Do IPOs underperform in the long run? Evidence from the Johannesburg Securities Exchange (JSE)

Brownhilder Ngek Neneh[#] and Van Aardt Smit*
[#,*] Department of Business Management, University of the Free State, Bloemfontein, South Africa. nenehbn@ufs.ac.za

Abstract

This article examines the three-, five- and ten-year long-run performance of initial public offerings (IPOs) on the Johannesburg Securities Exchange (JSE). The Buy and Hold Abnormal Return (BHAR) and the Cumulative Abnormal Return (CAR) methods were used to calculate the IPO long-run performance. Using a sample of 313 companies listed for the period 1996– 2007, this study established that IPOs on the (JSE) underperformed the market over three years (by 65.59% and 59.77% for BHAR and CAR respectively) and five years (by 64.37% and 7.77% for BHAR and CAR respectively). Also observed was that IPOs on the JSE outperform the market over a ten-year period when using the CAR (116.23%). Furthermore, the three-, five- and ten-year BHAR in the JSE were affected by the market period, which had no significant impact on the CAR. These findings basically stress the effect the different benchmarks and methodologies have when calculating the long-run performance of IPOs. Although IPOs underperform the market over a five-year period from the first trading day, the yearly performance of most of these companies from their fourth trading year is positive. As such, investors are advised to stay out of the stock market within the first three years, but in the fourth year they are encouraged to invest and buy mainly portfolios comprising companies that have been trading for at least four years.

Keywords: IPO, long-run performance, JSE

1 Introduction

Existing research (Loughran & Ritter, 1995; Ritter & Welch, 2002; Álvarez & González, 2005; Loughran, Ritter & Rydqvist, 2010) suggests that investing in initial public offerings (IPOs) is a poor strategy, since IPOs mostly underperform a market index. This is because the long-run underperformance of IPO shares tends to hurt investors, given that they do not get an opportunity to earn superior long-run returns from their investments. Liu (2009) defines the long run underperformance of IPOs as the negative average return over a long period after the issue. Yuhong (2010) asserts that long-run underperformance means that 'relative to other companies, investors appear to lose out by continuing to hold the shares of a company that have recently gone public'. Various studies (Drobetz, Kammerman & Wälchli, 2005; Gounopoulos, Nounis & Stylianides, 2008; Govindaamy, 2010; Santos, 2011) have provided evidence that IPO companies tend to underperform in a three- to five-year period, subsequent to an IPO.

There has been extensive evidence of long-run underperformance in IPO markets worldwide, ranging in magnitude across different markets (Karlsson & Sköld, 2006; Govindasamy, 2010). For example, Goergen, Khurshed and Mudambi (2007), who studied the performance of 252 IPOs listed on the London Stock Exchange from 1991–1995, observed that over the first 36 months, the average returns were -21.3 per cent. In studying the Taiwan stock market, Wen and Cao (2013) ascertained that when using the BHAR, IPOs underperform the market over a one-, three- and five-year period by -6.2, -34 and (a severe) 55 per cent, respectively. Jaskiewicz, González, Menéndez and Schiereck (2005), using a sample of 153 companies over the period 1990–2001, showed a BHAR of -32.8 per cent over three years. Cai, Liu and Mase (2008), using a sample of 335 companies, found a BHAR of -29.6 per cent over a three-year period. Assessing the five-year performance of listed IPOs in the United States (US), Gomper and Lerner (2003) established that when using the CAPM and Fama and French three factor model, both showed results which were insignificantly different from zero, or were even significantly positive in the long run. Drobetz, Kammerman and Wälchli (2005) examined the long-run performance of 109 Swiss IPOs from 1983 to 2000 and found that after three years, the underperformance was only about 7.5 per cent, using a broad market index as the benchmark – this increased to 21 per cent after four years and to 101 per cent after ten. Conversely, a study of Malaysian IPOs revealed that they outperformed the market during the period 1992–1996, with a substantial positive CAR of 41.7 per cent over three years (Corhay, Teo & Rad, 2002). Nevertheless, prior studies by Fama (1998), Saleh and Mashal (2008) and Espenlaub *et al*. (2000) contend that the underperformance of IPOs is sensitive to the methodology used to estimate abnormal performance. Likewise, studies by Ritter (1991) and Thomadakis, Nounis and Gounopoulos (2012) have shown that the market period in which the IPO is issued has a significant influence on its long-run performance.

In South Africa, several studies have been conducted on the JSE in order to document what happens with IPOs in the short and long run. For example, Govindasamy (2010) looked at the long-run performance of IPOs between 1995 and 2006, over a three year period. Using the BHAR and CAR methods, he showed that the IPOs underperformed the market by 50 per cent and 47 per cent for BHAR and CAR respectively, and that there were significant differences across sectors. Mangozhe (2010), who examined the long run investment performance of IPOs during from 1992 to 2007, found no evidence of abnormal performance. However, he noted that IPO performance depended on market conditions, since IPOs performed well in periods of market buoyancy (bull market) and suffered in periods of market distress (bear market). Also, a study by M'kombe and Ward (2002) on the aftermarket price performance of IPOs on the JSE during the period 1980 to 1998, established that IPOs on the JSE underperformed the market by 21.47, 35.67 and 87.84 per cent, over a three-, five and ten-year period respectively, when using the CAPM model. While these studies provide significant information on the long-run performance of IPOs on the JSE over various periods, it is important to note that further studies documenting this market trend still need to be completed. Given that

no recently published study on the JSE examined the long-run performance of IPOs over a three-, five- and ten-year period, using the sample frame of 1996 to 2007 and BHAR and CAR as benchmarks, this is exactly what the present study, on which this article is based, set out to achieve. The deliberate choice of a 1996 start date is significant – this is the year when the JSE All Share Index (ALSI) was introduced. The study uses the ALSI as a broad benchmark to assess the abnormal returns from these listings, to justify the study.

It is against this backdrop that the article aims to examine the aftermarket performance of IPOs listed on the JSE during 1996 to 2007, extending to the three, five and ten years following the IPO date. The authors aim to determine whether IPOs on the JSE outperformed or underperformed when using the BHAR and CAR methods. In particular, the article aims to provide a deeper understanding of newly issuing companies, as regards IPOs. Similarly, it will help listed companies understand their performances after the IPO, and guide them in making informed decisions when planning for seasoned equity offerings. The hope is that this study will help investors become more analytical and cautious in placing their investments.

2 Literature review

2.1 Theoretical explanation and prior evidence on long-run performance

Many theories have been advanced in an attempt to explain the issue of long-run underperformance. For example, a study by Karlsson and Sköld (2006) found that theories or hypotheses such as the impresario/fads, the window of opportunity, the earnings management, the overestimate and the signalling hypothesis can be used to explain long-run underperformance.

According to Ritter (1991) there are periods in which investors tend to be overoptimistic about the earnings potential of companies – periods he terms 'fads'. Rhee (2002) defines a fad as a temporary overvaluation caused by over-optimism on the part of investors. Since investors tend to be irrationally over-optimistic when trading starts, companies are usually able to distinguish periods when investors are optimistic and chose to go public when the market gives them a more favourable valuation, i.e., they capture a window of opportunity. According to Lijun (2006), the behavioural finance explanation suggests that share prices are subject to fads, and that managers and investment banks time the market in order to issue shares when it is overpriced and when investors are unable to discern that they are being taken advantage of by managers. Further evidence is provided by Rajan and Servaes (1994), who studied the market conditions on IPOs and indicated that more companies go public when other companies in the same industry are trading at high multiples (price-earnings or market-to-book reflecting optimistic assessments of the net present value of growth opportunities) with the intention of receiving high compensation.

Lijun (2006) stresses that the overestimate hypothesis sees companies predicting their future earning based on information available in the prospectus. Because share price predictions are based on the company's anticipated future activities, analysts' predictions are invaluable for investors. Predicting information included in the prospectus also helps to reduce information asymmetry in the IPO market. Lijun also suggests that since profits are projected, analysts' predictions are sometimes optimistic, while company managers are either too confident in their own companies or are happy to accept optimistic predictions in order to attract more investors. Rajan and Servaes (1997) concur, providing empirical evidence that new shares with high initial returns usually gain more attention from market analysts. Consequently, analysts more often than not tend to overestimate companies' prospects and profitability. Besides, when these optimisms spread across the whole security market, the listing of new equities is likely to increase.

With regard to the earning management hypothesis, Lijun (2006) maintains that investors usually build their expectations of future earnings levels and risks on the company's past performance. Due to limited information about the issuing company prior to it going public, investors often judge the company's real value based on information contained in the prospectus or roadshows, where verbal earnings projections are made. Cormier and Martinez (2005) state that in order to reduce the problem of information asymmetry, managers usually send credible signals about the earning prospects of their companies to the public. The main source of information comes from the financial statements presented in the prospectus. Jog and McConoomy (2003) examined the role played by the voluntary inclusion of earning forecasts in the valuation of IPOs, and established that such disclosures are not only relevant, they also have a noticeable impact on the degree of information asymmetry. However, as information is gradually revealed by the media and subsequent financial reports, investors notice that the earnings are not maintaining momentum and thus lose their optimism. Chaney and Lewis (1998) demonstrate that most companies managing earnings at the time of offering are more concerned about the short-run benefits, and thus they perform worse after the IPO. Alternatively, findings by Kamel (2012) show that pre-offering accruals do not explain the post-offering underperformance in earnings, but predict a portion of the subsequent poor performance of the shares.

Furthermore, Ljungqvist *et al*. (2006) propose a theoretical model to explain the IPO anomalies markets conditions and long-run underperformance. Yung, Colak and Wang (2006) observe that the distributions of IPO returns in hot and cold periods are substantially different: long-run abnormal returns increase substantially during hot IPO markets, with most hot IPOs tending to delist within the first few years after listing. Cook *et al*. (2003) established that the performance of IPOs during hot markets was worse than during cold markets. Shikha and Balwinder (2008), in their study on the Indian stock market, found that market conditions had a significant and positive relationship with the returns for the first three years, two years and one year. Also, Thomadakis *et al.* (2012), on the Athens stock market, showed that IPO long-run performance over three years was significantly affected by the market period.

3 Methodology

3.1 Sample and data collection methods

The population of the study comprised a sample of 313 IPOs listed on the JSE during 1996–2007. The information was sourced from the McGregor-BFA database, where data regarding the offering price, closing day prices, monthly data and number of shares, along with a prospectus of IPO companies, were hosted. The JSE ALSI was used as the broad benchmark to assess the abnormal returns from these listings. In calculating the long-run performance in this study where companies were de-listed within their first three, five and ten years, the listings were not included in the sample. This reduced the initial sample size from 313 to 269 for three years after market performance, and 220 for the five years after market performance for 1996–2007. For the ten years' sample, the period 1996–2002 was chosen to ensure that data for their ten years after market performance were available, as opposed to the three years and five years samples. This resulted in the initial sample size reducing from 313 to 81 for the ten years after market performance.

3.1.2 Measurement techniques: Long-run performance

We calculated IPO long-run performance using the CAR and BHAR over 120 months after the IPO. Firms delisted within the 36-month, 60-month and 120-month test period were not included in the sample. For the cumulative abnormal returns, the return on a security or index is defined as:

$$R_{i,t} = \left(\frac{P_{i,t}}{P_{i,t-1}}\right) - 1 \quad (1)$$

Where is the return for firm i in period t; $P_{i,t}$ is the price of the security at the end of the current period and $P_{i,t-1}$ is the price of the security at the end of the previous period (Suherman & Buchdadi, 2010).

The benchmark-adjusted return for stock i in event month t is defined as:

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad (2)$$

Where $R_{i,t}$ is the return for firm i in period t and $R_{m,t}$ is the return on a benchmark (JSE ALSI) for the same period.

The average adjusted return for a portfolio of n stocks in period t is the mean of the benchmark-adjusted returns, which is given as:

$$AR_t = \frac{1}{N}\sum_{i=1}^{n} AR_{i,t} \quad (3)$$

The cumulative adjusted return during the 36-month after market period is therefore the sum of the average adjusted returns for each period

$$CAR_t = \sum_{s=1}^{t} AR_s \quad (4)$$

As an alternative to using CAR, we used buy-and-hold (BHAR) to compute three-year holding period returns. BHAR is the return on a buy-and-hold investment in the sample firm, less the return on a buy-and-hold investment in the market index (JSE ALSI). For each firm i stock, the long-term returns in the after market are calculated from the first trading month to the month where the stock celebrates its third anniversary.

The holding period return (BHR) for a firm i stock is calculated for the period T as

$$BHR_{i,T} = \left[\left(1 + R_{i,1}\right)\left(1 + iR_{i,2}\right) \ldots\ldots\ldots\ldots (1 + R_{i,t})\right] - 1 \quad (5)$$

This formula can be rewritten as:

$$BHR_{i,T} = \left[\prod_{t=1}^{T}(1 + R_{i,t})\right] - 1 \quad (6)$$

Where $R_{i,t}$ is the raw return of firm i stock at time t and T is the time period for which the BHR is calculated.

This is given by the following expression:

$$\text{BHAR}_{i,t} = \frac{1}{N}\sum_{i=1}^{N}\left[\left(\prod_{t=1}^{T}(1 + R_{i,t})\right) - \left(\prod_{t=1}^{T}(1 + R_{m,t})\right)\right] \quad (7)$$

Where $\text{BHAR}_{i,t}$ is the buy-and-hold return of firm *i* in event month *t*. While $R_{i,t}$ is the return for firm *i* in period *t* and $R_{m,t}$ is the return on a benchmark (JSE ALSI) for the same period.

4 Results and discussion

The results on the three-, five- and ten-year performance are presented below.

Table 1: Long-run performance for period of three years (sample of 269) on the JSE (1996–2007)

Period	BHAR			CAR		
	Average returns	Median returns	T-stats	Average returns	Median returns	T-stats
One year	-5.41%	-30.19%	-0.76227	-8.77%	-29.93%	-1.4492
Two years	-33.20%	-79.45%	-3.34163***	-45.29%	-70.92%	-6.08384***
Three years	-65.59%	-94.59%	-8.11958***	-59.77%	-98.82%	-7.27264***

***Significant at 1%; **Significant at 5%; *Significant at 10%

Table 1 shows the three-year long-run performance using the closing market price at the first trading day. It is evident that for both the BHAR and CAR, IPOs on the

JSE underperformed the market over a three-year period (by -65.59% and -59.77% for BHAR and CAR respectively). These findings are consistent with studies on the JSE and other stock markets across the world. Govindasamy (2010) established that IPOs on the JSE underperformed the market by 50 and 47 per cent for BHAR and CAR respectively, over a three-year period. Also, studies by M'kombe and Ward (2002) found that IPOs on the JSE underperformed the market by 21.47 per cent over a three-year period, when using the CAPM model as benchmark. Furthermore, Wen and Cao (2013), in their study on the Taiwan stock market, observed that IPOs underperformed the market over three years by 34 per cent, when using the BHAR. The negative returns starting from year one show that the effects of the huge initial underpricing have diminished and all indications are that the market overacted to the market price. This result suggests that investors who did not get the chance to buy their shares at the offer price (mostly individual investors) do not benefit from the abnormal returns, and thus incur substantial losses starting from the first year (using BHAR and CAR).

Table 2: IPO long-run performance for a period of five years (sample of 220) on the JSE (1996-2007)

Period	BHAR				CAR			
	Mean returns	Yearly performance	Median returns	T-stats	Mean returns	Yearly performance	Median returns	T-stats
One year	-3.77%	-3.77%	-23.02%	-0.53207	-4.59%	-4.59%	-22.72%	-0.77337
Two years	-32.19%	-32.03%	-66.94%	-3.66024***	-35.65%	-31.06%	-58.38%	-4.8015***
Three years	-56.33%	-16.34%	-84.42%	-6.22473***	-46.75%	-11.11%	-85.60%	-5.51643***
Four years	-64.02%	2.90%	-103.98%	-5.43032***	-28.80%	17.96%	-100.51%	-1.55923
Five years	-64.37%	5.71%	-120.09%	-4.02447***	-7.77%	21.02%	-111.05%	-0.38115

NB: *The returns are based on what happens from the first trading day to the end of each year. To further understand the performance of the IPOs over the years, their annual performance was also recorded. Within year four and five, the IPO performance tends to become positive (2.90% and 5.71% for the BHAR and 17.96% and 21.02% for the CAR).*

***Significant at 1%; **Significant at 5%; *Significant at 10%

The results in Table 2 indicate that IPOs on the JSE underperformed the market in a five-year period by 64.37 and 7.77 per cent, when using the BHAR and CAR respectively. When using the CAR, there was a drastic increase in the level of

underperformance in years two and three. However, the level of underperformance in years four and five drastically reduced to 17.96 and 21.02 per cent respectively. The positive returns for CAR identified in years four and five provide an incentive for investors to come in during the fourth year and possibly sell by the end of the fifth. These results are not statistically significant in years four and five, and as such, the trends should be interpreted with great caution. When using the BHAR, the level of underperformance drastically increases from years two and three (-32.19% and -56.33% respectively), but remains relatively stable in years four and year five (-64.02% and -64.37% respectively). The stability in IPO performance for years four and five can be explained by the positive trends established in those years. The BHAR however yielded only slightly positive returns within years four and five, giving investors little incentive to come in at the beginning of the fourth year and leave by the end of the fifth year.

The long-run underperformance of IPOs on the JSE in a five-year period is consistent with studies by M'kombe and Ward (2002), who observed that IPOs on the JSE underperformed the market in a five-year period by 35.67 per cent, when using the CAPM model as benchmark. However, the differences in the five-year results can be explained by the differences in the benchmarks used. Also, a study by Kooli and Suret (2004) established that IPOs in Canada underperformed the market by 20.65 per cent in a five-year period, when using CAR. Similarly, when the calendar-time analysis was used, the results showed that IPOs significantly underperformed the market. But when the event-time BHAR analysis was used, the result was no longer statistically significant. Gomper and Lerner (2003), who examined the five-year performance of listed IPOs in the US, showed that IPOs underperformed the market when using the BHAR by 33.4 and 31.7 per cent (for equal weighted and value weighted respectively) when using Size and Book-to-Market as benchmarks. Furthermore, Wen and Cao (2013) observed that when using the BHAR, IPOs underperformed the Taiwan stock market over a five-year period by 55 per cent.

Moreover, the results further indicate that the level of underperformance over a five-year period was worse when using the BHAR than when using the CAR, possibly due to the effect of monthly compounding. BHAR includes the compounding effect, while CARs ignores it (Barber & Lyon, 1997). The findings, however, contradict Barber and Lyon (1997), who established a significant positive five-year BHAR and a 60-month CAR when using the equally weighted market index. However, the researchers noted that the positive five-year BHAR resulted from the effect of new listing bias which dominated the rebalancing bias. As such, it can be assumed for the results in Table 2 that the rebalancing bias more than offset the new listing bias, thereby leading to a mean negative BHAR (see Barber & Lyon, 1997). Although both the BHAR and the CAR in this study were negative for the five-year period, only the five-year BHAR was significantly different from zero. As such, it is advisable for investors on the JSE to consider the BHAR when calculating their long-run performance, as CARs are biased predictors of BHARs (Barber & Lyon, 1997).

Table 3: IPO long-run performance for a period of ten years on a sample of 81 companies on the JSE (1996–2002)

Period	BHAR			CAR		
	Returns	Yearly performance	T-stats	Returns	Yearly performance	T-stats
One year	-5.33%	-5.33%	-0.34005	-7.63%	-7.63%	-0.71529
Two years	-31.43%	-28.68%	-1.71418*	-34.25%	-26.62%	-2.63324**
Three years	-50.66%	-16.44%	-2.43638**	-49.36%	-15.11%	-1.95701*
Four years	-44.02%	18.08%	-1.50714	-35.20%	14.16%	-0.92596
Five years	-26.41%	27.53%	-0.64298	4.25%	39.44%	0.80709
Six years	-35.53%	32.88%	-0.81736	59.32%	55.07%	2.23209**
Seven years	-85.51%	34.70%	-2.38450**	86.51%	27.20%	2.78654***
Eight years	-76.99%	15.63%	-1.11062	100.86%	14.35%	3.13945***
Nine years	-65.16%	29.22%	-0.59231	120.64%	19.78%	3.44515***
Ten years	-25.43%	-0.29%	-0.19004	116.23%	-4.41%	3.29376***

NB: *The returns are based on what happens from the first trading day to the end of each year. To further understand the performance of the IPOs over the years, their annual performance was also recorded. From years four to year ten, the yearly trends indicated positive performance for both the BHAR and the CAR.*

***Significant at 1%; **Significant at 5%; *Significant at 10%

Table 3 shows the ten-year long-run performance based on a sample of 81 IPO companies for the period 1996–2002. From the table, it is clear that when using CAR, IPOs on the JSE outperformed the market by 116.23 per cent and the results are significant at the one per cent level. Also, when using the BHAR, IPOs on the JSE underperformed the market by -25.43 per cent, but the results are not statistically significant. This is in line with the study by M'kombe and Ward (2002), who established that IPOs on the JSE underperformed the market by 87.84 per cent over a ten-year period, when using the CAPM model. Also, Drobetz, Kammerman and Wälchli (2005) examined the long-run performance of 109 Swiss IPOs from 1983 to 2000 and found that there was underperformance of -173.46 per cent (BHAR) after 120 months (ten years) when using the Swiss Performance Index (SPI) as benchmark. Also, when using the Vontobel Small-Cap Index (VSCI) benchmark, IPOs underperformed the market by -17.30 per cent using the BHAR. The findings of this study indicated a negative BHAR (-25.43%) using the JSE ALSI. However,

it is noted that the results were not statistically significant. Then again, when using CAR, Swiss IPOs underperformed the market by -9.51 per cent using the SPI benchmark and by -101.33 per cent with the VSCI benchmark. The findings for the CAR contradict those in this study, as the ten-year CAR was significantly positive (116.23%). The findings stress the effect different benchmarks and methodologies have, when calculating the long-run performance of IPOs. Various studies (Fama, 1998; Alvarez & Gonzalez, 2001; M'kombe & Ward 2002; Sun, 2004) emphasised that the long-run underperformance of IPOs depended on the methodology used. Hence, investors should exercise great caution when using any of these methodologies to determine their long-run performance.

Since it has been established that IPOs underperform the market in the long run, when using BHAR and CAR, it is now important to determine whether the market period in which the IPOs were listed can be used as a predictor of long-run performance, as highlighted in studies (Cook *et al*., 2003; Shikha & Balwinder, 2008). A regression analysis is performed to determine if the market period can predict stock returns for BHAR and CAR over three, five and 10 years.

Table 4: Regression analysis for market period (hot and cold) and IPO long-run performance

		Dependent variable: IPO long-run performance					
		BHAR		**CAR**			
	3 years	**5 years**	**10 years**	**3 years**	**5 years**	**10 years**	
Intercept	B	1.875	1.267	1.727	1.750	2.400	2.500
	T-value	6.049	3.678	6.034	5.723	8.279	11.722
Market period	Beta	-0.152	-0.219	-0.409	0.071 1.169	0.045 0.666	-0.132
	T-value	-2.513	-3.259	-3.988			-1.187
R^2		0.023	0.005	0.168	0.005	0.002	0.018
F-value		6.325	1.071	15.902	1.366	0.444	1.409
P-Value		0.012***	0.001***	0.000***	0.243	0.506	0.239
Durbin-Watson stat		1.550	1.797	2.078	1.767	1.906	1.500

***Significant at 1%; **Significant at 5%; *Significant at 10%

Table 4 shows the regression analysis for the market period, with hot and cold market periods defined based on the annual volume of new listings. The market period was categorised as a dummy variable equal to 1 if the IPO was listed in the hot market period, and as 0 if the IPO was listed in the cold market period. From Table 4, it is clear that the market period significantly affects the BHAR for three, five and ten years. However, the market period does not have any effect on the CAR for those time frames. The results for the BHAR are consistent with Helwege and Liang (2001) who, using the BHAR, established that the market period had a significant relationship with long-run stock returns for one, three and five years post-IPO. Thomadkis *et al*. (2012), using 254 Greek IPOs, established that the market period

significantly affected the three-year BHAR. However, when taking the three-year CAR from the first trading month to three years after going public, Thomadakis *et al*. (2012) established that the market period did not significantly affect the CAR. This confirms the findings of the present study, which established that the market period has no significant influence on long-run IPO returns, when computed using the CAR.

5 Conclusion

The empirical findings obtained in this study indicate that IPOs on the JSE underperformed the market over a three- and five-year period, when using BHAR and CAR, which is consistent with other international studies (M'kombe & Ward, 2002; Gomper & Lerner, 2003; Kooli & Suret, 2004). However, IPOs on the JSE outperformed the market over a ten-year period when using CAR. The high level of long-run underperformance over a three-year period gives the impression that the long-run underperformance of IPOs on the JSE might be caused by investors' over-optimism. Brav *et al.* (2000) provide evidence in support of the role of investors' over-optimism in explaining long-run underperformance, which is consistent with the overreaction hypothesis (i.e., an assumption that in the long run, the market corrects the over-valuation caused in the initial period). As a result, the underperformance of IPOs in the long run can be explained by the fact that under the hypothesis of efficient markets, the price of IPOs should reach their equilibrium price, leading to a negative correlation between initial returns and the long-term performance of IPOs.

With regard to five-year long-run performance, the positive yearly returns identified in years four and five provide an incentive for investors to stay out of the stock market within the first three years after listing, to come in during the fourth year and possibly sell by the end of the fifth, so as to make profits. The positive returns in the fourth and fifth years indicate that IPO companies have had time to adjust to the market – the problem of asymmetric information is no longer relevant, and the market now reacts to the true behaviour of IPOs in the long run. Furthermore, also evident with respect to the ten-year long-run performance is the fact that positive returns are earned from the fourth year, which offers a positive incentive for investors to buy mainly portfolios comprising companies that have been trading for at least four years.

The results on the long-run performance of IPOs on the JSE demonstrated varied performances across the methodology used. These findings stress the effect the different benchmarks and methodologies have when calculating the long-run performance of IPOs. Various studies (Fama, 1998; M'kombe & Ward, 2002; Sun, 2004) emphasised that the long-run underperformance of IPOs depended on the methodology used. Based on these findings, it is recommended that investors considering a one-year holding period should buy the shares at the offer price and sell by the end of the first year. Moreover, with regard to long-term profits, investors are advised to stay out of the stock market within the first three years, but to come

in during the fourth year and buy mainly portfolios comprising companies that have been trading for at least four years. The advantage of this approach is that investors can gather enough information over the four-year period of trading to make an informed decision on the quality of the portfolio. However, the disadvantage is that investors may lose out on short-run returns which could be earned by purchasing IPO shares at the offer price and selling within the first year. Therefore, future studies should focus on the long-run performance using the Capital Asset Pricing Model (CAPM) and the Fama and French Three Factor model to determine which is best suited for calculating IPO returns on the JSE. Particular emphasis should be placed on ascertaining the accuracy of the predicting power of each model for long-run IPO performance on the JSE. Different benchmarks should be employed when calculating the long-run performance of IPOs on the JSE, to ensure that the research results meet the needs of a wider range of international investors. Moreover, in exploring the differences in long-run performance in this study, only the market period was considered. However, there are many factors that affect the long-run returns of IPOs. As such, in addition to the market period, further studies on IPOs on the JSE should control for factors such as the size of the offer, the age of the firm, and the industry in which it operates.

Biographical notes

Dr Brownhilder Neneh is a Senior Lecturer at the University of the Free State, Bloemfontein, South Africa. She has a Master's degree in Business Management (Cum Laude) and a PhD in corporate finance. She can be contacted at nenehbn@ufs.ac.za or brahilder@gmail.com

Professor Van Aardt Smit is a Professor at the University of the Free State, Bloemfontein, South Africa. He specialises in Financial Management and New Venture Creation. He can be contacted at smitava@ufs.ac.za

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APPENDICES

Appendix 1: Three-year long-run performance

Months	Long-run IPO performance		$AR_{i,t}$
	BHAR	CAR	
1	-0.16%	-0.16%	-0.16%
2	1.50%	0.28%	0.44%
3	1.93%	-0.43%	-0.71%
4	2.75%	-1.39%	-0.96%
5	7.98%	-0.29%	1.10%
6	11.41%	-0.23%	0.06%
7	10.79%	-1.30%	-1.07%
8	9.47%	-2.39%	-1.09%
9	7.04%	-3.39%	-1.00%
10	1.04%	-3.62%	-0.24%
11	-2.47%	-5.65%	-2.03%
12	-5.41%	-8.77%	-3.12%
13	-7.98%	-13.91%	-5.14%
14	-6.95%	-14.78%	-0.87%
15	-5.72%	-16.95%	-2.18%
16	-4.21%	-18.31%	-1.36%
17	-4.65%	-22.90%	-4.59%
18	-7.67%	-25.20%	-2.30%
19	-11.79%	-28.77%	-3.57%
20	-16.62%	-32.20%	-3.43%
21	-19.26%	-35.28%	-3.08%
22	-23.48%	-38.48%	-3.20%
23	-29.03%	-42.20%	-3.72%
24	-33.20%	-45.29%	-3.08%
25	-36.49%	-46.06%	-0.78%
26	-43.13%	-47.35%	-1.29%
27	-40.64%	-45.17%	2.18%
28	-41.82%	-47.91%	-2.74%

29	-47.56%	-49.61%	-1.70%
30	-48.34%	-51.12%	-1.52%
31	-52.48%	-54.08%	-2.96%
32	-55.90%	-55.60%	-1.52%
33	-58.23%	-55.44%	0.16%
34	-61.06%	-58.33%	-2.89%
35	-62.78%	-57.99%	0.34%
36	-65.59%	-59.77%	-1.78%

Appendix 2: Five-year long-run performance

Months	**Long-run IPO performance**		**$AR_{i,t}$**
	BHAR	**CAR**	
1	1.06%	1.06%	1.06%
2	4.41%	3.21%	2.15%
3	5.32%	2.93%	-0.27%
4	6.53%	2.41%	-0.53%
5	10.63%	3.49%	1.08%
6	11.53%	2.98%	-0.51%
7	10.29%	2.12%	-0.86%
8	10.99%	2.00%	-0.12%
9	10.34%	0.45%	-1.55%
10	-0.06%	-0.63%	-1.08%
11	-2.06%	-2.07%	-1.44%
12	-3.77%	-4.59%	-2.52%
13	-7.30%	-9.39%	-4.81%
14	-6.68%	-11.22%	-1.82%
15	-5.91%	-12.91%	-1.69%
16	-4.66%	-14.25%	-1.34%
17	-4.51%	-17.82%	-3.56%
18	-7.08%	-18.80%	-0.99%
19	-10.57%	-21.39%	-2.59%
20	-15.62%	-24.89%	-3.50%
21	-19.83%	-28.61%	-3.72%

22	-24.46%	-31.33%	-2.72%
23	-29.31%	-32.97%	-1.65%
24	-32.19%	-35.65%	-2.67%
25	-37.28%	-37.44%	-1.79%
26	-39.74%	-37.77%	-0.34%
27	-38.16%	-34.36%	3.41%
28	-40.23%	-36.64%	-2.28%
29	-41.78%	-38.25%	-1.60%
30	-42.45%	-38.73%	-0.49%
31	-45.72%	-41.64%	-2.91%
32	-49.42%	-42.08%	-0.44%
33	-51.78%	-43.32%	-1.24%
34	-52.55%	-45.29%	-1.97%
35	-54.22%	-45.34%	-0.05%
36	-56.33%	-46.75%	-1.42%
37	-59.86%	-48.58%	-1.83%
38	-60.13%	-47.99%	0.59%
39	-61.67%	-45.84%	2.15%
40	-65.10%	-47.98%	-2.14%
41	-66.45%	-47.65%	0.33%
42	-69.69%	-50.81%	-3.16%
43	-67.34%	-48.41%	2.40%
44	-66.45%	-30.64%	17.76%
45	-64.42%	-28.42%	2.22%
46	-62.00%	-29.28%	-0.85%
47	-62.81%	-28.12%	1.16%
48	-64.02%	-28.80%	-0.68%
49	-65.74%	-25.13%	3.66%
50	-65.72%	-24.84%	0.29%
51	-65.30%	-23.74%	1.10%
52	-63.92%	-16.27%	7.47%
53	-64.40%	-9.33%	6.94%
54	-62.69%	-8.87%	0.46%

55	-61.78%	-9.36%	-0.49%
56	-61.52%	-6.22%	3.14%
57	-60.58%	-5.76%	0.46%
58	-61.54%	-6.14%	-0.38%
59	-61.57%	-6.70%	-0.56%
60	-64.37%	-7.77%	-1.07%

Appendix 3: Ten-year long-run performance

Months	**Long-run IPO performance**		**$AR_{i,t}$**
	BHAR	**CAR**	
1	-3.81%	-3.81%	-3.81%
2	-2.45%	-1.96%	1.85%
3	0.56%	-0.70%	1.26%
4	6.01%	-1.16%	-0.46%
5	18.23%	1.35%	2.51%
6	22.36%	2.14%	0.79%
7	20.72%	2.72%	0.58%
8	25.64%	5.52%	2.81%
9	28.69%	4.50%	-1.03%
10	-5.39%	-4.32%	-8.81%
11	-6.24%	-6.82%	-2.50%
12	-5.33%	-7.63%	-0.81%
13	-9.34%	-12.10%	-4.48%
14	-6.83%	-15.96%	-3.86%
15	-0.42%	-14.12%	1.84%
16	4.54%	-14.46%	-0.34%
17	4.73%	-17.67%	-3.22%
18	-2.66%	-18.07%	-0.39%
19	-8.28%	-16.76%	1.31%
20	-12.89%	-22.51%	-5.75%
21	-20.02%	-26.97%	-4.46%
22	-24.16%	-28.56%	-1.59%
23	-27.80%	-30.17%	-1.62%

24	-31.43%	-34.25%	-4.07%
25	-41.80%	-37.98%	-3.74%
26	-40.71%	-39.87%	-1.88%
27	-36.98%	-40.86%	-0.99%
28	-42.42%	-41.64%	-0.79%
29	-43.39%	-44.88%	-3.24%
30	-46.43%	-47.13%	-2.25%
31	-43.64%	-47.22%	-0.09%
32	-47.35%	-46.55%	0.67%
33	-50.27%	-49.77%	-3.22%
34	-48.26%	-44.70%	5.07%
35	-49.96%	-48.20%	-3.49%
36	-50.66%	-49.36%	-1.16%
37	-55.52%	-52.35%	-3.00%
38	-55.30%	-52.92%	-0.57%
39	-57.32%	-48.77%	4.15%
40	-59.73%	-49.62%	-0.85%
41	-60.35%	-49.83%	-0.22%
42	-64.83%	-53.91%	-4.08%
43	-58.16%	-48.26%	5.65%
44	-55.65%	-46.05%	2.21%
45	-50.49%	-41.55%	4.50%
46	-45.25%	-41.95%	-0.40%
47	-46.49%	-37.68%	4.27%
48	-44.02%	-35.20%	2.48%
49	-46.00%	-28.39%	6.81%
50	-41.96%	-27.82%	0.56%
51	-40.28%	-23.64%	4.19%
52	-33.17%	-17.03%	6.61%
53	-32.63%	-6.31%	10.71%
54	-29.25%	-4.08%	2.24%
55	-27.21%	-5.73%	-1.65%
56	-28.20%	-1.04%	4.69%

57	-24.39%	-1.40%	-0.36%
58	-23.34%	1.08%	2.47%
59	-21.10%	3.14%	2.07%
60	-26.41%	4.25%	1.10%
61	-30.81%	6.45%	2.20%
62	-29.59%	14.92%	8.48%
63	-27.62%	25.12%	10.19%
64	-28.92%	41.20%	16.09%
65	-30.56%	42.29%	1.09%
66	-27.39%	44.24%	1.95%
67	-27.11%	47.03%	2.79%
68	-21.10%	52.52%	5.49%
69	-24.77%	53.75%	1.24%
70	-35.32%	53.54%	-0.21%
71	-35.25%	56.43%	2.89%
72	-35.53%	59.32%	2.89%
73	-38.39%	60.83%	1.52%
74	-48.52%	65.81%	4.98%
75	-56.70%	64.45%	-1.36%
76	-56.17%	70.43%	5.99%
77	-57.39%	72.67%	2.24%
78	-54.71%	76.26%	3.58%
79	-52.03%	78.06%	1.80%
80	-59.05%	79.33%	1.27%
81	-69.45%	84.51%	5.18%
82	-78.95%	81.28%	-3.24%
83	-83.28%	83.50%	2.22%
84	-85.51%	86.51%	3.02%
85	-82.27%	86.78%	0.27%
86	-80.99%	86.85%	0.07%
87	-86.25%	85.94%	-0.91%
88	-88.71%	88.09%	2.16%
89	-86.73%	87.98%	-0.12%

90	-85.12%	88.35%	0.37%
91	-77.41%	94.93%	6.58%
92	-77.19%	97.51%	2.57%
93	-75.59%	100.13%	2.62%
94	-74.02%	100.68%	0.56%
95	-82.36%	97.18%	-3.51%
96	-76.99%	100.86%	3.68%
97	-76.06%	102.03%	1.17%
98	-81.92%	103.17%	1.13%
99	-81.07%	107.21%	4.04%
100	-68.95%	113.23%	6.02%
101	-67.58%	113.69%	0.46%
102	-66.50%	115.30%	1.61%
103	-59.80%	114.26%	-1.05%
104	-64.42%	113.15%	-1.11%
105	-60.57%	112.97%	-0.18%
106	-50.62%	115.37%	2.40%
107	-53.84%	114.23%	-1.14%
108	-63.59%	120.64%	6.41%
109	-53.85%	121.04%	0.39%
110	-45.11%	122.60%	1.57%
111	-45.50%	119.67%	-2.93%
112	-59.52%	120.06%	0.38%
113	-70.15%	121.75%	1.69%
114	-61.57%	122.10%	0.35%
115	-46.82%	120.45%	-1.65%
116	-51.46%	120.18%	-0.27%
117	-47.08%	121.17%	0.99%
118	-43.80%	120.61%	-0.56%
119	-37.09%	118.35%	-2.26%
120	-25.43%	116.23%	-2.12%