

## Limited arbitrage: the South African evidence

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### ABSTRACT

One of the cornerstones of Financial Theory is that arbitrage will eliminate any excess profit opportunities. Over the past decade anomalous empirical evidence has been showing up, the return patterns of which do not fit this prediction. Most anomalies self-destruct, but the value premium (i.e., higher share price returns for companies trading at low prices to fundamentals) has been a stubborn anomaly. This study tests for the existence of the value premium in South Africa's equity market and interpret the results in terms of its implication for arbitrage and our understanding of it as a cornerstone of financial markets.

Keywords: financial markets, arbitrage, value premium, value premium in South Africa, value investing



## INTRODUCTION

Our basic understanding of financial markets is that prices of financial assets reflect the intrinsic value of an asset. This value can be measured by the present value of expected future cash flows from the asset. If an asset is under-priced compared to its intrinsic value, the demand for that asset will increase, driving up its price and thereby eliminating any excess returns. This is the process of arbitrage. Arbitrage plays a critical role in the analysis of securities markets, because its effect is to bring prices in line with fundamental values and keep markets efficient.

In efficient financial markets, rational investors can and will take advantage of any “wrong” pricing that develop; thus, no arbitrage opportunities (i.e. excessive profit opportunities) will exist for long. Rational traders base their expectations on objectively correct probability distributions of return, conditional on what is known at the time. In contrast, irrational noise trading is based on incorrect, emotionally charged probability assessments and will therefore make financial losses that will drive them out of the market. It has never been argued that all investors are rational; some investors might make irrational decisions or process information incorrectly; however, this is not systematic, and arbitrage will always prevent any wrong pricing from being there for long.

In efficient markets the only way a stock can earn higher rates of return on a consistent basis is if it is more risky than the market. If a group of stocks, such as value stocks, can be found that consistently generates a higher rate of return over decades without being more risky, it challenges the efficiency of arbitrage.

Since 1992, when Fama and French (1992) published the now well-known paper on “the cross-section of expected stock returns”, a growing body of empirical evidence suggests that investment in the stocks of value companies has outperformed investment in the stocks of growth companies. This phenomenon carries the name of the value premium, and tests for it have been done in a wide range of markets and time periods (Chan, Hamama, & Lakonishok, 1991; Fama and French, 1998; Chan, Lakonishok, 2004).

The purpose of this study is to test whether value companies also generated a higher rate of return in South Africa’s financial market over the 29-year period between 1972 and 2001, and to interpret the results in terms of its implications for arbitrage. Why South African data? South Africa has a well established, sizable, and liquid financial market, that is internationally recognized as well- managed and effective in allocating capital. It is also isolated and under-studied, which means its data has not been over-analyzed and does not suffer from the well-known data limitations as does North American equity research. These factors make South Africa a good case study with which to shed further light on the existence of the value premium and what it means in terms of arbitrage.

The existence of the value premium in South Africa has been tested before by other researchers such as Graham and Uliana (2001), Fraser and Page (2000), Rousseau and Van Rensburg (2003a), Auret and Sinclair (2006), Mutooni and Muller (2007). However, all these previous South African studies used small sample sizes that included industrial companies, but excluded mining companies and small and illiquid companies; tests were conducted for a short time period using monthly data only. All these factors are in contrast to how it was done in this study – see the method description below.

## **VALUE AND GROWTH STOCKS**

The 1992 study of Fama and French, referred to above, tested to see if US stock prices might be related to a fundamental value, specifically book value of equity (BV) to market value of equity (MV). They found a strong and consistent pattern which showed that companies with high book value relative to market value of equity (BV/MV) tend to outperform the market. This finding indicated that value company stocks outperformed growth company stocks in the US between 1963 and 1992.

Fama and French were not the first to suggest it might be profitable to buy shares trading at low prices relative to fundamentals such as earnings, assets, dividends, etc. This concept dates back to the 1930s when Graham and Dodd (1934) suggested that taking company fundamentals into consideration when buying shares is a prerequisite for good returns. However, since 1992, the notion that value company share price returns outperform the market was extensively tested around the world. Fama and French (1998) tested it themselves with data from 12 major European countries as well as from Australia and the Far East. The consistency of their findings is impressive. They found that in almost every country, value stocks had a higher return than growth stocks. Even after refining their study by incorporating other value measurements such as earnings/price, cash flow/price, and dividend/price, they found similar value premiums.

### **TESTING FOR THE VALUE PREMIUM IN SOUTH AFRICA: METHOD**

The accounting and share price data necessary for this South African study was obtained from McGregor BFA in Johannesburg, South Africa. All the companies (including the delisted ones) trading on the Johannesburg Stock Exchange (JSE) between 1972 and 2001 were classified and listed annually, based on a value classification such as book-value-to-market-value (BV/MV) or cash-flow-to-price-ratio (cash flow). All shares were then grouped into five portfolios (i.e., quintiles), starting with the highest values of BV/MV (the value companies) working down to the companies with the lowest values (the growth companies). Portfolios were adjusted annually, which resulted in 29 portfolio in total. For each portfolio, returns were computed in each of the five years following portfolio formation as well as the average annual return over the five-year period. The reported portfolio return is the arithmetic average, and equally weighted, return of all the shares in each portfolio.

### **TESTING FOR THE VALUE PREMIUM IN SOUTH AFRICA: FINDINGS**

Tables 1 and 2 below show the average return of the five portfolios mentioned in the previous section for the entire period of data availability (1972 – 2001). Strong and unmistakable evidence was found that the value premium existed in South Africa over the past 29 years. Regardless of which measure of value was used—BV/MV or cash flow—Portfolio 1 in Table 1 below (the value portfolio) consistently outperformed Portfolio 5 (growth portfolio) in the same table. In addition, irrespective of the length of time the portfolios were carried (1 through 5 years), value portfolios did significantly better.

In Table 1, the value indicator used to do the portfolio formation was BV/MV. On average, over 5 post-formation years, the first-quintile stocks (value stocks) had an average annual return of 30.07%, compared to the fifth-quintile stocks (growth stocks) that generated an average annual return of only 18.23%.

**Table 1 - BV/MV 1-5 Year Annually Adjusted Return**

	High Value	Values in %			High Growth
Years after portfolio formation	<i>Portfolio 1</i>	<i>Portfolio 2</i>	<i>Portfolio 3</i>	<i>Portfolio 4</i>	<i>Portfolio 5</i>
<i>1<sup>st</sup> yr</i>	39.20	17.57	11.10	11.80	13.33
<i>2<sup>nd</sup> yr</i>	29.06	16.99	12.21	15.27	21.91
<i>3<sup>rd</sup> yr</i>	27.29	19.40	17.94	16.87	17.28
<i>4<sup>th</sup> yr</i>	29.39	23.07	20.59	17.75	19.95
<i>5<sup>th</sup> yr</i>	25.42	25.30	24.84	16.98	18.65
<b>Average Annual Return</b>	<b>30.07</b>	<b>20.46</b>	<b>17.34</b>	<b>15.73</b>	<b>18.23</b>

In Table 1, we see that in the first year after portfolio formation (*1<sup>st</sup> yr*), the high-value portfolio (Portfolio 1) generated an average annual return of 39.20%. Portfolio 2 generated a return of 17.57%, Portfolios 3 and 4 around 11% each, and Portfolio 5 (the high-growth portfolio) generated a 13.33% annual return. A detailed analysis of the data reveals that in the 29 years of data availability, there were only 5 years in which the high-value portfolio (Portfolio 1) did not outperform the high-growth portfolio (Portfolio 5) in the first year after portfolio formation. These 5 years were 1973—the time of the first OPEC oil price hike, 1984, and 1985—years of intensified international sanctions against South Africa accompanied by internal unrest, and 1992 and 1998—both years of great political uncertainty before initially Mandela and subsequently Mbeki became president of South Africa.

In the second year after portfolio formation (*2<sup>nd</sup> yr*), the same pattern was found as with data for one year after portfolio formation. The high-value portfolio (Portfolio 1) generated, on average, an annual return of 29.06%. Portfolio 2 generated 16.99%, Portfolio 3 generated 12.21%, Portfolio 4 generated 15.27%, and Portfolio 5 (high growth) generated a 21.91% annual return. A detailed analysis of the data reveals that there were only 8 years in which the high-value portfolio (Portfolio 1) did not outperform the high-growth portfolio (Portfolio 5) in the second year after portfolio formation. These 8 years were roughly the same as those relevant to the 1-year analysis. The OPEC oil price hikes of 1972 and 1975 had the same effect as before. So did the tightening of international sanctions against South Africa in 1984 and 1985. The likely effect of political uncertainty showed up more markedly in the 2-year analysis. In each of 1990 (the year Mandela was released from jail), 1991 (the year negotiations started to end apartheid), 1994 (the first democratic election), and 1997 (the year before Mandela stepped down as first president), growth stocks outperformed value stocks.

This pattern continued for the annual return in years 3, 4, and 5 after portfolio formation. There were always a couple of years during which the high-value portfolio (Portfolio 1) did not outperform the high-growth portfolio (Portfolio 5). Consider the analysis in the fourth year after portfolio formation, there were 14 years during which the above-mentioned pattern is repeated. Even then, the high-value portfolio (Portfolio 1), on average, still generated an average annual return of 29.42% in that year (*4<sup>th</sup> yr*) category, compared to the 19.95% generated by the high-growth portfolio (Portfolio 5).

Clearly, the years during which the high-value portfolio did not outperform the high-growth portfolio always coincided with exceptional and/or unusual political or economic events that originated either in South Africa or internationally.

Interestingly, the worst performing portfolio each year is not Portfolio 5 (the high growth) but Portfolio 4 (the second-highest growth portfolio). The reason for this is not clear and requires further investigation. However, this is not the case in Table 2 where portfolio formation is based on cash flow rather than on BV/MV.

**Table 2 - Cash Flow: 1-5 Year Annually Adjusted Returns**

	High Value	Values in %			High Growth
Years after portfolio formation	<i>Portfolio 1</i>	<i>Portfolio 2</i>	<i>Portfolio 3</i>	<i>Portfolio 4</i>	<i>Portfolio 5</i>
<i>1yr</i>	42.71	19.40	7.30	3.01	1.61
<i>2yr</i>	31.65	19.05	10.64	6.13	5.24
<i>3yr</i>	23.33	16.46	18.94	9.26	6.05
<i>4yr</i>	27.27	19.86	17.69	19.37	15.54
<i>5yr</i>	23.48	18.80	12.74	19.58	23.24
<b>Average Annual Return</b>	<b>29.69</b>	<b>18.72</b>	<b>13.46</b>	<b>11.47</b>	<b>10.34</b>

In Table 2, cash flow is used as value indicator for portfolio formation. All shares were again grouped into five portfolios (i.e., quintiles), starting with the highest values of cash flow/share price (the value companies) working down to the companies with the lowest values (the growth companies). On average, over 5 post-formation years, the first-quintile (value) portfolios have an average annual stock price return of 29.69% per year, compared to the fifth-quintile (growth) portfolios average annual return of only 10.34%. The average annual return pattern in Table 2 is monotonous (meaning that the average return from Portfolio 1 to Portfolio 5 decreases in a stepwise negative linear regression).

**STATISTICAL SIGNIFICANCE OF RESULTS****Table 3 - Linear Regressions**

		<b>Book Value</b>	
Annual Return in Year 1	T-stats	2.1183	7.0834
	P-Value	0.0341	0.0000
Annual Return in Year 2	T-stats	3.8591	3.4262
	P-Value	0.0001	0.0006
Annual Return in Year 3	T-stats	6.5991	2.4538
	P-Value	0.0000	0.0000
Annual Return in Year 4	T-stats	3.7316	8.0833
	P-Value	0.0002	0.0000
Annual Return in Year 5	T-stats	3.8996	1.9081
	P-Value	9E-05	0.0564

Statistically significant at 0.05 level where critical  $t = 1.2816$ .

All  $t_{stat} > t_{critical}$  and  $P\text{ value} < \alpha = 0.10$ .

To confirm that BV/MV and cash flow are not only economically significant ways to capture the value premium but also statistically significant, a linear regression was done between BV/MV as independent variable and stock price return as dependent variable. For each company in each of the 5 portfolios for each of the 29 years under investigation, a regression analysis was done between its BV/MV ratio and its stock price return in years 1 through 5 after portfolio formation. It is clear from Table 3 that BV/MV is a statistically significant indicator of stock price return. Statistically significant T-values and P-values were found for each of the 5 years that returns were tracked after portfolio formation, with the 3-year annual adjusted return particularly strong (T-stat of 6.59 and P-value of 0.0000).

The same procedure was followed to confirm that cash flow is a statistically significant indicator of stock price return. Each company's cash-flow-to-price ratio was regressed on its share price return in years 1 to 5 (independently) after portfolio formation. Statistically significant T-values and P-values were found for each of the 5 years after portfolio formation, with the 4-year return particularly strong with a T-stat of 8.08 and P-value of 0.0000.

## INTERPRETING RESULTS

These observations require interpretation because the information that the value portfolios are based on is publicly known and the data covers 29 years, meaning unless value stocks are more risky than growth stocks this observation cast doubt on the efficiency of arbitrage. Unless the higher return on value companies is compensation for higher systematic risk investors are exposed to, the value premium is risky free profit – something efficient arbitrage cannot allow. If the assumption of efficient arbitrage is too be maintained, then the value premium should be a measure of risk – an indicator of a higher discount rate that compensates investors for risk factors. In other words, the higher rate of return on value stock should be an indicator of a higher discount rate used in discounted future cash flow. If the value premium is nothing more than a higher discount rate (a higher cost of capital) that investors expect as compensation for higher risk, the value premium evidence which made the model look anomalous had in fact been a misrepresentation.

## RISK AS EXPLANATION

The risk-return trade-off is a cornerstone of finance theory. The assumption that investors are risk avoiders who will accept higher levels of risk only if they are compensated by higher returns on their investment is the fundamental assumption of the Modern Portfolio Theory and the Capital Asset Pricing Model or CAPM. (Sharpe, 1964; Lintner, 1965; Black, 1972) If value stocks and by extension value portfolios are not more risky than growth stock and –portfolios it would mean arbitrage is limited in its ability to bring stock prices to fundamental values and keep markets efficient.

The traditional measurement of risk is beta which captures systematic risk that cannot be diversified away. Fama and French (1993) did extensive beta testing on value portfolios and found that beta does not explain the value premium. This finding resulted in the value premium becoming an anomaly because it was an investment strategy that has historically earned higher returns than what could be justified by the investment's systematic risk exposure as measured by beta.

In South Africa, empirical work by Bowie and Bradfield (1998a and 1998b) and Van Rensburg and Robertson (2003a) tested beta's explanatory power for stock market returns in the South African context. Van Rensburg and Robertson (2003a) formed quintile portfolios based on one-dimensional (size) and two-dimensional (size and EPS) attributes and tested beta's power to make accurate predictions. They came to the conclusion that "...if anything, beta is inversely related to returns!" (2003b:9).

Fama and French (1993) suggested that book-value-to-market-value (BV/MV) might capture additional risk— called "distress factors"—not captured by beta. Referring to work done by Chan and Chen (1991), it was argued that firms judged to have poor prospects by the market—as reflected in low share prices and high BV/MV ratio—might require a higher discount rate to compensate investors for additional risk than companies with strong prospects. In other words, the higher rate of return on value stock is an indicator of a higher discount rate used in discounted future cash flow. Fama and French (1993) suggested that these "distress factors" were not purely idiosyncratic (i.e.,

company-specific risk that can be diversified away) because of the observation that the prices of high BV/MV stocks tend to move up and down together in a way that suggests one or more common risk factors. What those distress factors might be was not clear to Fama and French, who suggested that value firms might be more vulnerable to business cycle downturns or changes in credit conditions.

A year later, Lakonishok, Shleifer, and Vishny (1994) examined the sensitivity of value companies (i.e., companies with high BV/MV relative to share price) to business cycles by comparing the performance of value and growth companies during bad times. They found that when the overall financial market return was negative, value stocks outperformed growth stocks. When the overall financial market earned a positive return, the value portfolios at least matched the performance of the growth portfolios. In short, they found that value companies did well in good economic times and performed quite impressively in bad economic times. They also argued against the “metaphysical” approach to risk in which higher average returns from an investment strategy must necessarily reflect some source of risk. It was not that Lakonishok, Shleifer, and Vishny (1994) (henceforth referred to as LSV) disputed the possibility that there may be distress factors associated with value stocks. Rather, they argued that the return premiums associated with these portfolios are too large and their covariance with macro economic factors just too low (or, in some cases, negative) to be considered compensation for systematic risk.

That influential article by LSV (1994) set in motion significant attempts by many researchers to discover what the distress factor(s) might be. Finding these would make it possible to explain away the value anomaly and explain results which currently questioned the efficiency of arbitrage. Identifying distress factors entailed locating a covariance between the return on the value portfolio and some macroeconomic factor. However, all the companies in the value portfolio had to be vulnerable to the same risk factor. If not, it would be purely idiosyncratic (i.e., company specific) and could be diversified away. If the assumption of arbitrage is to be maintained, the book-to-market (BV/MV) premium should be a measure of risk—an indicator of a higher discount rate that compensates investors for “distress factors.”

Despite numerous influential papers such as Daniel and Titman (1995) who did not find any empirical evidence of value company specific distress factors, the risk-based explanation for the existence of the value premium was not laid to rest. Recent articles that attempt to link fundamentals on firm level risk and the value premium (Berk, Green, & Naik, 1999; Gomes, Kogan, & Zhang, 2003; Carlson, Fisher, & Giammarino, 2004) have found some evidence that fundamentals on firm level is a determinant of expected return, but to date, the empirical evidence supporting these arguments is not conclusive.

## CONCLUSIONS

Findings from this study suggest that the basic assumption about arbitrage, namely that it will always prevent wrong pricing from exciting for long, might not reflect reality in South Africa. The value premium continues to exist internationally and in South Africa—at least for the 29 years examined in this study without evidence that it is more risky.



This observation requires explanation which falls outside the scope of this paper, but Shleifer and Vishny (1997) suggested a possible explanation is that arbitrage requires capital. Commonly arbitrage is conducted by relatively few professional, highly specialized investors who combine their knowledge with resources of outside investors such as high net worth individuals, banks or endowment funds to take large positions in stocks. The knowledge and resources are separated by an agency relationship. Arbitrageurs can become most constrained when they have the best opportunities, that is, when the mispricing they have bet against gets worse, because the owners of the resource generally understand little about the process; they might withdraw capital at the moment when the best arbitrage opportunity presents itself. This makes arbitrageurs cautious and less effective in bringing markets back to fundamental values.

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