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Empirical investigation of the value effect in the large and small cap segments of the JSE: evidence from the South African stock market

Abstract

This paper undertakes to investigate whether the value effect continues to exist on the Johannesburg Stock Exchange (now JSE Ltd.) with an updated dataset from 1997 through 2013 using the earnings-to-price (E/P) ratio, the book-to-price (B/P) ratio and the sales-to-price (S/P) ratio as the relative valuation proxies. Although the value effect is exhibited for the E/P and S/P portfolios; and the growth effect is exhibited for the B/P portfolios, independent value and growth effects appear to be weak for the entire sample and across different firm size segments on the JSE. Contradictory findings to some of the prior studies could be attributed to the fact that this study includes the period of turmoil post the 2007 global financial crisis, and the less concentrated tertile (one third of the sample) analysis to form value and growth portfolios. The paper thus concludes that if different time periods and samples could lead to different conclusions regarding the independence of the value effect on the JSE, the value investment style is probably not as effective as it appears to be once the potentially higher trading costs due to illiquidity are taken into account. In addition, value portfolios seem to be more sensitive to the market movements and are potentially riskier than the growth portfolios. On the other hand, a significant size effect is detected regardless of the portfolio's value or growth tilt, which suggests that the size effect dominates the value effect on the JSE over the examination period.

Keywords: value stocks, growth stocks, value effect, style anomalies, efficient market hypothesis (EMH), JSE.
JEL Classification: G11, G12, G14, G15.

Introduction

The value effect, amongst other well-known capital market anomalies, is formally introduced by Basu (1977) as a test of the efficient market hypothesis (EMH) of Fama (1970). He finds that stocks with low price-to-earnings (P/E) ratios, on average, outperform stocks with high P/E ratios in the United States (U.S.) over the period from April 1957 to March 1971. Basu (1977) concludes that "*P/E ratio information was not "fully reflected" in security prices in as rapid a manner as postulated by the semi-strong form of the efficient market hypothesis*".

While Fama and French (1992) point to a rational explanation for the existence of capital market anomalies, Lakonishok, Shleifer and Vishny (1994) hold the view that it is rather the cognitive biases underlying the behavioral aspects of irrational investors that result in persistence of these anomalies. According to Fama and French (1992), the excess returns earned by small caps and value stocks represent risk premiums for higher risks inherent in these investments. On the other hand, Lakonishok et al. (1994) argue that value stocks generate higher returns by exploiting the suboptimal behavior of investors in the market. While the successful stories of the Fama and French (1993) three-factor model in explaining the returns of portfolios formed by known anomalies are well-popularized in the 1990s, Chan and Lakonishok (2004) update their research through 2001 and argue that common risk measures do not explain the superior returns of value stocks.

Since firm size, risk and security valuations are interrelated, tests on capital market anomalies generally involve tests of the independence of an anomaly while holding one or other variables constant (Chopra, Lakonishok and Ritter, 1992). This paper intends to investigate whether the value effect continues to exist on the JSE Ltd. (JSE) with the updated dataset from 1997 through 2013, using different relative valuation benchmarks that include the earnings-to-price (E/P) ratio, the book-to-price (B/P) ratio and the sales-to-price (S/P) ratio. The independence of the value effect is examined within the large cap and the small cap controlled segments of the JSE. The study further compares and contrasts the performances of the value and growth portfolios in bull and bear markets over the examination period.

1. Literature review

Capaul, Rowley and Sharpe (1993) investigate the merit of the value effect using the P/B ratio to distinguish value stocks from growth stocks over the period from January 1981 to June 1992. Significant value risk premiums are reported in six countries, namely France, Germany, Switzerland, the United Kingdom (U.K.), Japan and the United States over the period from January 1981 to June 1992. Further evidence suggests that the value tilt in

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a global portfolio would be more mean-variance efficient compared to any domestic value portfolio, given the low correlations between the value-growth spreads across countries. Fama and French (1998) document the value effect as an international phenomenon over the period from 1975 through 1995 in the U.S. and twelve EAFE (Europe, Australia and the Far East) countries. The value stocks are found to earn higher returns than growth stocks in most countries over the examination period. They conclude that the value effect is an international phenomenon in both developed and emerging economies. Their study also reveals that the international value risk premium could be captured by a risk factor proxied by the relative distress factor.

Kwag and Lee (2006) argue that the value effect could potentially be cyclical in nature, which has significant implications for investors and financial planners in their asset allocation decisions. They conduct studies to compare the relative performance of the value portfolios to that of the growth portfolios during expansionary and contractionary phases of the U.S. business cycle over the period from July 1954 through December 2002. They find that although the value portfolios consistently outperform their growth counterparts in both expansionary and contractionary phases of the business cycle, the value effect is more pronounced during periods of contraction. This evidence suggests that value investing is a potential safe haven during periods of poor economic conditions. Bird and Casavecchia (2007) argue that although the value effect is well-documented over the long run, such phenomenon may not exist over shorter holding periods. Examining the effectiveness of using sentiment and financial health indicators for value and growth stocks in the European stock markets over the period from 1989 to 2004, Bird and Casavecchia (2007) conclude that these indicators are effective instruments for both timing of the value/growth cycle and the selection of outperforming value and growth stocks.

In a Canadian study, Athanassakos (2009) finds a significant value risk premium using firms with low price-to-earnings (P/E) ratio and price-to-book value (P/B) ratio as value proxies over the period from 1985 through 2005. The author concludes that value investing is a long-term investment approach that assists investors to beat the market. Asness, Moskowitz and Pedersen (2013) examine the co-movements of the value and the momentum effects across equities in the U.S., U.K., Europe and Japan; country equity index futures; government bonds; currencies; and commodity futures over the period from January 1972 to July 2011. The study results document negative return correlation between value and momentum strategies within and across asset classes. This evidence suggests that there could be a set of common global risk factors shared by the value and momentum investment styles. In addition, liquidity risk is found to partially explain the value and the momentum risk premiums and their co-movements.

Basiewicz and Auret (2009) investigate the predictability of equity returns using size and value risk premiums on the JSE over the period from December 1989 through July 2005. They find compelling evidence of value and size effects after transaction costs are accounted for. The book-to-market (B/M) ratio is found to have the greatest explanatory power of equity returns whilst the earnings yield is the weakest. In line with the liquidity risk argument of Asness, Moskowitz and Pedersen (2013), Basiewicz and Auret (2009) suggest that the excessively high value premiums observed in prior empirical works might be due to the fact that the higher liquidity risk and its associated transaction cost for value stocks are not accounted for in earlier studies.

Auret and Cline (2011) examine the value, size and January effects on the JSE over the period from 1988 through 1995; and from 1996 through 2006. The study finds that value firms tend to be large caps on the JSE and vice versa in both examination periods. While the profitability of various investment styles tends to be cyclical over the examination periods, no significant anomalies are found based on the value, size or January effects on the JSE. Auret and Cline (2011) argue that contradictory findings in empirical studies could be attributed to differing time periods, databases or different style proxies. The authors further suggest that sector-based norms could be established in future studies to avoid differing value/growth benchmarks across sectors to unduly bias the research outcome.

Hodnett (2014) investigates the cyclical nature of the value-growth spread on the JSE over the period from 1997 through 2013. The three measures used to define value and growth stocks include the earnings-to-price (E/P) ratio, the book-to-price (B/P) ratio and the sales-to-price (S/P) ratio. Examining the median ratio between the value and growth portfolios reveals that the median ratio is the highest and most volatile for portfolios classified by the S/P ratio. This suggests that the S/P ratio could contain crucial information regarding market sentiments throughout various phases of the business cycle in South Africa. Regression results also indicate that the value-growth spreads could

be used to predict near-term market risk premium on the JSE as these two variables appear to be positively significantly correlated.

2. Data and methodology

This study undertakes to test the value effect on the JSE over the 10-year period from 01 January 2004 through 31 December 2013 using price multiples namely the earnings-to-price (E/P) ratio, book-to-price (B/P) ratio and sales-to-price (S/P) ratio as the relative valuation proxies. In order to prevent the possibility of the size effect unduly biasing the study results, sample stocks are grouped into the large cap segment or the small cap segment of the JSE. This enables the tests of the value effect to be conducted in the whole sample, within the large cap segment and within the small cap segment of the JSE respectively. Comparing the relative degrees and the existence of the value effect in different size segments assists the analysis of whether the value effect is independent of firm size and represents a unique anomaly on the JSE.

2.1. Research sample. The FTSE/JSE All Share Index constituents are used as the database for this research. All companies that form part of the above index over the period from 01 January 1997 to 31 December 2013 are included in the sample to avoid survivorship bias. Delisted or suspended shares are removed from the sample as of their respective delisting or suspension dates. Listed firms on the JSE are permitted to have different calendar months for their interim and financial year-ends. To ensure that the research sample is free from look-ahead bias, data obtained from financial statements are recorded with a standard three months delay counted from the interim and financial year-ends of the respective stocks in the sample.

2.2. Value and growth stocks in the large and small cap segments of the JSE. Sample stocks are first ranked according to their market capitalizations at the beginning of each month in the examination period. The top one-third of the sample stocks in terms of their market capitalizations are classified as stocks in the large cap segment of the JSE; and the bottom one-third of the sample stocks by market capitalization are grouped into the small cap segment at the beginning of each month. Within each of the large cap and small cap segments, the one-third of the stocks with the highest E/P ratio, B/P ratio and S/P ratio at the beginning of each month are classified as value stocks and the bottom one-third of the stocks are classified as growth stocks based on the E/P ratio, B/P ratio and S/P ratio respectively. Equally-weighted value and growth portfolios based on the E/P ratio, B/P ratio and S/P ratio in the large cap and small cap segments are subsequently constructed and rebalanced monthly throughout the examination period. Adopting this methodology, monthly-rebalanced growth and value portfolios based on the E/P ratio, B/P ratio and S/P ratio are also constructed for the entire research sample over the examination period.

2.3. Portfolio performance evaluation. The monthly arithmetic return and standard deviation for each of the value and growth portfolios are computed to provide a general indication of the return and risk characteristics of the respective portfolios. The return for portfolio P in month t is computed using Equation 1:

$$r_{p,t} = \sum_{i=1}^{N} r_{i,t} / N, \quad (1)$$

where, $r_{i,t}$ is the return on the ith constituent in portfolio P; and N is the total number of constituents in portfolio P.

The arithmetic returns for the value and growth portfolios in the bull and bear markets are also computed respectively to determine whether the respective portfolios perform better in bull or bear markets. The bull market in this study is defined as the period during which the market proxy return is higher than the risk-free proxy return; and the bear market is defined as the period when market proxy earns less return compared to the risk-free proxy.

The risk-adjusted performance measure employed in this study is the Sharpe ratio. To compute the Sharpe ratio, the time-series arithmetic return on portfolio P over the examination period from 01 January 2004 through 31 December 2013 (120 months) is first computed as R_P. The monthly standard deviation for portfolio P is subsequently computed using Equation 2:

$$\sigma_p = \sqrt{\frac{\sum_{t=1}^{120}(r_{p,t} - R_p)^2}{119}}. \quad (2)$$

Using the South African 90-day Treasury bill as the proxy for the risk-free investment, the Sharpe ratio for the portfolio is calculated using Equation 3:

$$\text{Sharpe ratio} = (R_p - R_f)/\sigma_p. \quad (3)$$

Where: R_P is the return on portfolio P; R_f is the return on the risk-free proxy; and σ_p is the standard deviation of return on portfolio P.

The Sharpe ratio estimates the excess return of a portfolio per unit of total risk, which is a more appropriate risk measure in this study compared to the beta coefficient that measures the portfolio's exposure to market risk only. This is because further diversification by combining a value or growth portfolio with other investment styles should be

minimal to retain the unique value or growth exposure from a value or growth of investor's perspective. Assuming no further diversification benefits are available, the Sharpe ratio effectively attributes the portfolio performance to the unique value or growth investment style using E/P, B/P or S/P as the benchmark in selecting value and growth stocks.

2.4. Evaluating independent value effect in different firm size segments. Independent value effect in each of the large cap segment, small cap segment and the entire sample are determined by the statistical significance of the average monthly value-growth spread. A correlation matrix is also constructed to enhance the analysis of the cross-correlation between the returns on the value and growth portfolios. Such analysis provides evidence as to whether the portfolios represent unique investment styles over the examination period. The Pearson product moment correlation coefficient between monthly returns for portfolio X and portfolio Y is computed using Equation 4:

$$r_{X,Y} = \frac{\sum_{t=1}^{120}(r_{X,t} - R_X)(r_{Y,t} - R_Y)}{\sqrt{(r_{X,t} - R_X)^2 (r_{Y,t} - R_Y)^2}}. \quad (4)$$

3. Results

The performances of the value portfolios and their growth counterparts when all sample firms are included in the portfolio selection are demonstrated in Panel (a) of Table 1. The performances of the value and growth portfolios selected from the large cap and small cap segments of the JSE are demonstrated in Panel (b) and Panel (c) of Table 1 respectively. The value portfolios are represented by stocks with high E/P, B/P and S/P ratios. On the other hand, stocks with low E/P, B/P and S/P are included in the growth portfolios. The market proxy in this study is represented by an equally-weighted portfolio of all sample stocks. Equal-weighting methodology is applied for the market proxy to mitigate the size effect that might potentially create a performance drag in the cap-weighted market proxy, which forms an upward bias when assessing portfolio performance.

Examining the performances of the value and growth portfolios in Table 1 reveals that the value portfolios formed by E/P and S/P earn higher monthly returns compared to their growth counterparts across different firm size segments. The higher returns earned by the E/P and S/P value portfolios are accompanied by higher standard deviations. When the risk is accounted for, the value portfolios continue to outperform their growth counterparts in terms of the Sharpe ratio with the exception of the portfolios formed by B/P. The growth portfolios formed by B/P outperform their value counterparts with higher returns and lower standard deviation, leading to significantly higher Sharpe ratios across various size spectrums. Overall, value portfolios formed by E/P and S/P deliver better returns and risk-adjusted performance compared to their growth counterparts. On the contrary, the growth effect is exhibited in the portfolios formed by B/P as portfolios that are comprised of low B/P firms deliver superior risk-adjusted performance compared to their high B/P counterparts.

Table 1. Portfolio performance statistics

Performance statistics	Market proxy	Value portfolios			Growth portfolios		
		High E/P	High B/P	High S/P	Low E/P	Low B/P	Low S/P
PANEL (a) All sample stocks							
Monthly return	1.94%	2.22%	1.89%	2.11%	1.81%	2.15%	1.82%
Std. deviation	4.05%	4.62%	4.36%	4.66%	4.21%	4.25%	3.99%
Sharpe ratio	32.99%	35.21%	29.58%	32.49%	28.89%	36.56%	30.69%
PANEL (b) Large cap segment							
Monthly return	1.94%	1.63%	1.62%	1.55%	1.49%	1.72%	1.52%
Std. deviation	4.05%	5.34%	4.83%	4.81%	4.64%	4.37%	5.00%
Sharpe ratio	32.99%	19.42%	21.13%	19.74%	19.28%	25.60%	18.50%
PANEL (c) Small cap segment							
Monthly return	1.94%	2.73%	2.24%	2.50%	2.35%	2.92%	2.46%
Std. deviation	4.05%	5.30%	5.15%	5.57%	5.28%	4.95%	4.57%
Sharpe ratio	32.99%	40.28%	31.93%	34.16%	33.13%	46.87%	40.83%

The next step of the analysis includes the determination of whether the value effect exhibited by the E/P and S/P portfolios, and the growth effect exhibited by the B/P portfolios are statistically significant and independent of firm size. The monthly return differences between the value and growth portfolios formed by E/P, B/P and S/P are computed for each of the large cap segment, small cap segment and the entire sample. The statistical significance of the average value-growth spreads in different firm size segments based on the Student's t-statistic is demonstrated in Table 2. Although the monthly averages of the value-growth spreads for the E/P and S/P portfolios are positive across

different firm size segments, they are statistically insignificant. This is so for the entire sample as well. On the other hand, the independent growth effect represented by the negative value-growth spread for the B/P portfolios is statistically insignificant for the large cap segment and the entire sample, but statistically significant at the 10% level for the small cap segment of the JSE. Overall, the value effect for the E/P and S/P portfolios and the growth effect for the B/P portfolios seem to be weak over the examination period using various valuation benchmarks.

Table 2. Independent value effect in different firm size segments

Performance statistics	Average value-growth spread		
	High E/P – low E/P	High B/P – low B/P	High S/P – low S/P
PANEL (a) All sample stocks			
Mean	0.409%	-0.263%	0.290%
t-statistic	1.5093	-1.0424	1.0592
p-value	0.1323	0.2973	0.2897
PANEL (b) Large cap spectrum			
Mean	0.142%	-0.099%	0.024%
t-statistic	0.3443	-0.3317	0.0621
p-value	0.7302	0.7396	0.9504
PANEL (c) Small cap spectrum			
Mean	0.388%	-0.675%	0.037%
t-statistic	0.9405	-1.6694	0.0911
p-value	0.3469	0.0963	0.9272

The dominance of the size effect is evident in the research sample over the examination period since all portfolios (regardless of value or growth tilt) in the small cap segment earn higher returns compared to their comparable counterparts in the large cap segment. Although the small cap portfolios, regardless of their value or growth tilts, have relatively higher risk (represented by standard deviation) compared to their large cap counterparts, the returns earned by the small cap portfolios is more than commensurate for their risks, which results in higher Sharpe ratios for the small cap portfolios. With the exception of the value portfolio formed by the B/P ratio in the small cap segment, all small cap portfolios outperform the market proxy in terms of their Sharpe ratios. By contrast, all portfolios from the large cap segment underperform the market proxy with higher risks, lower returns and lower Sharpe ratios.

Table 3 demonstrates the returns for the value and growth portfolios in the bull and bear markets respectively. The examination of the bull and bear market returns for the value and growth portfolios across various size segments reveals that most of the value portfolios earn higher returns in the bull market; yet encounter greater losses when the market is bearish compared to their growth counterparts. This suggests that value stocks are more sensitive to market movements on the JSE.

Table 3. Bull and bear market returns

Performance statistics	Market proxy	Value portfolios			Growth portfolios		
		High E/P	High B/P	High S/P	Low E/P	Low B/P	Low S/P
PANEL (a) All sample stocks							
Return: Bull	4.14%	4.57%	4.09%	4.54%	3.91%	4.32%	3.72%
Return: Bear	-2.48%	-2.48%	-2.52%	-2.74%	-2.38%	-2.20%	-1.97%
PANEL (b) Large cap segment							
Return: Bull	4.14%	4.11%	3.91%	3.96%	3.37%	3.71%	3.40%
Return: Bear	-2.48%	-3.32%	-2.98%	-3.28%	-2.27%	-2.28%	-2.24%
PANEL (c) Small cap segment							
Return: Bull	4.14%	5.11%	4.47%	4.90%	4.57%	5.14%	4.50%
Return: Bear	-2.48%	-2.01%	-2.06%	-2.30%	-2.10%	-1.53%	-1.61%

The cross-correlation matrix between value (V) and growth (G) portfolios returns from different firm size segments is illustrated in Table 4. A "heat-map" is applied to the table with strong correlations demonstrated in dark red and weaker correlations demonstrated in light grey. The first column represents the correlations between the various portfolios' returns with the market proxy returns. The triangle on the top-left region represents the correlations between various value portfolios' returns while the bottom-right triangle illustrates the correlations between various growth portfolios' returns. The averages of the correlations in these two regions are 80.9% and 74.2% respectively. On the other hand, the average return correlation between value portfolios and growth portfolios in the bottom-left square region is 69.2%,

comparably lower than the average return correlations between portfolios of similar valuation benchmarks. An important observation is that the correlations between portfolios from the large and small cap segments are amongst the lowest in all three regions, demonstrating significant size effect on the JSE. This finding also suggests that firm size is a more important attribute in determining the cross-section of stock returns on the JSE compared to the stocks' value or growth orientation.

Table 4. Cross-correlation matrix

	Market	V E/P (A)	V E/P (L)	V E/P (S)	V B/P (A)	V B/P (L)	V B/P (S)	V S/P (A)	V S/P (L)	V S/P (S)	G E/P (A)	G E/P (L)	G E/P (S)	G B/P (A)	G B/P (L)	G B/P (S)	G S/P (A)	G S/P (L)	G S/P (S)
Market	1																		
V E/P (A)	0.95	1																	
V E/P (L)	0.87	0.90	1																
V E/P (S)	0.85	0.89	0.67	1															
V B/P (A)	0.94	0.93	0.87	0.83	1														
V B/P (L)	0.83	0.80	0.91	0.60	0.86	1													
V B/P (S)	0.79	0.78	0.63	0.81	0.87	0.59	1												
V S/P (A)	0.95	0.95	0.83	0.88	0.94	0.78	0.83	1											
V S/P (L)	0.90	0.89	0.91	0.73	0.87	0.89	0.65	0.89	1										
V S/P (S)	0.82	0.82	0.64	0.87	0.83	0.60	0.84	0.88	0.67	1									
G E/P (A)	0.92	0.78	0.72	0.72	0.83	0.79	0.69	0.83	0.78	0.749	1								
G E/P (L)	0.75	0.59	0.60	0.54	0.65	0.73	0.47	0.61	0.67	0.536	0.88	1							
G E/P (S)	0.82	0.78	0.64	0.75	0.78	0.61	0.67	0.73	0.67	0.639	0.73	0.56	1						
G B/P (A)	0.94	0.84	0.75	0.76	0.80	0.72	0.66	0.86	0.83	0.756	0.90	0.76	0.74	1					
G B/P (L)	0.87	0.78	0.79	0.65	0.75	0.75	0.55	0.76	0.84	0.584	0.84	0.83	0.67	0.88	1				
G B/P (S)	0.79	0.71	0.57	0.71	0.68	0.54	0.62	0.78	0.64	0.767	0.73	0.52	0.69	0.85	0.59	1			
G S/P (A)	0.92	0.82	0.78	0.71	0.83	0.75	0.63	0.77	0.76	0.667	0.88	0.80	0.85	0.89	0.88	0.69	1		
G S/P (L)	0.75	0.61	0.66	0.52	0.63	0.70	0.45	0.59	0.63	0.520	0.84	0.92	0.54	0.77	0.85	0.49	0.83	1	
G S/P (S)	0.77	0.68	0.57	0.64	0.74	0.59	0.72	0.76	0.58	0.784	0.82	0.55	0.66	0.73	0.56	0.75	0.69	0.55	1

Figure 1 illustrates the risk-return trade-off for the value (V) and growth (G) portfolios from the large (L) and small (S) cap segments where returns of the respective portfolios are plotted against their standard deviations. Observing the scatter plots reveals that all portfolios have marginally higher standard deviations compared to that of the market proxy. This observation is expected since the market proxy is a better diversified portfolio. Regardless of a portfolio's value or growth tilt, it is noted that all portfolios from the small cap segment earn returns above the market proxy while the portfolios from the large cap segment earn less returns compared to the market proxy. The distinctive risk-return trade-off between portfolios in the large and small segments of the JSE provides further evidence that firm size is a more dominant attribute compared to the relative valuations of the firms in differentiating portfolio returns on the JSE.

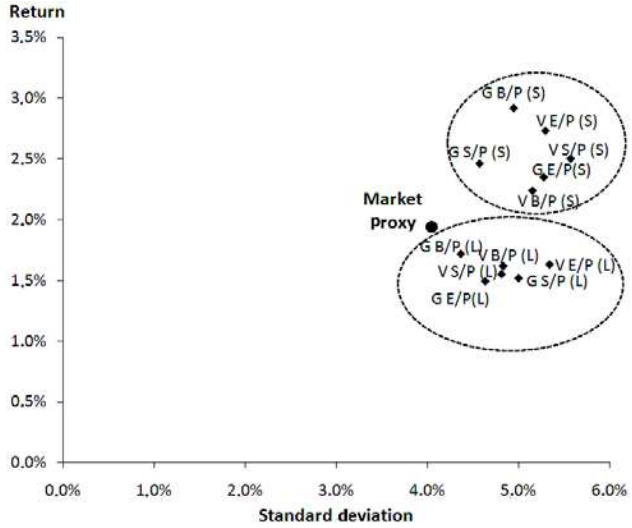

Fig. 1. Risk-return trade-off

Conclusion

Although the value effect is exhibited for the E/P and S/P portfolios; and the growth effect is exhibited for the B/P portfolios, independent value and growth effects appear to be weak throughout the examination period. This finding is in line with recent studies conducted by Auret and Cline (2011) who find no significant value or growth anomalies on the JSE. While contradicting the studies of Basiewicz, and Auret (2009) that find significant value effect independent of firm size, the contradictory findings could be attributed to different time periods and samples employed by various studies. Firstly, the period examined in this research includes financial market turbulence experienced as a result of the 2007 subprime crisis, which led to the global financial market crash in 2008 and the on-going European debt crisis to-date. Most of the South African literature on the value effect does not incorporate the study period post-2007. Secondly, this study divides the market into tertiles (one-third of the population) to distinguish value and growth portfolio performances, while most prior studies usually sort the portfolios into quartiles or quintiles. The advantage of conducting analysis based on less concentrated tertiles is that sufficient sample size could be obtained to dilute the effect of extreme outliers in the sample. However, this might lead to the dilution of the value or the growth effect in the study, which is probably the primary reason for the less conclusive results. If different time periods and samples could lead to different conclusions regarding the independence of the value effect on the JSE, the value investment style is probably not as effective as it appears to be once the potentially higher trading costs, due to illiquidity, are taken into account. In addition, value portfolios seem to be more sensitive to market movements and are potentially riskier than the growth portfolios.

On the other hand, a significant size effect is detected regardless of the portfolio's value or growth tilt based on the tertile analysis. This observation provides solid evidence that the size effect is the dominant anomaly above the value effect on the JSE over the examination period.

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