also indicates a linear progressive relationship showing that as quality increases so do your returns.

The line graph “Q5/Q1” represented the relative performance of the best and worst performing portfolios. The graph showed a persistent relationship between the two. The line graph “Q1/All160” represented the relative between the best performing portfolio and the benchmark. Visually it can be observed that the best performing portfolio consistently outperformed the benchmark.

Figure 2 below demonstrated the CAGR of each portfolio and confirmed the results based on the ranking. The portfolio with the best quality stocks delivered the highest returns.

Figure 2: Performance of quality Quintiles



Quintile one (Quality Blend 1) represented the portfolio of companies that ranked highest and those that followed had progressively lower rankings. As can be seen in the graph above; higher quality firms delivered better results and the relationship between quality and performance is linear.

Table 4: Portfolio percentage statistics

Quality Blend	1	2	3	4	5
Mean	5.54	3.58	3.05	2.46	2.04
Std. Deviation	4.03	1.43	0.98	0.95	0.49
Minimum	1	1	1	1	1
Maximum	15.54	5.79	4.49	4.51	3

5.1 Results for Research Question One

The graphical time series plot in Figure 1 enabled the observation of the cumulative returns of the portfolios from December 2005 to October 2023. The results showed that the portfolio with the best quality stocks perfromed the best and the one ranked second best berformed second best and so forth. This was confirmed in Figure 2 when

the returns were viewed on a histogram and the linear relationship between the quintiles and the performance could be observed.

A substantial spread could be observed in the perfromance of the best and worst ranked portfolio.

Table 5: Mean Rank per Quality Quintile

	n	Mean	Median	Standard deviation
QualityBlend1	214	5.54	4.89	4.03
QualityBlend2	214	3.58	3.95	1.43
QualityBlend3	214	3.05	3.32	0.98
QualityBlend4	214	2.46	2.45	0.95
QualityBlend5	214	2.04	2.04	0.49

Table 4 exhibits the mean ranks based on the Friedman Test. The monthly returns of the portfolios were analysed and the Friedman test was used to compare the mean ranks of the portfolios over time and indicate their differences. The Friedman Test is a non-parametric statistical test for the analysis of repeated measures that is employed when the assumptions for an ANOVA are violated. Friedman tests are used when the data sets do not display normality and homogeneity so an ANOVA cannot be used however the Friedman is a robust alternative to the ANOVA (Riffenburgh, 2006)

Table 6: Friedman Test Results

N	214
Chi²	635.09
Df	4
p	< 0.01

As can be observed in Table 5 above; the chi^2 p-value or Friedman's Q was 635.09. The p-value was less than 0.01 which is lower than the 0.05 confidence interval. The

data gleaned from the analysis led the researcher to reject the Null hypothesis as there is a significant difference between the portfolios.

Subsequent to the above; a post-hoc test was required as the Friedman test only tested for overall differences. The post-hoc test would identify specific differences in perfromance between the portfolios. The Wilcoxon signed-rank test was able to identify the where amongst the portfolios the statistically significant differences lay.

Table 7: Results for Wilcoxon Signed-Rank test for quintile pairs.

Pairs	W	z	p	r
Quintiles 1 & 2	1428	-10.95	<.001	0.75
Quintiles 1 & 3	2873.5	- 9.36	<.001	0.64
Quintiles 1 & 4	0	-12.65	<.001	0.87
Quintiles 1 & 5	0	-12.62	<.001	0.86
Quintiles 2 & 3	3616	-8.4	<.001	0.57
Quintiles 2 & 4	11	-12.61	<.001	0.86
Quintiles 2 & 5	7	-12.65	<.001	0.86
Quintiles 3 & 4	351	-12.04	<.001	0.82
Quintiles 3 & 5	1	-12.59	<.001	0.86
Quintiles 4 & 5	4306	-7.62	<.001	0.52

Table 6 above contains the results of the Wilcoxon-Signed-Rank test for the pairs of quintiles. The Wilcoxon test is the non-parameric test for two ordinal values. Based on the p-values in the table above it was seen that all the pairs of portfolios had statistically significant perfromance with all the p-values coming in below 0.05. The size of the effect; *r* was also significant with all the computed values being above 0.5.

This confirmed what was seen in Figure 2 that there is a linear relatipnship between quality and performance and that there is a statistically significant difference in the performance of portfolios compiled on the basis of quality.

5.3 Results for Research Question Two

This research question looked to see if a persistent difference could be observed between the best and worst performing portfolios. From Figure 1 it can be visually observed that the best perfroming portfolio, quintile 1 delivered a CAGR of 16.3% whilst the worst perfroming portfolio delivered 6.0%. The CAGR of the two portfolios yielded a spread of 10.3%.

The price relative observed in Figure 1 which is the difference between the best and worst performing portfolios showed persistence outperfromance with a upward trending slope throughout the time period. The price relative shows an upward trend from 2005 to 2015 but the relative perfromance declined from mid-2015 and rebounded by the second quarter of 2016. Thereafter the relative performance continued steadily. The upwards slope of the trend line illustrated a consistent positive relative of quintile one compared to quintile five.

Table 8: Descriptive Statistics of Quantiles 1 & 5

	n	Mean	Median	Standard deviation
QualityBlend1	214	5.54	4.89	4.03
QualityBlend5	214	2.04	2.04	0.49

Quintile 1 had higher values (*Mdn* = 4.89) than the quintile 5 (*Mdn* = 2.04).

5.3.1 Wilcoxon - Signed Rank Test

The Wilcoxon-signed rank test for this research question compared the performance of best perfroming portfolio, quintile one with the worst perfroming one; quintile five to establish if the difference in perfromance is statistically significant as illustrated in the tables below.

Table 9: Rank of Quintile 1 and Quintile 5

		n	Mean Rank	Sum of Ranks
QualityBlend5 - QualityBlend1	Negative Ranks	212	106.5	22578
	Positive Ranks	0	0	0
	Ties	2		

		n	Mean Rank	Sum of Ranks
	Total	214		

- Negative Ranks: QualityBlend5 < QualityBlend1
- Positive Ranks: QualityBlend5 > QualityBlend1
- Ties: QualityBlend5 = QualityBlend1

From Table 8 it is observed that out of 214 data points; 212 of them were negative ranks where quintile 5 was below quintile 1, no positive ranks where quintile 5 was above quintile 1 were observed and the data points were tied on two occasions.

Table 10: Wilcoxon signed rank test statistics - quintiles 1 and 5

	W	z	p	r
QualityBlend5 - QualityBlend1	0	-12.62	<.001	0.86

The Wilcoxon Test indicated that this difference was statistically significant, W = 0, p = <.001. The p-value of <.001 is below the specified significance level of 0.05. The result of the Wilcoxon test was therefore significant for the present data and the null hypothesis is rejected.

5.4 Results for Research Question Three

It can be visually observed from Figure 1; that quintile one was the best perfroming portfolio with a CAGR of 16.3% which is superior to the ALL160 that generated 9.3%. A comparison of the two yielded a spread of 7.0%.

The benchmark is a portfolio made up of the 160 largest firms on the JSE by market capitilisation. It constitutes 99% of the JSE by market capitilisation. The price relative Q1/All160 shown in Figure 1 illustrated that quintile 1 consistently outperformed the benchmark.

5.4.1 Wilcoxon - Signed Rank Test

Table 11: Descriptive Statistics of Quintile 1 and the Allshare Index

	n	Mean	Median	Standard deviation
QualityBlend1	214	5.54	4.89	4.03
All160	214	2.84	2.91	1.15

Table 10 compares the monthly returns of quintile 1 and the All-Share Index. Of the 214 data points observed 213 of them had the All160 lower than quintile 1. There were no instances of the data points where the All160 ranked higher than quintile 1 and only one instance of a tie.

Table 12: Ranks of Quintile 1 and All Share Index

		n	Mean Rank	Sum of Ranks
All160 - QualityBlend1	Negative Ranks	213	107	22791
	Positive Ranks	0	0	0
	Ties	1		
	Total	214		

- Negative Ranks: All160 < QualityBlend1
- Positive Ranks: All160 > QualityBlend1
- Ties: All160 = QualityBlend1

Table 13: Wilcoxon Signed-Rank test statistics - quintile pairs

	W	z	p	r
All160 - QualityBlend1	0	-12.65	<.001	0.87

The Wilcoxon signed rank test compared the best performing quality portfolio with the J203T. Quintile 1 had higher values (*Mdn* = 72.6) than the J203T portfolio (*Mdn* = 19.11). The Wilcoxon Test indicated that this difference was statistically significant, $W = 69.5$, $p = <.001$.The p-value of <.001 is below the specified significance level of 0.05. The result of the Wilcoxon test is therefore significant, and the null hypothesis was rejected.

5.5 Reliability and validity of the data

This research used historical JSE index and firm-level data for the analysis and construction of the portfolos. The researcher verified that the data had the same calculation methods and definitions for the period under review.

The reliability of the data was taken as a given as it is measured consistently, over the same timeframe, and the results are dependable considering that all the firms operate in the same environment. The data sets were deemed to be reliable as they were based on audited financial statements.

It was assumed that no accounting fraud occurred in the compilation of the financial statements. The data is presumed to be valid as the findings can be generalised and are a true representation of what they intend to measure.

The data was tested for robustness as per Muller and Ward (2013) by constructing a market capitilisation weighted index (J203T) was created and the results thereof were compared to the All Share Index (ALS160) . All Share Index total return and constructed portfolios were tracked and it was confirmed that the data was complete and accurate by Muller and Ward (2013).

From the above; it was concluded that the methodology was robust and that the integrity of the data was sound.

Chapter 6: Discussion of Findings

The results garnered for the research as put forward in Chapter 5; will be discussed in this chapter. The results will be interpreted in relation to the literature that was reviewed as well as the research questions posed. Muller & Ward's (2013) style based graphical time series analysis served as the basis of the findings.

6.1 Descriptive Statistics

Quality as an investment style was investigated and found to be feasible. Thereafter, the various definitions of quality were discussed and Piotrosky's quality factors were selected as the basis of the research. The factors were entered into Muller & Ward's (2013) proprietary StyleEngine to see how each one performed, and they were weighted based on the difference between the positive and negative end of the factors. In an effort to circumvent "look ahead" bias the weightings were measured from 1988 to 2005 and the analysis of portfolios constructed along the lines of quality were constructed from 2005 to 2023 to confirm if the factors still provided handsome returns. The factors that showed the biggest differences between the positive and negative ends were weighted higher as they were presumed to have a larger impact on performance. The portfolios were then compiled considering weighting of the different factors and the performance of the portfolios was run through the StyleEngine to see how each portfolio would perform.

The sample was the JSE All Share Index because it constitutes 99% of the exchange by market capitalisation. The remaining firms were also too small and illiquid for consideration by institutional investors.

There were 214 monthly returns for the five quintiles and the benchmark the ALL160 in the review period which was from 2005 to 2022. The performance of the different portfolios as well as the ALL160 can be observed in Figure 1.

6.1 Discussion Towards Research Question One

Research question one and hypothesis one considered the performance of portfolios that were compiled based on quality and the relative performance of each one. The aim of this question was to see if better quality firms indeed perform better than lower quality firms and what the nature of the relationship between quality and performance was. After creating the portfolios in the StyleEngine the research needed to confirm if

the differences in performance were statistically significant. This was done with a Friedman's Test and a post-hoc Wilcoxon Signed-Rank test which showed a statistically significant difference between the portfolios.

The results showed that portfolios made up of shares with better quality metrics performed better and that there is a linear relationship between quality and share price performance. The portfolio with the best quality metrics was quintile one, the second best was quintile two and so forth as was seen in Figure 2.

The Wilcoxon Signed rank test tested for statistical significance between the pairs of portfolios exhibited a p-value below 0.01 which is less than 0.05 for all the portfolio pairs. This indicated a statistically significant relationship between all the pairs of portfolios allowing us to reject the Null Hypothesis

This confirms the research that states that quality is a coherent investment style. High quality companies are those that are strong, profitable, and consistent. They are firms that can weather storms and demonstrate that they can survive tough periods and grow during bountiful periods (NASDAQ, 2023).

Novy-Marx (2014) also notes that quality companies are more likely to experience favourable corporate events and are able to sustain elevated profitability for proracted periods relative to the market. This was evidenced in the dot-com bust and the 2008 stock market crash. Remaining profitable during unfavourable or volatile conditions is especially relevant to forms on the JSE as the South African operating environment is volatile. This was seen when the exchange rate to the dollar went into free fall in 2015 after the Minister of Finance was replaced without warning. Another severe event was the outbreak of Covid-19 and subsequent lockdowns of 2020. These wreaked havoc on global markets and the JSE. By the middle of April 2020, a mere two weeks after the lockdown was implemented; the All-Share Index had lost R2.3 trillion in value (Muthu & Wesson, 2023).

Another interesting observation is how quality performed during the 2008 global economic downturn. Quintile 1 dropped lower than the All-Share Index but rebounded convincingly afterwards. This is in line with (Cronje, 2019; Muller & Ward,2013) findings that investment styles have a significant correlation to superior equity returns

and can be used to predict stock market returns. Novy-Marx (2014) goes on to substantiate this, stating that quality companies are more likely to experience positive corporate occurances and are able to maintain superior profitability for protracted periods relative to the market. His findings were based on the dot com bust of the early 2000's but we see it consistently as it also applied after the 2008 crash and the coronavirus induced economic downturn of 2020.

The share portfolios produced in this study could produce excess returns on the JSE, corroborating Heymans & Santana's (2018) findings that the JSE is weak form efficient.

6.2 Discussion Towards Research Question Two

The second research question looked to answer if there was a persistent difference between the best and worst performing portfolios. The best perfroming portfolio was quintile one and the worst quintile five. The price relative served as the basis of comparison in performance. The statistical significance of the performance of the two portfolios was tested using a Wilcoxon-signed rank test.

Quintile one gave a CAGR of 16.3%; delivering superior results to the worst perfroming portfolio quintile five which delivered 6.0% giving a spread of 10.3%. The p-value from the Wilcoxon-signed rank test was less than 0.01 indicating a statistically significant relationship between the best and worst performing portfolios. The result lead the researcher to reject the Null Hypothesis.

The price relative (Q1/Q5 calculated the performance of the two portfolos and showed persistence outperformance as can be seen in Figure 1.

The data gleaned from this study corroborates the previous research that states that quality is a systematic and predictable investment approach that avoids the disappointment associated with glamorous growth stocks generate a return premium more than the market with lower risk (Schroders QEP, 2023). The advantage of a quality investment style is that it is multi-faceted, and its elements can be found in every sector is both developed and developing markets. This style offers the promise of higher returns paired with lower risk because quality companies carry lower

absolute volatility which generates compounding benefits over multiple periods simply because there is a lower risk of loss in any single period.

6.3 Discussion Towards Research Question Three

The last research question asked if there was a persistent difference between the best performing portfolio and the benchmark. This was to confirm the viability of quality as an investment style. The research garnered a CAGR of 16.3% from quintile one and 9.3% for the benchmark. Resulting in a spread of 7%.

The hypothesis was tested using a Wilcoxon -signed rank test which gave the result of a p-value of less than 0.01 indicating a statistically significant relationship between the two. The findings led the researcher to reject the Null Hypothesis.

The findings confirm previous research by Tortoriello & Kallu (2012) that found that high quality stocks have greater liquidity, larger market value and higher average price per share and exhibit high stability over time. They demonstrated that a quality investment style can be employed in pursuit of excess returns. The same researchers also found that found that between the years 1985 and 2005 high quality stocks outperformed the S&P 500.

The research findings are also consistent with Gopani (2022) who found that found that portfolios put together along the lines of quality outperformed the market consistently over the long term in the Indian stock market. Even in periods of extreme volatility quality performed better than other investment styles.

6.5 Quality as an Investment Style

The data that has been discussed confirmed that quality is a feasible and coherent investment style that can be expected to deliver positive results when investing on the JSE. The research showed a linear relationship between higher quality and better performance making this a desirable investment style. The research showed that even second-tier quality companies outperformed the benchmark, and a statistically significant relationship exists between the best performing portfolio and the benchmark.

Prior research showed that by Lepetit, Cherief, Ly, & Sekine (2021) showed that quality is multi-faceted and focuses on a number of metricsas selecting only one would exclude a wide array of quality factors. Assessing quality under the paradigm of profitablity alone would be misleading as it would not provide a measure of leverage or the quality of its earnings. They further stated that only quality measures that have been subject to extensive academic research proving that they can accurately produce excess returns should be used. Their paper shortlists eight measures of quality in the realms of of profitability, investment, safety and earnings.

The analysis of quality as an investment style did not take cycle theory into account and did not distinguish between firms in different industries (Cronje, 2019).

Chapter 7: Conclusions and Recommendations

This study investigated the appropriateness of quality as an investment style in the pursuit of market beating returns. Quality factors were investigated and the quality factors for this study were selected using Piotrosky's quality factors. The study also established if a statistically significant relationship existed between the quality portfolios and the JSE All-Share Index.

7.1 Relevance and Background to the Research

Investors around the world have been trying to accurately predict the shares they should buy and sell to maximise returns. A great amount if intellectual effort has gone into the developmetnt of asset pricing models that can generate market beating returns however to date none have found to be accurate over the long term. Although asset pricing models have improved over the years it is to be noted that market performance is affected by many variables that investors cannot predict.

It is well established that the past behaviour of stocks is not an indication of future performance and that stock markets are inherently volatile and complex. The premise of this is that no asset pricing model can provide a perfect understanding of the drivers of share performance however as we gain more understanding, we can make better informed decisions.

This research sought to establish a relationship between quality and portfolio performance and contribute to the relevance of quality metrics in investment making decisions. The research findings are relevant in both a local and global context as it relates to academic research on effective investment styles.

No universally accepted definition of quality exists because it is not rooted in financial statements however all the definitions broadly contain measures of quality that track profitability, stability, and financial strength. This study contributed to the body of knowledge attempting to explain and predict the performance of the JSE. To date, no study on the specific parameter of quality has been conducted on the JSE.

7.2 Principal Findings

The research questions looked at whether a portfolios compiled along the lines showed statistically significant resullts. The first research question looked to see if portfolios with higher quality shares would outperform those with lower quality shares. The finding was that higher quality did lead to higher performance and a linear relationship existed between quality and performance.

The second research question looked at the best and worst performing quality portfolios to understand if a statisticaly significant relationship existed. The findings were that there was a statistially significant relationship between the best and worst performing portfolios.

The third research question analysed the performance of the best performing portfolio against the benchmark and found a statistically significant relationship between the two portfolios. The best performing quality portfolio outperformed the benchmark confirming quality's utility in investment decisions.

The research also confirmed Heymans & Santana's (2018) research into the effecienty of the JSE by finding a way to generate excess returns; confirming that the JSe is weak form efficient.

The methodology for this research was based on the research on investment styles previously employed by Muller & Ward (2013). The portfolio time series methodology applied in their paper was applied for this research as was their style engine software.

7.3 Limitations and suggestions for future research

This study focused on quality as an investment style, using Piotrosky's quality factors as the basis. The limitations to this research include:

- The effects of macroeconomic movements are not consistent for firms in resource and non-resource sectors. For this research, the industry that firms operate in was not included as a factor.
- The population definition and sampling only considered the top 160 firms on the JSE, this may have posed a threat due to subject selection (Saunders & Lewis , 2018). However, this methodology had been followed by other researchers as

small, illiquid stocks could confound the results (Muller & Ward, 2013; Viljoen, 2016).

- Transaction costs were ignored as the researcher assumed that they were negligible and the same across all the portfolios that were created.
- The measurement instrument analysed monthly returns. The results of the research may have been different if annual results had been taken into account.
- The study drew from South African and international literature to analyse the JSE however; the conditons elswhere in the world could be completely different.

Future research could use other factors of quality in a similar way to test how varying quality factors perform.The scope of this research was limited to the JSE; it would be thought-provoking to see how the quality factors used in this study fare in a developed market.

7.4 Concluding Remarks

This study analysed the concept of quality as an investment style, compiled portfolios of quality stocks and analysed how they performed. The findings showed a statistically significant relationship between higher quality stocks with better quality portfolios giving rise to and the best performing quality portfolio was found the outperformt he benchmark of the JSE.

The study contributed to the research about quality as an investment style and found an investment style that produced persistently superior returns.

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Appendix: Ethical Clearance

Please be advised that your application for Ethical Clearance has been approved.
You are therefore allowed to continue collecting your data.
We wish you everything of the best for the rest of the project.

Ethical Clearance Form

Kind Regards