An Insight into Value Investing in South Africa

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ABSTRACT

This study aims to investigate whether a simple accounting-based fundamental analysis strategy can separate winners from losers to aid in creating a stronger value portfolio by shifting the distribution of returns. It will also investigate whether the Size Effect was pervasive during the same period. The results confirm that the mean market-adjusted return earned by a high BM investor can be increased by at least 46.4% annually through the selection of financially strong firms while the entire distribution of realised market-adjusted returns is shifted to the right. In addition, a strategy that buys expected winners and shorts losers generates a mean market-adjusted annual return of 84.7% between 2004 and 2014, and the strategy appears to be robust during periods of market anomalies and market expansions. The statistical analysis contradict the graphical observation which indicates that the Size Effect was indeed pervasive. Although the results are not statistically significant, the evidence that the mean market-adjusted annual returns of a strategy concentrated in small firms consistently yields returns superior to a strategy concentrated in larger firms is promising in that it shows a hint that the Size Effect was pervasive. Fewer number of observations and a shorter sample period are factors that may have contributed to results diverging from those presented by Banz (1981). Overall, the evidence suggests that the market does not fully incorporate historical financial information into prices in a timely manner and that an investor applying the F_SCORE to differentiate firms from a high BM portfolio can take advantage of this market anomaly.

CONTENTS

1 INTRODUCTION

The last few decades bore witness to an abundance of research comparing strategies involving value and growth stocks. The asset pricing model of Sharpe (1964), Lintner (1965), and Black (1972) would give rise to many debates amongst academics which has led to ground breaking findings by pioneers of finance such as the Size Effect of Banz (1981) and the effect of leverage on returns brought forward by Bhandari (1988), to name a few. The frustration to understand what drives the value and growth phenomenon has indeed been a work in progress.

Fama and French (1996) posit that a strong value premium exists in average returns. In their earlier work, they suggested that much of the value stock's superior returns were due to them being fundamentally riskier (Fama & French, 1992). Subsequent studies cast doubt in Fama and French's (1992) theory and found little support that value strategies are fundamentally riskier but instead yielded superior returns because they were consistent with the contrarian model of De Bondt and Thaler (1985) suggesting that superior returns were merely as a result of a contrarian strategy (Lakonishok, Shleifer, & Vishny, 1994).

Further, work by Jaffe, Keim, and Westerfield (1989) and their comparison to the earnings yield; Blume (1980) and his comparison to dividends per share; and Rosenberg, Reid, and Lanstein (1984) and their comparison to book value of equity show that stocks with fundamentally high values relative to market values outperform the market. Chan, Hamao, and Lakonishok (1991) extended and refined these results and also put forward that a high ratio of cash flow to price also predicts higher returns.

On an international scale, value stocks were found to outperform growth stocks in twelve of thirteen major markets (Fama & French, 1998). A study of six major security markets including France, Germany, Switzerland, U.K., Japan and U.S. over the period from January 1981 through June 1992 documented and confirmed the existence of a value-growth factor and that stocks with low-price-to-book (value stocks) provided superior risk adjusted performance (Capaul, Rowley, & Sharpe, 1993). In addition, another study based on 21 international markets with more than 28 000 annual stocks return observations supports that value stocks generally outperform growth stocks, on a total-return and a risk-adjusted basis

(Bauman, Conover, & Miller, 1998). This evidence corroborates the value phenomena on global scale and eliminates assumptions that the phenomena only exists in specific markets.

For the purposes of this research, local studies have also shown evidence that value stocks outperform growth stocks. Auret and Sinclaire's (2006) recent study on the Johannesburg Stock Exchange (JSE) found that there is a significant positive relationship between book-to-market and stock returns. Although it was found growth stocks offer superior performance pre-1992 due to possible political and economic factors, there was a consensus that the value phenomena is prevalent on the JSE post-1992 (Graham & Uliana, 2001).

Although, not all research has unanimously confirmed that value strategies are superior to growth strategies some research has gone as far as concluding that growth stocks outperform value stocks. Drew, Naughton and Veeraraghavan (2003) investigated stock returns on the Shanghai Stock Exchange and concluded that small and growth firms generated superior returns due to investors overexploiting detected return patterns. While this is only one of a few studies that suggest that growth stocks significantly earn superior returns, there is an overwhelming amount of research that suggests otherwise.

Regardless of what drove value stock's superiority, even though some authors were in disagreement, the majority were in agreement that the value phenomena certainly exists. Given the abundance of research in the value versus growth topic with overwhelming conclusions pointing towards value stocks the question remains, which value stocks offer this superior performance. Surely the success of a value strategy relies on the strong performance of a handful of firms while tolerating the inferior performance of the remainder. Piotroski's (2002) use of the F_SCORE in his study of high BM (value) stocks to establish a simple and intuitive financial criteria to help separate the winners from the losers will certainly lend a hand in answering the questions that this study posits.

1.1 PROBLEM STATEMENT

To show that investors in a South African context can create a stronger value portfolio by using simple screens based on historical financial performance. If such strategies prove to be effective, investors would have predicted future firm performance allowing them to differentiate between winners from losers and shift the distribution of the returns earned by value investing.

1.2 RESEARCH OBJECTIVES

- This study aims to dissect high book-to-market firms (value stocks) by examining whether a simple accounting-based fundamental analysis strategy can identify which stocks are expected to be outperformers to aid in creating a stronger value portfolio.
- This study will also investigate whether the Size Effect was pervasive within a sample of high book-to-market firms (value stocks) during the same period.

1.3 IMPORTANCE AND BENEFITS OF THE PROPOSED STUDY

Given the numerous debates that have given rise to why value stocks are under-priced, this study offers a simple approach to the fundamental analysis of identifying strong and weak value stocks. Research into this class of stocks will also add much needed analysis and possibly promote higher investor interest such as the coverage enjoyed by growth stocks. This research will promote a level playing field for value stocks which may otherwise be overlooked due to negative traits such as a recent run in poor performance or the fact that they may be financially distressed.

Auret and Sinclaire (2006) and Graham and Uliana (2001) find that a value phenomenon certainly exists in the South African context. However, this knowledge alone does not enable South African researchers the ability to make academic, economic and comparative inferences on this theory‘s existence. Replicating this work in a South African context would allow researchers to take one step further and get an insight into the prospect of establishing an effective value strategy.

The study’s sample period coincides with the time during which the global markets and South African market were faced with a credit crisis (year 2008) and when there was a recession (late 2010). The results of this study will be beneficial to market analysts, government and academics in providing insight on which value stocks were a more favourable investment (if at all favourable) during this turbulent period and whether the Size Effect is resilient even through adverse market conditions.

If such a strategy proves to be successful, this study will reveal that the ability to differentiate between strong and poor future performing firms suggests that the market does not efficiently incorporate past financial signals into current stock prices.

1.4 DELIMITATIONS

Only firms on the Johannesburg Securities Alternative Exchange (AltX) with their data available on the I-Net and McGregor BFA database are studied limiting the sample size. Also, the data might be exposed to ex-post selection bias since the databases where the data is sourced do not include firms that have ceased trading or have been de-listed. The JSE AltX is predominantly comprised of securities of small and medium-sized high-growth companies with limited amount of high capitalisation stocks which may result in selection bias and inconclusive results when testing for the size affect.

The time period of study does not exactly coincide since, returns data on the JSE is readily available from 1995 and the Johannesburg Securities Alternative Exchange (AltX) was only established towards the end of 2003. Furthermore, an F_SCORE for each stock must be computed. The sum of the nine underlying signals (comprising of financial ratios) yield an F_SCORE which can range from a low of 0 to a high of 9, where a low (high) F_SCORE represents a firm with very few (mostly) good signals. Given the vast amount of data required for purposes of computing the ratios necessary for the F_SCORE, the time period of the study had to be significantly reduced from twenty years to ten years.

1.5 DEFINITION OF KEY TERMS

Value stocks are defined as stocks in which the market price is relatively low in relation to earnings per share (according to Basu, 1977), cash flow per share (according to Lakonishok *et al.*, 1994), book value per share (according to Fama & French, 1992), and dividends per share (according to Blume, 1980 and Rozeff, 1984). Value stock portfolio strategies call for buying stocks that have these characteristics. For the purposes of this study one is only concerned with book value per share as some of the other classifications are captured in the F_SCORE. The Size Effect refers to the relationship between the size of the firm or its market capitalisation value and average returns (Banz, 1981).

Table 1: Abbreviations used in this document

Abbreviation	Meaning
JSE	Johannesburg Securities Exchange
JSE AltX	JSE Alternative Exchange Index
JSE ALSI	JSE All Share Index
MVE	Market Value of Equity
BM	Book Value to Market Value Equity Ratio
ASSETS	Total Assets
ROA	Net Income to Total Assets Ratio
CFO	Cash Flow from Operations to Total Assets Ratio
ACCRUAL	Net Income before Extraordinary Items less Cash Flow from Operations to Total Assets Ratio
MARGIN	Gross Margin Ratio defined as Revenue less Cost of Goods Sold scaled by Revenue
TURN	Asset Turnover defined as Total Sales to Total Assets Ratio
LEVER	Leverage defined as Long Term Debt to Total Assets Ratio
LIQUID	Total Current Assets to Total Current Liabilities Ratio
EQ_OFFER	Common Equity Issued

In the next section this research will review prior literature on "value" investing and financial statement analysis, touch on the Size Effect and define the nine financial signals that are used to discriminate between firms. Section 3 outlines the data collection, research design and empirical tests to be employed progressing to the discussion of data constraints and sampling modification in section 4. The results and conclusion are presented in section 5 and 6 respectively.

2 LITERATURE REVIEW

Reviewing past literature on topics related to value investing is essential in order to investigate the potential benefits of leaning a portfolio towards smaller stocks and relying on specific financial performance signals to formulate an investment strategy that will ultimately separate winners from losers.

2.1 VALUE INVESTING

Value investing was first introduced by Graham and Dodd (1934) in their book, *Security Analysis*, and has subsequently been a topic for heavy debate by several authors over the decades. Value investing calls for selecting stocks based on a firm's book-to-market ratio where stocks appear to be inexpensive relative to some fundamental current measure such as book value of equity, earnings, cash flow and dividends (Bauman *et al.*, 1998). Perhaps this phenomenon exists because value stocks are financially distressed (Fama & French, 1995) or perhaps it is a product of market mispricing (Desai, Rajgopal, & Venkatachalam, 2004). Nonetheless, the phenomenon certainly exists and this study aims to exploit the strategy to earn superior risk adjusted returns.

Recent work by Graham and Uliana (2001) and Auret and Sinclaire (2006) confirm the presence of the value phenomenon on the JSE, however spanners are thrown in the works by Robins, Sandler and Durand (1999) and Auret and Cline (2011) who document that there is no significant support for the value effect on the JSE. Notably, many established authors (Basu, 1977; Fama & French, 1992; Capaul *et al.*, 1993; Lakonishok *et al.*, 1994; Bauman *et al.*, 1998) show that a portfolio of high BM firms outperform a portfolio of low BM firms suggesting that value investing seems to prevail over time and should certainly be a consideration of investment professional concerned with earning above average risk adjusted returns. In examining value strategies, this research will make use of financial statement analysis which will give one insight into changes in firm fundamentals and will assist in plotting the probable course to be taken by value firms.

2.2 FINANCIAL STATEMENT ANALYSIS

Financial statement analysis is an alternative valuation method to those that are based on long-term forecasts of sales and the resultant cash flows, and specifically comes in handy for high BM stocks that are not synonymous with the prospect of strong growth. Investors and analysts rarely recommend high BM firms when forming their buy (sell) recommendations (Stickel, 2007) and are less willing to follow poor performing, scarcely-traded, and small firms (Hayes, 1998; McNichols & O'Brien, 1997). As such, valuation of high BM stocks should focus on recent changes in firm fundamentals as Seng (2012) found that information contained in financial statements may actually be more useful than some people choose to

believe. Although the trend has been for analysts and investors to naïvely extrapolate the past growth rates of top performing firms too far into the future (Lakonishok *et al.*, 1994), analysis of a firm's financial statement can be used to accurately predict future changes in earnings (Ou & Penman, 1989) or to successfully predict future excess returns directly (Holthausen & Larcker, 1992). Lev and Thiagarajan (1993) were able to predict future changes in earnings and future revisions in analyst earnings forecasts by simply utilising 12 signals obtained from financial statements.

For the purposes of this research on high BM firms, financial statement analysis is perceived to be the most appropriate and effective method to measure firm performance and the analysis is expected to be enhanced by the selection of the nine signals that are described in turn.

2.3 THE SIZE EFFECT

The small firm effect, also known as the Size Effect, first documented by Banz (1981) posits that there exists an inverse relationship between market returns and the market value of common stocks. Banz (1981) shows that returns on small NYSE firms from 1926 to 1980 had significantly larger risk adjusted returns than large NYSE firms. Although Reinganum (1981) documents inconsistencies relating to the P/E-effect, he too finds a significant Size Effect even when he controls for the P/E ratio. In investigating reasons to explain the Size Effect, Lakonishok and Shapiro (1986) and many other authors are unable to solve the puzzle of why the Size Effect exists, however they find strong evidence certainly showing that small firms tend to outperform large firms after adjusting for risk.

The conflicting findings of Auret and Basiewicz (2009) and Auret and Cline (2011) regarding the presence of the Size Effect on the JSE highlights the need for further research on this topic. As such, this study aims to investigate whether the Size Effect is prevalent in a South African context when isolating a portfolio to high BM stocks only. These findings would certainly add another dimension to how one can shift the distribution of the returns earned by value investing.

2.4 FINANCIAL PERFORMANCE SIGNALS

One who may be concerned with a firm's efficiency such as Fama and French's (1995) and Chen and Zhang's (1998) discovery that high BM firms are financially distressed would investigate the profitability; financial leverage and liquidity; and operating efficiency of such firms. Financial variables falling into these categories such as margin, profit, cash flow, liquidity and financial leverage holistically provide a signal pertaining to future firm performance. Selecting a combination of these variables do no more than provide signals that are easy to interpret and implement, albeit there may be other signals that one could implement that would have more explanatory power at predicting future firm performance. Signals are classified as either good or bad where 1 (0) is assigned to variables with good (bad) signals. Nine binary signals that comprise the F_SCORE which measure the overall quality and strength of the firm's financial position are defined in turn.

2.4.1 PROFITABILITY

A firm's current profit and cash flow give great insight in the firm's abilities to pay for its own operations and generate funds internally. Four variables are used to measure these performance-related factors: ROA, CFO, ΔROA, and ACCRUAL. ROA and CFO is defined as net income before extraordinary items and cash flow from operations, respectively, scaled by beginning of the year total assets. If the firm's ROA (CFO) is positive, the indicator variable F_ROA (F_CFO) is equal to one, zero otherwise. ΔROA is defined as the current year's ROA less the prior year's ROA. If ΔROA > 0, the indicator variable F_ΔROA equals one, zero otherwise. Sloan (1996) posits that if profits are greater than cash flow from operations it portrays a bad signal about future profitability and returns. As such, the variable ACCRUAL is defined as current year's net income before extraordinary items less cash flow from operations, scaled by beginning of the year total assets. The indicator variable F_ACCRUAL equals one if CFO > ROA, zero otherwise.

2.4.2 LEVERAGE, LIQUIDITY AND SOURCES OF FUNDS

Three variables measure changes in capital structure and the firm's ability to meet future debt service obligations: ΔLEVER, ΔLIQUID, and EQ_OFFER. An increase in leverage, a deterioration of liquidity, or in particular the use of external financing, as documented by

Barclay and Smith (2005), is a bad signal about financial risk considering most high BM firms are financially constrained. ΔLEVER captures changes in the firm's long-term debt levels. ΔLEVER is measured as the historical change in the ratio of total long-term debt to average total assets, and view an increase (decrease) in financial leverage as a negative (positive) signal. The indicator variable F_ΔLEVER is equal to one (zero) if the firm's leverage ratio fell (rose) in the year preceding portfolio formation. The variable ΔLIQUID measures the historical change in the firm's current ratio between the current and prior year, where the current ratio is defined as the ratio of current assets to current liabilities at fiscal year-end. It can be assumed that an improvement in liquidity (ΔLIQUID > 0) is a good signal about the firm's ability to service current debt obligations. The indicator variable F_ΔLIQUID equals one if the firm's liquidity improved, zero otherwise. The indicator variable EQ_OFFER is equal to one if the firm did not issue common equity in the year preceding portfolio formation, zero otherwise.

2.4.3 OPERATING EFFICIENCY

The last two signals measure changes in the efficiency of the firm's operations giving one more insight on return on assets: ΔMARGIN and ΔTURN. ΔMARGIN is defined as the firm's current gross margin ratio (total sales less cost of goods sold scaled by total sales for the year) less the prior year's gross margin ratio. An improvement in margins signifies a potential improvement in factor costs, a reduction in inventory costs, or a rise in the price of the firm's product. The indicator variable F_ΔMARGIN equals one if ΔMARGIN is positive, zero otherwise. ΔTURN is defined as the firm's current year asset turnover ratio (total sales scaled by beginning of the year total assets) less the prior year's asset turnover ratio. An improvement in asset turnover signifies greater productivity from the asset base. Such an improvement can arise from more efficient operations (fewer assets generating the same levels of sales) or an increase in sales (which could also signify improved market conditions for the firm's products). The indicator variable F_ΔTURN equals one if ΔTURN is positive, zero otherwise.

As expected, the signals (chosen to measure profitability and default risk trends) chosen in this paper are consistent with the work of Piotroski (2002) in order to replicate (with a few adjustments) the examination of smaller (including larger), more financially distressed firms in a South African context.

2.4.4 COMPOSITE SCORE

Summing all these binary variables that ultimately affect a firm's performance to form one intuitive measure of expected firm performance, one would compute Piotroski's (2002) F_SCORE which is defined as follows:

$$F\_SCORE = F\_ROA + F\_\Delta ROA + F\_CFO + F\_ACCRUAL + F\_\Delta MARGIN + F\_\Delta TURN + F\_\Delta LEVER + F\_\Delta LIQUID + EQ\_OFFER \quad (1)$$

As such, an F_SCORE value can range from 0 to 9 where a low (high) F_SCORE represents a firm with poor (good) future prospects. This analysis is contrary to Fama's (1965) Random Walk Theory that stock price changes evolve according to a random walk and are independent of each other, so that past movement or trend of a stock price or the market cannot be used to predict its future movement. Instead, the F_SCORE was formulated with the notion that current fundamentals predict future fundamentals. One would expect the F_SCORE to be positively associated with changes in future firm performance and stock returns. The creation of value portfolios will solely be based on identifying and selecting firms with high F_SCORES and discriminating against firms with low F_SCORES allowing investors to use an intuitive but simple application to construct their portfolios. This approach alone may leave many holes in fundamental analysis and as such the F_SCORE should be perceived as a supplementary tool as in Lev and Thiagarajan (1993).

3 METHODOLOGY

The methodology used in Piotroski (2002) was instrumental in the classification of stocks in the construction of the various portfolios used in this study with some sampling modifications to align it to a South African context.

3.1 SAMPLING AND DATA COLLECTION

A ten year sample period has been chosen starting from the beginning of October 2003 until the end of September 2013. Although this has a significantly shorter sample period compared to the twenty year sample period of the study conducted by Piotroski (2002) this study period

is more recent and includes periods of market anomalies (the 2008 credit crunch and the recession) as well as market expansion experienced after the end of the Dot-com Boom. It has the advantage of using more recent data hence an ability to produce results that verify whether findings of Piotroski (2002) hold.

Firms are identified on the JSE AltX with sufficient stock price and book value data from I-Net bridge database and McGregor Bureau of Financial Analysis database respectively. The use of the JSE AltX will result in a modestly sized sample of listed companies of both medium and low market capitalisation on the JSE hence paving the unfamiliar path to achieve new inferences that will be made on the South African financial market. Although it is the sample most likely to be plagued by the microstructure effects, such as stocks with lower traded volumes, the prospects of achieving ground breaking discoveries from tapping into an under-researched market index far outweighs any complications associated with data integrity.

The market value of equity and BM ratio will not be calculated for each firm at fiscal year-end as in Piotroski (2002). Instead, a twelve month average BM ratio will be calculated using monthly data owing to unexpected high volatility associated with the low market capitalisation, illiquid and scarcely traded nature of companies listed on the JSE AltX. Companies with such characteristics may be subject to fluctuations in share price prior to fiscal year-end, possibly as a result of insider trading, which may drastically alter the BM ratio at fiscal year-end leaving one with inaccurate misrepresentation of the true BM ratio. Observations are grouped by and ranked within the corresponding year of the calculated twelve month average BM ratio so that all observations related to a specific year form an observation to determine that year's BM cut-offs. BM cut-offs coincide with the last trading day of September in each year.

In each year, all firms are ranked with sufficient data to identify book-to-market quartile cut-offs. The prior year's BM distribution is used to classify firms into BM quartiles to avoid look-ahead bias. Firms are retained in the upper BM quartile with sufficient financial statement data to calculate the various financial performance signals. In order to investigate the Size Effect, firms found to be in the upper BM quartile are further ranked to determine the size median cut-off. A firm's size classification (small or large) is determined using the prior year's monthly distribution of market capitalisations using the same method that determined

BM cut-offs. A twelve month average market capitalisation is used to mitigate the possible effects of firms issuing more equity or repurchasing shares during the trying period after listing, however the latter would be a rare occurrence as firms listing for the first time choose to go public for various reasons other than to repurchase its own shares (Ritter & Welch, 2002). The upper quartile and not the top quintile is selected to classify value stocks; however this slight modification to the method used in Piotroski (2002) should not impact the results thus enabling inferences to still be deduced from both papers without any element of bias creeping into the results.

As in Piotroski (2002); firm specific returns are measured as one year buy-and-hold returns however, this study differs such that returns are measured from the last day of the twelfth month of the previous portfolio year until the last day of the twelfth month of the current portfolio year as monthly data is employed. Returns are measured from one year after the inception of the sample period (beginning of October 2003) marking the commencement of the first portfolio. If a firm is suspended from trading or de-lists for whatever reason, the return is measured up until the month of de-listing or suspension and the calculated return would be considered to be that firm's yearly buy and hold return. If a firm is promoted to the JSE Main Board, the return is measured until the end of the portfolio year irrespective of the firm trading on the JSE Main Board. Firms that transferred from the JSE Main Board to the JSE AltX are considered to be new listings for portfolio formation purposes. Given that companies may have different fiscal year-ends; data from the prior year's financial statement is used, if available, at the time of portfolio formation. Should prior year's data not be available at the time of portfolio formation, the firm is removed from the portfolio however the occurrence of such a scenario is scarce considering listed stocks must comply with regulations set by the JSE or they face being suspended from trading. Market-adjusted return is defined as firms' twelve month buy-and-hold return less the buy-and-hold return on the value-weighted JSE AltX over the corresponding time period.

3.2 DESCRIPTION OF OVERALL RESEARCH DESIGN

Based on the requirements of the proposed research, portfolios are formed using an equal weighted approach and selection is based on the firms' aggregate score (F_SCORE) and market capitalisation. Firms with weak (strong) fundamental signals are classified as low (high) F_SCORE firms. Firms with low F_SCORES (F_SCORE between 0 and 5) are

expected to have the worst subsequent stock performance. Alternatively, firms with high F_SCORES (F_SCORE between 6 and 9) are expected to have the best subsequent stock performance. Small (large) firms are classified by values that fall below (above) the size median of ranked firms and consistent with Banz (1981), are expected to have significantly better stock performance than stocks of larger firms.

This study aims to test whether the high F_SCORE portfolio and the small firm portfolio outperform the high BM portfolios as well as its benchmark (the JSE AltX). To test if the distribution of the returns can be shifted by fine-tuning the value portfolio, two sets of tests are set-up to investigate the mean of the market-adjusted returns of the various portfolios. The first set of tests compares the market-adjusted returns earned by high F_SCORE firms against the market-adjusted returns of the low F_SCORE firms and the portfolio of all high BM firms. Similarly, the second set of tests compares the market-adjusted returns earned by small firms against the market-adjusted returns of large firms and the portfolio of all high BM firms. Each series of market-adjusted returns for each respective portfolio are also tested for statistical significance.

Keeping in line with the methodology of Piotroski (2002), results are tested using the Traditional t-Test. The test of market-adjusted return differences between high and low F_SCORE portfolios (small and large firm portfolios) is performed as follows: from the sample of high BM firms, high F_SCORE (small) and low F_SCORE (large) firms are assigned to their respective portfolios and market-adjusted returns computed. The Paired Sample t-Test is used to analyse the mean of the difference between the market-adjusted returns of these two sets of portfolios and this difference represents an observation under the null hypothesis of no difference in the market-adjusted return performance (mean equal to zero). The distribution of these market-adjusted return differences is used to test the statistical significance at a 5% level of significance.

The test of market-adjusted return differences between high F_SCORE (small) firms and all high BM firms is performed in a similar manner as described above. The Paired Sample t-Test is used to analyse the mean of the difference between the market-adjusted returns of the high F_SCORE portfolio and the entire high BM portfolio, and the small firm portfolio and the entire high BM portfolio; thereby generating an observation under the null hypothesis of no difference in the market-adjusted return performance (mean equal to zero). The

distribution of these market-adjusted return differences is once again used to test the statistical significance at a 5% level of significance.

Each portfolio's market-adjusted returns (high F_SCORE, low F_SCORE, small firm, large firm, F_SCORE and market capitalisation value portfolios) are initially tested using the One Sample t-Test where the market-adjusted return performance represents an observation under the null hypothesis of no return deviation from the JSE AltX (mean equal to zero). The distribution of each portfolio's market-adjusted returns are used to test the statistical significance at a 5% level of significance.

This study expects to find that a strategy that uses relevant historical information to eliminate firms with poor prospects from a generic high BM portfolio can shift the distribution of returns earned by an investor. It also seeks to ascertain if a negative relationship exists between stock performance and firm size within the same portfolio of high book-to-market firms.

4 DATA CONSTRAINTS & SAMPLING MODIFICATION

The sample includes all common stocks quoted on the JSE AltX between the beginning of October 2003 and the end of September 2013. A total of 106 firms were identified to have actively traded on the JSE AltX during this period (see Appendix A). Monthly price and return data, BM and the number of shares outstanding at the end of each month are available from I-Net bridge database and McGregor Bureau of Financial Analysis database. Annual financial statements were retrieved from the respective companies' websites or other electronic sources such as *Sharenet* and *Moneyweb* if data was not available.

Given that the beginning of the sample coincides with the launch of the JSE AltX, the majority of the listings were new listings with only a fraction transferring from other boards. As such, portfolios were constructed with data that was collected from firms after the twelfth month of listing to allow one the opportunity to assess firms' BM behaviour as well as have access to the first set of fiscal year-end financial statements after listing. Firms that were suspended or did not have sufficient financial information (retrieved from financial statements) for a specific year were removed from that year's firm selection portfolio to be invested in the subsequent year. The only exception made was during the first two years of

portfolio construction where selected high BM firms were substituted for the next high BM firm with sufficient financial information. This adjustment was done as a result of only 1 and 2 firms matching the high BM criteria of this study in year 1 and year 2 respectively. As a result of insufficient financial information for certain firms, the value portfolios used for the F_SCORE study differs from the value portfolios used for the Size Effect study.

Market data for the JSE AltX Index was only available from the end of April 2006 affecting the calculation of market-adjusted returns in the first two years (year 2 and 3) of portfolio analysis. Data from the JSE Small Cap (J202) Index has been used in place of the missing data to calculate a market return for the first two years (year 2 and 3) so that market-adjusted returns could be calculated.

Table 2: Matrix of JSE AltX Listed Firms

Matrix							
Year	**Yearly Maximum**	**Start**	**New Listings**	**De-Listings**	**Promotions**	**Board Transfers**	**End**
Year 1	**7**	0	2	0	0	5	**7**
Year 2	**16**	7	8	0	0	1	**16**
Year 3	**25**	16	9	2	0	2	**25**
Year 4	**61**	25	33	0	1	4	**61**
Year 5	**79**	61	19	1	2	1	**78**
Year 6	**79**	78	3	3	2	1	**77**
Year 7	**78**	77	1	2	7	2	**71**
Year 8	**72**	71	3	2	3	2	**71**
Year 9	**71**	71	3	5	5	0	**64**
Year 10	**64**	64	6	9	1	1	**61**

Table 2 illustrates a matrix with details of the listings and changes that occurred between October 2003, when the JSE AltX was established, and the end of September 2013 (see Appendix B, C, D and E for full details of listing dates and changes). Due to its infancy, the JSE AltX only had its first handful of listings in early 2004 ending its first year with seven listings. The JSE AltX only gained popularity among medium to small firms in its 4th year of existence with the number of listings in excess of 60. The number of listed firms increased in the subsequent year resulting in a maximum number of listed firms equal to 80, remaining

steady for the next two years before gradually decreasing to maximum of 64 listed firms at the end of the 10th year. In addition, 19 firms transferred to the JSE AltX from various boards (Main Board, Development Capital Market Board & Venture Capital Market Board) while the majority of the JSE AltX constituents were comprised of new listings with a total of 87 firms listing for the first time during the sample period. During the same period, 21 firms were promoted from the JSE AltX to the Main Board while a staggering 24 firms de-listed with the yearly high (9 firms) surprisingly occurring during its 10th year of existence (October 2012 to September 2013).

The first five years of the sample period has resulted in very few observation given that there were a handful of listings on the JSE AltX during this period and that firms were only observed after the twelfth month of listing. As such, the results were not expected to be robust during the first five years. However, it was expected that the subsequent 5 years would result in a more comprehensive study and yield a more meaningful outcome given the stability and quantity of the data during the second 5 year period. These contrasting periods have surprisingly yielded consistent results which will be discussed in the next section.

A slight adjustment has been made to the sample period to include an additional 8 month buy-and-hold period (October 2013 to May 2014) at the end of the ten year sample (September 2013) when firms were selected based on this study's criteria. The main reason is due to the fact that the JSE AltX was established in September 2003 which coincides with the start of our sample period, eliminating the possibility to extract at least twelve months' worth of listed financial data prior to the first year necessary for firm selection. This adjustment will allow this study to analyse the return of firm selection at the end of the tenth year and will enable this study to have at least ten years' worth of returns for analysis. The last period's returns were calculated as an 8 month buy-and-hold period, however the returns are assumed to be the firms' yearly buy and hold return as stocks are assumed to follow a random walk (Fama, 1965) and cannot be converted to annual return.

Another adjustment has been made to the analysis of the Size Effect to accommodate the use of the median as a cut-off to separate small and large firms. In the years (5, 6, 7 & 9) where the high BM portfolio had an odd number of observations, the firm with the market capitalisation that coincided with the median was used in both the small and large firm portfolios to avoid eliminating firms that were "on the fence".

As a result of only one observation meeting the criteria of a high BM firm in Year 1, the firm was used in both the high and low F_SCORE portfolio in the F_SCORE analysis and was also used in both the small firm and large firm portfolio in the Size Effect analysis. It is important to note that the firm used in the F_SCORE analysis differs from the firm used in the Size Effect analysis as there was no financial data available in Year 1 for the firm initially selected. The next firm falling into the high BM category was used instead for the F_SCORE analysis resulting in two different returns for the F_SCORE and Size Effect analysis in Year 1.

In Year 3 of the F_SCORE analysis, the requirements to categorise high F_SCORE firms were revised from an F_SCORE value between 6 and 9 to an F_SCORE value between 5 and 9 to accommodate firms only scoring a maximum F_SCORE value of 5. The requirements for the low F_SCORE value were subsequently revised to an F_SCORE value between 0 and 4 in the same year. This adjustment was only subject to Year 3.

The Size Effect analysis yielded observations that included 9 stocks that were promoted to JSE Main Board and 5 stocks that were de-listed mid-year as a result of the firms being acquired by another firm, including one case of voluntary de-listing. Stock returns of firms that were promoted to the JSE Main Board were calculated until the end of the portfolio year including the months that it traded on the JSE Main Board. Stock returns of firms whose stock were de-listed were calculated until the last day of trading and this calculated return was assumed to be the annual buy-and-hold return. The same 9 stocks that were promoted to JSE Main Board were also included in the observations yielded by the F_SCORE analysis and its stock returns were calculated in the same manner performed in the Size Effect analysis. In addition, only 2 stocks de-listed mid-year as a result of the firms being acquired by another firm and its stock returns too were calculated until the last day of trading and this calculated return was assumed to be the annual buy-and-hold return.

Stocks are selected for portfolio creation from the end of Year 1 until the end of Year 10 resulting in 10 years of portfolios to be invested in. The selected stocks that create these portfolios are only invested in the year following identification, and as a result the portfolio investment years run from Year 1 (2) until Year 10 (11) where the value in the brackets corresponds to the year in which the stocks of the portfolio are actually invested in (see

Appendix F). As previously stated, Year 10 (11) only has 8 months ending in May 2014; however the 8 month returns are assumed to be the annual buy-and-hold return.

Results of this study are further compared to the returns that could be received from the overall market. An additional market-adjusted return, market-adjusted return (ALSI), is computed for all portfolios and the results are mentioned in the next section and presented in the Appendix. Market-adjusted return (ALSI) is defined as firms' twelve month buy-and-hold return less the buy-and-hold return on the value-weighted JSE ALSI over the corresponding time period.

5 RESULTS AND DISCUSSION

The results of this study are examined using graphical and statistical analysis. Although one would naturally draw conclusions from a statistical model; it is also important to explore how the figures were obtained, their impact on the study and investigate the graphical nature of the results in order to have a complete picture of the conclusions that will be deduced from statistically testing the results.

5.1 GRAPHICAL ANALYSIS

5.1.1 F_SCORE

The F_SCORE analysis delivered interesting results, however before the findings are jumped into and discussed it is important to understand how these figures came about. Table 3 summarises the number of observations used to arrive at the results. As previously noted, this study was not expecting a large sample to draw from, consequently resulting in only 96 observations to conduct this study. Approximately a third of this figure made up firms that fell into the high F_SCORE category with the remainder falling into the other category. This figure is surprising as it implies that 66% of firms contained in the high BM (value) portfolio are expected to have the worst subsequent stock performance. This alarming percentage certainly casts doubt in Graham and Dodd's (1934) strategy of investing in the entire high BM portfolio and points to the need to further discriminate stocks contained in the value portfolio to enhance returns.

Table 3: Total F_SCORE Yearly Observations

Observations			
Period	**High F_SCORE**	**Low F_SCORE**	**Value Portfolio**
Year 1 (2)	1	1	1
Year 2 (3)	1	1	2
Year 3 (4)	2	2	4
Year 4 (5)	5	2	7
Year 5 (6)	3	8	11
Year 6 (7)	6	11	17
Year 7 (8)	2	15	17
Year 8 (9)	5	11	16
Year 9 (10)	7	5	12
Year 10 (11)	2	7	9
Total	34	63	96

Figure 1: Total F_SCORE Yearly Observations

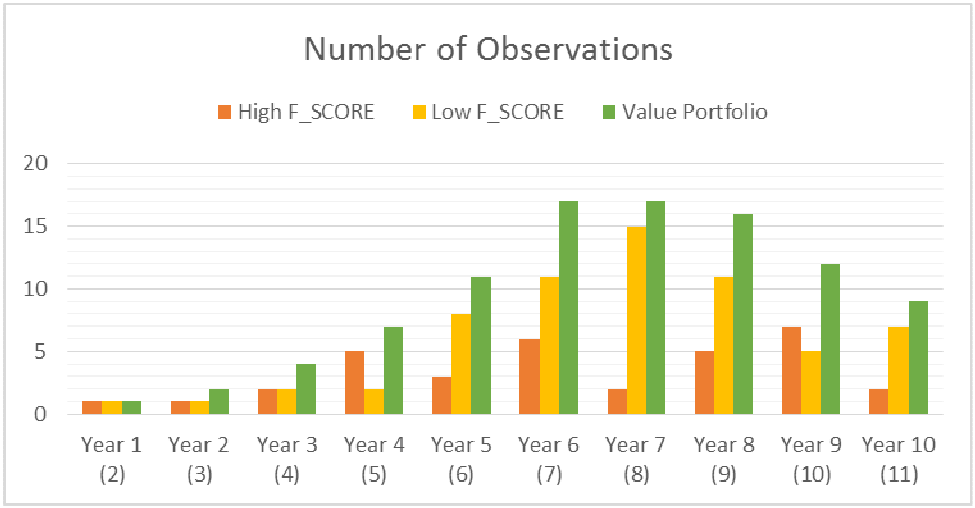

Figure 1 displays the frequency of observations over the 10 year sample period. The first three years yielded very few observations due to the JSE AltX's infancy. The results, which will be discussed below, were nonetheless robust during the initial years corroborating that there will always be winners and losers and that this test could potentially be powerful enough to differentiate winners from losers even when there are few observations. The number of observations was steady over the next 7 years yielding mixed results with some years comprising of more high F_SCORE firms than other years.

Table 4: F_SCORE Yearly Observations by Max & Min Value

F_SCORE Values			
Period	**Highest Value**	**Lowest Value**	**Mean**
Year 1 (2)	5	5	5.0
Year 2 (3)	6	3	4.5
Year 3 (4)	5	3	4.3
Year 4 (5)	7	4	5.9
Year 5 (6)	7	2	4.5
Year 6 (7)	9	1	4.4
Year 7 (8)	7	2	3.9
Year 8 (9)	8	2	4.9
Year 9 (10)	8	2	5.5
Year 10 (11)	6	3	4.2

Figure 2: F_SCORE Yearly Observations by Max & Min Value

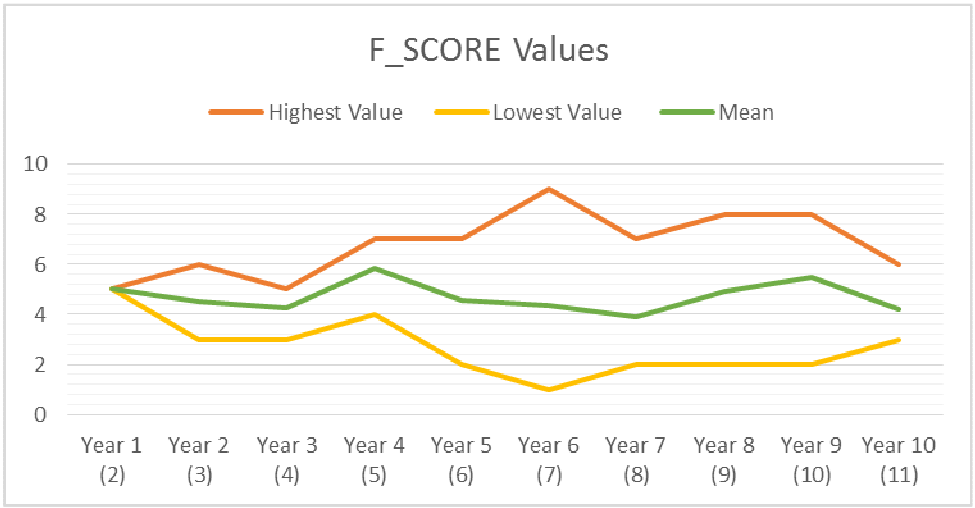

Table 4 explores the notion that high F_SCORE firms are expected to have the best subsequent stock performance and that low F_SCORE firms are expected to have the worst subsequent stock performance. Intuitively, one would expect that the higher the F_SCORE value of a firm the better the performance and similarly, an F_SCORE value closer to 0 would result in poor relative firm performance. Year 4, 5, 6, 7, 8 and 9 include firms with the highest F_SCORE values in the sample while Year 5, 6, 7, 8 and 9 include firms with the lowest F_SCORE values. The latter coincides with the 2008 credit crunch and the recession that followed after. Figure 2 plots the results from Table 4 on a line graph. The line graph suggests that between Year 4 and Year 9 one could expect the high F_SCORE portfolio to achieve the best market-adjusted performance. It also suggests that between Year 5 and Year 9 one could expect the low F_SCORE portfolio to achieve devastating market-adjusted performance. Surprisingly, these expectations were confirmed by the results which will be discussed shortly.

Table 5: F_SCORE Yearly Frequency Analysis

F_SCORE Analysis									
Period	**ROA**	**CFO**	**ΔROA**	**ACCRUAL**	**ΔLEVER**	**ΔLIQUID**	**EQ_OFFER**	**ΔMARGIN**	**ΔTURN**
Year 1 (2)	1	0	1	0	0	1	1	1	0
Year 2 (3)	2	1	1	0	1	2	0	1	1
Year 3 (4)	3	3	1	2	2	2	1	1	2
Year 4 (5)	7	6	4	4	3	5	2	4	6
Year 5 (6)	10	10	2	7	5	5	1	6	4
Year 6 (7)	11	11	4	12	9	9	7	7	4
Year 7 (8)	7	13	4	11	9	6	6	5	5
Year 8 (9)	5	10	7	14	10	6	9	5	13
Year 9 (10)	6	7	9	9	6	8	6	7	8
Year 10 (11)	1	6	2	9	5	1	6	4	4
Total	53	67	35	68	50	45	39	41	47

Figure 3: F_SCORE Yearly Frequency Analysis

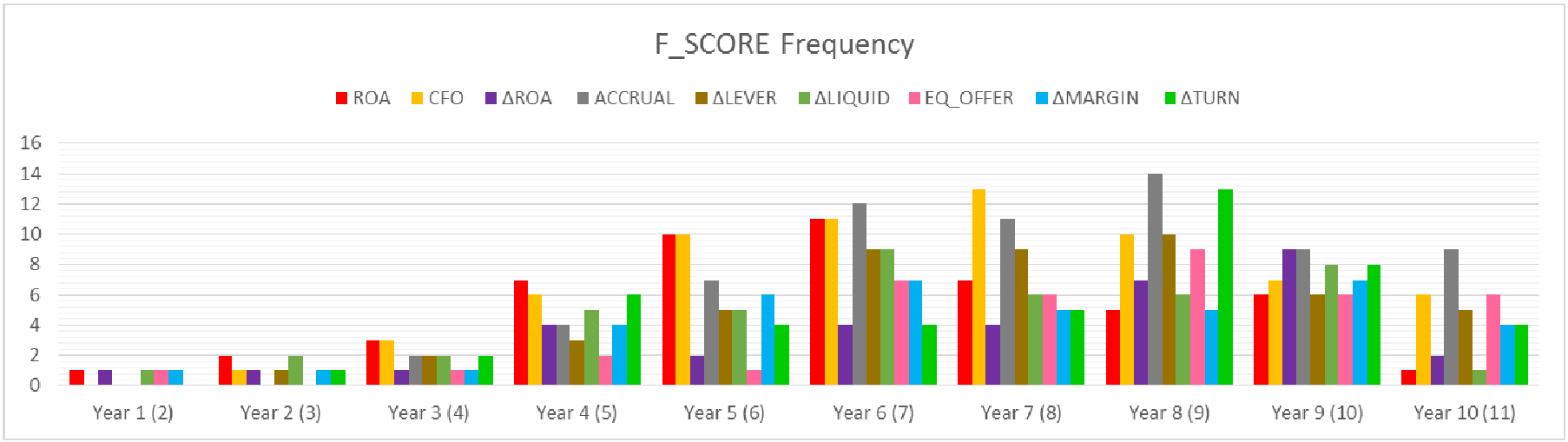

Table 5 investigates the nine individual binary signals that comprise the F_SCORE while Figure 3 presents these findings in a histogram to bring a visual dimension to the analysis facilitating its interpretation. Interestingly, the variable ΔROA was observed the least amount of times throughout the sample period; however it was much more prevalent during the years in which high F_SCORE firms had the best market-adjusted returns. On the other extreme, the variable ACCRUAL was observed the most number of times within the observed firms and was similarly prevalent during the years in which high F_SCORE firms had the best market-adjusted returns. These observations alludes to the possibility that some variables were more sensitive than others in predicting better subsequent stock performance. The variable CFO appeared in tandem with ROA almost throughout every year while EQ_OFFER occurred sporadically throughout the sample not really cementing itself as a significant predictor of better subsequent stock performance. The lack of trend was also observed in variables ΔLEVER, ΔLIQUID, ΔMARGIN and ΔTURN with the exception that variables ΔLEVER and ΔTURN maximum yearly observations coincides with the year (Year 8) that the high F_SCORE portfolio experienced the second highest market-adjusted return. As expected, all the F_SCORE variables in Year 9 had a similar frequency and coincides with the year in which the high F_SCORE portfolio experienced the highest market-adjusted return. Surprisingly, Year 6 saw the high F_SCORE experience its worst meaningful market-adjusted return performance; however only variables ΔROA and ΔTURN had relatively low occurrence suggesting it dominated the other variables in Year 6. In totality, these findings are not suggesting that some variables in the F_SCORE are unimportant but merely that some variables may possess stronger explanatory power as was displayed by the inconsistency of the F_SCORE results and its expected corresponding market-adjusted returns. Exploring an F_SCORE with variables that are weighted differently could potentially enhance the current F_SCORE, however that will remain to be seen.

These findings expose the shortcomings of the current F_SCORE's ability to differentiate firms throughout the sample period and could potentially assist in fine tuning the F_SCORE to suit the characteristics of firms listed on the JSE AltX or of firms in general operating in a South African climate. Nonetheless, the current F_SCORE has done an excellent job in differentiating firms and the proof is in the results which is discussed next.

Table 6: F_SCORE Returns

Returns			
Period	**High F_SCORE**	**Low F_SCORE**	**Value Portfolio**
Year 1 (2)	39.24%	39.24%	39.24%
Year 2 (3)	86.49%	-68.18%	9.15%
Year 3 (4)	145.38%	42.65%	94.02%
Year 4 (5)	-11.78%	-58.33%	-25.08%
Year 5 (6)	-40.26%	-45.83%	-44.31%
Year 6 (7)	-14.47%	-39.38%	-30.59%
Year 7 (8)	99.17%	27.13%	35.61%
Year 8 (9)	230.55%	33.69%	95.21%
Year 9 (10)	234.70%	-3.75%	135.34%
Year 10 (11)	91.42%	86.28%	87.42%

Table 7: F_SCORE Market-Adjusted Returns

Market-Adjusted Returns			
Period	**High F_SCORE**	**Low F_SCORE**	**Value Portfolio**
Year 1 (2)	-22.12%	-22.12%	-22.12%
Year 2 (3)	60.63%	-94.04%	-16.71%
Year 3 (4)	46.55%	-56.18%	-4.82%
Year 4 (5)	13.02%	-33.53%	-0.28%
Year 5 (6)	16.99%	11.42%	12.94%
Year 6 (7)	6.37%	-18.54%	-9.75%
Year 7 (8)	102.19%	30.16%	38.63%
Year 8 (9)	225.52%	28.65%	90.17%
Year 9 (10)	243.62%	5.17%	144.26%
Year 10 (11)	63.76%	58.62%	59.76%

Figure 4: F_SCORE Market-Adjusted Returns

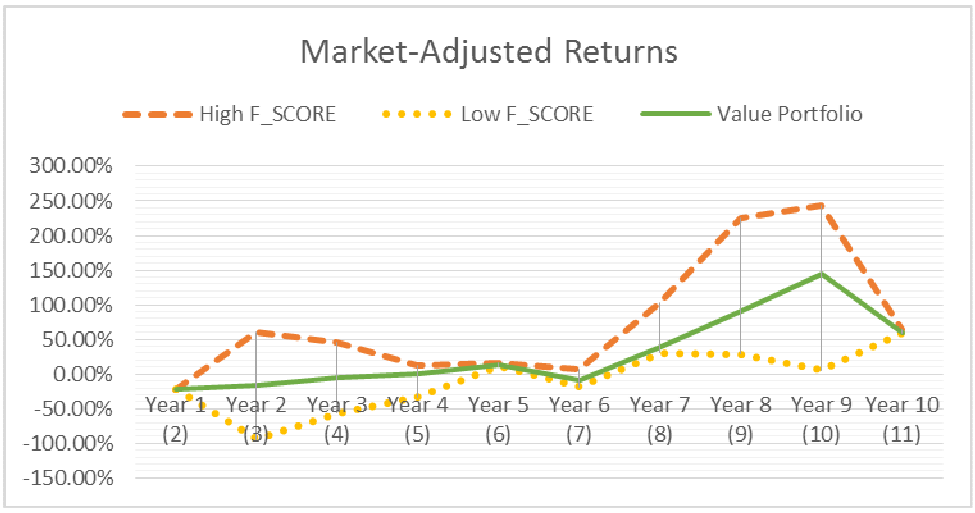

Table 8: Benchmark Returns

Benchmark		
Period	**AltX Return**	**ALSI Return**
Year 1 (2)	61.36%	43.49%
Year 2 (3)	25.86%	32.58%
Year 3 (4)	98.83%	33.90%
Year 4 (5)	-24.80%	-20.44%
Year 5 (6)	-57.25%	4.51%
Year 6 (7)	-20.84%	18.25%
Year 7 (8)	-3.03%	0.74%
Year 8 (9)	5.03%	20.50%
Year 9 (10)	-8.92%	23.14%
Year 10 (11)	27.66%	19.67%

Figure 5: Benchmark Returns

Table 6 contains returns earned by the high, low and value F_SCORE portfolios over the 10 year sample period. Its market-adjusted returns are presented in Table 7 and plotted on Figure 4 (market-adjusted returns based on the ALSI are presented and plotted in Appendix G and H respectively). The 3 different portfolio returns are consistent in that all portfolios registered the same sign (negative or positive returns) albeit by varying degrees. Year 4, 5 and 6 were the only years that all portfolios unanimously generated negative returns which is consistent with the credit crisis leading up to 2008. The only exceptions were in Year 2 and 9 where the low F_SCORE portfolio yielded a negative return while both the other portfolios enjoyed positive returns. These exceptions are nonetheless welcomed as the purpose of the F_SCORE is to differentiate between winners and losers.

The market-adjusted returns presented in Table 7 paints an entirely different picture. The consistency observed in Table 6 are further scrutinised revealing what this study was aiming to uncover. With the exception of Year 1 where the returns in all 3 portfolios are the same, the high F_SCORE portfolio earned positive market-adjusted returns throughout the 10 year sample period while market-adjusted returns earned by the low and value F_SCORE portfolios were mixed tending towards positive towards the latter years of the sample. The same can be said of the market-adjusted ALSI returns, with the exceptions that the high F_SCORE portfolio earned negative market-adjusted returns in only 2 out of 10 years. These years of negative performance coincide with the credit crisis leading up to 2008.

Table 8 and Figure 5 present and display the performance of the JSE AltX and ALSI. One can clearly observe the credit crisis leading up to 2008 and the slow recovery that followed from Figure 5. Both benchmarks seem to follow a similar path, however the JSE AltX appears to lag the JSE ALSI by as much as two years towards the end of the sample period potentially as a result of the Local Lagging Effect synonymous with Small Cap stocks. The JSE AltX's lagged performance appears to be pronounced at the troughs and peaks of the JSE ALSI's performance, opening the door for these market delays to be taken advantage of. However, for the purposes of this study, the lagged response experienced by the JSE AltX (especially a two year delay) could impact the findings of this study hence the inclusion of market-adjusted returns ALSI in the appendix (G & H) of the study. The market-adjusted performance of the high F_SCORE portfolio appear to be robust when comparing portfolio returns to both the JSE AltX and the JSE ALSI further corroborating the F_SCORE's ability to differentiate firms. Whether or not the performance is significantly robust, will be explored in Section 5.2.

Figure 4 gives visual confirmation that the portfolio of high F_SCORE firms consistently outperformed the portfolio of low F_SCORE firms and the entire value F_SCORE portfolio. These results are further corroborated by the figure in Appendix H which presents market-adjusted ALSI returns. Although, the outperformance was marginal in Year 4, 5 and 6; the F_SCORE withstood the test of market anomalies and proved to be a reliable indicator even during times of recession.

It is important to note that the results presented in the above tables and figures are not inclusive of transactions costs. Several stocks contained in the value F_SCORE portfolio are considered to be penny stocks and are therefore plagued by large bid-ask spreads which makes trading them costly. Considering the consistency and margin by which the firms contained in the high F_SCORE portfolio exceeded the 2 benchmarks, the high transaction costs associated with penny stocks are not expected to be large enough to erode the superior returns earned by the high F_SCORE portfolio. The F_SCORE's proven ability to differentiate firms with prospective superior performance from firms that are expected to perform poorly (post of transactions fees) would certainly hold; even after factoring in a modestly estimated average transaction cost of 2.5% per trade.

5.1.2 THE SIZE EFFECT

The Size Effect analysis delivered results consistent with Banz (1981). The observations used to arrive at the results are summarised in Table 9. As previously noted, this study was not expecting a large sample to draw from, consequently resulting in only 105 observations to conduct this study. As a result of the median being used as the cut-off to differentiate firms according to size; the small firm and large firm portfolios had the same number of observations. A total of 55 observations over the 10 year sample period were identified for the small firm and large firm portfolios. The discrepancy in the total values is the result of the inclusion of the firm with a market capitalisation equal to the median in both the small and large firm portfolio. This anomaly occurred in Year 5, 6, 7 and 9 where there were an uneven number of observations and in Year 1 where the only observation was used in both the small and large portfolios.

Table 9: Total Firm Size Yearly Observations

Observations			
Period	**Small Firms**	**Large Firms**	**Value Portfolio**
Year 1 (2)	1	1	1
Year 2 (3)	1	1	2
Year 3 (4)	2	2	4
Year 4 (5)	4	4	8
Year 5 (6)	8	8	15
Year 6 (7)	9	9	17
Year 7 (8)	9	9	17
Year 8 (9)	8	8	16
Year 9 (10)	7	7	13
Year 10 (11)	6	6	12
Total	55	55	105

Figure 6: Total Firm Size Yearly Observations

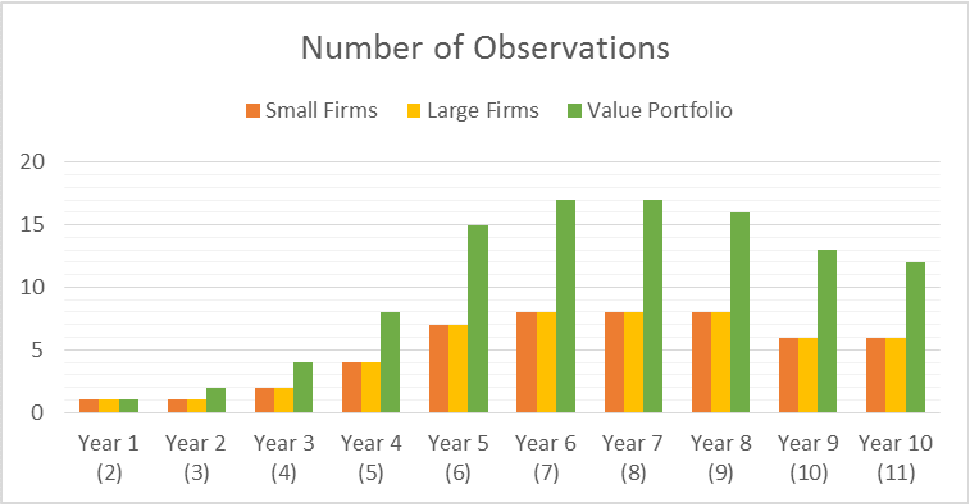

Figure 6 displays the frequency of observations over the 10 year sample period. The first four years yielded very few observations (less than 5) due to the JSE AltX's infancy. The results were not as robust in the initial years owing to the fact that there were fewer observations to test the pervasiveness of the Size Effect during this teething period. The number of observations grew steady over the next 6 year period yielding an average of 8 observations per portfolio per year. This spike in number of observations certainly played a role in revealing the pervasiveness of the Size Effect which is discussed in turn.

Table 10: Firm Size Returns

Returns			
Period	**Small Firms**	**Large Firms**	**Value Portfolio**
Year 1 (2)	16.67%	16.67%	16.67%
Year 2 (3)	-68.18%	86.49%	9.15%
Year 3 (4)	172.53%	15.51%	94.02%
Year 4 (5)	34.06%	-36.83%	1.38%
Year 5 (6)	-32.96%	-40.89%	-39.39%
Year 6 (7)	-16.92%	-36.86%	-30.59%
Year 7 (8)	43.71%	32.09%	35.61%
Year 8 (9)	145.30%	45.11%	95.21%
Year 9 (10)	178.56%	66.90%	127.02%
Year 10 (11)	64.61%	67.86%	66.23%

Table 11: Firm Size Market-Adjusted Returns

Market-Adjusted Returns			
Period	**Small Firms**	**Large Firms**	**Value Portfolio**
Year 1 (2)	-44.69%	-44.69%	-44.69%
Year 2 (3)	-94.04%	60.63%	-16.71%
Year 3 (4)	73.69%	-83.33%	-4.82%
Year 4 (5)	58.86%	-12.03%	26.19%
Year 5 (6)	24.29%	16.36%	17.86%
Year 6 (7)	3.92%	-16.03%	-9.75%
Year 7 (8)	46.74%	35.12%	38.63%
Year 8 (9)	140.27%	40.08%	90.17%
Year 9 (10)	187.48%	75.82%	135.94%
Year 10 (11)	36.95%	40.19%	38.57%

Figure 7: Firm Size Market-Adjusted Returns

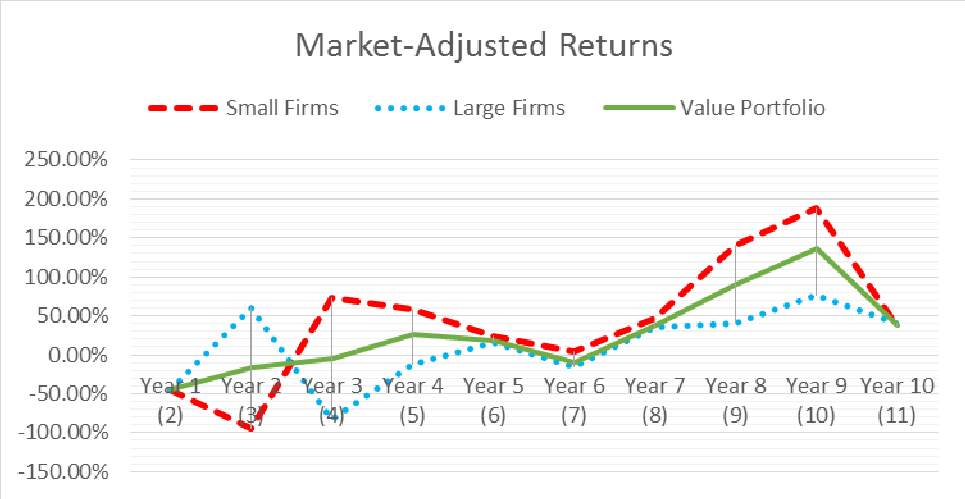

Table 10 contains returns earned by the small firm, large firm and size value portfolios over the 10 year sample period. Its market-adjusted returns are presented in Table 11 and plotted on Figure 7 (market-adjusted returns based on the ALSI are presented and plotted in Appendix I and J respectively). Apart from Year 2 and 3 where the small firm and large firm portfolios experienced negative returns, the sign of the returns earned by all three portfolios were consistent albeit by varying degrees. Year 5 and 6 resulted in negative returns across the board, however this is attributed to the period leading up to the 2008 credit crunch.

The market-adjusted returns presented in Table 11 completely eliminate the negative returns earned by the small firm portfolio (with the exception of Year 2) and those of the large and size value portfolios in Year 5. This suggests that although the firms generated negative returns during these periods, they were less negative that the returns earned by the JSE AltX possibly attributing to the advantage of selecting high BM firms. Table 11 also reveals that the large firm and size value portfolios were plagued by an initial period of mixed returns as well as negative returns in Year 6 most liked caused by the lagged reaction to the AltX caused by the 2008 credit crunch. Similar observations can be deduced from the market-adjusted ALSI returns presented in Appendix I. The small firm portfolio only beat the overall market in 6 out of 10 years, a considerable drop to the 80% success rate of the JSE AltX, The negative market-adjusted returns earned in Year 5 and 6 across the board seem to coincide with the credit crisis leading up to 2008, however the large firm portfolio's negative run appeared to have started in Year 3 adding fuel to Banz's (1981) Size Effect theory. The overall market-adjusted ALSI returns presented in Appendix I suggests that the small firm, large firm and size value portfolios were not able to consistently beat the overall market during the first 6 years. However, the consistent superior market-adjusted performance experienced in the subsequent 4 years cast hope in proving the theory put forward by proponents of the Size Effect.

Figure 7 gives visual confirmation that the portfolio of small firms consistently outperformed the portfolio of large firms and the entire size value portfolio with the exception of Year 2. These results are further corroborated by the figure in Appendix J which presents market-adjusted ALSI returns. Although, the outperformance was marginal in Year 5 and 6; the pervasiveness of the Size Effect withstood the test of market anomalies and proved to be exist even during times of recession.

The market-adjusted performance of the small firm portfolio appear to be robust when comparing portfolio returns to both the JSE AltX and the JSE ALSI further corroborating the pervasiveness of Banz's (1981) Size Effect. Whether or not the performance is significantly robust, will be explored in Section 5.2.

It is important to note that the results presented in the above tables and figures are not inclusive of transactions costs. Several stocks contained in the size value portfolio are considered to be penny stocks and are therefore plagued by large bid-ask spreads which

makes trading them costly. Considering the consistency and margin by which the firms contained in the small firm portfolio exceeded the large firm and size value portfolios, the high transaction costs associated with penny stocks are not expected to be large enough to erode the superior returns earned by the small firm portfolio. The Size Effect's pervasiveness (post of transactions fees) would certainly exist; even after factoring in a modestly estimated average transaction cost of 2.5% per trade.

5.2 STATISTICAL ANALYSIS

5.2.1 F_SCORE

The above graphical analysis is further corroborated and backed up by statistical analysis presented in this section. Table 12 summarises the results of the tests conducted on the returns of the high, low and value F_SCORE portfolios (results of the tests based on market-adjusted ALSI returns are summarised and presented in Appendix K). A One Sample t-Test was used to test the significant of the series of market-adjusted returns for each portfolio. The results displayed in Table 12 clearly indicate that the market-adjusted returns of the high F_SCORE portfolio were significantly different from zero at the 5% significance level yielding a p-value of 0.0272. Although the returns were highly volatile (standard deviation equal to 90.9%) compared to both benchmarks; they nonetheless yielded an average yearly market-adjusted return of 75.7% over the 10 year sample period. The market-adjusted returns of the low and value F_SCRORE portfolios were not significantly different from zero at the 5% significance level yielding a p-value of 0.5436 and 0.1231 respectively. Even though the later results were not conclusive, we are more concerned with the results of the high F_SCORE which statistically confirms that the F_SCORE certainly has power to differentiate winners from losers. The results presented in Appendix K which is based on market-adjusted ALSI returns echo the results of the market-adjusted returns based on the JSE AltX. It is important to note that the market-adjusted ALSI return series of the high F_SCORE portfolio were significantly different from zero at the 5% significance level, albeit it yield a slightly lower average yearly market-adjusted return of 69.4% over the 10 year sample period. Both the market-adjusted ALSI returns of the low and value F_SCORE portfolios were not significantly different from zero 5% significance level.

Table 12: One Sample t-Test Results

One Sample t-Test			
Period	**High F_SCORE**	**Low F_SCORE**	**Value Portfolio**
Year 1 (2)	-22.12%	-22.12%	-22.12%
Year 2 (3)	60.63%	-94.04%	-16.71%
Year 3 (4)	46.55%	-56.18%	-4.82%
Year 4 (5)	13.02%	-33.53%	-0.28%
Year 5 (6)	16.99%	11.42%	12.94%
Year 6 (7)	6.37%	-18.54%	-9.75%
Year 7 (8)	102.19%	30.16%	38.63%
Year 8 (9)	225.52%	28.65%	90.17%
Year 9 (10)	243.62%	5.17%	144.26%
Year 10 (11)	63.76%	58.62%	59.76%
Mean	75.65%	-9.04%	29.21%
High - Low	265.74%	152.66%	166.38%
Std Dev	0.9087	0.4529	0.5429
p-value	0.0272	0.5436	0.1231
(t-statistic)	2.6300	-0.6300	1.7000

The series of market-adjusted returns of the various portfolios were further tested against each other using the Paired t-Test. Table 13 and 14 summarises the results of the tests conducted on the high vs low F_SCORE portfolios and the high vs value F_SCORE portfolios. Table 13 confirms that the difference between investing in the high F_SCORE portfolio instead of the low F_SCORE portfolio is significantly different from zero at the 5% significance level yielding a p-value of 0.0124. An investor would earn a return of 84.7% from going long in the high F_SCORE portfolio and shorting the low F_SCORE portfolio. This strategy would result in returns experiencing lower volatility (standard deviation equal to 85.9%). Table 14 confirms that the difference between investing in the high F_SCORE portfolio instead of the value F_SCORE portfolio is significantly different from zero at the 5% significance level yielding a p-value of 0.012. An investor would earn a return of 46.4% from going long in the high F_SCORE portfolio and shorting the value F_SCORE portfolio. This strategy would result in returns experiencing a relatively lower volatility (standard

deviation equal to 46.89%). These results are mirrored when performed using market-adjusted ALSI returns.

The One Sample and Paired t-Test for the F_SCORE analysis were run on SAS and full results can be found in Appendix M. See Appendix N for full results based on market-adjusted return (ALSI).

Table 13: High vs Low Paired t-Test Results

Paired t-Test		
Period	**High F_SCORE**	**Low F_SCORE**
Year 1 (2)	-22.12%	-22.12%
Year 2 (3)	60.63%	-94.04%
Year 3 (4)	46.55%	-56.18%
Year 4 (5)	13.02%	-33.53%
Year 5 (6)	16.99%	11.42%
Year 6 (7)	6.37%	-18.54%
Year 7 (8)	102.19%	30.16%
Year 8 (9)	225.52%	28.65%
Year 9 (10)	243.62%	5.17%
Year 10 (11)	63.76%	58.62%
Mean	84.69%	
High - Low	238.45%	
Std Dev	0.8589	
p-value	0.0124	
(t-statistic)	3.1200	

Table 14: High vs Value Paired t-Test Results

Paired t-Test		
Period	**High F_SCORE**	**Value Portfolio**
Year 1 (2)	-22.12%	-22.12%
Year 2 (3)	60.63%	-16.71%
Year 3 (4)	46.55%	-4.82%
Year 4 (5)	13.02%	-0.28%
Year 5 (6)	16.99%	12.94%
Year 6 (7)	6.37%	-9.75%
Year 7 (8)	102.19%	38.63%
Year 8 (9)	225.52%	90.17%
Year 9 (10)	243.62%	144.26%
Year 10 (11)	63.76%	59.76%
Mean	46.44%	
High - Low	135.35%	
Std Dev	0.4684	
p-value	0.0120	
(t-statistic)	3.1400	

The results attained from the statistical analysis corroborate that the F_SCORE certainly has power to differentiate winners from losers. The mean market-adjusted return earned by a high BM investor can be increased by at least 46.4% annually through the selection of financially strong high BM firms while the entire distribution of realised market-adjusted returns is shifted to the right. In addition, an investment strategy that buys expected winners and shorts expected losers generates a mean market-adjusted annual return of 84.7% between 2004 and 2014, and the strategy appears to be robust even during periods of market anomalies (the 2008 credit crunch and the recession) as well as market expansion experienced after the end of the Dot-com Boom.

5.2.2 THE SIZE EFFECT

The graphical analysis used to test the pervasiveness of the Size Effect is further corroborated and backed up by statistical analysis presented below. Table 15 summarises the results of the tests conducted on the returns of the small firm, large firm and the size value portfolios (results of the tests based on market-adjusted ALSI returns are summarised and presented in Appendix L). A One Sample t-Test was used to test the significant of the series of market-adjusted returns for each portfolio. The results displayed in Table 15 clearly indicate that the market-adjusted returns of the small firm portfolio were not significantly different from zero at the 5% or 10% significance level yielding a p-value of 0.1273. Although the results are not significant, they nonetheless yielded an average yearly market-adjusted return of 43.4% over the 10 year sample period albeit at the cost of higher volatility. The market-adjusted returns of the large firm and size value portfolios were not significantly different from zero at the 5% significance level yielding a p-value of 0.4937 and 0.1422 respectively. The statistical insignificance of the results of all three portfolios suggest that one cannot be 95% certain that their market-adjusted returns are different from zero and as such cannot corroborate if the Size Effect was pervasive during the sample period. The results presented Appendix L which is based on market-adjusted ALSI returns echo the results of the market-adjusted returns based on the JSE AltX. The market-adjusted returns of the small firm portfolio were similarly not significantly different from zero at the 5% or 10% significance level yielding a p-value of 0.2161, however yielding a an average yearly market-adjusted return of 36.1% over the 10 year sample period also at the cost of higher volatility. Both the market-adjusted ALSI returns of the small firm and size value portfolios were also not significantly different from zero at the 5% significance level.

Table 15: One Sample t-Test Results

One Sample t-Test			
Period	**Small Firms**	**Large Firms**	**Value Portfolio**
Year 1 (2)	-44.69%	-44.69%	-44.69%
Year 2 (3)	-94.04%	60.63%	-16.71%
Year 3 (4)	73.69%	-83.33%	-4.82%
Year 4 (5)	58.86%	-12.03%	26.19%
Year 5 (6)	24.29%	16.36%	17.86%
Year 6 (7)	3.92%	-16.03%	-9.75%
Year 7 (8)	46.74%	35.12%	38.63%
Year 8 (9)	140.27%	40.08%	90.17%
Year 9 (10)	187.48%	75.82%	135.94%
Year 10 (11)	36.95%	40.19%	38.57%
Mean	43.35%	11.21%	27.14%
High - Low	281.52%	159.15%	180.64%
Std Dev	0.8160	0.4970	0.5336
p-value	0.1273	0.4937	0.1422
(t-statistic)	1.6800	0.7100	1.6100

The series of market-adjusted returns of the various portfolios were further tested against each other using the Paired t-Test. The results were no expected to be significant as all three One Sample t-Tests were not significant. Table 16 and 17 summarises the results of the tests conducted on the small firm vs large firm portfolios and the small firm vs size value portfolios. Table 16 confirms that the difference between investing in the small firm portfolio instead of the large firm portfolio is not significantly different from zero at the 5% significance level yielding a p-value of 0.2671. Although insignificant, an investor would earn a return of 32.1% from going long in the small firm portfolio and shorting the large firm portfolio. This strategy would result in returns experiencing higher volatility (standard deviation equal to 85.9%). Table 17 confirms that the difference between investing in the small firm portfolio instead of the size value portfolio is not significantly different from zero at the 5% significance level yielding a p-value of 0.2558. Although insignificant, an investor would earn a return of 16.2% from going long in the high F_SCORE portfolio and shorting the value F_SCORE portfolio. This strategy would result in returns experiencing relatively

lower volatility (standard deviation equal to 42.2%). These results are mirrored when performed using market-adjusted ALSI returns.

The One Sample and Paired t-Test for the Firm Size analysis were run on SAS and full results can be found in Appendix O. See Appendix P for full results based on market-adjusted return (ALSI).

Table 16: Small vs Large Paired t-Test Results

Paired t-Test		
Period	**Small Firms**	**Large Firms**
Year 1 (2)	-44.69%	-44.69%
Year 2 (3)	-94.04%	60.63%
Year 3 (4)	73.69%	-83.33%
Year 4 (5)	58.86%	-12.03%
Year 5 (6)	24.29%	16.36%
Year 6 (7)	3.92%	-16.03%
Year 7 (8)	46.74%	35.12%
Year 8 (9)	140.27%	40.08%
Year 9 (10)	187.48%	75.82%
Year 10 (11)	36.95%	40.19%
Mean	32.13%	
High - Low	311.69%	
Std Dev	0.8589	
p-value	0.2671	
(t-statistic)	1.1800	

Table 17: Small vs Value Paired t-Test Results

Paired t-Test		
Period	**Small Firms**	**Value Portfolio**
Year 1 (2)	-44.69%	-44.69%
Year 2 (3)	-94.04%	-16.71%
Year 3 (4)	73.69%	-4.82%
Year 4 (5)	58.86%	26.19%
Year 5 (6)	24.29%	17.86%
Year 6 (7)	3.92%	-9.75%
Year 7 (8)	46.74%	38.63%
Year 8 (9)	140.27%	90.17%
Year 9 (10)	187.48%	135.94%
Year 10 (11)	36.95%	38.57%
Mean	16.21%	
High - Low	155.84%	
Std Dev	0.4223	
p-value	0.2558	
(t-statistic)	1.2100	

The results attained from the statistical analysis contradict the graphical observation that indicated that the Size Effect was indeed pervasive during the sample period. Although the results are not statistically significant, the evidence that the mean market-adjusted annual returns of an investment strategy concentrated in small firms consistently yields returns superior to an investment strategy concentrated in larger firms is promising in that it shows a hint that the Size Effect was pervasive even during periods of market anomalies (the 2008 credit crunch and the recession) as well as the market expansion experienced after the end of the Dot-com Boom. The relatively fewer number of observations and shorter sample period are factors that could have potentially contributed to results diverging from those presented by Banz (1981) which had a far more comprehensive sample to conclusively and significantly prove that the Size Effect was indeed pervasive.

6 CONCLUSION

This study has documented the use of a simple accounting-based fundamental analysis strategy to identify which stocks are expected to be outperformers to aid in creating a stronger value portfolio. This study has also delved into the pervasive nature of the Size Effect during the same sample period.

The results of this study showed that the use of the F_SCORE to aid in stock selection was able to significantly shift the distribution of the returns earned by value investing. Piotroski's (2002) results demonstrated that a strategy that uses relevant historical information to eliminate firms with poor prospects from a generic high BM portfolio can shift the distribution of returns earned by an investor by as much as 7.5% annually. The results presented in this study demonstrate that the same strategy can shift the distribution of returns earned by an investor by as much as 75.7% annually, proving that the F_SCORE can be an effect tool to South African investors.

Although a hint of the Size Effect was observed throughout the sample period, it was not found to be pervasive during the entire sample period. These results were inconclusive partly due to the significantly fewer number of observations available for research inhibiting this study's ability to make conclusive statistical inferences. Banz (1981), whose work included all common stocks quoted on the NYSE for at least five years, had a far more comprehensive sample at his disposal; enabling him to conclusively and significantly show evidence of the Size Effect.

Given that the JSE AltX is comprised of good quality, small and medium-sized high-growth companies; the reality is that out of the 106 companies that had listed on the JSE AltX, 21 of them graduated to the JSE's Main Board while 97% of de-listings were due to acquisitions. There is evidence that suggests that the ambition of some companies listed on the JSE AltX is to graduate to the R9.24-trillion Main Board. Though the JSE AltX can point to its successful graduates as evidence of a successful trading platform for smaller to mid-sized companies, this development is both a blessing and a curse specifically to research. This platform plays the role of a springboard for small and medium-sized companies aiming to get the exposure and capital they need to grow their organizations; however if the best companies continue to

be promoted to the Main Board, then the JSE AltX risks being left with the rats and mice. A counter littered with hapless, loss-making or hopelessly illiquid shares does not make for attractive research. In reality, this has become a cycle which will continue to bring in the most promising companies which will eventually migrate onto greener pastures.

Another challenge facing an investor wishing to invest in the JSE AltX is its pale trading volumes in comparison to the billions spent in trade of the JSE's top 40 companies every day. Although the calibre of stocks that are listed on the JSE AltX would not be desirable for the average investor, the illiquid nature of the stocks would require one to take a seriously long-term view. The evidence strongly suggests that there are indeed attractive stocks on the JSE AltX, however whether or not one would opt to take advantage of their superior returns would depend entirely one ones risk profile and time horizon for the investment.

The composition and structure of the JSE AltX has certainly played a major role in reinforcing the results of this study by fostering its ability to reveal the contents of the JSE AltX's Pandora's Box; which has the potential to shed ground breaking light to market analysts and academics about applying different investment strategies, such as the use of the F_SCORE, in a South African context. In future, one may benefit from capturing the true essence of the JSE AltX by not excluding firms that graduate onto the Main Board from their sample period or perhaps by conducting a study entirely on stocks that have been promoted onto the Main Board. Although listings slowed due to the recent recession, the JSE AltX's lower listing costs and less onerous listing requirements is expected to result in more companies seeking exposure and capital to grow their companies as the markets turn. This expected growth in popularity of the JSE AltX will certainly benefit research, as an increase in listings will ultimately enable academics access to a healthier sample to draw data from and to ultimately make statistical inferences. The study of the F_SCORE has provided solid results, however future research will certainly be required in order to accurately test the effects of leaning towards the selection of low market capitalisation firms to shift the distribution of the returns earned by value investing on the JSE AltX. Extending the sample period will certainly benefit the study of the F_SCORE, as a longer period that includes numerous booms, busts, bull and bear markets would eliminate any misconceptions associated with results being influenced by the infancy of the JSE AltX.

Overall, the evidence suggests that the market (both the JSE AltX and ALSI) does not fully incorporate historical financial information into prices in a timely manner and that an investor applying the F_SCORE to differentiate firms from a high BM portfolio can take advantage of this market anomaly.

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8 APPENDIX

A Listed Firms (Including Name Change) on the JSE AltX

Instrument Alpha Code	Instrument Alpha Code	Instrument Alpha Code
1TM	ELI	PLC / SKW / ILE
ABK	ENL / CMP	PLD
ABU	ERB	POY
ACC / PNG	ESR	PSV
ACD / ALM	FPF / FGL	RAC
ACH	FWX	RAR
AEA	GAM	RBA
AEC / QPG	GDN	RGT
AET	GGP	RLF
ALJ / AHL	GIY	ROC
ANS	HUG	SAN
APS / ADW	HWW	SBL
ATR	IDE / MTG	SFH
BCK	IFC / SHB	SIC / ACE
BEE	IMU / NUT	SNG / SVB
BEG	INS	STA
BFS	IPS	SUL
BIK	IQG	SUM / SNV
BSS	IRA	TAS
BWI	ISB	TCS
BWK / CIL	IWE	TFX / MSA
CCI	KBO	TLM
CEL	KCM	TOR
CFO	KGH / CUH	VUN
CGR	LAF	WCC
CMO	MKX / UBU	WEA
COH	MNY	WKF
CPN / MRI	MSP	WLL / BIO
CRD	MYD / LHG	WSL
CSP	MZR	WTL
CYB / QHL	NEP	XAN / SBG / MOR
DLG	OAS	YBA / SAH
DMC	OLG	YHK / ISA
DMCCB	OLI	ZPT
DTH	OPI / DLI	
DTP / VOX	PAN	

B New Listings on the JSE AltX

Listing Date	Instrument Alpha Code	Listing Date	Instrument Alpha Code
2004-08-20	XAN / SBG / MOR	2007-08-08	IQG
2004-09-27	MKX / UBU	2007-08-14	1TM
2004-10-18	DTP / VOX	2007-08-17	ABU
2004-11-29	YBA / SAH	2007-08-21	PLC / SKW / ILE
2004-12-10	ACH	2007-08-24	AEA
2005-03-30	ACD / ALM	2007-09-05	ELI
2005-06-10	ENL / CMP	2007-09-20	RBA
2005-07-20	WSL	2007-09-28	HWW
2005-08-12	CMO	2007-10-03	CFO
2005-09-22	WLL / BIO	2007-10-08	ABK
2005-11-23	OAS	2007-10-18	RAC
2006-02-16	ACC / PNG	2007-10-24	BSS
2006-02-21	WEA	2007-10-30	IDE / MTG
2006-03-14	ESR	2007-11-06	CSP
2006-04-21	PSV	2007-11-06	DTH
2006-06-02	SAN	2007-11-07	SFH
2006-06-21	TAS	2007-11-16	CGR
2006-09-19	DLG	2007-11-21	MZR
2006-09-26	GDN	2007-11-26	OLI
2006-10-12	BFS	2007-11-28	BWK / CIL
2006-10-17	MYD / LHG	2007-11-28	VUN
2006-10-19	IPS	2007-11-30	CCI
2006-11-21	WKF	2007-12-07	ERB
2006-11-22	CEL	2008-03-14	ISB
2006-11-23	SIC / ACE	2008-04-07	TCS
2006-11-29	ATR	2008-05-27	KCM
2006-11-30	SUL	2008-07-09	POY
2006-12-06	TFX / MSA	2009-04-17	NEP
2006-12-08	IFC / SHB	2009-08-31	MSP
2006-12-12	IMU / NUT	2009-09-01	PLD
2007-02-23	RAR	2010-04-14	RGT
2007-03-01	AET	2011-05-30	KBO
2007-03-12	TLM	2011-06-02	COH
2007-05-23	RLF	2011-08-12	BCK
2007-06-07	ANS	2012-06-25	CPN / MRI
2007-06-14	IWE	2012-07-26	ROC
2007-06-15	FPF / FGL	2012-08-20	OPI / DLI
2007-07-03	WTL	2012-11-26	TOR
2007-07-05	BWI	2012-12-14	GAM
2007-07-24	KGH / CUH	2013-04-29	GGP
2007-07-31	IRA	2013-06-26	GIY
2007-07-31	PAN	2013-06-26	DMCCB
2007-08-07	BIK	2013-09-30	WCC
2007-08-08	HUG		

C De-Listings on the JSE AltX

De-Listing Date	Instrument Alpha Code	De-Listing Date	Instrument Alpha Code
2005-10-11	INS	2012-01-10	ABK
2006-08-15	ACH	2012-02-13	DLG
2008-07-07	SUL	2012-07-03	OLI
2008-12-19	KGH / CUH	2012-11-27	IQG
2009-05-26	CEL	2012-12-03	SFH
2009-09-14	CFO	2013-02-18	CYB / QHL
2010-09-14	DTH	2013-02-26	HWW
2010-09-28	ABU	2013-04-30	ZPT
2010-11-08	KCM	2013-07-30	IDE / MTG
2011-06-13	BEE	2013-07-30	RGT
2011-10-25	PLD	2013-08-05	LAF
2011-11-15	DTP / VOX	2013-09-03	SBL

D Promotions from the JSE AltX to the JSE Main Board

Effective Date	Instrument Alpha Code	Effective Date	Instrument Alpha Code
2007-07-31	YBA / SAH	2010-09-20	BWK / CIL
2008-07-14	MZR	2010-11-26	ELI
2008-07-17	SAN	2011-06-20	XAN / SBG / MOR
2009-06-25	ESR	2011-07-08	TAS
2009-08-24	CCI	2011-11-02	SUM / SNV
2009-12-01	PAN	2011-11-21	RLF
2010-02-01	IRA	2012-01-20	ISB
2010-04-15	WSL	2012-02-23	CGR
2010-05-17	MYD / LHG	2012-07-02	COH
2010-07-05	1TM	2013-06-18	OLG
2010-08-04	NEP		

E Board Transfers from Various Boards to the JSE AltX

Effective Date	Instrument Alpha Code	Effective Date	Instrument Alpha Code
2004-01-28	BEG	2007-06-01	STA
2004-01-28	INS	2007-06-13	FWX
2004-05-05	APS / ADW	2008-09-12	CYB / QHL
2004-05-27	OLG	2008-10-13	AEC / QPG
2004-07-08	ALJ / AHL	2009-10-15	BEE
2005-06-27	YHK / ISA	2010-01-12	DMC
2006-06-23	ZPT	2011-03-14	SBL
2006-06-26	SUM / SNV	2011-05-17	LAF
2006-11-07	MNY	2013-09-18	CRD
2006-11-27	SNG / SVB		

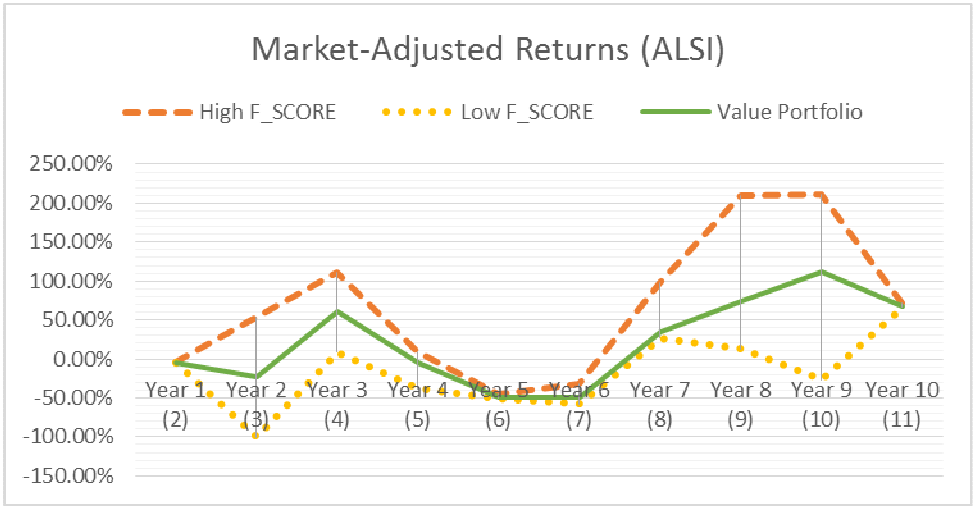
F Sample Period Breakdown

Sample Period Breakdown			
Actual Date Range	**Number of Months**	**Portfolio Formation Year**	**Portfolio Investment Year**
Oct 2003 - Sep 2004	***12***	***Year 1***	
Oct 2004 - Sep 2005	***12***	***Year 2***	***Year 1 (2)***
Oct 2005 - Sep 2006	***12***	***Year 3***	***Year 2 (3)***
Oct 2006 - Sep 2007	***12***	***Year 4***	***Year 3 (4)***
Oct 2007 - Sep 2008	***12***	***Year 5***	***Year 4 (5)***
Oct 2008 - Sep 2009	***12***	***Year 6***	***Year 5 (6)***
Oct 2009 - Sep 2010	***12***	***Year 7***	***Year 6 (7)***
Oct 2010 - Sep 2011	***12***	***Year 8***	***Year 7 (8)***
Oct 2011 - Sep 2012	***12***	***Year 9***	***Year 8 (9)***
Oct 2012 - Sep 2013	***12***	***Year 10***	***Year 9 (10)***
Oct 2013 - May 2014	***8***		***Year 10 (11)***

G F_SCORE Market-Adjusted Returns ALSI (Table)

Market-Adjusted Returns (ALSI)			
Period	**High F_SCORE**	**Low F_SCORE**	**Value Portfolio**
Year 1 (2)	-4.25%	-4.25%	-4.25%
Year 2 (3)	53.90%	-100.77%	-23.43%
Year 3 (4)	111.49%	8.75%	60.12%
Year 4 (5)	8.65%	-37.89%	-4.65%
Year 5 (6)	-44.77%	-50.34%	-48.82%
Year 6 (7)	-32.72%	-57.63%	-48.83%
Year 7 (8)	98.43%	26.39%	34.87%
Year 8 (9)	210.05%	13.18%	74.70%
Year 9 (10)	211.56%	-26.89%	112.21%
Year 10 (11)	71.75%	66.60%	67.75%

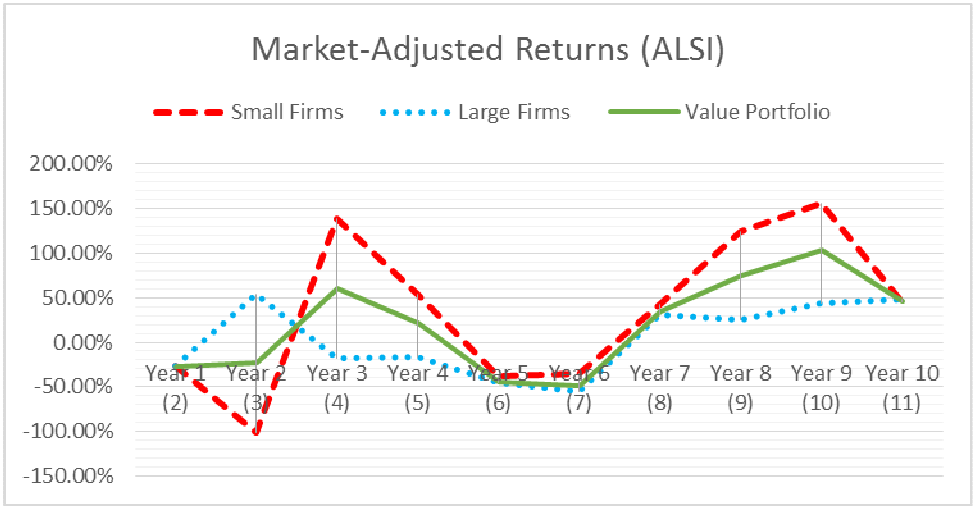
H F_SCORE Market-Adjusted Returns ALSI (Figure)



I Firm Size Market-Adjusted Returns ALSI (Table)

Market-Adjusted Returns (ALSI)			
Period	**Small Firms**	**Large Firms**	**Value Portfolio**
Year 1 (2)	-26.82%	-26.82%	-26.82%
Year 2 (3)	-100.77%	53.90%	-23.43%
Year 3 (4)	138.63%	-18.39%	60.12%
Year 4 (5)	54.50%	-16.39%	21.82%
Year 5 (6)	-37.47%	-45.40%	-43.90%
Year 6 (7)	-35.16%	-55.11%	-48.83%
Year 7 (8)	42.97%	31.35%	34.87%
Year 8 (9)	124.80%	24.61%	74.70%
Year 9 (10)	155.42%	43.76%	103.88%
Year 10 (11)	44.93%	48.18%	46.56%

J Firm Size Market-Adjusted Returns ALSI (Figure)



K F_SCORE One Sample t-Test Results (Market-Adjusted Return ALSI)

JSE ALSI			
One Sample t-Test			
Period	**High F_SCORE**	**Low F_SCORE**	**Value Portfolio**
Year 1 (2)	-4.25%	-4.25%	-4.25%
Year 2 (3)	53.90%	-100.77%	-23.43%
Year 3 (4)	111.49%	8.75%	60.12%
Year 4 (5)	8.65%	-37.89%	-4.65%
Year 5 (6)	-44.77%	-50.34%	-48.82%
Year 6 (7)	-32.72%	-57.63%	-48.83%
Year 7 (8)	98.43%	26.39%	34.87%
Year 8 (9)	210.05%	13.18%	74.70%
Year 9 (10)	211.56%	-26.89%	112.21%
Year 10 (11)	71.75%	66.60%	67.75%
Mean	68.41%	-16.28%	21.97%
High - Low	256.33%	167.37%	161.04%
Std Dev	0.9154	0.4821	0.5590
p-value	0.0424	0.3133	0.2454
(t-statistic)	2.3600	-1.0700	1.2400

L Firm Size One Sample t-Test Results (Market-Adjusted Return ALSI)

JSE ALSI One Sample t-Test			
Period	**Small Firms**	**Large Firms**	**Value Portfolio**
Year 1 (2)	-26.82%	-26.82%	-26.82%
Year 2 (3)	-100.77%	53.90%	-23.43%
Year 3 (4)	138.63%	-18.39%	60.12%
Year 4 (5)	54.50%	-16.39%	21.82%
Year 5 (6)	-37.47%	-45.40%	-43.90%
Year 6 (7)	-35.16%	-55.11%	-48.83%
Year 7 (8)	42.97%	31.35%	34.87%
Year 8 (9)	124.80%	24.61%	74.70%
Year 9 (10)	155.42%	43.76%	103.88%
Year 10 (11)	44.93%	48.18%	46.56%
Mean	36.10%	3.97%	19.90%
High - Low	256.19%	109.01%	152.72%
Std Dev	0.8581	0.4082	0.5320
p-value	0.2161	0.7655	0.2672
(t-statistic)	1.3300	0.3100	1.1800

M F_SCORE Analysis SAS Results

High F_SCORE (AltX) – One Sample t-Test

t Test

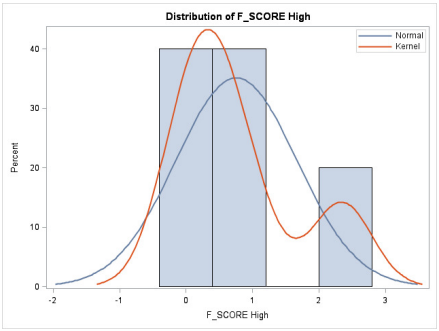
The TTEST Procedure

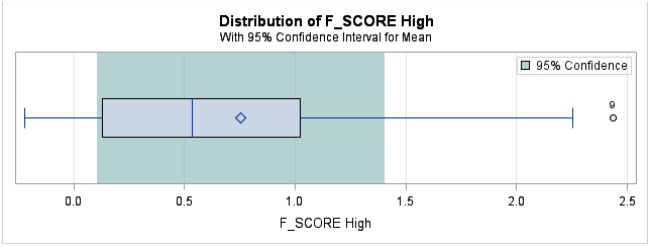
Variable: F_SCORE High

N	Mean	Std Dev	Std Err	Minimum	Maximum
100.7565	0.9087	0.2874	-0.2212	2.4362	

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.7565	0.1065	1.4066	0.9087	0.6250	1.6589

DF	t Value	Pr > |t|
9	2.63	0.0272





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{Sd/\sqrt{n}}$

$p(t) = 0.0272 < 0.05$

We reject H_0. There is sufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is different from zero (there is a difference from investing in the high F_SCORE portfolio).

The histogram appears to be leptokurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is greater than the median suggesting that the data is skewed to the right. There are outliers present on the diagram.

Low F_SCORE (AltX) – One Sample t-Test

t Test

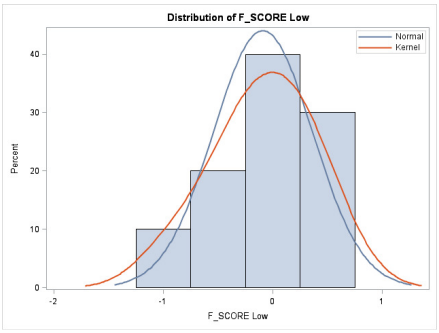
The TTEST Procedure

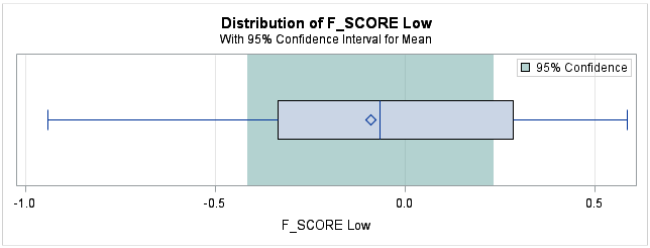
Variable: F_SCORE Low

N	Mean	Std Dev	Std Err	Minimum	Maximum
10	-0.0904	0.4529	0.1432	-0.9404	0.5862

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
-0.0904	-0.4144	0.2336	0.4529	0.3116	0.8269

DF	t Value	Pr > |t|
9	-0.63	0.5436





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

p(t) = 0.5436 > 0.05

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the low F_SCORE portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is slightly negatively skewed suggesting that the mean is less than the median.

The Box and Whisker Plot verifies that the mean is less than the median suggesting that the data is skewed to the left, however the difference is very small. There are also no outliers present on the diagram.

F_SCORE Value Portfolio (AltX) – One Sample t-Test

t Test

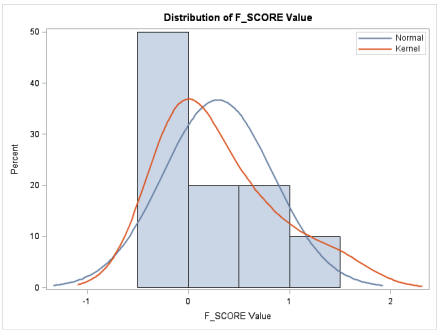
The TTEST Procedure

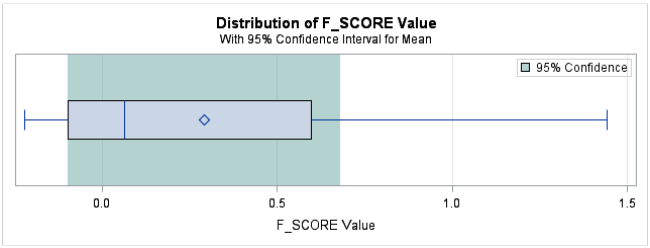
Variable: F_SCORE Value

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.2921	0.5429	0.1717	-0.2212	1.4427

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.2921	-0.0963	0.6805	0.5429	0.3734	0.9912

DF	t Value	Pr > |t|
9	1.70	0.1231





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.1231 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the value F_SCORE portfolio).

The histogram appears to be leptokurtic and confirms the findings that the data does not follow a normal distribution. The data is negatively skewed suggesting that the mean is less than the median.

The Box and Whisker Plot verifies that the mean is less than the median suggesting that the data is skewed to the left. There are also no outliers present on the diagram.

High F_SCORE vs Low F_SCORE (AltX) – Paired t-Test

t Test

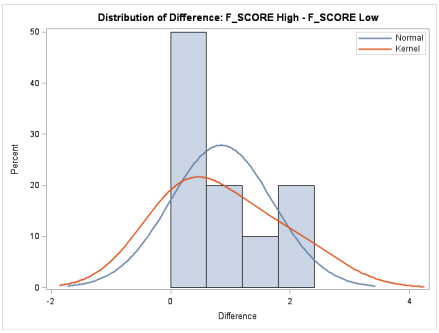
The TTEST Procedure

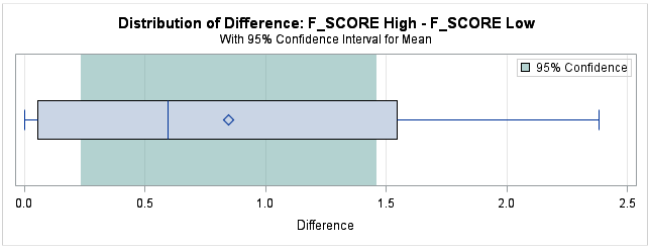
Difference: F_SCORE High - F_SCORE Low

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.8469	0.8589	0.2716	0	2.3845

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.8469	0.2325	1.4614	0.8589	0.5908	1.5680

DF	t Value	Pr > |t|
9	3.12	0.0124





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sa/\sqrt{n}}$

$p(t) = 0.0124 < 0.05$

We reject H_0. There is sufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is different from zero (there is a difference between investing in the high vs low F_SCORE portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is greater than the median suggesting that the data is skewed to the right. There are also no outliers present on the diagram.

High F_SCORE vs F_SCORE Value Portfolio (AltX) – Paired t-Test

t Test

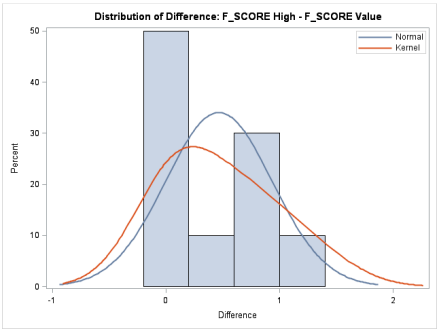
The TTEST Procedure

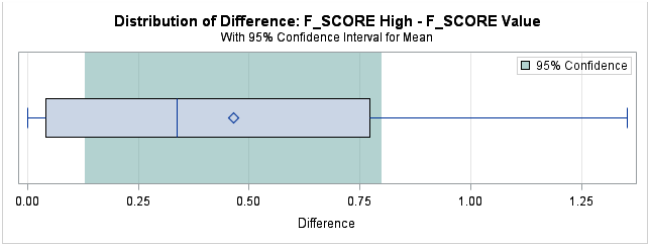
Difference: F_SCORE High - F_SCORE Value

N	Mean	Std Dev	Std Err	Minimum	Maximum
10	0.4644	0.4684	0.1481	0	1.3535

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.4644	0.1293	0.7995	0.4684	0.3222	0.8552

DF	t Value	Pr > |t|
9	3.14	0.0120





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{Sd/\sqrt{n}}$

$p(t) = 0.012 < 0.05$

We reject H_0. There is sufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is different from zero (there is a difference between investing in the high vs value F_SCORE portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is greater than the median suggesting that the data is skewed to the right. There are also no outliers present on the diagram.

N F_SCORE Analysis SAS Results (Market-Adjusted Return ALSI)

High F_SCORE (ALSI) – One Sample t-Test

t Test

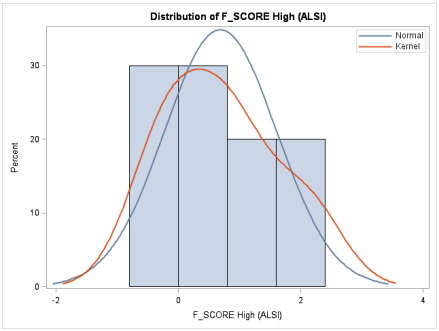
The TTEST Procedure

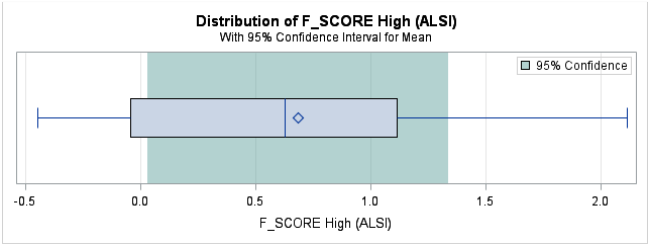
Variable: F_SCORE High (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
100.6841	0.9154	0.2895	-0.4477	2.1156	

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.6841	0.0292	1.3389	0.9154	0.6296	1.6712

DF	t Value	Pr > |t|
9	2.36	0.0424





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.0424 < 0.05$

We reject H_0. There is sufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is different from zero (there is a difference from investing in the high F_SCORE portfolio).

The histogram appears to be slightly platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is slightly greater than the median suggesting that the data is skewed to the right. There are also no outliers present on the diagram.

Low F_SCORE (ALSI) – One Sample t-Test

t Test

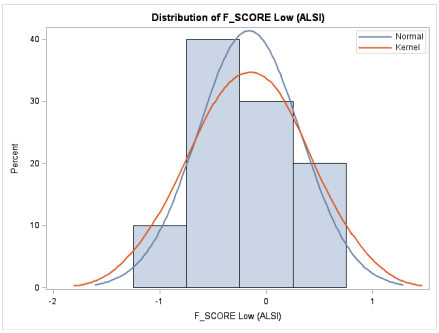
The TTEST Procedure

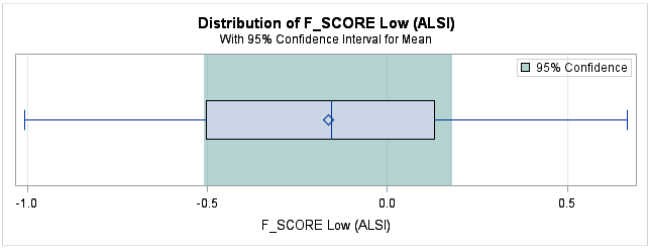
Variable: F_SCORE Low (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
10	-0.1628	0.4821	0.1525	-1.0077	0.6660

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
-0.1628	-0.5077	0.1820	0.4821	0.3316	0.8801

DF	t Value	Pr > |t|
9	-1.07	0.3133





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.3133 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the low F_SCORE portfolio).

The histogram appears to be slightly platykurtic albeit very close to mesokurtic. There does not appear to be any skewness present in the data.

The Box and Whisker Plot verifies that the mean is very close the median suggesting that the data is in fact very close to being normally distributed. There are also no outliers present on the diagram.

F_SCORE Value Portfolio (ALSI) – One Sample t-Test

t Test

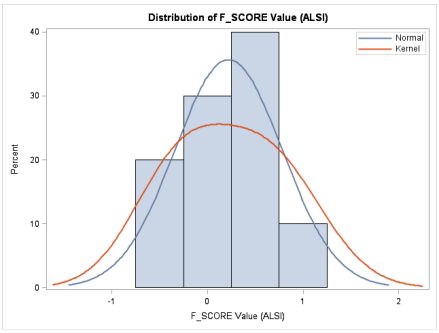
The TTEST Procedure

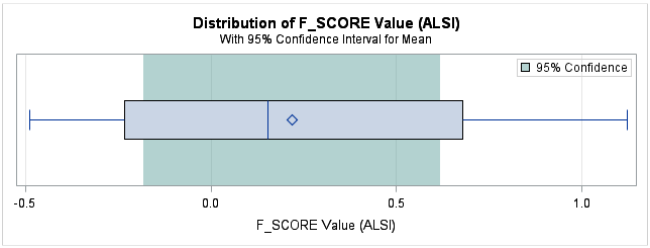
Variable: F_SCORE Value (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.2197	0.5590	0.1768	-0.4883	1.1221

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.2197	-0.1802	0.6195	0.5590	0.3845	1.0205

DF	t Value	Pr > |t|
9	1.24	0.2454





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{Sd/\sqrt{n}}$

$p(t) = 0.2454 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the value F_SCORE portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is greater than the median suggesting that the data is skewed to the right. There are also no outliers present on the diagram.

High F_SCORE vs Low F_SCORE (ALSI) – Paired t-Test

t Test

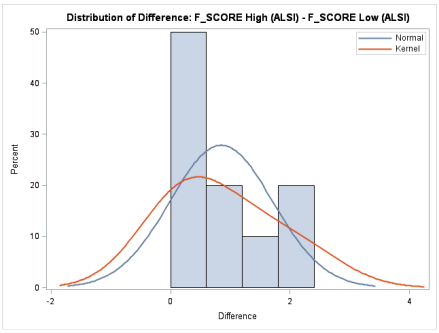
The TTEST Procedure

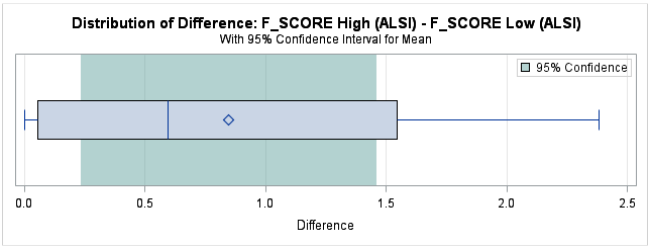
Difference: F_SCORE High (ALSI) - F_SCORE Low (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.8469	0.8589	0.2716	0	2.3845

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.8469	0.2325	1.4614	0.8589	0.5908	1.5680

DF	t Value	Pr > |t|
9	3.12	0.0124





$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sa/\sqrt{n}}$

$p(t) = 0.0124 < 0.05$

We reject H_0. There is sufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is different from zero (there is a difference between investing in the high vs low F_SCORE portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is greater than the median suggesting that the data is skewed to the right. There are also no outliers present on the diagram.

High F_SCORE vs F_SCORE Value Portfolio (ALSI) – Paired t-Test

t Test

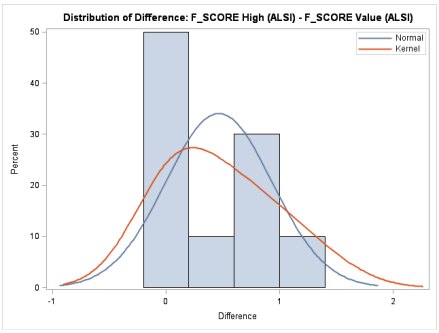
The TTEST Procedure

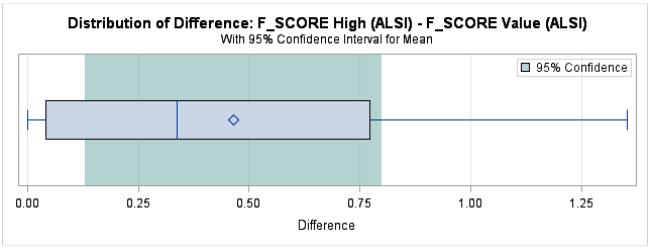
Difference: F_SCORE High (ALSI) - F_SCORE Value (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
10	0.4644	0.4684	0.1481	0	1.3535

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.4644	0.1293	0.7995	0.4684	0.3222	0.8552

DF	t Value	Pr > |t|
9	3.14	0.0120





$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sa/\sqrt{n}}$

$p(t) = 0.012 < 0.05$

We reject H_0. There is sufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is different from zero (there is a difference between investing in the high vs value F_SCORE portfolio).

The histogram appears to platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is greater than the median suggesting that the data is skewed to the right. There are also no outliers present on the diagram.

O Firm Size Analysis SAS Results

Low Market Cap (AltX) – One Sample t-Test

t Test

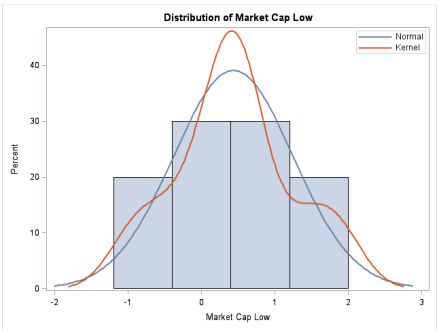
The TTEST Procedure

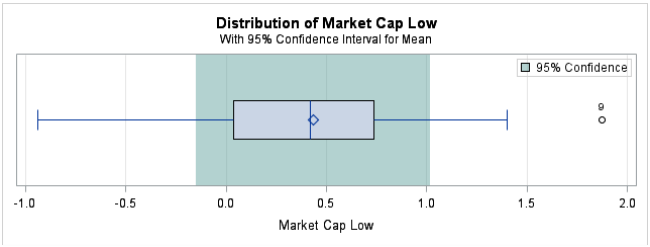
Variable: Market Cap Low

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	.4335	0.8160	0.2580	-0.9404	1.8748

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.4335	-0.1503	1.0172	0.8160	0.5613	1.4897

DF	t Value	Pr > |t|
9	1.68	0.1273





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{Sd/\sqrt{n}}$

$p(t) = 0.1273 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the small firm portfolio).

The histogram appears to be mesokurtic, however there appears to be a hint of leptokurtosis. There does not appear to be any skewness present in the data.

The Box and Whisker Plot verifies that the mean is equal to the median suggesting that the data is normally distributed. There are outliers present in the diagram possibly causing the mean to be marginally larger than the median.

High Market Cap (AltX) – One Sample t-Test

t Test

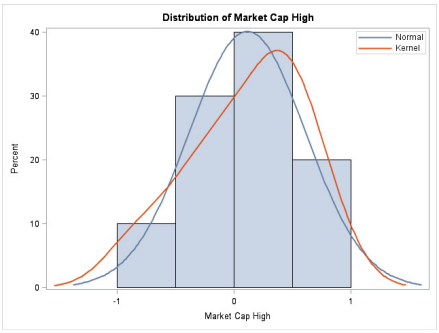
The TTEST Procedure

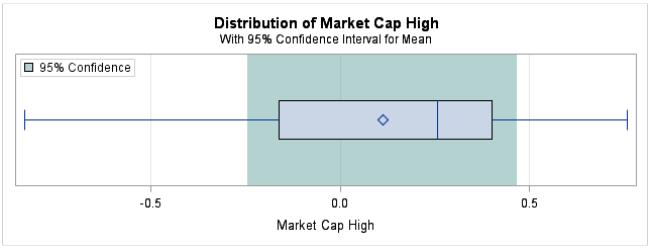
Variable: Market Cap High

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.1121	0.4970	0.1572	-0.8333	0.7582

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.1121	-0.2434	0.4677	0.4970	0.3419	0.9074

DF	t Value	Pr > |t|
9	0.71	0.4937





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.4937 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the large firm portfolio).

The histogram appears to be slightly platykurtic and confirms the findings that the data does not follow a normal distribution. The data is negatively skewed suggesting that the mean is less than the median.

The Box and Whisker Plot verifies that the mean is less than the median suggesting that the data is skewed to the left. There are also no outliers present on the diagram.

Market Cap Value Portfolio (AltX) – One Sample t-Test

t Test

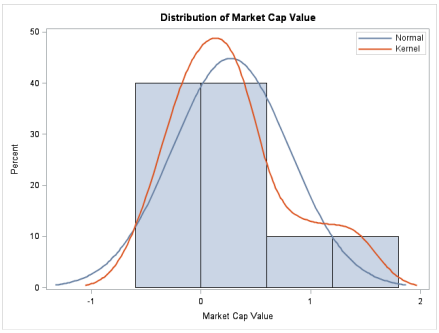
The TTEST Procedure

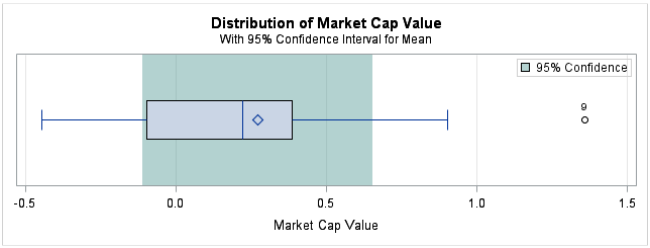
Variable: Market Cap Value

N	Mean	Std Dev	Std Err	Minimum	Maximum
100.2714	0.5336	0.1687	-0.4469	1.3595	

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.2714	-0.1103	0.6531	0.5336	0.3670	0.9742

DF	t Value	Pr > |t|
9	1.61	0.1422





$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{Sd/\sqrt{n}}$

$p(t) = 0.1422 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the size value portfolio).

The histogram appears to be slightly leptokurtic and confirms the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is relatively greater than the median suggesting that the data is skewed to the right. There are outliers present on the diagram possibly causing the mean to be marginally larger than the median.

Low Market Cap vs High Market Cap (AltX) – Paired t-Test

t Test

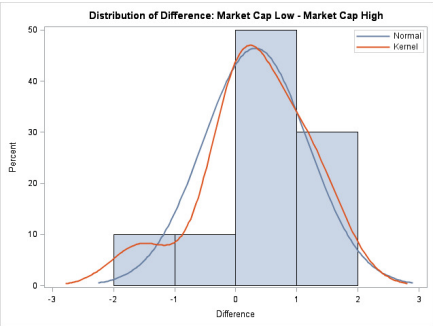
The TTEST Procedure

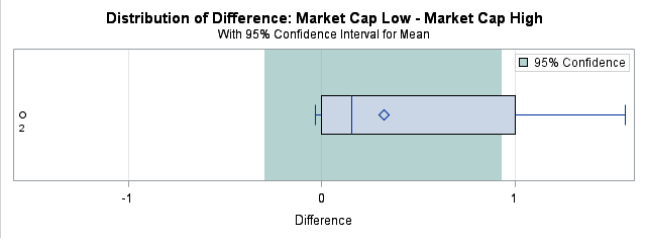
Difference: Market Cap Low - Market Cap High

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	.3213	0.8589	0.2716	-1.5467	1.5702

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.3213	-0.2931	0.9357	0.8589	0.5908	1.5680

DF	t Value	Pr > |t|
9	1.18	0.2671





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sd/\sqrt{n}}$

$p(t) = 0.2671 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is not different from zero (there is no difference between investing in the small vs large firm portfolio).

The histogram appears to be mesokurtic, however the left tail extends further out confirming the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is marginally greater than the median suggesting that the data is skewed to the right. There are outliers present on the diagram.

Low Market Cap vs Market Cap Value Portfolio (AltX) – Paired t-Test

t Test

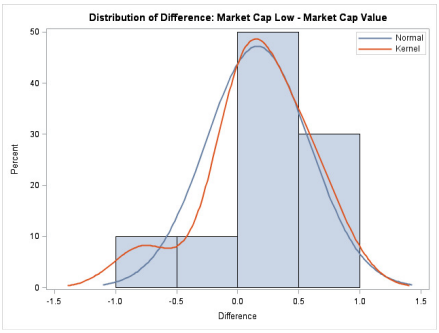
The TTEST Procedure

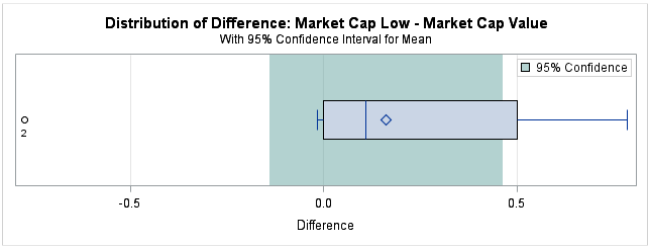
Difference: Market Cap Low - Market Cap Value

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.1621	0.4223	0.1335	-0.7733	0.7851

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.1621	-0.1400	0.4641	0.4223	0.2904	0.7709

DF	t Value	Pr > |t|
9	1.21	0.2558





$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sd/\sqrt{n}}$

$p(t) = 0.2558 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is not different from zero (there is no difference between investing in the small vs size value portfolio).

The histogram appears to be mesokurtic, however the left tail extends further out confirming the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is marginally greater than the median suggesting that the data is skewed to the right. There are outliers present on the diagram.

P Firm Size Analysis SAS Results (Market-Adjusted Return ALSI)

Low Market Cap (ALSI) – One Sample t-Test

t Test

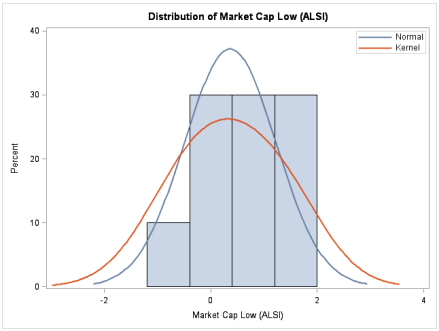
The TTEST Procedure

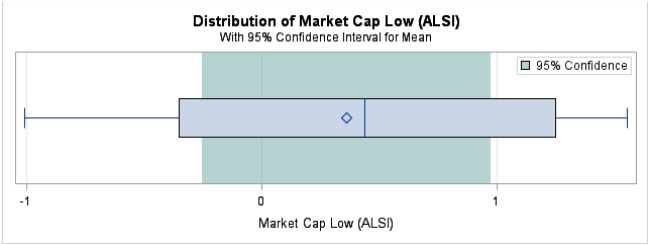
Variable: Market Cap Low (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	.3610	0.8581	0.2713	-1.0077	1.5542

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.3610	-0.2528	0.9748	0.8581	0.5902	1.5665

DF	t Value	Pr > |t|
9	1.33	0.2161





$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.2161 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the small firm portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is positively negatively skewed suggesting that the mean is less than the median.

The Box and Whisker Plot verifies that the mean is less than the median suggesting that the data is skewed to the left. There are also no outliers present on the diagram.

High Market Cap (ALSI) – One Sample t-Test

t Test

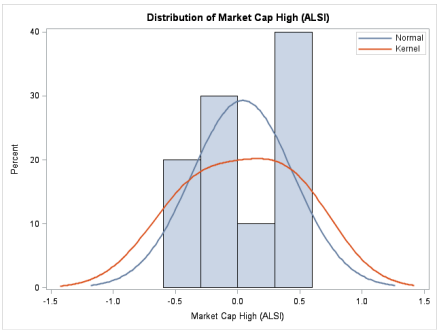
The TTEST Procedure

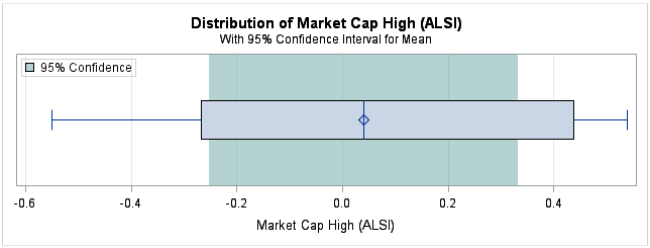
Variable: Market Cap High (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	0.0397	0.4082	0.1291	-0.5511	0.5390

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.0397	-0.2523	0.3317	0.4082	0.2808	0.7452

DF	t Value	Pr > |t|
9	0.31	0.7655





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.7655 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the large firm portfolio).

The histogram appears to platykurtic and confirms the findings that the data does in fact follow a normal distribution. There does not appear to be any skewness present in the data.

The Box and Whisker Plot verifies that the mean is equal to the median suggesting that the data follows a normal distribution. There are also no outliers present on the diagram.

Market Cap Value Portfolio (ALSI) – One Sample t-Test

t Test

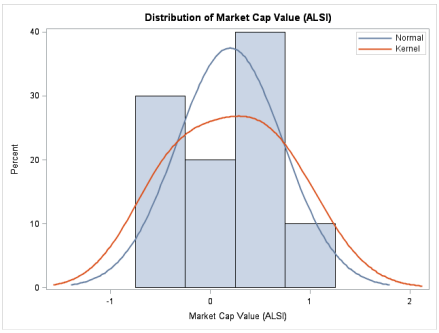
The TTEST Procedure

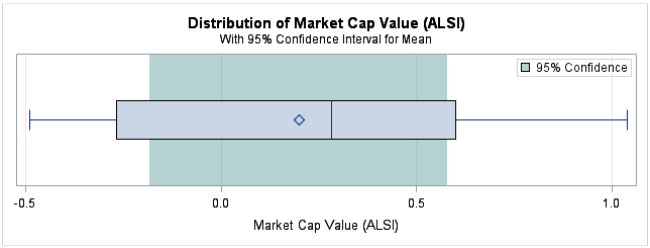
Variable: Market Cap Value (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
100	.1990	0.5320	0.1682	-0.4883	1.0389

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.1990	-0.1816	0.5795	0.5320	0.3659	0.9711

DF	t Value	Pr > |t|
9	1.18	0.2672





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{x} - \mu}{sd/\sqrt{n}}$

$p(t) = 0.2672 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the market-adjusted returns is not different from zero (there is no difference from investing in the size value portfolio).

The histogram appears to be platykurtic and confirms the findings that the data does not follow a normal distribution. The data is negatively skewed suggesting that the mean is less than the median.

The Box and Whisker Plot verifies that the mean is less than the median suggesting that the data is skewed to the left. There are also no outliers present on the diagram.

Low Market Cap vs High Market Cap (ALSI) – Paired t-Test

t Test

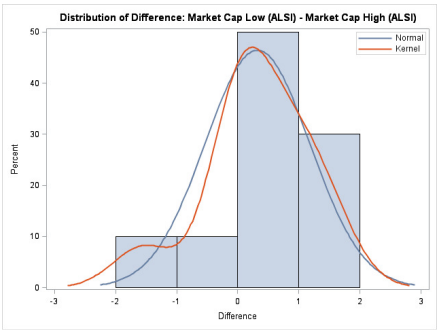
The TTEST Procedure

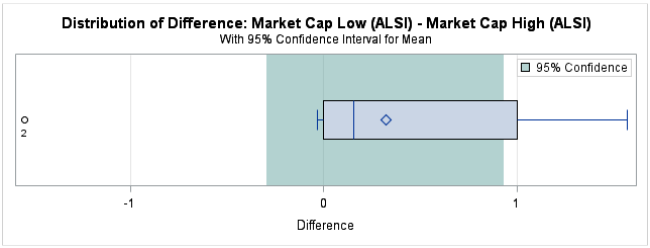
Difference: Market Cap Low (ALSI) - Market Cap High (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
10	0.3213	0.8589	0.2716	-1.5467	1.5702

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.3213	-0.2931	0.9357	0.8589	0.5908	1.5679

DF	t Value	Pr > |t|
9	1.18	0.2671





$H_0: \mu_d = 0$

$H_A: \mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sa/\sqrt{n}}$

$p(t) = 0.2671 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is not different from zero (there is no difference between investing in the small vs large firm portfolio).

The histogram appears to be mesokurtic, however the left tail extends further out confirming the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is marginally greater than the median suggesting that the data is skewed to the right. There are outliers present on the diagram.

Low Market Cap vs Market Cap Value Portfolio (ALSI) – Paired t-Test

t Test

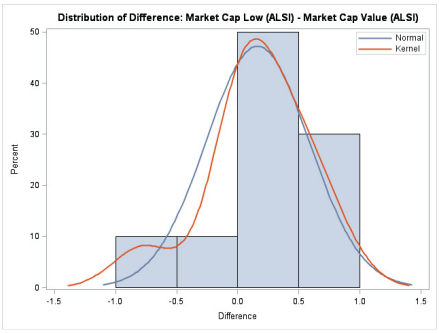
The TTEST Procedure

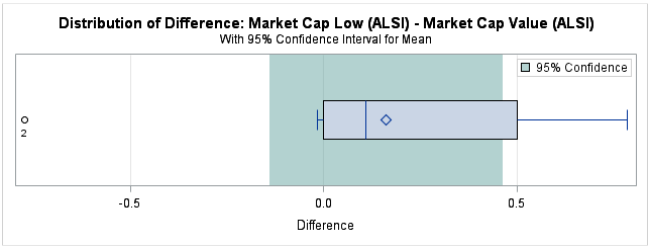
Difference: Market Cap Low (ALSI) - Market Cap Value (ALSI)

N	Mean	Std Dev	Std Err	Minimum	Maximum
10	0.1621	0.4223	0.1335	-0.7733	0.7851

Mean	95% CL Mean		Std Dev	95% CL Std Dev	
0.1621	-0.1400	0.4641	0.4223	0.2904	0.7709

DF	t Value	Pr > |t|
9	1.21	0.2558





H_0: $\mu_d = 0$

H_A: $\mu_d \neq 0$

$\alpha = 0.05$

$t = \frac{\bar{d} - 0}{sa/\sqrt{n}}$

$p(t) = 0.2558 > 0.05$

We fail to reject H_0. There is insufficient evidence to conclude that $\mu_d \neq 0$ at the 5% significance level. This implies that the mean of the difference in market-adjusted returns is not different from zero (there is no difference between investing in the small vs size value portfolio).

The histogram appears to be mesokurtic, however the left tail extends further out confirming the findings that the data does not follow a normal distribution. The data is positively skewed suggesting that the mean is greater than the median.

The Box and Whisker Plot verifies that the mean is marginally greater than the median suggesting that the data is skewed to the right. There are outliers present on the diagram.