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Aftermarket price performance of initial public offerings on the JSA: 1980-1998

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1 INTRODUCTION

An unlisted company can be listed on the Johannesburg Stock Exchange (JSE) via a number of methods such as an introduction, public offer, private placing, preferential offer or reverse take over. In a public offering, a prospectus printed by the company is made available to the public who may then subscribe for new shares in the company. The company is then able to raise new equity as well as obtain the spread of shareholders required for the JSE listing.

The benefits of listing a company on the JSE include the following:

- The ability to raise new capital, which allows for future growth without the interest burden associated with borrowed funds.
- Other forms of financing can be obtained more easily by a listed company due to the better credit rating accorded to listed companies. A listed company is likely to have a good credit rating since it would have shown that it can meet stringent JSE requirements. Its actions would be subject to the JSE and public scrutiny.
- Original shareholders may benefit from the increased liquidity of their investment and from the market's valuation of their shares.
- Employee motivation through share incentive schemes.
- Greater company publicity that would affect employee morale as well as enhance company status and perception among banks, suppliers and customers.

Initial public offering (IPO) firms are often initially priced at high price earnings (P/E) multiples, implying that investors have high expectations of good earnings growth in the future. Many IPO firms may have high market-to-book (M/B) and P/E ratios relative to their industry counterparts. It is important for investors to know how these measures fare after the IPO since on average, investors value firms going public based on expectations that future earnings growth, positive market sentiment and favourable economic conditions will continue.

Many companies that list on the JSE are fast-growing firms. In order to grow, these firms use the money raised via share issues to invest in positive net present value projects. At times, these projects might actually have negative present value. Managers who insist on investing in these projects effectively destroy shareholder value. An efficient market would require that the share price reflect all the available information on the company including the viability of

projects. This and other factors such as underpricing will have implications for the long run price performance of listed shares. This research seeks to determine whether investors who invest in IPO shares receive returns that are consistently equal to or greater than expected returns. The returns are measured over a period of up to 10 years.

2 RELEVANCE OF THE RESEARCH

The objective of any new issue is to achieve the highest value for the issuer while ensuring a buoyant start to secondary trading. Research by Ibbotson (1975) and Loughran & Ritter (1995) indicated that the companies most likely to list are those whose valuations (reflected in the company prospectus) are high. Overvaluation of IPOs is likely to occur in a bull market. Therefore, the volume of IPOs seems to be correlated with the bull market.

The timing of an IPO is therefore critical to an issuer who intends to successfully raise adequate capital. If issues are over subscribed in a bull market, then the majority of investors who can only buy shares at the market price (as opposed to the offer price) will be interested in the aftermarket performance of these shares. Investors who purchase shares at the market price need the assurance that their returns will be maximized over a certain period of time, otherwise they would be better off investing in other securities.

IPOs of small growth companies typically have high risk. Therefore, shareholders of these companies would require high returns. The aftermarket return is the difference between the closing price at the end of the period of interest and the closing price on the first day of trade. If in general, aftermarket returns of IPOs were lower than acceptable benchmarks, then this would imply that the cost of raising equity capital was not adequately high for the companies concerned. Furthermore, if small growth companies dominate IPOs, then this could lead to a conclusion that these companies, which are potentially risky, do not necessarily face a higher cost of capital compared to other less risky companies.

It is possible for IPOs to underperform in the aftermarket as a result of the overvaluation of these IPOs in bull market conditions. The overvaluation of IPOs could be due to abuse of existing accounting standards. This could raise important issues for bodies that set accounting standards that are aimed at determining how much discretion to allow corporate managers to adjust reported earnings in the IPO prospectus.

A share is underpriced if its offer price at the IPO is lower than the closing price on the first day of trade. In an efficient market, shares would at all times be correctly priced and the price would reflect all the available information on the share. Furthermore, the aftermarket performance would be independent of the level of underpricing.

Underwriters and advisors to IPO companies have a direct interest in the aftermarket performance of shares. The negative repercussions of bad listing decisions and poor aftermarket performance could damage their reputation and future business prospects.

This research is relevant to managers of issuing companies, all market practitioners (underwriters, transfer secretaries, and attorneys) and institutional as well as private investors (short, medium and long term investors).

3 LITERATURE REVIEW

3.1 IPO Valuation

The process of equity pricing takes into account many factors including the following-: future earnings prospects, overall market sentiment, economic conditions and management quality. The company advisors/underwriters/investment bankers help determine a price such that selling of the shares is easy. There are many valuation methods used to determine IPO prices and they yield different results depending on the assumptions made. The issuing company faces a potential cost if the offering price is set too high or too low.

Analysts who value IPOs want to maintain sound relationships with their investment bank clients since these clients pay large fees for their services. Furthermore, such good relationships assure the analysts of access to the management of issuing companies at a later stage. Therefore, analysts are tempted to present overly optimistic forecasts of the issuing company to potential investors, resulting in over subscription of shares. This increased demand for shares would result in a successful listing of the shares, enabling the issuing company to raise the intended capital. It would also cause a large price increase during the first few trading days resulting in abnormal profits for short-term investors.

In addition to optimistic forecasts, companies may be overvalued due to the abuse of reported earnings and the contravention of the GAAP (Generally Accepted Accounting Practice) system by managers. (Bhana, 1989) suggests that some companies that listed on the JSE were guilty of creative accounting when they presented figures in the prospectus that had been modified by removing adverse effects of high finance charges, excessive managers' fees, extraneous trading losses and so forth.

If a company underprices its IPO shares and if the shares are all sold on listing, then the company would receive less capital compared to the amount that it would have received had the shares been fairly priced. The difference between the amount of money that could

have been raised at a fair share price and the actual amount of money raised is referred to as “money left on the table”. Ritter (1984) suggests that companies seeking a listing could get the best deal by going public immediately after a "hot issue" market period of high average initial returns. A “hot issue” period refers to a period during which the initial returns on new listings are high. During these periods, investors are willing to accept shares that offer high initial returns without considering the risk associated with these shares.

Sometimes companies issuing /underwriting IPOs place large portions of shares with their trusted shareholders/clients at a preferential offer price. When only a small portion of equity is sold to outsiders, the long-term public relations and marketing benefits realised from giving a handful of investors a quick capital gain outweighs the initial disadvantage to the company of giving away shares too cheaply.

3.2 Underpricing

Underpricing occurs when the pricing of a new issue is lower than the price at which it trades after listing. The level of underpricing is also referred to as the initial premium. IPOs on the JSE between 1980 and 1995 were on average underpriced by 27.2 % (Lawson, 1996). Issuers “leave so much money on the table" for various reasons such as i) the need to attract uninformed investors, ii) the need to return to the market to raise funds at a later stage, iii) the need to improve staff retention by offering the same shares to the staff at a discount, iv) reduce likelihood of legal suits (e.g. errors in the prospectus may be less likely to result in legal suits if the stocks' initial performance is positive) etc. Many small and risky shares tend to be underpriced as a means of compensating investors for taking on the higher risk associated with these companies.

Under normal market conditions, if an issue is overpriced, then only uninformed investors will submit purchase orders and consequently will be awarded 100% of the shares. Typically, these shares subsequently trade at a discount in the aftermarket. Some companies underprice their shares in order to induce informed investors to purchase their shares. Therefore, underpricing could also be perceived as compensation to investors for

the cost of becoming informed i.e. performing security analysis etc. On the contrary, Ibbotson (1975) speculated that IPOs may not be underpriced and that instead, the initial aftermarket period may actually be overpriced. The poor long-run performance of IPOs would then indicate that in spite of the short run underpricing phenomenon, the cost of equity for young growth firms is not excessively high.

3.3 Hot Vs Cold Issue Periods

A hot issue period refers to a period during which the initial premia on new listings are high, while a cold issue period is a period during which the initial premia on new listings are low.

Ritter has found that periods when IPOs are prevalent tend to follow periods of high average initial returns (Ritter, 1984). Ritter also found that significant differences existed between opening premia in hot and cold issue periods. The existence of hot and cold issue periods is likely to impact differently on the aftermarket performance of new listings in these periods. Bradfield & Hampton (1989) showed that average excess returns for issues on the JSE in the hot issue periods were significantly positive for each month over the subsequent year. On the other hand, average excess returns for issues in the cold periods did not show a discernible pattern for the subsequent year after listing. Lawson (1996) found that on the JSE, initial returns in hot periods were significantly greater than initial returns in cold periods.

Ibbotson, Sindelaar, & Ritter (1994), Bhana (1989) and Macdonald & Fisher (1972) argued that whilst significant high initial returns would be identified for hot periods, this would not be the case with aftermarket returns. In contrast, Lawson showed that the aftermarket (up to 1 year) performance of shares for hot periods was significantly higher than that observed for cold periods on the JSE.

3.4 Effect Of Initial Premia On Performance

Using the method proposed by Macdonald & Fisher (1972), Bradfield & Hampton (1989)

concluded that shares with high opening premia did generally have relatively higher abnormal returns in their respective aftermarket periods (less than 1 year). This would support the belief noted by Bradfield & Hampton (1989, p85) that "in order for a share to have a successful performance after listing, it should make its debut with a relatively large opening premium".

3.5 Market Efficiency

In a strong form efficient market, all information is reflected in the share prices.

In a semi strong form efficient market, prices of new issues would quickly adjust to reflect the available relevant public information. Subsequent price behaviour of the issued shares in the aftermarket would then be independent of the initial rate of return at offering (i.e. abnormal returns should not be significantly different from 0 over a long period of time regardless of the opening premia etc). Other researchers such as Reilly and Hatfield (1969) have suggested that the short-term price adjustment after the offering could be continued through the long-term as the market continues to recognise and adjust for the underpricing. This suggests positive excess returns in the aftermarket.

Bhana (1989), in his research on the JSE, noted that investors who acquired shares in new issues in the secondary market received negative returns for a one-year holding period. He ascribed this under performance over the 12 months to (semi strong) market efficiency because the results were associated with the market correction for the initial over reaction, which resulted in shares opening above the issue price.

Ibbotson (1975, p258) concluded that there were “very few, if any, departures from market efficiency in the aftermarket". He observed slightly higher performance in the second to sixth month after listing. However, taking advantage of these insignificant positive abnormal returns would not be profitable due to transaction costs.

Weak form efficiency suggests that current share prices reflect past prices. If the arrival of new information that may affect future share prices cannot be predicted in advance,

then it would be difficult to accurately predict the share prices. Therefore, aftermarket share performance in a weak form efficient market would be difficult to predict.

3.6 Effect Of Risk On Performance

Newly listed companies might be expected to have higher risk than average market risk. Therefore, the risk needs to be taken into account when measuring share performance in order to avoid over stating performance results.

Bradfield & Hampton (1989) found that the opening premia on the JSE were not affected by systematic risk as measured by β. They also found that risk adjusted aftermarket excess returns to first day purchasers who held their position for a year thereafter, averaged 29%. They assumed that the share β values were stationary over the period of their study. Returns were positive for both cold and hot issue periods. Bhana (1989) showed that the risk adjusted long-term performance of IPOs was below average and he suggested that the market for new issues was based more on speculation and rumours than on investment fundamentals. Ibbotson (1975) showed that the systematic risk of new issues is greater than the market systematic risk and that this systematic risk reduces as the issues become seasoned.

3.7 Aftermarket Performance In Other Markets

3.7.1 United States Of America (USA)

A lot of research into the aftermarket performance of shares in the USA has been done. Ritter (1991) found that the matching firm-adjusted cumulative average returns, exclusive of initial returns, decline to –29.1% by the end of month 36. Loughran & Ritter (1995) report that IPOs in the USA underperformed by 7% per year in the first five years after issuing. In their comparison between companies that issued shares in IPOs and non-issuers, they state (p 23) that "…. based on the realized returns, an investor would have had to invest 44 percent more money in the issuers than in non-issuers of the same size in order to have the same wealth five years after the offering date."

Jain & Kane (1994) state that more than 50% of IPOs in their sample had a subsequent deterioration in aftermarket performance. Ibbotson's work (1975) indicated negative risk adjusted aftermarket performance in the USA. However, he believed that this was a correction to the initial underpricing of shares and that there was no departure from market efficiency in the aftermarket.

3.7.2 United Kingdom (U.K.)

In the 1980's the UK was the world's third largest capital market. Research by Levis (1993), in the UK for the period 1980 - 1988, showed a gradual and steady decline in performance for a period of up to 36 months. The level of IPO underperformance was both statistically and economically significant. The magnitude of underperformance was dependent on the benchmark used.

Levis also suggested that underperformance in the aftermarket continued beyond the 36 months. However, he argued that the average underperformance of new issues in the UK was not as excessive as in the U.S.A. Furthermore, unlike in the U.S.A., his findings did not indicate a systematic relationship between annual volume of IPOs and aftermarket performance. Levis also found that the size of the issue was an important determinant of long run performance. He observed a positive correlation between size of issue and level of aftermarket performance.

3.7.3 Latin America

Like Latin America, South Africa is perceived by international investors as an emerging capital market. It would therefore be reasonable to expect similar performance trends between the two markets.

Aggarwal, Leal & Hernandez (1993), studied the aftermarket performance of initial public offerings in Latin America between 1980 and 1990. They found that in Brazil, investors who purchased shares in the aftermarket at the closing price on the first trading day, and held them for one year, received mean and median excess returns of –9.0% and -51.1%, respectively. The mean excess returns became –34.9% and –47.0% for two and three year holding periods respectively. Similar trends were observed in the Mexican and

Chilean markets. However, these researchers warn that interpretation of the results should be done cautiously since the samples studied were small and the economies investigated were prone to high inflation. Other anomalies exist in the Latin American markets such as a small number of listed shares and low level of trading liquidity.

International evidence consistently shows that the long-run aftermarket returns are negative. However, these long run performance results must be interpreted carefully, because many markets are volatile and on some exchanges a few companies tend to dominate the value-weighted indices used as benchmarks.

4 PUBLISHED METHODS USED TO MEASURE LONG RUN PERFORMANCE

In several instances, published results showing long run positive excess returns have led to follow-up studies, which in turn revealed that the initial results were sensitive to the test methodology applied. Brav & Gompers (1997) re-examined post-IPO performance and concluded that underperformance is concentrated in a small number of firms and is sensitive to the weighting of the observations.

Kothari & Warner (1997) simulated long run performance of shares in the USA and warned that conclusions from existing long-horizon studies could be erroneous. They noted that many tests are "mis specified", and that both positive and negative abnormal performances following simulated events persist for a long time. Furthermore, their findings together with those of Barber & Lyon (1997) indicated that the direction and magnitude of bias in long run studies can be sensitive to sample characteristics such as book to market, size, exchange listing and time period. They showed that the bias towards over rejection is related to both sample selection and survival (e.g. requiring prior return data i.e. event survival). The bias can cause estimated post event abnormal returns to be systematically positive in random samples. These researchers also indicated that long-horizon buy and hold abnormal returns were significantly right skewed while cumulative abnormal returns were not.

4.1 Abnormal Returns Measurement

Two procedures are used to determine long run performance namely i) cumulated abnormal returns (CAR) and ii) buy and hold abnormal returns (BHAR). In the CAR procedure, the monthly excess returns are added together over a defined period. If R_{it} is the month t simple return on sample firm i, $E(R_{it})$ is the expected return in month t of the sample firm i, then the abnormal return in month t, AR_{it} would be given by

$$AR_{it} = R_{it} - E(R_{it}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.1)$$

The cumulative abnormal returns would then be given by

$$CAR_{i\tau} = \sum_{t=1}^{\tau} AR_{it} \quad \text{.....(4.2)}$$

The return on a buy-and-hold investment in the sample firm i less the return on a buy and hold investment in an asset / portfolio with an appropriate expected buy-and-hold return (ie the BHAR) is given by the following

$$BHAR_{i\tau} = \prod_{t=i}^{\tau}[1 + R_{it}] - \prod_{t=i}^{\tau}[1 + E(R_{it})] \quad \text{.....(4.3)}$$

The main differences between CARs and BHARs are due to the effect of compounding. CARs ignore compounding while BHARs include the effect of compounding. Barber & Lyon (1977) advocate the use of BHARs returns instead of CARs because CARs are a biased prediction of long run BHARs i.e. CARs are subject to measurement bias. Furthermore, they believe that BHARs measure the underlying parameter of interest. Loughran & Ritter (1995) indicate that the BHAR method provides a sharper distinction between portfolios when classifying firms.

These researchers conducted simulations and event studies that required shares to have a history of at least 24 months to be included in their samples. They then used the data from the 24 months to determine pertinent regression coefficients for the shares. They thus expected the population mean of CARs and BHARs to be positively biased due to listing bias. This is because newly listed firms become part of the market index against which the sample firm's performance is measured. The inclusion of these newly listed firms in the market index and their exclusion from the potential sample can cause the population mean CAR/BHAR to depart from zero. The population mean CAR/BHARs would be positive if newly listed firms underperformed market averages while it would be negative if newly listed firms outperformed market averages.

When BHARs are calculated using an equally weighted market index, the long-run return on the index is compounded assuming monthly re-balancing of all securities constituting the index. If the consecutive monthly returns for the individual securities are correlated, the monthly re-balancing leads to bias on the population mean. This is known as re-balancing bias. Re-balancing is done by selling the gains on high performing shares and replenishing the losses on those shares that underperformed.

Summary of weaknesses in the measurement procedures for excess returns.

	CAR	BHAR
Measurement bias	x	
New listing bias	x	x
Re-balancing bias		x

Table 4.1 showing the weaknesses in the excess returns measurement procedures

4.2 Return Benchmarks

4.2.1 Reference portfolios

Various references can be used to determine the long-run abnormal returns of firms. The literature review indicated that the popular reference portfolios were i) size (market capitalisation) based portfolios, ii) book-to-market portfolios and iii) size/book-to-market portfolios. The literature review also revealed that until recently (about 8 years ago), researchers did not control for both size and book-to-market patterns in studies that analyse long run abnormal returns. This was despite the fact that Financial Economists have long recognised the importance of controlling for both these factors.

Size based portfolios

Fama and French (1992) have shown that size based portfolios can assist in predicting share returns. When constructing these portfolios, the shares on the stock exchange are sized according to their market value of equity. Size deciles are then created based on the rankings, and the shares are placed into the deciles based on their market value of equity at a certain month (e.g. June) of each year. The monthly returns for each decile can be calculated by averaging the monthly returns across all securities in that particular size decile. The calculation of the size benchmark return is equivalent to a strategy of investing in an equally weighted size decile portfolio with monthly re-balancing.

Book to market portfolios

Fama & French (1992) showed that a powerful predictor of returns across securities is the

ratio of the book value of the firm's equity to the market value of equity. These researchers stratified firms into 10 groups according to book-to-market ratios. They then examined the average monthly rate of return of each of the 10 groups over a 27-year period. They found that the decile with the highest book-to-market ratio had an average monthly return of 1.65%, while the decile with the lowest ratio averaged only 0.72% per month. A strong correlation between the book-to-market ratio and monthly returns was observed for the other deciles. The dependence of returns on book-to-market ratio was independent of beta, suggesting that the book-to-market ratio was serving as a proxy for a risk factor that affects expected returns.

When constructing the book-to-market decile portfolios, the shares on the stock exchange are ranked according to their book-to-market ratios. Book-to-market deciles are then created based on the rankings, and shares on the exchange are then placed into the deciles based on their book-to-market ratios. The book to market portfolios can be reconstituted in a certain month of each year e.g. July of each year. The monthly returns for each decile can be calculated by averaging the monthly returns across all securities in that particular book-to-market decile.

Size/book-to-market portfolios

These portfolios can be formed in two stages. First, in June of year y, all shares on the stock exchange are ranked on the basis of their market value of equity and corresponding size deciles created. Then within each size decile, firms are sorted into quintiles on the basis of their book-to-market ratios in year y-1. The shares are then placed into appropriate size/book-to-market portfolios based on their size in June of year y and book-to-market ratio in year y-1. The monthly returns for each decile can be calculated by averaging the monthly returns across all securities in that particular size/book-to-market decile.

4.2.2 Control firms

Barber & Lyon (1997) proposed the use of control firms as an alternative to the use of reference portfolios in calculating abnormal returns. This is because reference portfolios

are subject to measurement and new listing biases when used to determine CARs while their use to determine BHARs is subject to new listing and re-balancing biases. New listing bias is only relevant if historic data is needed to accept a firm into the sample. In the control firm method, sample firms are matched to control firms on the basis of specified firm characteristics such as size, book-to-market ratio and size / book-to-market ratio.

The control firm approach is ideal because both the sample and control firms must be listed in the same month thus eliminating listing bias. The re-balancing bias is also removed if both the sample and control firm returns are calculated without re-balancing. Barber & Lyon (1997) reported that identifying control firms by first filtering on size (market value of equity) and then matching on book-to-market ratio could yield test statistics that were well specified.

4.2.3 Models

Four models commonly used to estimate security-specific abnormal returns are

- Market adjusted model abnormal return given by

$$AR_{it} = R_{it} - R_{mt} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.4)$$

Where AR_{it} is the abnormal return for share i in month t

R_{it} is the monthly return inclusive of dividends for share i in month t

R_{mt} is the monthly return on the equal weighted market index in month t

- Market model abnormal return given by

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.5)$$

Where AR_{it} is the abnormal return for share i in month t

R_{it} is the monthly return inclusive of dividends for share i in month t

R_{mt} is the monthly return on the equal weighted market index in month t

α_i and β_i are market model parameter estimates obtained by regressing monthly returns for share i on the equally weighted market index returns.

- CAPM model abnormal return given by

$$AR_{it} = R_{it} - R_{ft} - \beta_i[R_{mt} - R_{ft}] \ldots\ldots\ldots\ldots\ldots\ldots (4.6)$$

Where AR_{it} is the abnormal return for share i in month t

R_{it} is the monthly return inclusive of dividends for share i in month t

R_{mt} is the monthly return on the equal weighted market index in month t

β_i is the slope of a regression of $(R_{it} - R_{ft})$ on $(R_{mt} - R_{ft})$ for the estimation period with the regression line going through the origin

R_{ft} is the risk free rate

- Fama – French three-factor abnormal return model given by

$$AR_{it} = R_{it} - R_{ft} - \beta_{i1}[R_{mt} - R_{ft}] - \beta_{i2}HML_t - \beta_{i3}SMB_t \ldots\ldots\ldots\ldots (4.7)$$

Where AR_{it} is the abnormal return for share i in month t

R_{it} is the monthly return inclusive of dividends for share i in month t

R_{mt} is the monthly return on the equally weighted market index in month t

β_{i1}, β_{i2} and β_{i3} are estimated by regressing share i monthly returns against excess returns on the monthly market returns for the estimation period

R_{ft} is the risk free rate

HML_t is the high minus low book-to-market portfolio return in month t

SMB_t is the small minus big size portfolio return in month t.

Long horizon results are potentially very sensitive to the assumed model for generating expected returns. Fama & French (1993) report that failure to use the correct model would result in systematic biases and misspecifications. On the contrary, Kothari & Warner (1997) examined a variety of abnormal return models and found that the degree of misspecifications was not highly sensitive to the model employed. In tests for 36-month abnormal performance using test period standard deviation, the researchers found all four models to exhibit excessive rejection frequencies over the three years. The market model performed the worst, followed by the CAPM and market adjusted models.

Fama and French indicated that the three-factor model might explain the cross-section of

share returns, unlike the CAPM. An advantage of the three-factor model is that it does not require size or book-to-market data for sample firms. This means that firms without available data on the market value of equity or book-to-market ratio can be included in the analysis. Furthermore, shares of large firms (low book-to-market ratios) may closely follow the pattern observed for shares of small firms (high book-to-market ratios). The three-factor model allows for this possibility unlike the reference portfolios.

One main disadvantage of the three-factor model is that, given four parameters in the regression, it requires at least 5 observations of monthly returns post listing. The second disadvantage is that when long horizon returns (e.g. 5 years) are considered, the regression estimates are considered stable over the estimation period. Unlike the size/book-to-market portfolios, in which a firm's portfolio assignment is allowed to change once a year, the three-factor regression model assumes that a firm's market size and book-to-market characteristics are stable over time. Another disadvantage was summarized by Loughran & Ritter (1995, p44) as " to the degree that the portfolios are correlated with omitted factors, the coefficients can embody factors other than what is explicitly being controlled for."

A summary of the methods that can be used to calculate abnormal returns is shown in table 4.2.

Methods for calculating abnormal returns

	CARs $\sum_{t=1}^{T} [R_{it} - E(R_{it})]$	BHARs $\prod_{t=i}^{\tau}[1 + R_{it}] - \prod_{t=i}^{\tau}[1 + E(R_{it})]$
Reference portfolios	Size decile portfolios Book to market portfolios Size/book-to-market portfolios Equally weighted market index	Size decile portfolios Book to market portfolios Size/book-to-market portfolios Equally weighted market index
Control firm	Size matched Book-to-market matched Size/book-to-market matched	Size matched Book-to-market matched Size/book-to-market matched
Models	Market adjusted model Market model Capital asset pricing model Fama-French 3 factor model	Market adjusted model Market model Capital asset pricing model Fama-French 3 factor model

Table 4.2 showing a summary of the methods that can be used to calculate abnormal returns. (Modified from Barber & Lyon (1997)).

4.3 Test Statistics

In order to test the null hypothesis that the mean cumulative or buy-and-hold abnormal returns are equal to zero for a sample of n firms, one of the following parametric test statistics is employed.

$$t_{CAR} = \overline{CAR}_{i\tau} \; / \; (\sigma(CAR_{i\tau}) / \sqrt{n}) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.8)$$

or

$$t_{BHAR} = \overline{BHAR}_{i\tau} / (\sigma(BHAR_{i\tau}) / \sqrt{n}) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.9)$$

Where $\overline{CAR}_{i\tau}$ and $\overline{BHAR}_{i\tau}$ are the sample averages and $(\sigma(CAR_{i\tau})$ and $(\sigma(BHAR_{i\tau})$ are the cross sectional standard deviations of abnormal returns for the sample of n firms. If the sample is drawn randomly from a normal distribution, these test statistics should follow a Student's t distribution under the null hypothesis.

The null hypothesis is inappropriately rejected if the measured average abnormal performance is systematically non zero, or the standard deviation used to calculate the test statistic is too small, or both.

5 OBJECTIVES OF THE RESEARCH

Based on the review of published literature, the main objectives of this research were formulated. The main objectives of the research were-:

1 To determine whether shares that list on the JSE yield risk-adjusted aftermarket abnormal returns.

2 To determine whether significant differences exist between different holding period returns (1 year, 3 years, 5 years, 10years) on the JSE.

3 To determine whether IPO characteristics namely i) the IPO listing price, ii) the level of underpricing, iii) the amount of capital raised, iv) the volume of shares issued and v) the presence of "hot issue period" vs. "cold issue period" have an effect on the level of aftermarket performance.

4 To qualitatively compare the aftermarket performance of IPOs on the JSE with the aftermarket performance of IPOs in other markets.

6 RESEARCH HYPOTHESES

6.1 Effect Of Underpricing On Aftermarket Returns

In a strong form efficient market, the after market return should be independent of the level of underpricing on listing. The aftermarket excess return should be zero since shares would be fairly priced and the price would reflect all the available information on the share. Indeed, Ibbotson (1975) stated that underpricing of IPOs does not exist since the poor long-run performance of IPOs would compensate for the level of underpricing. In his research, he observed positive performance in the first year, negative performance in the following three years and positive performance in the fifth year after IPOs in the USA. This trend of performance could have implications for short term (less than 1 year), medium term (1-5 years) and long - term (greater than 5 years) investors who want to maximize their returns.

The following hypotheses were tested:

H1 The excess aftermarket return (i.e. buy and hold abnormal return) on IPO shares is zero.

In testing this hypothesis, aftermarket share performance was measured over 1, 3, 5 and 10 years. Three benchmarks were used to test this hypothesis. These were i) the CAPM model, ii) the book-to-market portfolios and iii) the size (market capitalisation) portfolios. The significance of the differences between the share performance levels for the various holding periods (1, 3, 5 and 10 years) were determined.

Shareholders expect returns on their investments commensurate with the risk associated with the investments. The CAPM model advocates this theory. However, Bhana (1989) showed that the risk adjusted long-term performance of IPOs on the JSE was below average. It was therefore important to determine whether observed performance trends were dependent on risk as measured by β. Applying a β of 1 for all the shares in the CAPM model used to test H1, and comparing the results with those observed when

calculated share β values are used would determine this.

H2 The aftermarket returns on IPO shares that yielded different initial premia are not significantly different.

This hypothesis was tested for 1, 3, 5 and 10 year buy and hold periods.

H3 The aftermarket returns on IPO shares with different listing prices are not significantly different.

6.2 Effect Of Hot And Cold Issue Periods On Aftermarket Performance

During a hot issue period, high initial premia as well as a large number of IPOs are observed while the converse is true for cold issue periods. Ritter (1995) showed that hot issue periods are associated with bull markets in which over-valuations of IPOs can be expected. If the listing price of an IPO was higher than the IPOs intrinsic value, then the aftermarket excess returns would be negative as an efficient market adjusts the share price to reflect its intrinsic value. Previous research on the JSE identified hot and cold periods between 1975 and 1995 (Lawson, 1996). The following hypothesis was tested.

H4 The aftermarket performance of shares (1, 3, 5 and 10 years) listed in a hot issue period is not significantly different from the aftermarket performance of shares listed in a cold issue period.

6.3 Effect Of Issue Size Statistics On The Aftermarket Performance.

The following hypotheses were tested.

H5 The aftermarket performance of IPO shares with different initial issue volumes is not significantly different.

H6 The aftermarket performance of IPO shares with different amounts of capital raised on listing is not significantly different.

7 RESEARCH METHODOLOGY

7.1 Data Source

A list containing 690 companies that listed on the JSE between 1980 and 1998 was used as the bulk sample of IPOs. The list contained information pertaining to the date of listing, listing prices, the number of shares issued on listing and the amount of capital raised. The list is presented in Appendix 1.

The weekly and monthly share prices as well as share dividends were obtained from I-NET Bridge. The weekly and monthly All Shares Index data used to calculate the appropriate market return was also obtained from I-NET Bridge. The Macgregors BFANet database was used to obtain book-to-market ratios of all shares listed on the JSE. This database did not however provide information on shares that had been de-listed from the JSE.

The JSE Records and Statistics Department provided market capitalization values of all shares (both de-listed and currently listed) on the JSE between 1993 and 1999.

The monthly data on the RSA long bond rate that was used as the risk free rate proxy was obtained from the South African Reserve Bank, Statistics Department.

7.2 Aftermarket Horizon

The price performance of the shares was measured over 1, 3, 5 and 10 year periods. Shares that were de-listed were analysed only for the applicable duration e.g. a company that de-listed 4 years after listing was analysed for a period of up to 3 years. The study was therefore prone to a degree of survivor bias.

The after market periods were defined as follows: -

1 day: close of offer to closing price on the first day of trading.

1 year: first trading day close to month end closing price, one year after listing.

3 years: first trading day close to month end closing price, three years after listing.

5 years: first trading day close to month end closing price, five years after listing.

10 years: first trading day close to month end closing price, ten years after listing.

7.3 Test Methodology Applied

7.3.1 Calculation of returns

Initial returns were calculated using equation 7.1

$$\frac{\text{First day closing price} - \text{Listing price}}{\text{Listing price}} \quad \text{.....(7.1)}$$

Initial returns were also referred to as "the level of share underpricing"

Monthly returns were calculated using equation 7.2.

$$\frac{\text{Month}_{i+1}\text{ closing price} - \text{Month}_{i}\text{ closing price}}{\text{Month}_{i}\text{ closing price}} \quad \text{.....(7.2)}$$

7.3.2.Abnormal return measurement

The research employed the use of the buy and hold abnormal return (BHAR) as opposed to the cumulative abnormal return (CAR). This enabled comparison with work done by previous researchers. Equation 4.3 used to determine BHAR is shown below.

$$BHAR_{i\tau} = \prod_{t=i}^{\tau}[1 + R_{it}] - \prod_{t=i}^{\tau}[1 + E(R_{it})] \quad \text{.....(4.3)}$$

Where R_{it} is the monthly return inclusive of dividends for share i in month t

$E(R_{it})$ is the expected monthly return for share i in month t

7.3.3 Model used to determine share BHAR

The share price behavior was modeled using the capital asset pricing model (CAPM). The abnormal/excess return was the difference between the actual share return and the CAPM generated return. The actual share returns were the returns determined using the share monthly closing prices. The CAPM model abnormal return was determined using equation 4.6 shown below.

$$AR_{it} = R_{it} - R_{ft} - \beta_i[R_{mt} - R_{ft}] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.6)$$

Where AR_{it} is the abnormal return for share i in month t

R_{it} is the monthly return inclusive of dividends for share i in month t

R_{mt} is the monthly return on the equal weighted market index (ALSI) in month t

β_i is the slope of a regression of $(R_{it} - R_{ft})$ on $(R_{mt} - R_{ft})$ for the estimation period with the regression line going through the origin

R_{ft} is the risk free rate in month t represented by the R150 government bond

It was important to determine whether observed performance trends were dependent on risk measured by β. Therefore, a β of 1 was applied to the CAPM model and the results obtained compared with those observed when calculated share β values were used. Applying a β of 1 ascribes an average risk to each investment and therefore adjusts for mean market returns.

7.3.4 Reference portfolios

The reference portfolios used to determine abnormal excess returns were

- Book-to-market portfolios and
- Market capitalisation (size) portfolios

These reference portfolios have been shown by other researchers to be effective in predicting risk adjusted expected returns.

Book-to-market portfolios

The book-to-market data obtained did not include shares that had de-listed from the JSE between 1980 and the date the data was downloaded from Macgregors BFANet database. This introduced some degree of survivor bias into the analysis performed using the book-to-market portfolios. In December of each year between 1980 and 1998, all the shares on the JSE whose book-to-market values were available, were ranked according to the book to market values and then assigned to one of three portfolios. Therefore book-to-market tercile portfolios were formed. Each year, the portfolios were chosen such that the number of shares apportioned to each portfolio would be roughly the same. Shares could be allocated to a new portfolio once a year. The book-to-market ratios assigned to each tercile portfolio are presented in Appendix 2.

Monthly share returns for all shares in each portfolio were determined and the average of the monthly returns was deemed to be the portfolio monthly return.

In December of each year, the book-to-market ratio of each share that listed on the JSE between 1980 and 1998 was matched with one of the book-to-market tercile portfolios. The matched portfolio's monthly returns for the subsequent 12 months were deemed to be the expected returns for the share. These expected returns were then used to calculate the expected buy and hold abnormal returns for the share.

Market capitalisation (size) portfolios

Only data for the period 1993 to 1999 was available for constructing the market capitalization portfolios. This information included both the de-listed and listed shares. In December of each year, between 1993 and 1998 (inclusive) all the shares listed on the JSE were arranged according to their market capitalization values. Each share was then assigned to one of five portfolios i.e. quintile portfolios were formed. Each year, the five portfolios were chosen such that the number of shares apportioned to each portfolio would be roughly the same. Shares could be allocated to new portfolios once a year. Monthly share returns for all the shares in each portfolio were determined and the average of the monthly returns was deemed to be the portfolio's monthly return. The

market capitalisation values assigned to each quintile portfolio are presented in Appendix 2.

In December of each year, the market capitalization value of each IPO that listed on the JSE between 1993 and 1998 was matched with one of the 5 portfolios. The matched portfolio's monthly returns for the subsequent 12 months were then taken as the expected returns for the share. These expected returns were then used to calculate the expected buy and hold abnormal returns for the share.

7.4 Regression Coefficients

7.4.1 CAPM βs

The share β values were calculated by regressing the difference between the share returns and the risk free rate vs. the difference between the returns on the market and the risk free rate (i.e. $(R_{it} - R_{ft})$ vs. $(R_{mt} - R_{ft})$). The All Share Index (ALSI) was used as the proxy for the market while the yield on the R150 government bond was used as the risk free rate. 52 consecutive weekly data points were used for IPO shares in the regression, in line with work done by other researchers such as Lawson (1996) and Bradfield & Hampton (1989). Ideally, 60 consecutive monthly data points should be used to determine the β values in line with much of the published literature. Therefore the use of 52 weekly data could have introduced some error in the calculation of βs. However, it was felt that for the purpose of this research, these estimated β values would suffice for newly listed shares. Negative β values and β values greater than 2 were treated as outliers. These were then changed to 0 and 2 respectively for the purpose of this research.

7.5 Data Analysis

Data downloaded from I-NET Bridge, Macgregor's BFA Net, and data supplied by the JSE Statistics Department was manipulated in the Excel spread sheet to yield required data presentation and formats. All the calculations pertaining to the CAPM model and the reference portfolios were done using the Excel spread sheet functions.

Statistical analysis was performed using the Number Crunching Statistical System (NCSS). Graphical data automatically presented by this package included line plots, box plots and histograms.

7.5.1 Paired t-tests

In determining abnormal /excess returns, the samples used to determine the actual returns were used to determine the expected returns. Since each value in one sample was matched with a corresponding data value in another sample, matched pairs were formed. Therefore the matched-pair t-tests were used to determine whether the level of abnormal returns was statistically significant. The matched-pair t test focuses on the differences in paired observations. It involves computing the mean and standard deviation of the differences.

7.5.2 Two-sample t-tests

The two-sample t-test was used when two samples were drawn from independent populations. This t-test procedure tests the difference between the means of two samples for its statistical significance. It is a parametric procedure that assumes that the sample is randomly selected from independent, normally distributed groups.

The two-sample t-test was used to test whether the aftermarket performance of shares listed in a hot issue period was significantly different from the aftermarket performance of shares listed in a cold issue period.

7.5.3 Analysis of variance (ANOVA) tests

ANOVA is a statistical procedure for determining whether the means of three or more populations are equal. ANOVA assumes that all the populations being studied have the same variance, regardless of whether their means are equal. This procedure tests the means for differences by comparing the variance among the sample means and the variance within the samples using the F statistic distribution. The hypothesis test in ANOVA is one-tailed. A large F statistic will lead to the rejection of the null hypothesis

that states that the means of the populations are equal. A small value will lead to a failure to reject the null hypothesis.

The ANOVA analysis was used to test whether the level of underpricing, the listing price, the volume of shares issued and the amount of capital raised affected the aftermarket performance of IPOs.

8 RESULTS AND DISCUSSION

8.1 Yearly Listings On The JSE Between 1980 And 1998

The number of listings per year on the JSE during the period investigated (1980 to 1998) are shown in figure 8.1.

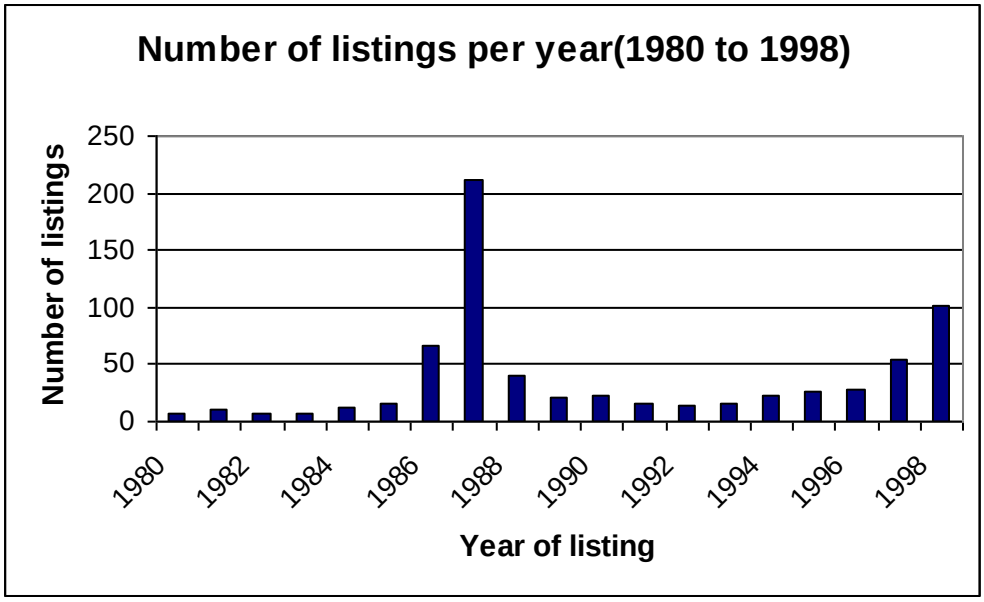


Figure 8.1 showing the number of listings per year on the JSE between 1980 and 1998.

8.2 Buy And Hold Abnormal Returns (BHAR)

Hypothesis H1 The excess aftermarket returns on IPO shares is zero.

The null hypothesis was H_o: $\mu_1 = \mu_2$

The alternative hypothesis was H_a: $\mu_1 \neq \mu_2$

Where μ_1 and μ_2, are mean aftermarket returns of IPO shares and selected benchmarks respectively.

Tables 8.1 and figure 8.2 show a summary of the BHAR calculations using three benchmarks, namely CAPM model with calculated β values (52 weeks data), book-to-market tercile portfolios and market capitalization quintile portfolios. The BHAR

calculations using the CAPM model with all β's=1 are also shown in the table for comparison with the CAPM model that employs calculated βs. Matched pair t-tests were used to determine whether the levels of abnormal returns were statistically significant. Detailed NCSS results of the analysis are presented in Appendix 2. Table 8.2 shows the expected buy and hold returns of the selected benchmarks.

		CAPM calculated βs	**CAPM all βs = 1**	**Book-to-Market Portfolios**	**Market Capitalisation Portfolios**
1 year	Level of outperformance	-3.30 %	0.50 %	-18.56%	-30.00%
	Sample size	541	541	154	53
	Critical t (α = 0.05)	1.96	1.96	1.96	1.96
	t statistic observed	-0.9933	0.151	-4.1594	-2.63
	Decision (5% conf. Level)	Accept H_o	Accept H_o	Reject H_o	Reject H_o
3 years	Level of outperformance	-21.47 %	-9.03 %	-21.09 %	-48.05%
	Sample size	376	376	100	15
	Critical t (α = 0.05)	1.96	1.96	1.96	1.96
	t statistic observed	-2.33	-0.9933	-1.274	-0.9110
	Decision (5% conf. Level)	Reject H_o	Accept H_o	Accept H_o	Accept H_o
5 years	Level of outperformance	-35.67%	-11.86%	-61.56%	N/A*
	Sample size	243	243	75	N/A*
	Critical t (α = 0.05)	1.96	1.96	1.96	N/A*
	t statistic observed	-2.1697	-0.7542	-2.0569	N/A*
	Decision (5% conf. Level)	Reject H_o	Accept H_o	Reject H_o	N/A*
10 years	Level of outperformance	-87.84%	-21.62%	-320.25%	N/A*
	Sample size	115	115	54	N/A*
	Critical t (α = 0.05)	1.96	1.96	1.96	N/A*
	t statistic observed	-2.3209	-0.5682	-4.119	N/A*
	Decision (5% conf. Level)	Reject H_o	Accept H_o	Reject H_o	N/A*

N/A * : Not applicable because calculations were not performed due to unavailability of data

Table 8.1 showing a summary of the BHAR using three benchmarks

	CAPM calculated βs	CAPM all βs = 1	Book to Market Portfolios	Market Capitalisation Portfolios
1 year BHR	8.47%	4.67%	17.20%	18.95%
3 year BHR	50.43%	38.00%	69.33%	108.46%
5 year BHR	100.49%	76.68%	178.75%	N/A*
10 year BHR	311.30%	245.88%	671.18%	N/A*

NA * : Not applicable because calculations were not performed due to unavailability of data

Table 8.2 showing the expected returns of benchmarks used to determine the BHARs.

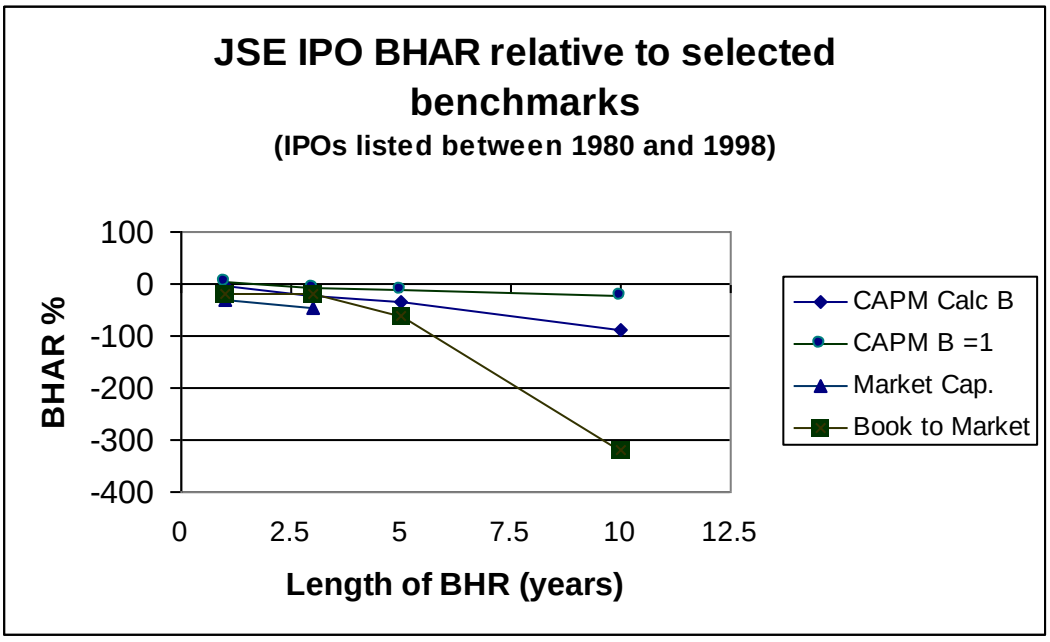


Figure 8.2 showing a summary of the BHAR using selected benchmarks.

The original list used in the research contained 690 IPOs that had listed on the JSE between 1980 and 1998. After removing companies whose weekly or monthly closing

prices were unavailable on either the I-Net Bridge database or the Macgregor's BFANet database, a total of 541 companies were left. These formed the bulk sample used to determine the BHAR of IPOs between 1980 and 1998.

What is evident from table 8.1 and figure 8.2 is that the IPOs studied consistently under-performed when compared to the benchmarks selected. The level of underperformance increased with time. The underperformance based on the CAPM model with all βs =1 follows a similar trend to that based on the CAPM model with calculated β. However, for all the time periods (1 year, 3 years, 5 years and 10 years), the level of under-performance was statistically insignificant when using the CAPM model with all βs =1. The level of under-performance when using the CAPM model (with the calculated βs) as a benchmark, was statistically insignificant for the 1 year buy and hold period only.

The samples used to determine BHAR using the book-to-market portfolios were smaller than those used in the CAPM model. This was due to the fact that the book-to-market data used excluded data for companies that had de-listed from the JSE prior to the time when the data was downloaded from Macgregors' BFA Net database (July 2000). The sample sizes used to determine BHAR using the market capitalisation benchmark were even smaller because the period considered was between 1993 and 1998, since data for this period only was available. Only the IPO shares that listed on the JSE between 1993 and 1998 could be analysed using the market capitalisation benchmark.

Only 1 year and 3 year BHAR values were calculated using the market capitalisation tercile portfolios. This was due to the fact that very few shares (less than 5) that listed on the JSE between 1993 and 1998 had been listed for 5 or more years.

8.2.1 Comparison of BHAR results with published information.

The BHAR results are comparable with those observed in other markets by various researchers. Loughran and Ritter (1995) reported that IPOS in the USA under–performed by 7% per year in the first five years after listing. Jain and Kane (1994) indicated that in their study of the USA market, more than 50% of IPOs in their sample had a subsequent

deterioration in aftermarket performance. Ibbotson (1975) also indicated negative risk adjusted aftermarket returns in the USA.

Levis (1993) showed a gradual and steady decline in IPO performance in the UK between 1980 and 1988. Although the underperformance was for a period of up to 36 months, he believed that the underperformance in the aftermarket continued beyond the 36 months.

Aggarwal, Leal and Hernandez (1993) found that in Brazil, the BHAR for the 1, 2 and 3-year periods were -9.0%, -34.9% and -47.0% respectively. It is clear that the level of under-performance observed for the South African market is similar to that observed in other international markets.

The fact that the aftermarket performance of IPO shares was in general lower than acceptable risk adjusted benchmarks could mean that on average, the cost of raising equity was not excessively high for the companies studied.

8.3 Effect Of Initial Premia On The IPO Aftermarket Performance.

Hypothesis H2 Aftermarket returns on the IPOs which yield different initial premia are not significantly different.

The null hypothesis was H_o: $\mu_1 = \mu_2 = \mu_3 = \mu_4$

The alternative hypothesis was H_a: $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$

Where μ_1, μ_2, μ_3, μ_4 are mean aftermarket returns of IPOs that yielded different initial premia.

Table 8.3 shows the results of the ANOVA analysis to determine whether aftermarket returns on IPOs that yielded different initial premia are significantly different. Detailed results are presented in Appendix 3.

	1 year			3 years			5 years			10 years		
Level of initial premia	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
-10% or less	43	8.35	13.43	27	-9.58	27.31	17	43.55	53.80	10	235.59	144.55
-9.9% to 0.0%	44	-8.48	12.88	30	58.87	25.91	20	73.41	49.60	11	110.23	137.83
0.1% to 10.0%	45	-5.03	12.74	32	19.03	25.08	19	32.52	50.89	8	23.41	161.61
10.1% to 25.0%	65	8.09	10.60	41	-8.83	22.16	25	34.10	44.37	11	547.34	137.83
25% or greater	144	6.77	7.12	82	-5.81	15.67	51	19.23	31.06	24	245.70	93.31
Critical F ratio	2.38			2.41			2.44			2.53		
Observed F ratio	0.46			1.44			0.22			1.91		
Probability level	0.7638			0.2211			0.9262			0.1201		
Decision (5% conf. Level)	Accept H_o			Accept H_o			Accept H_o			Accept H_o		

Table 8.3 showing results of the ANOVA analysis to determine whether the level of initial premia influences the aftermarket returns of IPOs.

The progressively diminishing sample sizes presented in table 8.3 for the various buy and hold return periods indicate that the analysis could have been subject to survivor bias. In order to reduce the effect of survivor bias on the results, it was decided to group the IPOs into two categories of initial premia namely “10% or less” and “greater than 10%”. The results of the t-test analysis to determine whether the BHR of the IPOs in the two groups were significantly different are presented in table 8.3a.

	1 year			3 years			5 years			10 years		
Level of initial premia	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
10 % or less	132	-1.82	71.7	88	12.40	138.3	56	50.47	229.5	29	129.51	270.0
Greater than 10%	202	7.18	92.7	123	-6.81	112.8	75	24.12	212.1	35	340.51	377.7
Critical t (α=0.05)	1.96			1.96			1.96			1.96		
Observed t stat.	0.9501			1.1094			0.6385			-1.8197		
Decision (5% conf. Level)	Accept H_o			Accept H_o			Accept H_o			Accept H_o		

Table 8.3a showing the results of the t-test analysis to determine whether the level of initial premia influences the aftermarket returns of IPOs.

It is clear from table 8.3 and table 8.3a that H_o could not be rejected. This indicated that the mean returns of samples grouped according to levels of initial premia were not significantly different. This indicated that the level of initial premia of the shares studied did not significantly influence the shares' aftermarket performance. These findings do not support the results quoted by Bradfield and Hampton (1989) that suggest that high opening premia are generally associated with a consistently superior aftermarket performance. They studied an aftermarket period of up to 1 year.

The efficient market hypothesis suggests that subsequent market price behavior should be independent of the initial premia after the offering. The findings could indicate that in the long term, the JSE is an efficient market. Macdonald & Fischer (1972) found slightly negative excess returns for an aftermarket period of one year. This was in spite of positive initial premia. Their study observed that a superior short-term performance of a new issue was of no value in predicting the long-term behavior of share prices.

8.4 Effect Of Listing Price On The IPO Aftermarket Performance

Hypothesis H3 Aftermarket returns on IPOs with different listing prices are not significantly different.

The null hypothesis was H_o: $\mu_1 = \mu_2 = \mu_3 = \mu_4$

The alternative hypothesis was H_a: $\mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$

Where μ_1, μ_2, μ_3 and μ_4 are the mean returns of IPO shares with different listing prices.

Table 8.4, graph 8.3 and graph 8.4 show the results of the ANOVA analysis to determine whether the returns of IPOs with different listing prices are significantly different. Detailed NCSS results are presented in Appendix 4.

Table 8.5 shows the level of underpricing of IPO shares grouped by listing price.

	1 year			**3 years**			**5 years**			**10 years**		
Listing price range (cents)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. Dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
0 to 99	126	-7.59	7.29	91	-15.0	15.65	53	-2.1	18.57	25	382.69	80.26
100 to 199	124	2.93	7.35	72	-21.2	17.60	44	3.52	20.38	24	84.33	81.92
200 to 499	91	26.60	8.57	58	83.73	19.61	38	43.32	21.93	18	167.99	94.60
500 or more	38	-8.77	13.26	25	16.03	29.86	16	-12.6	33.80	7	-25.55	151.59
Critical F ratio	2.64			2.65			2.66			2.74		
Observed F ratio	3.54			6.63			1.09			3.16		
Probability level	0.0149			0.0003			0.3538			0.0298		
Decision (5% conf. Level)	Reject H_o			Reject H_o			Accept H_o			Reject H_o		

Table 8.4 showing a summary of the ANOVA analysis to determine whether the aftermarket returns of IPOs with different listing prices are significantly different.

The progressively diminishing sample sizes presented in table 8.4 for the various buy and hold return periods indicate that the analysis could have been subject to survivor bias. In order to reduce the effect of survivor bias on the results, it was decided to group the IPOs into two categories of listing price ranges namely "199c or less" and "more than 199c". The results of the t-test analysis to determine whether the BHR of the IPOs in the two groups were significantly different are presented in table 8.4a

	1 year			**3 years**			**5 years**			**10 years**		
Listing price range (cents)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
199c or less	250	-3.68	76.74	163	-17.8	94.10	97	0.45	139.1	49	236.55	420.43
More than 199c	129	16.18	91.85	83	63.3	222.1	54	26.74	127.9	25	113.42	412.33
Critical t (α=0.05)	1.96			1.96			1.96			1.96		
Observed t stat.	-2.1060			-4.0137			-1.1460			-1.9998		
Decision (5% conf. Level)	Reject H_o			Reject H_o			Accept H_o			Reject H_o		

Table 8.4a showing the results of the t-test analysis to determine whether the listing price influences the aftermarket returns of IPOs.

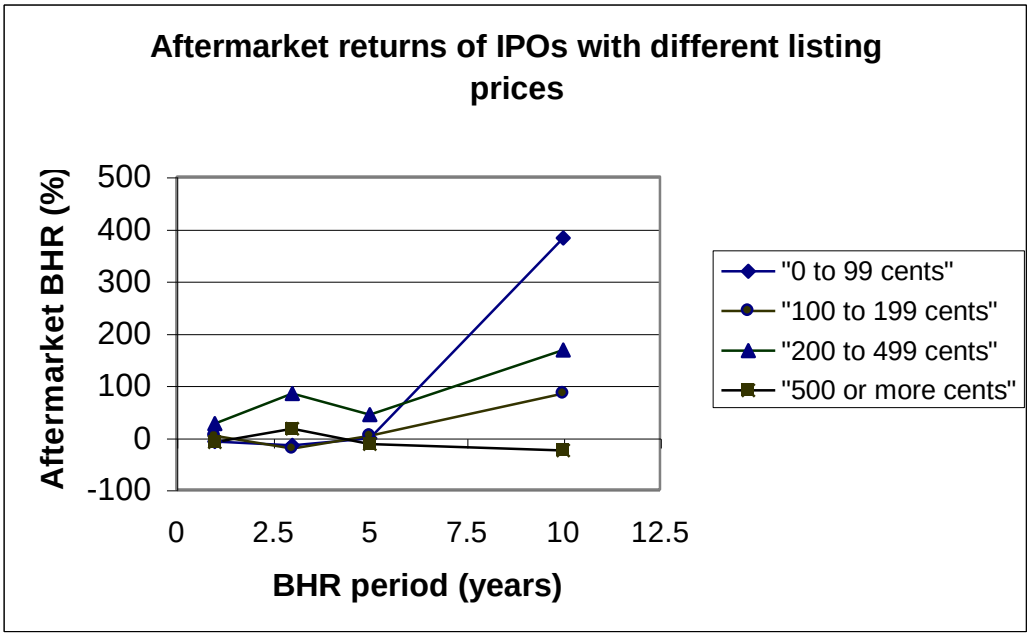
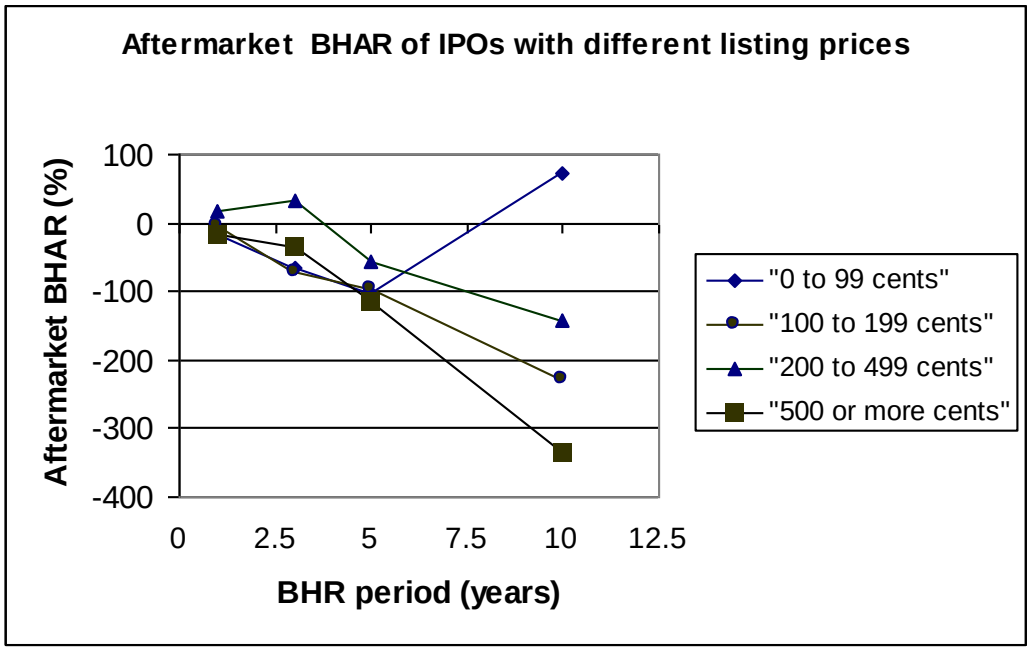


Figure 8.3 showing the aftermarket returns of IPOs with different listing prices.



Note: The CAPM expected returns were used to determine the BHAR

Figure 8.4 showing the aftermarket BHAR of IPOs with different listing prices.

Listing price	**0 to 99cents**	**100 to 199 cents**	**200 to 499 cents**	**500 cents or more**
Level of underpricing	63.04%	40.62%	20.04%	3.77%
Sample size	141	132	99	47
Std. Deviation	8.56%	8.84%	10.21%	14.82%
Critical F ratio	2.63			
Observed F ratio	5.68			
Probability	0.0008			
Decision at 5% conf. Level	Reject H_o			

The null hypothesis Ho stated that the level of underpricing (initial premia) yielded by IPO shares listed at different prices was not significantly different**.**

The alternative hypothesis Ha stated that the level of underpricing yielded by IPO shares listed at different prices was different.

Table 8.5 showing the level of underpricing (initial premia) of the IPO shares grouped by listing price

From table 8.4 and table 8.4a it is evident that the null hypothesis was rejected for 1, 3 and 10 year buy and hold periods. This showed that the mean returns of samples grouped according to listing price were significantly different for these buy and hold periods. This indicated that the aftermarket performance of IPOs was influenced by the listing price.

Figure 8.4 shows that the IPOs with a listing price between 200 and 499 cents initially outperformed the CAPM expected returns for the first three years. Thereafter, they under-performed this benchmark. However, of all the four price ranges investigated, they underperformed the CAPM expected returns the least over the first 5 years. Table 8.5 shows that the level of underpricing for these shares was moderate.

It is not clear why the shares whose listing price was within the "0 to 99 cents" range consistently underperformed for 5 years relative to the CAPM expected returns followed by an outperformance of more than 60 % after 10 years. The 60% outperformance after

10 years could have been due to survivor bias. Only shares yielding high returns within this price range could have survived for 10 years. One would have expected these potentially very risky shares to consistently outperform the other shares. This is because investors investing in very risky shares would expect above average returns.

Table 8.5 shows that the shares whose listing price was within the "0 to 99 cents" range enjoyed the highest initial premia. It could therefore be argued that the aftermarket underperformance of these shares was a correction to their high initial premium.

Figure 8.3 indicates that IPOs with a listing price of 500 cents or more yielded positive buy and hold returns after 3 years. In the subsequent years, the buy and hold returns were negative. Since these IPOs yielded the lowest level of underpricing (see table 8.5), they were perceived to be the least risky shares. However, in the long term, these shares exhibited the lowest returns. It seems that investors who invested in these shares paid premium prices for shares that yielded the lowest long-term returns.

8.5 Effect Of Hot And Cold Issue Periods On The Aftermarket Performance Of IPOs

Hypothesis H4 The aftermarket performance of shares listed in a hot issue period is not significantly different from the aftermarket performance of shares listed in a cold issue period.

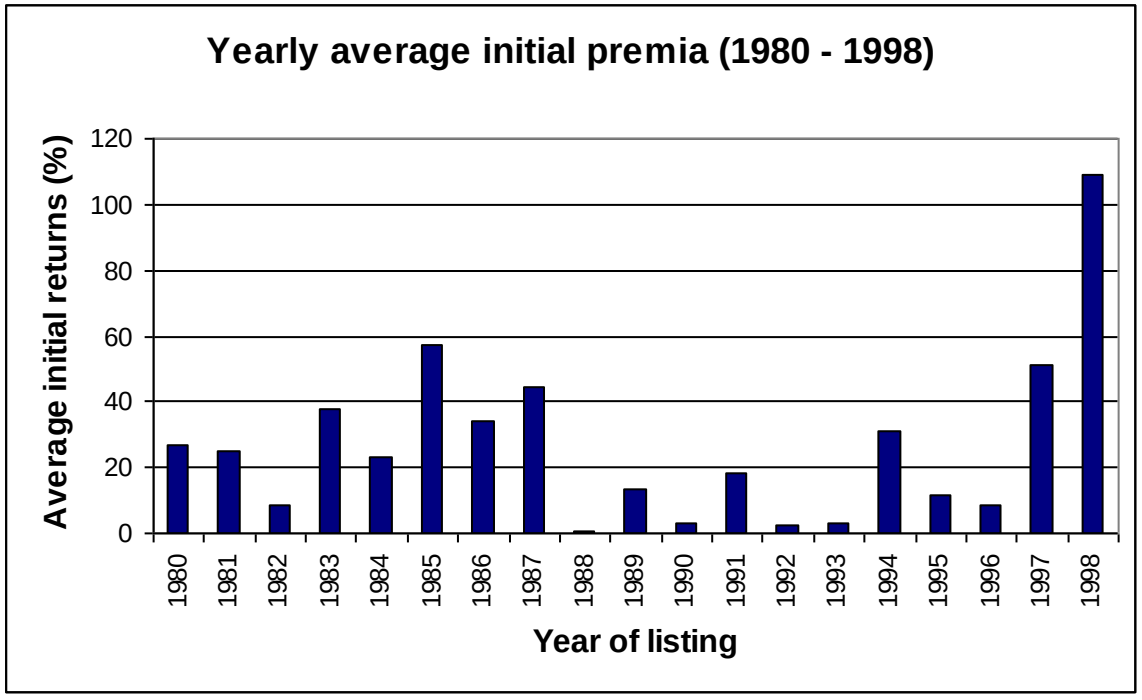
The null hypothesis was $H_o: \mu_h = \mu_c$

The alternative hypothesis was $H_a: \mu_h \neq \mu_c$

Where μ_h and μ_c are the mean return of IPOs listed in the hot and cold issue periods respectively

A hot issue period refers to a period during which the initial premia on new listings are high, while a cold issue period is a period during which the initial premia on new listings are low.

Figure 8.5 shows the yearly average initial premia for the period 1980 to 1998. The average yearly initial premia for the period 1980 to 1998 was 26.80% Hot issue periods were chosen to be calendar years whose average initial premia exceeded 26.80%. Cold issue periods were chosen to be calendar years whose initial returns were less than 26.80%. According to this definition, the hot issue period between 1980 and 1998 consisted of the calendar years 1983, 1985, 1986, 1987, 1994, 1997 and 1998. The cold issue period consisted of the remainder of the years.



Average for 1980 to 1998 :26.80%

Figure 8.5 showing the yearly average initial premia for the period 1980 to 1998.

Table 8.6 and figure 8.6 show the results of the two-sample t-test analysis to test whether the aftermarket performance of shares listed in a hot issue period was significantly different from the aftermarket performance of shares listed in a cold issue period. Detailed NCSS results are presented in Appendix 5.

	1 year			**3 years**			**5 years**			**10 years**		
	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
Hot issue period	353	-8.38	61.97	211	-13.0	87.55	148	-1.00	127.17	67	156.9	284.8
Cold issue period	183	18.59	67.65	156	31.70	128.54	95	100.85	201.68	38	201.8	327.5
Critical t ($\alpha = 0.05$)	1.96			1.96			1.96			1.96		
Observed t	-4.6728			-3.962			-4.8286			-0.7064		
Decision	Reject H_o			Reject H_o			Reject H_o			Accept H_o		

Table 8.6 showing the results of the two-sample t-test analysis to test whether the aftermarket performance of shares listed in a hot issue period was significantly different from the aftermarket performance of shares listed in a cold issue period.

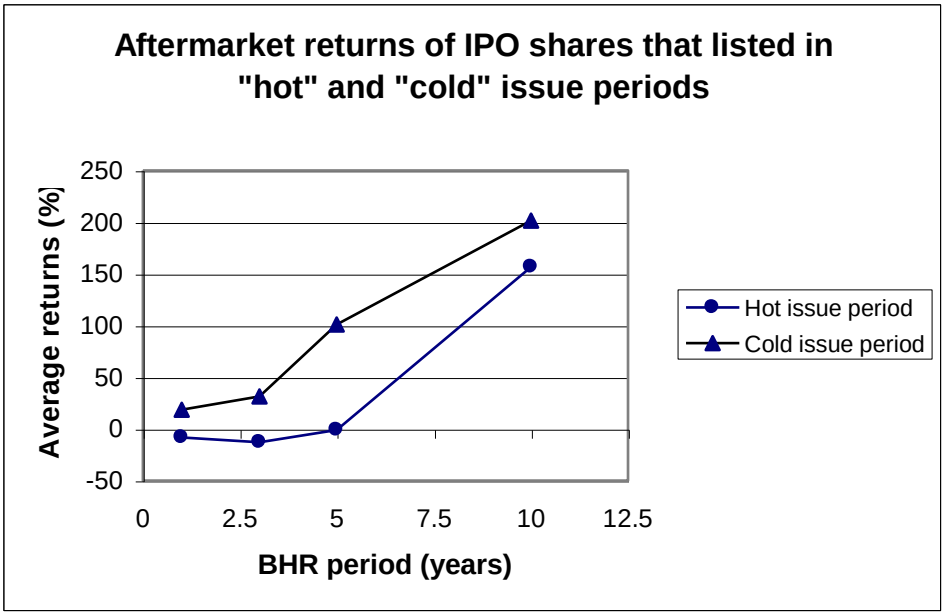


Figure 8.6 showing a graphical representation of the mean returns of IPO shares that listed during hot and cold issue periods.

A breakdown showing the percentage of shares according to listing price group that made up the hot and cold issue periods is presented in table 8.7. The ranking of the share performance according to figure 8.3 is also shown in table 8.7. The ranking of the shares was determined by visually inspecting figure 8.3 and table 8.4.

Listing price group	% of Hot issue period	% of Cold issue period	Rank of performance according to figure 8.3
200 to 499 cents	21.69 %	26.67%	1
100 to 199 cents	30.70%	30.00%	2
0 to 99 cents	38.94%	24.17%	3
500 cents or more	8.67%	19.16%	4
TOTAL	100.00%	100.00%	

Table 8.7 showing the percentage of shares according to listing price groups that made up the hot and cold issue periods on the JSE between 1980 and 1998.

Table 8.6 clearly indicates that the null hypothesis was rejected for 1, 3 and 5 year buy and hold returns. The hypothesis was accepted for the 10 year buy and hold returns probably due to the large standard deviation observed for the returns. The rejection of the null hypothesis indicated that the aftermarket performance of shares was significantly different depending on whether the shares were listed in a hot or cold period.

Table 8.7 indicates that the hot issue period consisted of a higher proportion of poorly performing shares (grouped according to listing price) compared to the cold issue period. The poorly performing shares were the ones with listing prices within the ranges "0 to 99 cents" and "500 cents or more". The shares that performed well had their listing prices within the other two price ranges. Table 8.7 also indicates that the hot issue period consisted of proportionally more risky IPO shares ("0 to 99 cents" group) compared to the cold issue period i.e. nearly 39% vs. 24%. Very risky shares typically enjoy high initial premia (see table 8.5). The presence of a large amount of these shares during the hot issue periods partly explains the high initial premia observed in hot issue periods.

On the other hand, the IPO shares that listed in the cold issue period had a higher proportion of shares that consistently yielded high returns in the aftermarket (the "200 to 499 cents" price range).

The IPO shares that listed in the hot issue period consistently underperformed compared to the shares that listed during the cold issue period. This result might appear to be in contradiction with Lawson's findings. Lawson (1996) studied the price performance of newly listed shares on the JSE. He found that for an aftermarket period of up to 1 year, the IPOs listed in the hot issue period significantly outperformed the IPOs listed in the cold issue period. Bradfield and Hampton (1989) also showed that the average excess returns for IPOs listed in the hot issue period on the JSE were significantly positive for each month over the subsequent year. They found the returns of IPOs issued during the cold issue period to exhibit a random pattern in the subsequent year of listing. However, the results of this research are for longer aftermarket periods.

Ibbotson, Sindelaar & Ritter (1994), Bhana (1989) and McDonald & Fisher (1972) argued that whilst significant high initial returns would be identified for hot issue periods, this would not be the case with the aftermarket returns. Ibbotson (1975) contended that negative aftermarket performance of IPOs with high initial premia was a correction to the high level of underpricing of these shares on listing. Since hot issue periods were made up of a large portion of highly underpriced risky shares, the long term aftermarket returns of the IPOs listed in hot issue periods would be expected to be low. The potentially risky shares that dominated the IPOs during the hot issue periods (see table 8.7) underperformed in the aftermarket. This could lead to a conclusion that the companies with risky shares do not necessarily face a higher cost of capital compared to other companies with less risky shares.

Bhana (1989) suggested that the market for new issues during hot issue periods was based more on speculation and rumours than on investment fundamentals. This could explain why many investors would invest in risky shares during hot issue periods. Although these shares offer above average initial premia, they subsequently underperform in the aftermarket.

8.6 Effect Of Volume Of Shares Issued On The Aftermarket Performance Of IPOs

Hypothesis H5 The aftermarket performance of IPOs with different initial issue volumes is not significantly different.

The null hypothesis was $H_o: \mu_1 = \mu_2 = \mu_3$

The alternative hypothesis was $H_a: \mu_1 \neq \mu_2 \neq \mu_3$

Where μ_1, μ_2, and μ_3 are mean returns of IPO shares with different volumes of shares issued on listing.

Table 8.8 shows the results of the ANOVA analysis to determine whether the aftermarket performance of IPOs with different initial issue volumes is significantly different. Detailed NCSS results are presented in Appendix 6.

	1 year			3 years			5 years			10 years		
Volume of shares issued (m)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
Less than 15.00	159	10.70	6.05	134	11.89	12.78	89	44.22	25.29	40	148.93	53.12
15.01 to 50.00	115	-7.85	7.11	101	3.60	14.73	68	61.08	28.94	30	269.27	61.34
More than 50	179	1.36	5.70	64	56.14	18.50	35	103.45	40.33	14	165.34	89.79
Critical F ratio	3.02			3.03			3.04			3.11		
Observed F ratio	2.00			2.71			0.77			1.16		
Probability level	0.1368			0.0679			0.4627			0.3175		
Decision (5% conf. Level)	Accept H_o			Accept H_o			Accept H_o			Accept H_o		

Table 8.8 showing a summary of the ANOVA analysis to determine whether the volume of shares issued on listing, affects the aftermarket performance of IPO shares.

It is clear from table 8.8 that the null hypothesis could not be rejected for all the holding periods (1, 3, 5 and 10 years). This indicates that the long-term aftermarket performance of IPO shares was not significantly dependent on the volume if shares issued on listing.

8.7 Effect Of Capital Raised On The Aftermarket Performance Of IPO Shares.

Hypothesis H6 The aftermarket performance of IPOs with different amounts of capital raised on listing, are not significantly different.

The null hypothesis was $H_o: \mu_1 = \mu_2 = \mu_3 = \mu_4$

The alternative hypothesis was $H_a: \mu_1 \neq \mu_2 \neq \mu_3 \neq \mu_4$

Where μ_1, μ_2, μ_3 and μ_4 are mean returns of IPO shares with different amounts of capital raised on listing.

Table 8.9, figure 8.7 and figure 8.8 show the results of the ANOVA analysis to determine whether the aftermarket performance of IPOs with different amounts of capital raised on listing is different. Detailed NCSS results are presented in Appendix 7.

	1 year			**3 years**			**5 years**			**10 years**		
Capital Raised (m)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)	Count	Mean BHR (%)	Std. dev. (%)
0 to 10	67	-17.1	8.72	61	-22.1	15.98	40	-3.9	31.77	15	111.5	69.91
10.01 to 25.00	81	-12.2	7.93	71	-20.3	14.81	45	-15.8	29.95	19	203.8	62.11
25.01 to 75.00	100	11.9	7.14	59	35.86	16.25	38	142.9	32.60	16	119.9	67.69
More than 75	164	0.5	5.58	72	30.78	14.71	43	63.9	30.64	19	102.3	62.11
Critical F ratio	2.63			2.65			2.66			2.75		
Observed F ratio	2.90			4.15			5.24			0.56		
Probability level	0.0348			0.0068			0.0018			0.6462		
Decision (5% conf. Level)	Reject H_o			Reject H_o			Reject H_o			Accept H_o		

Table 8.9 showing a summary of the ANOVA analysis to determine whether the amount of capital raised has on listing influences the aftermarket performance of IPO shares.

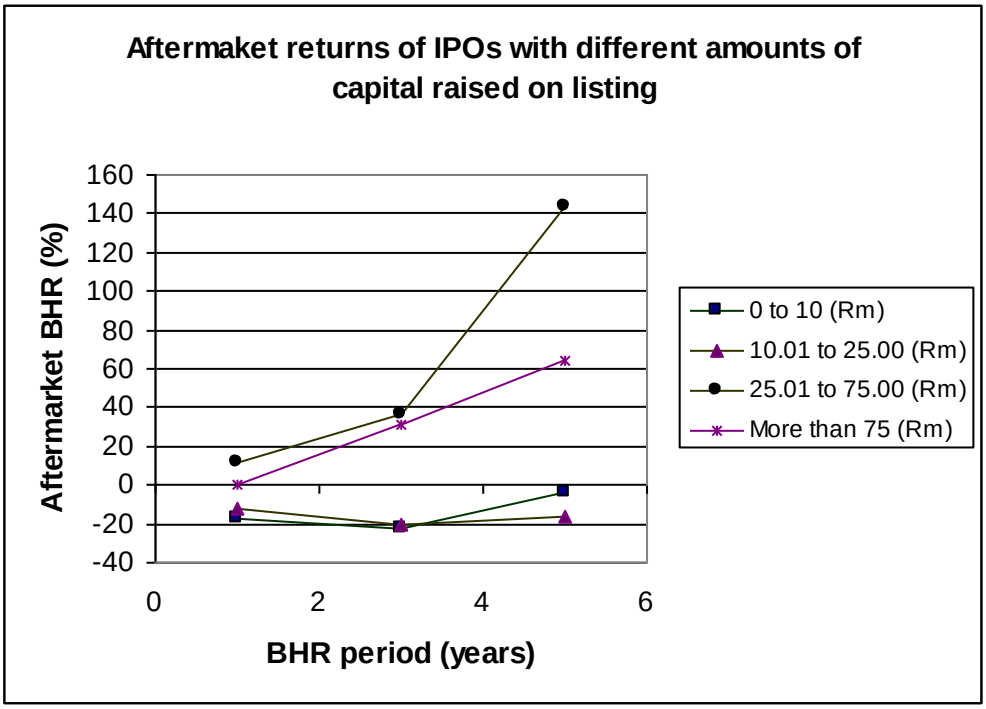
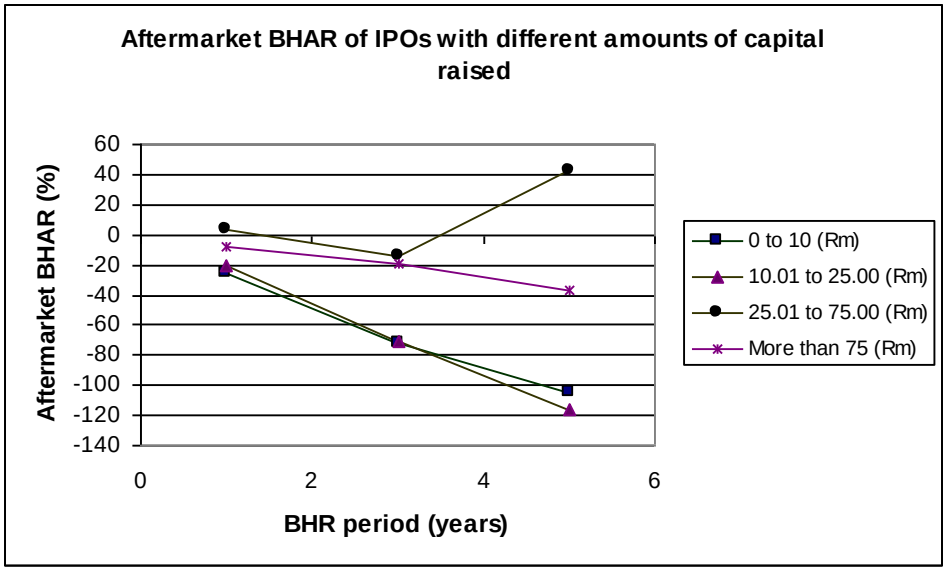


Figure 8.7 showing the aftermarket returns of IPO shares with different amounts of capital raised on listing.



Note: The CAPM expected returns were used to determine the BHAR

Figure 8.8 showing the excess returns of the IPO shares with different amounts of capital raised on listing.

Table 8.9 shows that for buy and hold periods of up to 5 years, the null hypothesis was rejected. This means that for these aftermarket periods, the mean returns of IPO shares with different amounts of capital raised on listing were significantly different. The null hypothesis for a buy and hold period of up to 10 years could not be rejected due to the high standard deviation of sample returns and small sample sizes.

Figure 8.7 and figure 8.8 were plotted using data for buy and hold periods of 1, 3 and 5 years. This is because for these periods, the null hypothesis was rejected. Figure 8.7 indicates that IPO shares that raised between R25.01 million and R75.00 million on listing, consistently outperformed IPOs that raised other amounts of capital on listing.

Figure 8.8 shows that in the first three years of the buy and hold period, the shares that raised between R25.01 million and R75.00 million on listing had the smallest negative excess returns when benchmarked against the CAPM expected returns. After 5 years, these IPO shares outperformed the CAPM expected returns by about 40%.

Generally, these results are in agreement with the observations made by Levis (1993) on the London Stock Exchange. He found that the amount of capital raised on listing was correlated with the level of aftermarket performance.

9 CONCLUDING REMARKS AND RECOMMENDATIONS

9.1 Buy And Hold Abnormal Returns

Three benchmarks were selected to measure the aftermarket buy and hold abnormal returns of IPOs on the JSE between 1980 and 1998. The benchmarks were i) The CAPM model expected returns, ii) book to market tercile portfolios and iii) market capitalization quintile portfolios. The results of the research indicated that the IPOs significantly under performed compared to the expected buy and hold returns of the three benchmarks selected. The under performance was found to increase with the buy and hold period. Therefore on average, the short, medium and long-term investors on the JSE over the period of study received negative risk adjusted excess returns. These findings were in line with observations made on other stock markets such as the London Stock Exchange, the New York Stock Exchange and the stock market in Brazil.

Since the aftermarket returns of the shares investigated were lower than the acceptable risk adjusted benchmarks, it could be implied that on average, the cost of raising equity for these companies was not excessively high.

9.2 Effect Of Initial Premia On The Aftermarket Performance Of IPOs

The findings of the research indicated that the size of the initial premia (i.e. the level of IPO shares' under pricing) did not significantly influence the shares' aftermarket performance. These results did not directly support the suggestions made by other researchers that high opening premia are generally associated with a consistently superior aftermarket performance. Other researchers in the USA however, found that in spite of high initial premia, many IPO shares had negative abnormal returns in the aftermarket.

The observations of this research support the notion that superior short-term performance of a new issue is of no value in predicting the long-term behaviour of share prices. It

could be argued that the long-term underperformance of shares with high initial premia is merely a correction of the initially high premia.

9.3 Effect Of Listing Prices On The Aftermarket Performance Of IPO Shares

The listing price was found to influence the aftermarket performance of IPO shares. Of all the price ranges investigated, IPOs with a listing price in the "200 to 499 cents" price range underperformed the CAPM expected returns the least. These shares yielded moderate initial premia. IPO shares within the "0 to 99 cents" price range and which are generally perceived to be risky shares, did not show high returns commensurate with the high risk associated with them. It could be concluded that the potentially risky shares did not face a higher cost of capital compared to other less risky IPO shares. However, these risky shares enjoyed the highest initial premia.

It appears as though investors who invested in shares with listing prices in the "500 cents or more" range paid premium prices for shares that yielded the lowest long-term returns.

It would be prudent for Issuers and Investment Bankers who desire to attract and retain long-term investors to issue appropriately priced (i.e. moderately underpriced) shares. Severely underpricing the shares (e.g. the "0 to 99 cents" range) or overpricing the shares (e.g. the "500 cents or more" range) could be disadvantageous to the investors because these shares had low aftermarket returns.

9.4 Effect Of Hot And Cold Issues Periods On The IPO Aftermarket Performance

The research showed that for 1, 3 and 5 year buy and hold periods, the IPOs that listed during a hot issue period yielded lower returns than IPOs that listed during a cold issue period. It is believed that one of the reasons that the hot issue period IPOs had lower returns is that they had a higher proportion (39% vs. 24%) of low priced risky shares. Although the risky shares had high initial premia, they consistently had low returns in the

long-term aftermarket. On the other hand, the moderately underpriced shares enjoyed high returns.

These findings supported the results of other researchers in the USA who found that significant initial returns during hot issue periods did not extend to the long-term aftermarket.

Some research work done on the JSE in the 1980's suggested that the market for new issues during hot issue periods was based on speculation and rumours and not on investment fundamentals. Therefore, during hot issue periods, investors should resist the temptation to invest in less known and risky IPOs, even though they might promise large initial premia. These shares could yield low / negative returns in the aftermarket.

9.5 Effect Of Volume Of Shares Issued On The Aftermarket Performance Of IPO Shares

It was found that the volume of shares issued on listing did not influence the aftermarket share performance. This was in agreement with the results of work done by other researchers who studied an aftermarket period of up to 1 year on the JSE.

9.6 Effect Of Amount Of Capital Raised On The Aftermarket Performance Of IPO Shares

For a buy and hold period of up to 5 years, it was found that the amount of capital raised on listing had a significant effect on the aftermarket performance of IPOs. IPOs that raised between R25.01 million and R75.00 million on listing consistently outperformed IPO shares that raised other amounts of capital on listing. Companies intending to list on the JSE, as well as raise money via successive share issues, could attract and retain long term investors if they raise the appropriate amount of capital on listing.

9.7 Recommendations For Further Research

9.7.1 Effect of survivor bias

Studies on the long-term performance of shares are subject to a degree of survivor bias. A study aimed at quantifying the effect of survivor bias on the research pertaining to the long-term performance of shares on the JSE would be beneficial to researchers.

9.7.2 Refining the book-to-market and market capitalization portfolios

The book-to-market portfolios constructed in this research excluded shares that had de-listed from the JSE prior to the date when the pertinent data was downloaded from the Macgregors BFANet database. As a result, the IPO shares that were analysed were the ones that were still listed when the data was downloaded.

The data available to construct the market capitalization portfolios was from 1993 to 1999. Therefore, only the shares that listed within this period could be analysed using this benchmark. The unavailability of the market capitalization data for the period between 1980 and 1992 at the time of conducting the research, introduced some degree of bias.

It could be of interest to future researchers to confirm the findings arrived at in this research, using the book-to-market and the market-capitalization portfolios. Book-to-market values of shares that de-listed from the JSE during the relevant period of study (e.g. 1980 to 1998), as well as market capitalization values for the entire period of study would be required.

9.7.3Application of a more robust benchmark to measure aftermarket abnormal returns

Three benchmarks were used to measure the aftermarket buy and hold abnormal returns of IPOs. The benchmarks were i) the CAPM model, ii) book-to-market portfolios and iii) market capitalization portfolios. Generally, the results indicated that IPOs consistently underperformed compared to the selected benchmarks. It would be beneficial to determine the most reliable of these benchmarks by comparing them with a more robust benchmark such as the Fama-French three-factor model. This model takes into account the book to market portfolios, the market capitalisation portfolios as well as the effect of systematic risk in determining the expected share returns.

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