

An analysis of the extent of initial underpricing and the determinants of long-run underperformance of IPOs on the Johannesburg Stock Exchange (JSE).

A research report submitted by

Cameron Fullerton

Student Number: 2330325

Cell: 0844302485

Email: 2330325@studuents.wits.ac.za

Supervisor: Yogesh Brahmhatt

Co-supervisor: Nicholas Schwenke

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Abstract:

This study examines the performance of initial public offerings (IPOs) on the Johannesburg Stock Exchange (JSE) from 2011 to 2021, focusing on the extent of initial underpricing, long-term share price performance, and the impact of pre-listing firm-level characteristics and market conditions on aftermarket performance. Using the complete set of IPOs on the JSE from 2011 to 2021, the research employs event-study methodology and regression analysis to evaluate short-term and long-term share price performance.

The findings of this study indicate a presence of initial underpricing that persists for subsequent trading days post the listing date which is consistent with global IPO literature. Long-term share price returns exhibit underperformance relative to market benchmarks. The findings are consistent with the “fads and overoptimism” hypothesis of Aggarwal and Rivoli (1990) and Ritter (1991) as well as the “hot issue market” theory according to Ibbotson and Jaffe (1975) as IPOs issued during high-volume years underperformed the market in the long term. Industry related factors appear to play a role in the extent of underpricing. Moreover, IPOs priced below R10 per share tended to yield the highest market-adjust returns in the short-term.

Furthermore, the study identifies key firm-specific factors that appear to influence long-term share price performance. Short-term, over-optimism and high initial returns on average lead to market rebalancing within the first six-months post-IPO. Firm-level characteristics play a role in long-term share price performance such as how older and more established companies performed better over the long-term. Similarly, large board sizes and higher listing costs relative to market capitalisation tended to result in worse long-term share price performance. Moreover, the use of an international investment bank or a Big 4 audit firm was linked to lower long-term market-adjusted share price returns.

The research contributes to the ongoing discourse on IPO efficiency and provides practical insights for investors, issuers and policymakers in South Africa’s equity capital markets.

1. Introduction

Historically, initial public offerings (IPOs) have been utilised by private companies to raise a large amount of capital which can be used to fund expansion projects, research and development, acquisitions, and other growth opportunities. From an investor's perspective, IPOs represent an opportunity to invest in a promising company in its early stages of growth in order to realise a gain from its share-price growth post-listing (Jenkinson and Ljungqvist, 2001). In reality, a considerable proportion of IPOs initially have high share price returns during the first few days of trading, largely caused by initial underpricing of the IPO, followed by long-term share price underperformance when compared to relevant benchmarks (Ritter and Welch, 2002, Ibbotson and Jaffe, 1975).

The initial underpricing of a share on the first day of trading and subsequent long-term under-performance of a company's share price has been present in many different stock exchanges across the world (Loughran et al., 1994, Cogliati et al., 2011). Underpricing of an IPO is described as occurring when shares of a company are issued at an offer price which is lower than the closing share price on the first day of trading and subsequent trading days in the short term. Ritter (1991), Loughran et al. (1994) demonstrate that in the long run after an IPO issuing firms significantly underperform similar listed companies based on size and industry. Initial underpricing and/or subsequent long-term underperformance have been documented in Germany (Günther and Rummer, 2006, Ljungqvist, 1997), the United Kingdom (Levis, 1993, Chambers and Dimson, 2009, Acedo-Ramírez et al., 2019), Italy (Cassia et al., 2004), Japan (Moshirian et al., 2010, Nielsen et al., 2015) and Australia (Lee et al., 1996). A very similar pattern of results has been found in research from emerging markets such as China (Chan et al., 2004), Mexico (Aggarwal et al., 1993, Boulton et al., 2011) and Türkiye (Kucukkocaoglu, 2008) to name a few.

From a South African context, Page and Reyneke (1997) and M'kombe and Ward (2002) document significant long-run underperformance of IPOs on the Johannesburg Stock Exchange (JSE) for the 1980-1991 and 1980-1998 sample periods respectively. Furthermore, research has been done into the determinants of long-run operating and share price performance of IPOs on the JSE from 1996 to 2010 (Chipeta and Jardine, 2014). The presence of initial underpricing has also been found to occur on the JSE as documented by Van Heerden and Alagidede (2012).

There is therefore a need to perform more recent research in a South African context regarding the initial underpricing and long-run underperformance of IPOs on the JSE in order to determine whether the phenomenon identified in prior research is still prevalent in more recent IPOs on the JSE.

The research questions for this study were each investigated for the period from 2011 to 2021:

- 1) Are IPOs on the JSE initially underpriced?
- 2) Did IPOs on the JSE underperform in the long term relative to market benchmarks?
- 3) What are the effects of pre-listing firm-level characteristics and market conditions on the aftermarket performance of IPOs on the JSE?

An event study methodology was used for research questions 1 and 2 to quantify the extent of initial underpricing and subsequent long-term share price underperformance respectively. A panel regression methodology was used for research question 3 to analyse the relationships between pre-listing firm-level characteristics and the long-term share price performance of IPOs on the JSE for the period 2011 to 2021.

Contribution:

This study attempts to add to the existing body of research by providing updated empirical evidence on the extent of initial underpricing and long-term underperformance of IPOs on the JSE from 2011 to 2021. By updating the work Chipeta and Jardine (2014), relating to long-term underperformance, and Van Heerden and Alagidede (2012), relating to initial underpricing, this study aims to determine whether the results documented relating to the initial underpricing and subsequent long-term underperformance on the JSE in prior decades are still relevant for the IPOs on the JSE from 2011 to 2021. Additionally, by applying more appropriate market benchmarks (as explained in section 3), this research aims to minimise the resource effect that is prevalent on the JSE and provide an updated perspective of IPO performance relative to the broader market.

Limitations and delimitations:

The share price of a company is affected by various factors and therefore there is an inherent limitation with research that involves share price performance because

it is not possible to prove causation. Consequently, the impact that confounding events can have on the share price of the company is a limitation of this study.

During the period under study from 2011 to 2021, the impact of the COVID-19 pandemic on the share prices of the companies under study is a potential confounding event that has been considered for the period under study. Once the data is collected, a sensitivity analysis was performed to determine what impact the COVID-19 pandemic and any other confounding events identified may have had on the share price performance of the companies in the sample.

This research delimited the scope of the pre-listing operating performance metrics utilised to the return on total assets (ROA) and the return on total equity (ROE) ratios in line with Chipeta and Jardine (2014). These ratios are most commonly used in prior IPO research as they provide insights into the firm's ability to generate profits relative to its assets and equity. This can be used to indicate the ability of the firm to generate long-term shareholder value.

A further delimitation of this research is that the determinants of initial underpricing have not been investigated in detail as the primary focus of research question 1 is determining the extent of initial underpricing.

The population used for this research includes IPOs on the JSE Main Board and excludes listings on the JSE's Alternate Exchange (JSE AltX). This was done due to the difference in liquidity between shares on the Main Board and AltX. Additionally, the JSE Main Board listings have stricter regulatory requirements and more investor participation than the JSE AltX listings. This makes the JSE Main Board listings more comparable to global IPO standards.

2.Literature review

This chapter provides a review of prior literature regarding the initial underpricing and long-term share price performance of IPOs from a global and South African perspective. The prior literature consists of a wide variety of studies in various different countries. The concepts of underpricing and long-term underperformance was addressed under separate subheadings in this chapter. This chapter also provides the theoretical reasons explaining IPO performance based on insights obtained from prior research into IPOs.

2.1. International evidence on the initial underpricing of IPOs:

The initial underpricing and subsequent underperformance of IPOs have been widely documented in prior literature across the globe. Early evidence of initial underpricing of IPOs demonstrated that there is a significant increase in share price from the offer price to the price at the end of the first day of trading (Ibbotson and Jaffe, 1975). The presence of the initial underpricing of IPOs is a phenomenon that has been present for many decades. Ritter (1984) examined over 5 000 IPOs in the US over the period from 1960 to 1982 to determine the extent of the initial underpricing of IPOs and any potential causes of this persistent phenomenon. Ritter's paper found that IPOs experienced an average initial return after the first day of trading 18.8% higher than the offering price.

A more recent study by Ritter and Welch (2002) analysed 6 249 IPOs in the US for the period 1980-2001 and found that the average return on the first day of trading was 18.8%. This is indicative of the consistent and significant initial underpricing that existed in the majority of IPOs. Ritter and Welch (2002) believe that the primary determinant of initial underpricing of IPOs is not due to information asymmetries between the company being listed and investors, but rather due to other explanations such as how IPO shares are allocated by the underwriter (Ellis et al., 2000). Market under-valuation or asset-pricing risk premia are unlikely to fully explain the average first-day return of 18.8% reported by Ritter and Welch (2002) which poses the question of what other factors contribute to this initial under-pricing that is observed.

Furthermore, Loughran et al. (1994) found that the phenomenon of short-run underpricing of IPOs exists in every country with a stock market, although the

amount of underpricing varies from country to country. The prior research suggests that the contractual mechanism as well as the composition of the companies that are going public through an IPO are significantly related to the degree of short-run underpricing.

When looking at the United Kingdom (UK), Buckland et al. (1981) and Levis (1993) found that the average returns on the first day after an IPO in the UK ranged from 8.5% to 17%. Levis (1993) found that from a sample of 712 IPOs on the LSE from 1980 to 1988, the average first-day market-adjusted return was 14.3%. Interestingly, this study also found that the return for this same sample of LSE IPOs for the first month of trading was 14.75%. These results suggest that institutional investors require a positive first-day return incentive to encourage them to participate in the purchase of IPOs and that the initial underpricing effects are shown even a month after the listing date.

Agathee et al. (2012) investigated 44 IPOs on the Mauritian stock exchange between 1989 and 2005 and found that the initial first-day return was 14.29% on average. The average returns are highest if the investors buy and hold every IPO until the end of their first month. Adjasi et al. (2011) found that the average first-day returns of 125 IPOs in Nigeria between 1990 and 2006 was 43.1% on average during that period. The firm size and audit quality were found to be important factors in the extent of IPO underpricing in Nigeria during that period. Cumulatively, the prior research very clearly demonstrates persistent initial underpricing across stock exchanges globally.

2.2. Local evidence on the initial underpricing of IPOs:

There has been prior research conducted into the initial underpricing of IPOs on the Johannesburg Stock Exchange (JSE) ranging up until the end of 2010. Bradfield and Hampton (1989) examined IPOs on the JSE from May 1975 to August 1986 and found that there was an average initial underpricing of 48% in times when the IPO market was “hot”. A “hot-issue” market is a period on the stock market where investor demand for IPO shares is high and is usually characterised by the oversubscription of shares in IPOs during a period (Ibbotson and Jaffe, 1975, Ritter, 1984). In contrast, Bradfield and Hampton (1989) found that the average initial underpricing of IPOs on the JSE was 25% in that same sample period during times when the IPO market was “cold”. A “cold-issue” market is a period on the stock market where investor demand for IPO shares is low often characterised by undersubscription of shares in IPOs over a period of time. Although this indicates a persistent initial underpricing of IPOs, it also suggests that

the level of activity of the IPO market as a whole has a statistically significant impact on the extent to which an IPO is underpriced initially (Ritter, 1984).

Additionally, Van Heerden and Alagidede (2012) showed significant short-run underpricing of IPOs on the JSE from 2006 to 2010, with trading day 15 after the first day of trading showing the highest initial returns. This further demonstrates that the initial underpricing phenomenon is persistent not only on the first day of trading but for a short period afterwards as well. It is also evident that similarly to the international literature on initial underpricing, the extent of underpricing appears to be impacted by the sector in which the company operates (Van Heerden and Alagidede, 2012).

2.3. International evidence on the long-term underperformance of IPOs:

When considering the long-run performance of IPOs, a clear trend of underperformance appears across many different stock exchanges globally. According to Ritter (1991), which investigated the long-run performance of IPOs in the United States of America (USA), it was shown that from a sample of 1 526 IPOs in the USA for the period 1975-1984, the IPO firms substantially underperformed when compared to a control portfolio of firms matched by size and industry over the three years post listing. Furthermore, firms issuing in years with a high volume of IPO activity tend to display higher levels of long-run underperformance when compared to firms which underwent IPOs in years with a lower volume of IPO activity. This mirrors a similar trend as what has been found to occur with the initial underpricing of IPOs during the same sample period. The industry in which the company operates is documented to have an impact on the long-run performance of the IPO (Ritter, 1991).

The patterns of long-run underperformance appear to not be limited to IPOs in the United States of America (USA). When looking at another developed country in the form of Germany, Ljungqvist (1997) documents that the initial underpricing on the first day of trading after the IPO was 9.2% on average and that there was a market-adjusted return of -12.1% over the three years post-IPO for a sample of 189 German IPOs for the period 1970 to 1993. Similar to the USA, Günther and Rummer (2006) also showed that high initial returns are associated with long-run underperformance when compared to the market for a sample of German IPOs between 1997 and 2001 which was a period with a high volume of IPOs in Germany.

From a United Kingdom (UK) perspective, Levis (1993) found that IPOs in the UK between 1980 and 1988 significantly underperformed several relevant benchmarks in the 36 months following their first day of trading. Moreover, Levis (1993) suggests that the long-run underperformance of IPOs is not limited to the first 36 months but that it persists for a longer period although the extent of share price underperformance becomes less prevalent over time.

2.4. Local evidence on the long-term underperformance of IPOs:

From a South African perspective, more recent research by Chipeta and Jardine (2014) found that for a sample of 154 IPOs on the JSE from 1999 to 2010, South African IPO shares significantly underperformed the market on average over 36 months from the date of listing. The magnitude of underperformance varies according to the benchmark index used, with benchmark-adjusted returns of -52.01%, -53.43%, -44.06%, and -33.91% relative to the All Share, Top 40, Mid Cap, and Small Cap indices respectively.

The results of Chipeta and Jardine (2014) were subject to a limitation caused by the resource effect. The resource effect is present on the JSE as the JSE Top 40 and JSE All Share indices are dominated by large resource firms which results in risk being highly concentrated in the resources market segment (Maritz, 2003). Consequently, the JSE Top 40 and JSE All Share indices are not the most appropriate benchmarks to use when looking at the overall market performance.

However, since then, the JSE has introduced three new indices:

- The Capped All Share Index (J303)
- The Shareholder-Weighted All Share Index (J403)
- The equally-weighted Top 40 index (J2EQ)

Each of these indices are better able to compensate for the resource effect than the JSE Top 40 and JSE All Share indices respectively, and thus are more suitable market benchmarks to use when looking at the overall market performance. This further illustrates the need for Chipeta and Jardine (2014) to be updated with new research making use of these more appropriate benchmarks.

Furthermore, firms that listed on the JSE in years which had a higher-than-average volume of IPOs tended to experience significantly poorer long-term performance than those which had IPOs in years of low IPO volume. This corresponds to

Bradfield and Hampton (1989) and Ritter (1984) which illustrates higher volatility for IPOs during times of a “hot-issue” market.

Chipeta and Jardine (2014) found that firms which forecasted high revenue estimates in their pre-listing prospectus tended to perform poorly in the long run when compared to those pre-listing revenue forecasts. This pattern of IPO share price underperformance in South Africa over this period is somewhat consistent with the Ritter (1991) ‘fads and overoptimism’ hypothesis which is when investors are irrationally over-optimistic about the future potential of certain industries.

2.5. Theoretical reasons explaining IPO performance:

Research into IPO performance primarily draws on asymmetrical information theory to explain initial underpricing and behavioural finance theories to understand long-term share price performance. These two theories provide the foundational theory for analysing the performance of IPOs.

Research question 1 of this research report, which examines the extent of initial underpricing, is primarily grounded in asymmetric information theory which suggests that issuers may underprice their IPOs to mitigate information gaps between insiders and potential investors (Rock, 1986). By analysing IPO pricing and initial performance, this study aims to determine whether asymmetric information plays a significant role in underpricing of IPOs.

Research question 2 and 3 of this research report, which investigate long-term share price performance, is based primarily on behavioural finance theories. The behavioural finance theories include theories such as investor sentiment (Ibbotson and Jaffe, 1975) and over-optimism (Ritter, 1991) which have been used to explain the long-term performance of IPOs in various different countries and stock exchanges globally.

Initial underpricing:

Prior research has found that the initial underpricing of an IPO might be caused by the underwriter in order to obtain information from investors through the process of ‘bookbuilding’ (Benveniste and Spindt, 1989). The ‘bookbuilding’ process is the most widely used method of determining the price at which shares were offered to investors. This is known as the offer price, and it is the responsibility of the appointed investment bank to lead this ‘book building’ process. The IPO is

marketed to potential investors during a roadshow which is used to determine the final offer price. Consequently, it has been found that the initial underpricing of the offer price range has been used by the investment bank to determine the appetite of investors for the stock at the respective offer price.

Underpricing might also be done to compensate investors' fears of potential losses from a 'winner's curse' (Rock, 1986). The 'winner's curse' is when an investor pays more for a share than what its intrinsic value is. Ritter and Welch (2002) explains that issuers may set the offer price at an amount that is below the expected price per share to incentivise investment into the company. The stock is therefore intentionally underpriced to compensate investors for taking on the higher risk often associated with a newly listed company. This suggests that underpricing is deliberately done by some issuers to attract investors and create positive market sentiment with the expectation that this will lead to stronger initial share price performance which will signal company quality.

Ritter and Welch (2002) found that empirical evidence from various studies is rather mixed regarding information asymmetry, and they believe that asymmetric information alone is unable to explain the extremely high returns that are present in the first few days of trading. Hanley and Hoberg (2010) found that more informative content in the pre-listing prospectus, as a proxy for premarket due diligence, results in more accurate issue prices and lowers the extent of initial underpricing. This suggests that although asymmetric information is not the only factor at play, it is still a key theoretical framework which explains initial underpricing.

Multiple theoretical explanations have been given as reasons behind the initial IPO underpricing phenomenon, including asymmetric information, signalling and 'winner's curse' but none of these theories are mutually exclusive to all circumstances (Van Heerden and Alagidede, 2012). Research question 1 in this study does not examine the determinants and theoretical reasons explaining initial underpricing in detail but rather attempts to examine the extent of initial underpricing on the JSE from 2011 to 2021.

Long-term underperformance:

The long-term underperformance of IPOs may potentially be caused by a variety of factors. One such example is the 'hot issue' market phenomenon documented by Ibbotson and Jaffe (1975) and Ritter (1984). These 'hot issue' periods occur when the number of companies going public and the average short-run share price

performance of new issues are abnormally high. Ritter (1991) documents how there is a positive relationship between IPO volume and the level of long-run underperformance over time. Younger firms have also demonstrated higher levels of long-run underperformance post-IPO (Chipeta and Jardine, 2014), and this was examined in research question 3 of this research study.

After the IPO, managers often overinvest as a result of excess funds available from the issue subsequently resulting in long-term underperformance by the company as a whole, which links to Jensen's free cash flow hypothesis (Jensen, 1986). Another potential reason for long-term underperformance is that managers attempt to take advantage of the firm's temporarily overvalued equity as a form of 'cheap' finance to acquire assets (Myers, 1984). This could lead to overinvestment in a project or investments in projects that do not return a positive net present value (NPV), therefore negatively impacting long-term operating performance of the company (Myers, 1984).

According to prior research by Ritter (1991) and Chipeta and Jardine (2014), amongst others, firm-level characteristics such as company size, company age, board size and revenue and profit forecast at the time of the IPO have all been seen to be factors that impact the long-term performance of a company post-IPO.

When looking at company age at the time of the IPO, Ritter (1991) found that poor long-run performance was associated more closely with younger firms when compared to older firms. Similarly in a South African context, Chipeta and Jardine (2014) also found a similar relationship between company age and long-run performance with older firms have better share price performance in the long-run than younger firms.

In similar fashion, Chipeta and Jardine (2014) found that firms with a larger asset value, which is representative of a larger sized company, have been found to perform better than firms with a smaller amount of assets. Ritter (1991) had similar findings which further indicates the ability of larger companies to weather more turbulent times which increases the chances of them succeeding in the long-term and having positive share price performance as a result of that success. Additionally, institutional investors have been found to play a role in driving demand for IPOs of larger sized firms (Gompers and Metrick 2001).

Regarding the size of the board of directors, Chipeta and Jardine (2014) found that companies that had a larger board size as at the time of listing tended to have positive performance from a ROA perspective. In contrast, as per the findings of Yermack (1996) as well as Chipeta and Jardine (2014), firms with a larger number

of directors on their board performed poorly in terms of market valuation and share price performance relative to the market as a whole.

Another contributor to the long-term underperformance of IPOs is the 'over-optimism and fads' phenomenon described by Ritter (1991) where unrealistic forecasts in pre-listing documents are not realised leading to poor long-term share price performance. The relationship between over-optimistic revenue and profit forecasts and long-term share price underperformance has also been demonstrated in research across the globe including Chipeta and Jardine (2014), Aggarwal and Rivoli (1990) as well as Ibbotson and Jaffe (1975).

These firm-level characteristics such as firm age, firm size, profit forecasts and board size prior to listing were investigated in research question 3 of the study along with other determinants in line with Chipeta and Jardine (2014).

3. Method

This is a quantitative study that uses publicly available financial information to collect data regarding the pre-listing firm-level characteristics as well as the post-listing share price performance of IPOs from 2011 to 2021 on the Johannesburg Stock Exchange (JSE).

The research questions for this study are as follows:

- 1) Are IPOs on the JSE initially underpriced?
- 2) Did IPOs on the JSE underperform in the long term relative to market benchmarks?
- 3) What are the effects of pre-listing firm-level characteristics and market conditions on the aftermarket performance of IPOs on the JSE for the period 2011 to 2021?

An event study methodology was used for research questions 1 and 2 to identify the presence and quantify the extent of initial underpricing and subsequent long-term share price under-performance respectively. A panel regression methodology was used for research question 3 to analyse the relationships between pre-listing firm-level characteristics and the long-term share price performance of IPOs. All of these research questions were answered for IPOs on the JSE for the period 2011 to 2021 as this provides an update to the latest research conducted into long-term share price performance of IPOs on the JSE by Chipeta and Jardine (2014). This study also provides an update to Van Heerden and Alagidede (2012) relating to the initial underpricing of IPOs on the JSE.

3.1. Population

The population that was used to conduct this research consisted of all the companies that underwent an initial public offering (IPO) on the Johannesburg Stock Exchange (JSE) main board from 01/01/2011 to 31/12/2021. The reason for choosing this period is to provide an update to Chipeta and Jardine (2014) which examined long-term underperformance IPOs on the JSE up until 2010 as well as Van Heerden and Alagidede (2012) which examined the initial underpricing of IPOs on the JSE up until 2010.

The monthly share price of the company was obtained for 36 months after the listing date of that company to allow the long-term performance of the IPO to be investigated which is in line with Chipeta and Jardine (2014). Hence, the cut-off in

2021 is to enable a post-listing analysis to be done for the full 36-month post-listing period which is the end of 2024.

Refer to Table 1 below for the numbers of IPOs across this period. The initial underpricing was examined by obtaining the share price for the 1st, 5th, 10th, 15th and 20th trading days after the IPO as per Van Heerden and Alagidede (2012).

The use of 36 months as the post-listing period is the consensus in prior research of what time frame best illustrates the long-term share price performance of an IPO (Ritter, 1991, Ritter and Welch, 2002, Chipeta and Jardine, 2014, Alli et al., 2010). After 36 months, the impact of the pre-listing financial data and other firm-specific characteristics related to its IPO are considered to have a less significant impact on the share price of the company (Ritter and Welch, 2002).

As per Chipeta and Jardine (2014), companies that are listed on the JSE AltX are not included in the population because these shares do not have the same level of liquidity as the shares that are listed on the main board of the JSE and are therefore not comparable.

Additionally, the population only includes companies that raised new capital through the issuing of new shares upon listing. Therefore, companies that listed without issuing new shares are excluded from this study. This ensures that the study focuses on IPOs and does not include all types of listings.

For example, instances where a company had an introduction of shares on the JSE were excluded from the population. This is because an introduction of shares is a method by which a company gets its shares listed on a stock exchange without issuing any new shares. This differs from an IPO because an introduction of shares does not raise any new capital and therefore there is no pricing process involved to determine the offer price. This study focused specifically on the concept of capital raising listings, namely IPOs, and that is why an introduction of shares was excluded from the population.

Additionally, Special Purpose Acquisition Companies (SPACs) were excluded from the population for this study. A SPAC is a type of company formed specifically to raise capital for the sole purpose of acquiring or merging with an existing private company. The main focus of this study is determining how the pre-listing firm-level characteristics of the listing firm impact its performance in the long term. Therefore, SPACs were excluded from the population for this study because a SPAC has no commercial operations or underlying business at the time of its listing and therefore

does not have the pre-listing firm-level performance metrics and characteristics of a normal IPO as required for research question 3.

Table 1 below illustrates the number of IPOs on the JSE from 2011 to 2021:

Table 1:

Number of IPOs on the JSE from 2011 to 2021:

Year	IPOs on the JSE
2011	1
2012	3
2013	4
2014	8
2015	7
2016	2
2017	6
2018	3
2019	0
2020	2
2021	0
Total	36

3.2. Sample

The full population of IPOs on the JSE from 2011 to 2021, as explained in section 3.1 Population, was used as the sample in this study. There were no instances where a company's pre-listing prospectus was unavailable nor were there instances where the pre-listing does not contain the required information. To mitigate a possible survivorship bias, the sample specifically includes firms which delisted within 3 years after their IPO (Chipeta and Jardine, 2014).

3.3. Data collection

Data collection comprised the collection of publicly available information. The pre-listing firm-level information was collected from the prospectus of each company in the sample. The availability of IPO prospectuses is ensured due to the listing requirements of the JSE which requires that all companies must publicly issue a prospectus which contains audited financial statements for the two financial years preceding the year in which the company intends to list on the JSE main board (JSE, 2022). Consequently, this ensured that the required information was

available in the pre-listing prospectus which was obtained from the IRESS Expert financial information tool, the Share Data website or the listing company's website. The prospectuses of all the companies in the sample were successfully obtained by the researcher.

The share price of each company was collected based on publicly available data that was obtained from the IRESS Expert financial information tool which is a reliable financial data platform which provides comprehensive data of the share price on any date required. The collection of the share prices on the JSE was verified by extracting the same data for a subset of IPOs in the sample from Equity RT to ensure the accuracy and reliability of the data provided by the IRESS Expert financial information tool. The data collected was stored on a secure Excel spreadsheet.

The data collection for this research paper required the following data points to be collected for each of the IPOs in the sample:

Table 2:

Data points collected:

	Pre-IPO and on listing date	Post-IPO
Required data	• Net profit after tax • Total assets • Total equity • Total number of shares approved for listing. • Offer price at listing. • Age (in years) of the company at the date of listing. • Current year revenue. • Forecasted revenue in the prospectus for the first-year post-listing. • Listing costs. • Number of board members.	• Net profit after tax at each financial year-end. • Total assets at each financial year-end. • Total equity at each financial year-end. • Revenue growth year-on-year. • Market capitalisation at the end of trading on the listing date. • The daily closing share price for the 1st, 5th, 10th, 15th and 20th day of trading after the IPO as per Van Heerden and Alagidede (2012). • The monthly share price of the company for 36 months post-listing. This was captured at the end of each calendar month.

	• Company's country of registration. • Investment bank involved in the IPO. • Country of registration of the investment bank. • Auditing firm of the company. • Presence of a contingent liability.	• Capped All Share Index (J303) returns for 36 months post-listing and the first 20 days of trading after the IPO. • Shareholder-weighted All Share Index (J403) returns for 36 months post-listing and the first 20 days of trading after the IPO. • Equally-weighted Top 40 index (J2EQ) returns for 36 months post-listing and the first 20 days of trading after the IPO.
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The reason behind the use of the Capped All Share Index (J303), the Shareholder-Weighted All Share Index (J403), and an equally-weighted Top 40 index (J2EQ) is that these indices are the most appropriate indices to minimise the resource effect which is prevalent on the JSE. The resource effect is present on the JSE as the JSE Top 40 and All Share indices are dominated by large resource firms which results in risk being highly concentrated in the resources market segment. Therefore, the JSE Top 40 and All Share indices are not the most appropriate representation of the market as a whole due to the prevalence of the resource effect on the JSE.

To calculate the market-adjusted returns, the following three market indices were used in order to take the resource effect into account and get a more representative market based view of the performance of the IPOs relative to the market as a whole:

- The Capped All Share Index (J303) is constructed in the same way as the All Share Index (J203), but all constituents with a weight larger than 10% in the index are capped at a fixed level of 10% at each quarterly review.
- The Shareholder-Weighted All Share Index (J403) which follows the construction of the All Share Index (J203) however, all constituents are weighted by an alternate free float, called the SWIX free float. The SWIX free float represents the proportion of a constituent's share capital that is held in dematerialised form and registered on the South African share register.
- Equally weighted Top 40 index (J2EQ) which replicates the constituents of the Top 40 Index, but the constituents are equally weighted.

Each of these benchmarks, to some extent, compensates for the resource effect that is present on the JSE through the weighting that is done in each index and thus would be the most suitable market benchmarks for the purposes of this study.

3.4. Data analysis

3.4.1. Measuring the extent of initial underpricing

The initial underpricing was analysed using the method set out by Van Heerden and Alagidede (2012) which adopts the mean market-adjusted short-run performance and the wealth relative method for calculating the initial underpricing of new share issues. Some economists argue that only using the first day's initial return is not sufficient enough as the market may have been irregular on that particular day, and this may distort the results. Therefore, several days were used to examine if IPOs are underpriced. Sadaqat et al. (2011) and Van Heerden and Alagidede (2012) used trading days 1, 5, 10, 15 and 20 in their studies. This paper selected these same days to be consistent with the prior literature. Therefore, the event study windows for research question 1 were the first 20 trading days after the IPO.

The mean market-adjusted short-run return is calculated by following the process described below per Van Heerden and Alagidede (2012):

The raw return of each stock is calculated as follows:

$$R_{x,d} = \frac{P_{x,d} - P_{x,0}}{P_{x,0}} \quad (1)$$

where $R_{x,d}$ is the return on stock 'x' at the end of the d th trading day. $P_{x,d}$ is the price of stock 'x' at the end of the d th trading day and $P_{x,0}$ is the offer price of stock 'x'.

The average raw return is calculated as follows:

$$\bar{R}_{x,d} = \frac{1}{N} \sum_{i=1}^n R_{x,d} \quad (2)$$

Where $\bar{R}_{x,d}$ is the average return on the sample IPOs. N and n are both the number of IPOs in the sample. $R_{x,d}$ is the return on stock 'x' at the end of the d th trading day.

The return of the indices stipulated in Table 2 were used as the benchmarks and is calculated as follows:

The market return for each benchmark is calculated as follows:

$$R_{m,d} = \frac{I_{m,d} - I_{m,0}}{I_{m,0}} \quad (3)$$

where $R_{m,d}$ is the market return at the close of day 'd'. $I_{m,d}$ is the market index value at the end of the d th trading day and $I_{m,0}$ is the market index value at the end of the first day of trading for stock 'x'.

The market-adjusted short-run performance (MASRP) for stock 'x' after day 'd' is calculated as follows:

$$MASRP_{x,d} = 100 \times \left\{ \frac{(1+R_{x,d})}{(1+R_{m,d})} - 1 \right\} \quad (4)$$

Where $MASRP_{x,d}$ is the market-adjusted short-run performance for stock 'x' after day 'd'. $R_{x,d}$ is the return on stock 'x' at the end of the d th trading day. $R_{m,d}$ is the market return at the close of day 'd'.

The market-adjusted model measures the initial trading returns in excess of the market return. This measurement, which is used by Van Heerden and Alagidede (2012), was also used in other earlier studies on the short-run performance of IPOs by economists such as Aggarwal et al. (1993) on Latin American IPOs and by Sadaqat et al. (2011) on IPOs in Pakistan.

The sample mean market-adjusted short-run performance for the d th trading day is calculated as follows:

$$\overline{MASRP}_{x,d} = \frac{1}{n} \sum_{i=1}^n MASRP_{x,d} \quad (5)$$

Where $\overline{MASRP}_{x,d}$ is the sample mean market-adjusted short-run performance for the d th trading day. n is the number of IPOs in the sample. $MASRP_{x,d}$ is the market-adjusted short-run performance for stock 'x' after day 'd'.

Given these calculations, the following hypothesis was tested:

H0. The mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) is negative or equal to zero.

H1. The mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) is greater than zero.

A mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) that is negative or zero indicates that the share was not underpriced and that the stock performed in a manner that is aligned with the market as a whole. A positive mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) indicates that the issue was underpriced as the share outperformed the market.

To test the hypothesis that $\overline{MASRP}_{x,d}$ equals zero, the following t-statistic is calculated:

$$t = \frac{\overline{MASRP}_{x,d}}{\frac{s}{\sqrt{n}}} \quad (6)$$

Where $\overline{MASRP}_{x,d}$ is the sample mean market-adjusted short-run performance for the d th trading day. 's' is the standard deviation of $MASRP_{x,d}$ for 'n' number of IPOs.

Additionally, the performance measurement for a group of IPOs is assessed by the following wealth relative model:

$$WR_d = \frac{1 + \left(\frac{1}{n}\right) \sum_{x=1}^n R_{x,d}}{1 + \left(\frac{1}{n}\right) \sum_{m=1}^n R_{m,d}} \quad (7)$$

Where WR_d is the wealth relative for the d th trading day and 'n' is the total number of IPOs in the sample. $R_{x,d}$ is the return on stock 'x' at the end of the d th trading day. $R_{m,d}$ is the market return at the close of day 'd'.

A wealth relative of greater than 1.00 can be interpreted as IPOs outperforming the market in that period. A wealth relative of less than 1.00 indicates that IPOs underperformed the market (Ritter, 1991, Van Heerden and Alagidede, 2012).

3.4.2. Measuring the long-term share price performance:

Prior research such as Loughran et al. (1994) and Gompers and Lerner (2003) argue that the magnitude of long-term share price underperformance is highly sensitive to the method used to measure it. The main issue is that there are several different benchmarks that can be chosen such as CAPM, multifactor models such as Fama-French 3-factor regressions or benchmarking against the market and matching industries and firms. According to Ritter and Welch (2002), there is no definitive method and therefore the method used by Chipeta and Jardine (2014), which is based on the method used by Ritter (1991), was followed.

Consequently, the long-run performance is examined using monthly Cumulative Average Abnormal Returns (CAARs), Return on Total Assets (ROA), and Return on Book Value of Equity (ROE). In terms of calculating CAARs, the convention as per Ritter (1991) and Chipeta and Jardine (2014) was followed, where the aftermarket period is defined to be the three years after the IPO, exclusive of the initial return period. The initial return period is defined to lie in month zero, and the aftermarket period includes the following 36 months, with months being measured in calendar, rather than event time. The use of calendar time instead of event time when measuring returns is more suitable for the purposes of statistical tests and is more consistent with a trading strategy (Bjerring et al., 1983). Additionally, Franks et al. (1991) argue that the use of calendar time is more appropriate than event time because serial correlation can be induced when portfolios are formed in event time.

Monthly benchmark-adjusted returns are calculated as the monthly raw return on a share minus the monthly benchmark return for the corresponding monthly period. For each issuing firm's share, the following benchmarks are used:

- The Capped All Share Index (J303).
- The Shareholder-Weighted All Share Index (J403).
- Equally weighted Top 40 index (J2EQ).

The use of market-based benchmarking over a CAPM-based benchmarking avoids the problems highlighted by Van Rensburg and Robertson (2003) regarding beta and how it is an inappropriate risk factor in describing the expected returns to JSE-traded shares. Similarly, Ritter and Welch (2002) also indicated using Fama-French factors to be equilibrium risk factors also poses potential problems which are avoided using market-based benchmarking.

CAARs were calculated using the following procedures:

The raw return for share i in event month t is calculated as:

$$r_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad (8)$$

where $r_{i,t}$ is the return for share ' i ' in event month t . $P_{i,t}$ is the price of share ' i ' at the end of event month t . $P_{i,t-1}$ is the price of share ' i ' at the end of event month $t - 1$.

The return for benchmark m in event month t is calculated as:

$$r_{m,t} = \frac{P_{m,t} - P_{m,t-1}}{P_{m,t-1}} \quad (9)$$

where $r_{m,t}$ is the return for benchmark m in event month t . $P_{m,t}$ is the price of benchmark m at the end of event month t . $P_{m,t-1}$ is the price of benchmark m at the end of event month $t - 1$.

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

$$ar_{i,t} = r_{i,t} - r_{m,t} \quad (10)$$

Where $ar_{i,t}$ is the benchmark-adjusted abnormal return for share i in event month t . $r_{i,t}$ is the return for share i in event month t . $r_{m,t}$ is the return for benchmark m in event month t

The average benchmark-adjusted share price returns for calendar month t in a sample of n shares are calculated as:

$$AR_t = \frac{1}{n} \sum_{i=1}^n ar_{i,t} \quad (11)$$

Where AR_t is the average benchmark-adjusted share price returns for all the shares in the sample for calendar month t . $ar_{i,t}$ is the benchmark-adjusted abnormal return for share i in event month t . ' n ' is the number of shares in the sample.

Cumulative average benchmark-adjusted share price returns (CAARs) from calendar month q to calendar month s are calculated as:

$$CAAR_{q,s} = \sum_{t=q}^s AR_t \quad (12)$$

Where AR_t is average benchmark-adjusted share price returns for calendar month t . An aftermarket period of 36 months were used, and therefore $(q, s) = (1, 36)$. Therefore, the event study windows were each month for the first 36 months post-IPO for research question 2. Equally-weighted CAARs were used in line with Ritter (1991) and Chipeta and Jardine (2014).

Given these calculations, the following hypothesis was tested:

H0. The post-IPO CAAR is equal to zero.

H1. The post-IPO CAAR is different from zero.

Statistically significant and positive CAARs imply IPO long-run outperformance relative to the respective benchmark. Statistically significant and negative CAARs imply IPO long-run underperformance relative to the respective benchmark. Essentially, a finding of statistically insignificant CAARs would imply that IPO shares did not perform significantly differently compared to the relevant benchmark.

A test of normality was performed to determine whether the data was parametric or non-parametric as this would impact the statistical test chosen. Due to the results of the test of normality illustrating the data was non-parametric, a one-sample Wilcoxon signed-rank test was performed to determine the statistical significance of the CAARs relative to zero as per Chipeta and Jardine (2014).

3.4.3. Investigating the determinants of long-term IPO performance:

To investigate the determinants of long-term IPO performance, the following panel regression was used as per Chipeta and Jardine (2014):

$$R_{i,t} = VOL_t + SIZE_{i,t} + APPLIST_{i,t} + AGE_{i,t} + REVF_{i,t} + LISTCOST_{i,t} + BS_{i,t} + DOM_i + INVBANK_i + AUDITQ_i + CONT_i + IPO1_t + IPO2_t + IPO3_t + e_i \quad (13)$$

The dependent variable is denoted by $R_{i,t}$ which represents the aftermarket performance of the IPO. Two operating performance measures were used, and

three different share price performance measures were used to capture the share price performance.

The operating performance measures are $ROA_{i,t}$ and $ROE_{i,t}$. $ROA_{i,t}$ is the Return on Total Assets for firm i at time t and is calculated as total comprehensive income attributed to ordinary shareholders divided by total assets. $ROE_{i,t}$ is the Return on Total Equity for firm i at time t and is calculated as total comprehensive income attributed to ordinary shareholders divided by the book value of total equity.

The three share price performance measures that were used are:

- (i) Three-year buy and hold returns,
- (ii) Three-year market-adjusted buy and hold returns using the Capped All Share Index (J303) as the market benchmark,
- (iii) The three-year size-adjusted buy and hold returns, using the Shareholder-weighted All Share Index (J403) as the market benchmark,
- (iv) Three-year Top 40-adjusted buy and hold return, using the Equally weighted Top 40 index (J2EQ) as the market benchmark.

The three-year buy-and-hold return for each share is calculated as follows:

$$BHR_{i,t} = \prod_1^n (1 + r_{i,t}) \quad (14)$$

Where $BHR_{i,t}$ is the annual buy and hold return for share i at time t . $r_{i,t}$ is the return on that share for each month. n is the number of months.

$$BHR_{m,t} = \prod_1^n (1 + r_{m,t}) \quad (15)$$

Where $BHR_{m,t}$ is the corresponding annual benchmark buy-and-hold return at time t . $r_{m,t}$ is the return for benchmark m in event month t . n is the number of months.

The benchmark-adjusted buy-and-hold abnormal return for share i at time t is defined as:

$$BHAR_{i,t} = BHR_{i,t} - BHR_{m,t} \quad (16)$$

Where $BHAR_{i,t}$ is the benchmark-adjusted buy-and-hold abnormal return for share i at time t . $BHR_{i,t}$ is the annual buy and hold return for share i at time t , and $BHR_{m,t}$ is the corresponding annual benchmark buy-and-hold return at time t .

The following independent variables in Table 3 are from the panel regression equation (13) and are measures that explain the aftermarket performance of IPOs as per Chipeta and Jardine (2014):

Table 3:

Independent variables for panel regression equation 13:

Independent variable	Reason for inclusion	Supporting literature	Calculation method
VOL_t	Measures the effect of IPO volume on the aftermarket performance of IPOs.	Ibbotson and Jaffe (1975) Ritter (1984)	The number of IPOs in a given year as a percentage of the total number of IPOs in the sample period.
$SIZE_{i,t}$	Measures the effect of the size (at the time of listing) on the aftermarket performance of the firm	Chipeta and Jardine (2014)	The natural logarithm of total assets for the firm at the time of listing
$APPLIST_{i,t}$	Measures the total number of new shares approved for listing as disclosed in the listing firm's prospectus	Chipeta and Jardine (2014)	The natural logarithm of the total number of new shares approved for listing
$AGE_{i,t}$	Measures the effects of the listing firm's age at the time of listing on aftermarket performance	Ritter (1991)	The number of years the firm has operated prior to listing.
$REVF_{i,t}$	Measures the annual revenue forecast of the firm prior to listing.	Ritter (1991)	The difference between the one-year forecasted revenue and the current revenue disclosed in the prospectus, divided by 100.
$LISTCOST_{i,t}$	Measures the listing cost incurred by the firm as shown in the prospectus as a	Chipeta and Jardine (2014)	Listing cost divided by the market capitalisation of the firm at the listing date.

	percentage of the market capitalisation of the firm at the listing date.		
$BS_{i,t}$	Represents the number of members on the board at the time of listing. Represents a basic proxy of the focus the firm places on corporate governance.	Chipeta and Jardine (2014)	The total number of board members at the time of listing.

The following dummy variables in Table 4 are from the panel regression equation (13) and are included to capture the effects of several factors on the aftermarket performance of the IPOs as per Chipeta and Jardine (2014):

Table 4:

Dummy variables for panel regression equation 13:

Dummy variable	Reason for inclusion	Supporting literature	Calculation method
DOM_i	Represents the domicile of the firm.	Chipeta and Jardine (2014)	A value of one is assigned to a foreign firm listing on to the JSE and zero for firms that are registered in South Africa.
$INVBANK_i$	Captures the effects of the investment bank/bookrunner on the aftermarket performance of the IPO.	Chipeta and Jardine (2014)	A value of one is assigned if an international investment bank is involved. A value of zero is assigned for local investment banks.
$AUDITQ_i$	Represents the quality of the auditing firm.	Chipeta and Jardine (2014)	A value of one is assigned for the BIG 4 (Deloitte, EY, PWC and KPMG) Audit firms and zero, otherwise.
$CONT_i$	Represents the presence of a contingent liability and/or litigation	Chipeta and Jardine (2014)	A value of one if present in the prospectus and zero otherwise.

	statements in the prospectus.		
$IPO1_t$	Dummy variables that capture the effects of the post-issuing years on the performance of the IPOs.	Chipeta and Jardine (2014)	
$IPO2_t$			
$IPO3_t$			

The analysis was carried out using the Fixed or Random Effects regressions. The regressions were run using SPSS. The Hausman (1978) specification test was used to determine if the Fixed Effects or Random Effects regression model is a better fit for the panel data obtained.

3.5. Ethics

The data that is used in this research is publicly available information and therefore only an ethics waiver is required. The data was collected in an ethical manner which ensures that the integrity of the research is upheld. The conclusions made from the data were made in a manner that attempts to minimise the impact of any bias of the researcher by substantiating all conclusions on the analysis of data that is performed.

3.6. Validity, reliability, assumptions and limitations:

The information that was collected to conduct this research comprises publicly available information. Regarding the pre-listing financial performance, the prospectus of each company is considered reliable because the 2 years of financial statements provided in the prospectus are required to be audited as per the JSE listing requirements which enhances the reliability of the information (JSE, 2022). The share price of each company as well as the share price of the relevant indices is considered reliable as they are representative of the market price on an actively traded market. The use of the IRESS Expert financial information to extract the relevant share prices ensured the reliability of the share price information as the IRESS Expert financial information is a leading global platform that is trusted by renowned organisations across the world and is therefore unlikely to make errors.

There are various assumptions that were made to conduct this research. Firstly, it is assumed that the prospectus of each company would be publicly available based

on the listing requirements of the JSE as discussed in section '3.3 Data collection'. This is assumed because all companies which have an IPO on the JSE are required to comply with the listing requirements of the JSE before being listed which requires the company to issue a prospectus which contains 2 years of audited financial statements, and all other information required as per section '3.3 Data collection'.

With regard to the use of a Fixed Effects or Random Effects regression model, it is assumed that all the predictor variables are continuous variables. It is also assumed that the outcome variable is a dependent variable. It is assumed that the outcome variable is related to each predictor variable in an approximately linear way. It is assumed that error terms are normally distributed and are not correlated.

An inherent limitation in this research exists because of the presence of confounding events. This refers to the events whose occurrence can distort or obscure the true relationship between the independent and dependent variables in this research. There are market-wide and industry-specific events which may mask or exaggerate the relationship between the pre-listing firm-level characteristics of the company and the post-listing share price performance. This creates a limitation as the results of this research are not necessarily able to determine whether a causal relationship exists between the variables under review.

Furthermore, this research focus on the 3 years post listing which creates a limitation due to the possibility that the 3 years of share price performance may not be an adequate depiction of the true long-term share price performance of the company. The impact that pre-listing information has on the post-listing share price is likely to diminish as time proceeds which is a limitation of the results which might be obtained from this research. The results of this research were limited regarding its ability to be generalised to all stock exchanges in all countries because of the significant differences between different exchanges in different countries.

Confounding events:

Potential confounding events were identified in the following manner:

The share price return of a firm, both for the period relating to initial underpricing (please see section 3.4.1) and each month over the 3 years post listing, were compared with the J303 market return for that same period. Where the returns of the firm deviate significantly from returns of the J303 market index, that is indicative of a potential confounding event. The cause of this significant deviation compared

to the market was investigated to determine the underlying cause of the potential confounding event.

Where a confounding event was found to have occurred, that specific data point was excluded, and the industry index return for that event window only was used instead of the original data point.

4. Results

The data used for this study includes 36 IPOs on the JSE during the period from 2011 to 2021. The full population of IPOs on the JSE from 2011 to 2021, as explained in section 3.2 Population, was used as the sample in this study. There were no instances where a company's pre-listing prospectus was unavailable nor were there instances where the pre-listing did not contain the required information.

The JSE provided data on the IPOs listed from 2011 to 2021 which was used to ensure the population for this study was complete. The monthly share prices of the listing company as well as the relevant benchmark index returns were obtained from the IRESS Expert financial information tool.

The population for this study only includes companies that raised new capital through the issuing of new shares upon listing. Therefore, share introductions without the company issuing new shares and any Special Purpose Acquisition Company (SPAC) was excluded from the population. Please see section 3.2 for more detail in this regard.

The sample period is restricted to 2021 because three years of post-IPO share price returns and profitability measures are required in order to analyse the long-run IPO performance. In order to mitigate a possible survivorship bias, the sample specifically includes firms that delisted within the three-year period post-listing. Firms that listed on the JSE AltX are not included because these shares are not as liquid as the shares listed on the main board of the JSE.

4.1. Initial underpricing – research question 1

This section provides an in-depth analysis of the results of the mean-market-adjusted short-run returns and wealth relatives for IPOs on the JSE during the period from 2011 to 2021. This analysis attempts to answer research question 1:

1) Are IPOs on the JSE initially underpriced?

The mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) was analysed and the following hypothesis was tested:

H0. The mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) is equal to zero.

H1. The mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) is greater than zero.

To test the hypothesis that $\overline{MASRP}_{x,d}$ equals zero, a one-sample t-test was performed, and the t-statistic is calculated as follows:

$$t = \frac{\overline{MASRP}_{x,d}}{\frac{s}{\sqrt{n}}} \quad (6)$$

Where $\overline{MASRP}_{x,d}$ is the sample mean market-adjusted short-run performance for the d th trading day. 's' is the standard deviation of $MASRP_{x,d}$ for 'n' number of IPOs.

This t-statistic is used to determine the statistical significance of the mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) findings.

Additionally, the performance measurement for a group of IPOs is assessed by the following wealth relative model:

$$WR_d = \frac{1 + \left(\frac{1}{n}\right) \sum_{x=1}^n R_{x,d}}{1 + \left(\frac{1}{n}\right) \sum_{m=1}^n R_{m,d}} \quad (7)$$

Where WR_d is the wealth relative for the d th trading day and 'n' is the total number of IPOs in the sample. $R_{x,d}$ is the return on stock 'x' at the end of the d th trading day. $R_{m,d}$ is the market return at the close of day 'd'.

A wealth relative of greater than 1.00 can be interpreted as IPOs outperforming the market in that period. A wealth relative of less than 1.00 indicates that IPOs underperformed the market (Ritter, 1991, Van Heerden and Alagidede, 2012).

Due to the possibility that market irregularities on the IPOs first trading day might distort results, various days post-listing are used to more comprehensively examine if IPOs are underpriced. This analysis used trading days 1, 5, 10, 15 and 20 post-listing as per Sadaqat et al. (2011) and Van Heerden and Alagidede (2012) to obtain a broader perspective of initial underpricing.

To provide a wide perspective of the initial underpricing phenomenon for this population of IPOs, this analysis also includes an analysis of each of the following aspects relating to the IPOs in the population:

- Industry sector

- Offer price
- Volume of new shares issued

Upon the performance of a confounding event analysis, 5 event windows were flagged for further investigation due to large daily differences in market-adjusted return. Of these 5 potential confounding, it was found that 4 of them were due to large underpricing and not a confounding event. Therefore, these data points were not excluded as these would not classify as confounding events. Upon investigation of the final flagged event window, it was found that due to a malfunction of the JSE system, fictitious trades were made causing the share price to drop dramatically. To deal with this confounding event, the specific data point was removed from the data and replaced with the return relative to the Financial Index (J580).

4.1.1.Short-run raw return analysis

The results for the short-run raw returns and market-adjusted returns are shown in Table 5.1. Three different benchmarks were used to conduct the market-adjusted returns analysis. The following benchmarks were used:

- The Capped All Share Index (J303).
- The Shareholder-Weighted All Share Index (J403).
- Equally weighted Top 40 index (J2EQ).

Please see section 3.4.1 for more details regarding the use of these market benchmarks.

Table 5:

Descriptive statistics of raw return:

<i>IPOs on the JSE from 2011-2021</i>	Raw return day 1	Raw return day 5	Raw return day 10	Raw return day 15	Raw return day 20
Average	7.494%	7.259%	6.696%	7.109%	7.014%
Median	3.739%	5.048%	5.467%	3.979%	3.729%
Maximum	82.143%	65.595%	72.857%	95.476%	87.500%
Minimum	-22.588%	-30.588%	-25.882%	-17.553%	-21.739%
Range	104.731%	96.183%	98.739%	113.029%	109.239%
Standard deviation	15.643%	13.583%	14.794%	18.046%	17.757%

Raw short-run returns confounding event analysis:

<i>IPOs on the JSE from 2011-2021 [excluding 2020]</i>	Raw return day 1	Raw return day 5	Raw return day 10	Raw return day 15	Raw return day 20
Average	7.799%	7.856%	7.136%	7.148%	6.875%

The averages in the confounding events analysis in the table above were calculated by excluding the two IPOs that occurred in 2020 because the COVID-19 pandemic was identified as a potential confounding event. Therefore, the short-run returns in the confounding events analysis table above depicts the average population short-run return for the period from 2011 to 2021 when the two IPOs in 2020 are excluded from the results. The purpose of this is to demonstrate that the results for the full population as per Table 5 above (when the two IPOs in 2020 are included in the analysis) does not significantly differ from the results for the population if the two IPOs in 2020 are excluded as per the confounding events analysis table above. This therefore demonstrates that the COVID-19 pandemic did not have a significant impact on the average short-run raw returns for this study as a whole. Additionally, the one IPO in 2021 was not excluded for the purposes of the confound events analysis above because it was determined that the more significant impacts of the COVID-19 on share price performance were not as prevalent in 2021 as they were in 2020 at the height of the COVID-19 pandemic. These same factors apply for the confounding event analysis done relative to the respective market benchmarks below Tables 6, 7 and 8 respectively.

As evident in Table 5 above, the average raw return of IPOs on the JSE from 2011 to 2021 for the first trading day was 7.494%, ranging from a minimum of -22.588% to a maximum of 82.143% with a standard deviation of 15.643%. This illustrates that IPOs on the JSE from 2011 to 2021 were, on average, underpriced relative to their offer price.

The average market-adjusted return of 108.3% on the 1st trading day that is reported in Van Heerden and Alagidede (2012) significantly differs from the average market-adjusted return of 7.494% (relative to the J303 market benchmark) on the 1st trading day that is reported in this study.

In contrast, in more recent research, Killins (2019) found that Canadian IPOs between 2010 to 2017 experienced an average first-day return of 1.45% which shows that Canadian IPOs during that period of study did not experience the same level of underpricing as what is found in this study on South African IPOs. This might suggest that there is a higher degree of underpricing in developed economies than developing economies.

It is also evident in Table 5 that IPOs are still underpriced after 5, 10, 15 and 20 trading days respectively. This indicates that underpricing is not only a phenomenon which occurs on the first day of trading post-IPO. The highest average raw return is on the first trading day post-IPO.

The median raw return for all 5 of the trading days examined in Table 5, indicates that the data is positively skewed. This means that there are a small number of IPOs in the sample which experienced a high extent of underpricing and have disproportionately raised the average. The highest median raw return occurs after trading day 5 which differs from when the highest average raw return is, namely on the first trading day post-IPO.

Table 5 shows large standard deviations for each of the trading days which demonstrates that there is high variability in the raw return experienced by IPOs. This variability amongst IPOs is further demonstrated by the large range reported in Table 5 which demonstrates that not all IPOs are underpriced and that there is a wide spectrum when it comes to the extent of underpricing.

4.1.2. Short-run mean market-adjusted returns analysis

The mean market-adjusted short-run performance ($\overline{MASRP}_{x,d}$) relative to 3 different market indices have been tabulated in Tables 6, 7 and 8 below. The use of three different market indices is used to ensure that the findings provide a more comprehensive analysis of market-adjusted performance. Each market index emphasises slightly different aspects of the market and therefore using all three ensures that the analysis considers these variations. Furthermore, using various market indices provides additional robustness as if results are consistent across all three indices, the findings are more robust.

Table 6:

Descriptive statistics of Capped All Share Index (J303) market-adjusted return:

<i>IPOs on the JSE from 2011-2021</i>	J303 market-adjusted return day 1	J303 market-adjusted return day 5	J303 market-adjusted return day 10	J303 market-adjusted return day 15	J303 market-adjusted return day 20
Average	7.870%	7.420%	6.679%	6.868%	6.754%
Median	3.969%	5.642%	4.595%	4.725%	3.510%
Maximum	82.157%	66.174%	70.598%	91.826%	89.299%
Minimum	-15.559%	-23.593%	-23.040%	-17.534%	-19.961%
Range	97.715%	89.767%	93.638%	109.360%	109.260%
Standard deviation	15.522%	13.382%	14.533%	17.228%	17.541%

J303 market-adjusted returns confounding event analysis:

<i>IPOs on the JSE from 2011-2021 [Excluding 2020]</i>	J303 market- adjusted return day 1	J303 market- adjusted return day 5	J303 market- adjusted return day 10	J303 market- adjusted return day 15	J303 market- adjusted return day 20
Average	8.050%	7.788%	7.035%	7.148%	7.121%

Table 7:

Descriptive statistics of Shareholder-Weighted All Share Index (J403) market-adjusted return:

<i>IPOs on the JSE from 2011-2021</i>	J403 market- adjusted return day 1	J403 market- adjusted return day 5	J403 market- adjusted return day 10	J403 market- adjusted return day 15	J403 market- adjusted return day 20
Average	7.806%	7.321%	6.560%	6.856%	6.582%
Median	4.037%	5.606%	4.666%	4.791%	4.188%
Maximum	82.486%	65.100%	69.700%	91.421%	87.923%
Minimum	-15.120%	-21.632%	-21.009%	-15.241%	-17.188%
Range	97.606%	86.732%	90.709%	106.662%	105.111%
Standard deviation	15.544%	13.104%	14.308%	17.184%	17.256%

J403 market-adjusted returns confounding event analysis:

<i>IPOs on the JSE from 2011-2021 [Excluding 2020]</i>	J403 market- adjusted return day 1	J403 market- adjusted return day 5	J403 market- adjusted return day 10	J403 market- adjusted return day 15	J403 market- adjusted return day 20
Average	7.968%	7.635%	6.845%	6.967%	6.826%

Table 8:

Descriptive statistics of Equally Weighted Top 40 index (J2EQ) market-adjusted return:

<i>IPOs on the JSE from 2011-2021</i>	J2EQ market- adjusted return day 1	J2EQ market- adjusted return day 5	J2EQ market- adjusted return day 10	J2EQ market- adjusted return day 15	J2EQ market- adjusted return day 20
Average	7.850%	7.561%	7.002%	7.338%	7.327%
Median	4.048%	5.939%	4.324%	4.630%	4.010%
Maximum	82.708%	65.662%	69.976%	91.680%	91.112%

Minimum	-15.605%	-21.037%	-19.765%	-13.770%	-19.845%
Range	98.314%	86.699%	89.741%	105.450%	110.957%
Standard deviation	15.625%	13.153%	14.219%	17.007%	17.656%

J2EQ market-adjusted returns confounding event analysis:

<i>IPOs on the JSE from 2011-2021 [Excluding 2020]</i>	J2EQ market- adjusted return day 1	J2EQ market- adjusted return day 5	J2EQ market- adjusted return day 10	J2EQ market- adjusted return day 15	J2EQ market- adjusted return day 20
Average	8.000%	7.864%	7.297%	7.471%	7.637%

The average market-adjusted return for the first trading day was 7.870% relative to the Capped All Share Index (J303), 7.806% relative to the Shareholder-Weighted All Share Index (J403), and 7.850% relative to the Equally Weighted Top 40 index (J2EQ). This illustrates that IPOs on the JSE from 2011 to 2021 outperformed the market in the short-term regardless of the market index used.

The outperformance of the IPOs relative to the market was largely caused by the initial underpricing of the IPO's offer price as demonstrated by short-term raw returns in Table 5 being similar to the market-adjusted return in Tables 6, 7 and 8 respectively. This illustrates that the positive raw return that IPOs experience in the short term is not caused by unusually good market conditions on any of the trading days that were analysed but is caused by the underpricing of the offer price prior to listing. This is similar to the findings of Van Heerden and Alagidede (2012) which also illustrated that the initial positive performance by the issuing firm is largely caused by the underpricing of the share issue rather than the performance of the market as a whole. These results demonstrate that market conditions were relatively stable across the trading days analysed, indicating that external market factors are unlikely to be the main cause for the observed positive short-term performance. This further reinforces the notion that underpricing of the offer price was a key factor driving the initial positive performance.

These findings demonstrate an average market-adjusted return on the first trading day that is substantially below the initial market-adjusted return of 14.8% that was documented by IPOs

It is also evident in Tables 6, 7 and 8 that IPOs outperformed the market's performance after 5, 10, 15 and 20 trading days respectively regardless of the market index that is used. This further emphasises that underpricing is not only a phenomenon which occurs on the first day of trading post-IPO but that the IPOs outperformed the market for up to 20 trading days post-listing. The highest average

market-adjusted return is in the first trading day post-IPO regardless of the market index that is used. This mirrors the trend found in Table 5 which demonstrated that the highest average raw return occurred in the first trading day post-IPO.

The median market-adjusted return for trading days 5, 10, 15 and 20 relative to all three market indices used, as per Tables 6, 7 and 8, indicates that the data is positively skewed. This means that there are a small number of IPOs in the sample that experienced a higher extent of underpricing than the rest which disproportionately raised the average.

The highest median market-adjusted return occurs on trading day 5 relative to the J303 and J403 market indices, but on trading day 15 relative to the J2EQ index. This shows that the highest median market-adjusted return differs in terms of the trading day from the highest average market-adjusted return.

The standard deviations for trading days 1, 5, 10, 15 and 20 that are reported in Tables 6, 7 and 8 each demonstrate that there is high variability in the market-adjusted return of IPOs, regardless of the market benchmark used. This variability amongst IPOs is further demonstrated by the large range reported in Tables 6, 7 and 8 respectively which demonstrates that not all IPOs are underpriced and that there is a wide spectrum when it comes to the extent of underpricing.

These market-adjusted returns reported in Tables 6, 7 and 8 indicate that the IPOs were able to outperform the market regardless of which market index was used. Additionally, these market-adjusted returns suggest that the positive share price performance of the IPOs in the short-term post-listing was not due to the market being irregular on that trading day, but rather due to the IPO being underpriced.

The 2015 MASRP were classified as outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box lengths. The outliers have been kept in the analysis as they do not drastically impact the results and a discussion regarding some of the factors that may have contributed to the significant underpricing in 2015 is discussed further in section 5.1.

Market-adjusted returns relative to all three indices were not normally distributed, as assessed by the Shapiro-Wilk's test ($p < .05$) and visual inspection of a Normal Q-Q plot. Despite this, the analysis continued to use the one-sample t-test as it is fairly robust to violations of normality (McDougall and Rayner, 2004). The results are shown in Table 9 and Table 10 below:

Confounding event analysis:

The analysis of confounding events was done by comparing the return of the JSE as a whole on each trading day versus the raw return of each individual IPO in the population. This was done for all 20 trading days post-IPO for all of the IPOs in the population. This analysis resulted in the identification of 5 instances of potential confounding events. These potential confounding events were determined to be any instances where the market-adjusted return on a single trading day was greater than 15%.

Of the five instances identified as potential confounding events, further investigation into each of them revealed that all four of these instances were caused by significant underpricing of the share offer. This indicates that their high market-adjusted returns were not due to a confounding event but rather due to high levels of underpricing. This was confirmed by the share price performance of these four IPOs performing consistently over the subsequent 20 trading days.

Further investigation into the remaining instance of a potential confounding found that there was a JSE system error which executed false trades causing the share price of the company in question to drop considerably in the day identified as a potential confounding event. The researcher deems this as a confounding event. The false trades were subsequently cancelled in the following trading day however the false trades still reflected in the closing share price on the day of the confounding event. In order to control for this confounding event, the industry return for the day of the confounding event was captured instead of the company's return in order to ensure that the confounding event did not unduly influence the results of the research.

Another potential confounding event that was identified during data collection and analysis was the COVID-19 pandemic and related country-wide lockdowns that occurred in 2020. In order to determine if this was a confounding event, the short-run raw and market-adjusted returns were determined excluding the two IPOs which occurred in 2020.

The results of the confounding event analysis are shown below Tables 5, 6, 7 and 8 respectively. These results illustrate that the average raw and market-adjusted returns for all IPOs on the JSE between 2011 and 2021 (excluding the two IPOs in 2020) are not substantially different from the average raw and market-adjusted returns for the whole population. There was not a significant change in the overall average when the short-run raw and market-adjusted returns were compared with

and without the IPOs in 2020. Therefore, the researcher concludes that the COVID-19 pandemic and related country-wide lockdowns that occurred in 2020 are not a confounding event that materially changed the results of this research.

Table 9:
Short-run IPO performance:

Year of listing	Trading days post-listing	Average raw return (%)	Market return (%)			Average market-adjusted return (%)		
			Market return for J303 index (%)	Market return for J403 index (%)	Market return for J2EQ index (%)	Average market-adjusted return for J303 index (%)	Average market-adjusted return for J403 index (%)	Average market-adjusted return for J2EQ index (%)
2011	1st	-1.840%	-1.287%	-1.385%	-1.188%	-0.561%	-0.462%	-0.660%
	5th	1.711%	-0.904%	-1.070%	-0.942%	2.639%	2.811%	2.678%
	10th	-0.549%	-3.334%	-2.995%	-3.370%	2.882%	2.522%	2.919%
	15th	-2.486%	-9.230%	-8.325%	-8.460%	7.429%	6.369%	6.526%
	20th	-1.518%	-6.526%	-5.989%	-5.411%	5.358%	4.757%	4.116%
2012	1st	5.248%	0.600%	0.706%	0.631%	4.633%	4.521%	4.598%
	5th	4.934%	0.828%	1.192%	1.216%	4.089%	3.708%	3.683%
	10th	2.232%	1.732%	2.107%	2.150%	0.542%	0.159%	0.119%
	15th	2.055%	1.425%	1.594%	1.332%	0.590%	0.440%	0.682%
	20th	3.130%	1.635%	1.659%	1.213%	1.470%	1.451%	1.889%
2013	1st	6.954%	-1.141%	-1.178%	-1.189%	8.179%	8.222%	8.230%
	5th	6.426%	0.477%	0.473%	0.419%	5.937%	5.936%	5.964%
	10th	6.565%	2.011%	1.746%	1.397%	4.408%	4.689%	5.024%
	15th	5.505%	1.432%	1.299%	0.775%	3.932%	4.076%	4.613%
	20th	5.005%	2.944%	2.538%	2.132%	1.940%	2.357%	2.753%
2014	1st	5.110%	-0.473%	-0.418%	-0.333%	5.602%	5.544%	5.452%
	5th	6.250%	-0.785%	-0.777%	-0.936%	7.065%	7.057%	7.230%
	10th	5.728%	-1.204%	-1.071%	-1.397%	7.009%	6.856%	7.235%
	15th	5.046%	-0.031%	0.289%	0.000%	5.090%	4.744%	5.057%
	20th	5.584%	0.426%	1.080%	0.624%	5.184%	4.504%	4.996%
2015	1st	17.545%	-0.042%	0.130%	0.113%	17.611%	17.439%	17.480%
	5th	15.744%	0.454%	0.894%	0.965%	15.318%	14.806%	14.781%
	10th	15.790%	0.100%	0.713%	0.584%	15.582%	14.899%	15.031%
	15th	18.399%	-0.317%	0.017%	-0.103%	18.501%	18.126%	18.234%
	20th	17.403%	-0.904%	-0.680%	-1.169%	18.261%	17.956%	18.629%

2016	1st	4.119%	-0.140%	-0.045%	-0.261%	4.262%	4.151%	4.390%
	5th	2.696%	-0.283%	-0.172%	-0.248%	2.993%	2.909%	3.007%
	10th	1.889%	-1.040%	-0.987%	-1.330%	2.989%	2.968%	3.309%
	15th	4.731%	-0.079%	-0.538%	-1.063%	4.814%	5.317%	5.823%
	20th	5.562%	-0.756%	-1.058%	-2.320%	6.422%	6.736%	8.052%
2017	1st	3.385%	0.318%	0.364%	0.260%	3.063%	3.015%	3.119%
	5th	4.753%	0.306%	0.363%	0.064%	4.474%	4.417%	4.716%
	10th	3.642%	1.115%	1.034%	0.243%	2.508%	2.608%	3.423%
	15th	4.473%	1.686%	1.702%	0.591%	2.694%	2.677%	3.813%
	20th	2.306%	2.186%	2.640%	0.976%	4.094%	3.692%	4.916%
2018	1st	8.528%	-0.430%	-0.350%	-0.427%	9.082%	9.000%	9.066%
	5th	8.022%	0.637%	0.667%	-0.611%	7.322%	7.257%	8.665%
	10th	7.118%	-0.382%	-0.130%	-1.641%	7.539%	7.215%	8.862%
	15th	1.208%	-2.934%	-2.713%	-4.021%	4.149%	3.862%	5.271%
	20th	2.949%	-0.527%	0.016%	-2.611%	3.471%	2.857%	5.560%
2020	1st	2.317%	-3.342%	-3.603%	-3.734%	4.805%	5.053%	5.299%
	5th	-2.895%	-5.014%	-6.033%	-6.469%	1.152%	1.984%	2.411%
	10th	-0.784%	-1.847%	-3.131%	-3.574%	0.637%	1.710%	1.981%
	15th	6.456%	3.563%	0.743%	0.447%	2.114%	4.974%	5.075%
	20th	9.371%	9.461%	7.111%	8.103%	0.509%	2.428%	2.056%
2011-2021	1st	7.251%	-0.395%	-0.341%	-0.375%	7.494%	7.569%	7.614%
	5th	6.954%	-0.182%	-0.107%	-0.310%	7.094%	6.993%	7.217%
	10th	6.380%	-0.008%	0.090%	-0.352%	6.357%	6.230%	6.689%
	15th	6.822%	0.176%	0.163%	-0.349%	6.552%	6.551%	7.066%
	20th	6.824%	0.957%	1.080%	0.293%	6.543%	6.380%	7.179%

NB: There were no IPOs on the JSE in 2019 and 2021 that were within the parameters of this study.

Table 10:
t-Statistics and wealth relatives for short-run IPO performance:

Year of listing	Trading days post-listing	t-Statistic			Wealth relative		
		t-Statistic for J303 index	t-Statistic for J403 index	t-Statistic for J2EQ index	Wealth relative for J303 index	Wealth relative for J403 index	Wealth relative for J2EQ index
2011	1 st	-0.0056	-0.0046	-0.0066	0.9944	0.9954	0.9934
	5 th	0.0264	0.0281	0.0268	1.0264	1.0281	1.0268
	10 th	0.0288	0.0252	0.0292	1.0288	1.0252	1.0292
	15 th	0.0743	0.0637	0.0653	1.0743	1.0637	1.0653
	20 th	0.0536	0.0476	0.0412	1.0536	1.0476	1.0412
2012	1 st	1.5260	1.5022	1.5349	1.0462	1.0451	1.0459
	5 th	0.9892	0.9174	0.9149	1.0407	1.0370	1.0367
	10 th	0.1398	0.0423	0.0319	1.0049	1.0012	1.0008
	15 th	0.1959	0.1331	0.2287	1.0062	1.0045	1.0071
	20 th	0.9272	0.8300	1.3263	1.0147	1.0145	1.0189
2013	1 st	2.4126*	2.4000*	2.4502*	1.0819	1.0823	1.0824
	5 th	1.4046	1.4165	1.5065	1.0592	1.0592	1.0598
	10 th	1.4760	1.5092	1.8835	1.0446	1.0474	1.0510
	15 th	1.8603	1.7322	2.3468	1.0401	1.0415	1.0469
	20 th	1.0123	1.0309	1.5634	1.0200	1.0241	1.0281
2014	1 st	2.1630*	2.1398*	2.1108*	1.0561	1.0555	1.0546
	5 th	3.5847****	3.5939****	3.6967****	1.0709	1.0708	1.0725
	10 th	2.4989**	2.4890**	2.4974**	1.0702	1.0687	1.0723
	15 th	1.9776*	1.8810	1.9672*	1.0508	1.0474	1.0505
	20 th	1.9301*	1.6827	1.8012	1.0514	1.0446	1.0493
2015	1 st	1.5455	1.5223	1.5198	1.1759	1.1739	1.1741
	5 th	1.7058	1.6650	1.6397	1.1522	1.1472	1.1464
	10 th	1.5962	1.5305	1.5475	1.1567	1.1497	1.1512
	15 th	1.4609	1.4316	1.4434	1.1878	1.1838	1.1852
	20 th	1.4299	1.4249	1.4447	1.1847	1.1821	1.1879

2016	1 st	0.7123	0.7083	0.7311	1.0426	1.0417	1.0439
	5 th	0.6117	0.5556	0.5582	1.0299	1.0287	1.0295
	10 th	0.5127	0.4852	0.5471	1.0296	1.0290	1.0326
	15 th	0.6393	0.6891	0.7841	1.0481	1.0530	1.0586
	20 th	0.8331	0.8814	1.1002	1.0637	1.0669	1.0807
2017	1 st	1.4893	1.4697	1.5325	1.0306	1.0301	1.0312
	5 th	1.6347	1.6229	1.7746	1.0443	1.0437	1.0469
	10 th	0.8216	0.8252	1.0700	1.0250	1.0258	1.0339
	15 th	0.8128	0.8113	1.1253	1.0274	1.0272	1.0386
	20 th	1.0199	0.9365	1.2224	1.0012	0.9967	1.0132
2018	1 st	1.2611	1.2429	1.2812	1.0900	1.0891	1.0899
	5 th	1.2490	1.3111	1.4737	1.0734	1.0731	1.0869
	10 th	0.9660	0.9739	1.1923	1.0753	1.0726	1.0891
	15 th	0.4300	0.4164	0.5632	1.0427	1.0403	1.0545
	20 th	0.3592	0.3071	0.6153	1.0349	1.0293	1.0571
2020	1 st	0.2359	0.2505	0.2535	1.0585	1.0614	1.0628
	5 th	0.0465	0.0840	0.1028	1.0223	1.0334	1.0382
	10 th	0.0269	0.0753	0.0911	1.0108	1.0242	1.0289
	15 th	0.1076	0.2461	0.2693	1.0279	1.0567	1.0598
	20 th	0.0249	0.1238	0.0939	0.9992	1.0211	1.0117
2011-2021	1 st	3.0168****	2.9910****	2.9931****	1.0768	1.0762	1.0766
	5 th	3.2343****	3.2535****	3.3414****	1.0715	1.0707	1.0729
	10 th	2.6733***	2.6596***	2.8756****	1.0639	1.0628	1.0676
	15 th	2.3313**	2.3376**	2.5506***	1.0663	1.0665	1.0720
	20 th	2.2948**	2.2749**	2.5048***	1.0581	1.0568	1.0651

NB: There were no IPOs on the JSE in 2019 and 2021 that were within the parameters of this study

Guide for statistical significance of t-Statistic:
Significant at the 1% significance level = ****
Significant at the 2% significance level = ***
Significant at the 5% significance level = **
Significant at the 10% significance level = *

For the 11-year period from 2011 to 2021, all the results of the market-adjusted returns for each trading day examined and regarding all three market indices used in this study are statistically significant at the 5% level or below. As illustrated by Table 10 and the respective colour guide provided below the aforementioned table the statistical significance of the results is interpreted as follows:

- The market-adjusted returns for the 1st trading day, regardless of which market index is used, are statistically significant at the 1% level.
- The market-adjusted returns for the 5th trading day are statistically significant at the 1% level for all three market indices used.
- The market-adjusted returns for the 10th trading day are statistically significant at the 1% level for all three market indices used.
- The market-adjusted returns for the 15th trading day are statistically significant at the 5% level for the J303 and J403 market-adjusted returns respectively. The market-adjusted returns for the 15th trading day are statistically significant at the 2% level for the J2EQ market-adjusted return.
- The market-adjusted returns for the 20th trading day are statistically significant at the 5% level for the J303 and J403 market-adjusted returns respectively. The market-adjusted returns for the 20th trading day are statistically significant at the 2% level for the J2EQ market-adjusted return.

These findings suggest that the market-adjusted short-run returns of IPOs on the JSE from 2011 to 2021 demonstrate statistically significant returns however the degree of significance varies across time and across the different indices used.

The results indicate that IPOs outperformed the market over the short-term post-listing and achieved market-adjusted positive returns that are not likely due to chance but are likely due to the underpricing of the IPO. The significance levels generally decrease over time, suggesting that the market-adjusted returns are most pronounced in the very short-term (e.g., 1st and 5th trading day) and taper off as time elapses post-listing. The results confirm the typical IPO phenomenon of short-term returns outperforming the market, particularly on the 1st and 5th day of trading post-listing. This differs from the results found by Agathee et al. (2012), which reported findings on Mauritian IPOs, as well as Van Heerden and Alagidede (2012), which both found that the 15th trading day had the highest return.

It does appear that the choice of market index has a slight influence on the statistical significance of the findings, with the results adjusted for the Equally Weighted Top 40 index (J2EQ) generally showing stronger significance levels compared to the have stronger significance than the Capped All Share Index (J303) and the Shareholder-Weighted All Share Index (J403). This might indicate that

smaller companies outperform in the short-run compared to the large-cap dominated J2EQ index which reflects the performance of the Top 40 companies by market capitalisation on the JSE.

Based on the results of the t-statistics discussed above, the null hypothesis can be rejected, providing evidence that the mean market-adjusted short-run returns ($\overline{MASRP}_{x,d}$) are greater than zero.

When taking a more specific look at the results on a year-on-year basis, there are various interesting results to point out as per Table 9 and Table 10 below.

In each of the years under study; other than 2011, 2014 and 2017; the average market-adjusted returns were highest on the 1st trading day post-IPO. It must be pointed out that there was only 1 IPO in 2011 that fell within the parameters of this study and therefore the results from 2011 alone are not necessarily generalisable to the broader market or IPO trends.

Interestingly, as can be seen in Table 9, the extent of underpricing, as demonstrated by positive mean market-adjusted returns, that is evident is largely consistent across each year with only slight variations in market-adjusted returns from year to year. This is in contrast to Van Heerden and Alagidede (2012) which found that the average market-adjusted returns differed significantly between each year studied.

The average raw return as well as the market-adjusted returns in 2015 were significantly higher than in any other year that was studied. Potential reasons for the unusual performance of IPOs in 2015 is provided in section 5.1.

In years in which the market return is negative or relatively flat over the first 20 trading days (such as 2011, 2014, 2015 and 2016), the highest average market-adjusted return occurred on the 10th, 15th or 20th trading day post-IPO. In contrast to this, years in which the market return is positive over the first 20 trading days (such as 2012, 2013 and 2017), the highest average market-adjusted return occurred on the 1st or 5th trading day post-IPO. This suggests that IPOs performed better in the very short term (e.g., 1st and 5th trading days) during periods when the overall market return is positive. Conversely, IPOs performed better in the latter trading days (e.g., 10th, 15th and 20th trading days) during periods when the overall market return was negative. This somewhat align with Van Heerden and Alagidede (2012) however, the relationship between market performance and the trading day that IPOs performed best was not as strong in Van Heerden and Alagidede (2012).

4.1.3. Short-run wealth relative analysis

The results from the wealth relative model, that has been reported in Table 10, correspond with the results discussed from the mean market-adjusted returns. The wealth relative is greater than 1.00 when the mean market-adjusted returns are positive and are less than 1.00 when they are negative as seen on the 1st trading day in 2011.

These wealth relatives demonstrate that the findings found in the market-adjusted returns analysis are consistent even when a different analysis method is utilised.

4.1.4. Sector analysis

The results of the sector-by-sector analysis are displayed in Tables 11, 12 and 13 below. The tables contain the market-adjusted returns relative to the three market benchmark indices that were used in this study. As the results relative to each benchmark are largely consistent, the analysis makes overarching comments regarding the performance per sector. Where there are noticeable differences between the different market indices in the analysis, this is specifically pointed out.

The JSE has many different sub-sectors in which it classifies its shares and therefore a vast number of different sectors exist, making it difficult for the researcher to analyse each sector individually. These sectors were therefore simplified into four broader categories, namely: financial, mining, property and 'other' (see Appendix A for all sectors). Mining has been highlighted as a sector, despite there only being two IPOs in the sector during the sample period, due to the significance of the mining sector in South Africa and the mining sectors dominance of the JSE.

Tables 11, 12 and 13 demonstrate that all sectors during the 11-year period outperformed the market indices. The sector with the highest return was the financial sector with the mining sector offering the lowest return. It should be noted however that the mining sector only had two IPOs during this time period.

As per Tables 11, 12 and 13, IPOs in the financial sector, over the full 11-year period, experienced large market-adjusted returns on the 1st trading day post-listing followed by lower returns after the 5th and 10th trading days. Interestingly, these IPOs in the financial sector then experienced higher returns in the 15th and

20th trading days with the 20th trading day demonstrating the highest market-adjusted return of the trading days examined.

The mining sector, over the 11-year period, experienced very low market-adjusted returns initially on the 1st trading day post-IPO. These IPOs experienced improved returns in the 5th and 10th trading days which largely were eroded by the 20th trading day.

The property sector, over the 11-year period, experienced its highest market-adjusted return in the 5th trading day post-IPO. The returns for the property sector were largely consistent across the trading days analysed with the sector's lowest market-adjusted return occurring in the 20th trading day.

The 'other' sector, over the 11-year period, experienced its highest market-adjusted returns in the 1st and 5th trading days. The return on this sector was largely consistent across the trading days analysed with the sector's lowest market-adjusted return occurring in the 15th trading day.

Analysing the results on a year-on-year basis, there is no single sector that consistently outperforms the other sectors which is in line with the findings of Van Heerden and Alagidede (2012). Furthermore, it is evident in Table 11 that, on average, an investment into any of the sectors in the JSE would have provided positive initial returns which is in line with the findings of Van Heerden and Alagidede (2012).

Although IPOs in the financial sector had the highest average return, it should be noted that financial sector IPOs did not perform well on a consistent basis. This is evident in 2012, 2016, 2017 and 2020 where the financial sector IPOs performed poorly over the short-term. This is consistent with the findings of Van Heerden and Alagidede (2012) which found that the financial sector's strong initial performance was not consistent across the years studied. The reason behind the financial sector's high average market-adjusted performance is likely due to the very high initial returns that occurred for financial sector IPOs in 2015.

The property sector had the most consistent performance across the entire 11-year period under study as 2016 was the only year in which the property sector experienced negative market-adjusted returns. Furthermore, the property sector's returns were subject to less variation than the financial and 'other' sector as evidenced by Table 14 below.

The financial sector had a very high standard deviation which illustrates that there is a significant variation in the returns of the financial sector for IPOs from 2011 to 2021. The mining sector had the lowest standard deviation however this is likely due to the fact there were only 2 IPOs that fell within the mining sector from 2011 to 2021.

More recent research by Salerno et al. (2022) found that in general, FinTech IPOs, which falls within the financial sector, experience a greater level of underpricing than IPOs in other sectors based a sample of 51 US and European FinTech IPOs and 4 210 non-FinTech IPOs over the time window 2005-2019. This aligns with the findings above where the financial sector experienced the highest level of market-adjusted returns.

Table 11:
Sector analysis relative to the J303 index:

Year	Sector	Number of IPOs	J303 Market-adjusted returns (%)				
			1	5	10	15	20
2011	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	1	-0.561%	2.639%	2.882%	7.429%	5.358%
2012	Financial	1	-0.879%	-3.248%	-7.020%	-5.407%	-1.275%
	Mining	0	-	-	-	-	-
	Property	1	5.183%	4.457%	2.838%	3.139%	4.215%
	Other	1	9.594%	11.058%	5.807%	4.037%	1.469%
2013	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	3	10.376%	9.957%	6.921%	5.827%	3.834%
	Other	1	1.589%	-6.124%	-3.128%	-1.752%	-3.741%
2014	Financial	1	12.761%	16.314%	19.218%	14.736%	18.377%
	Mining	2	0.786%	3.356%	3.927%	0.311%	1.205%
	Property	3	8.654%	8.252%	6.750%	6.260%	5.583%
	Other	2	2.260%	4.370%	4.376%	3.292%	1.968%
2015	Financial	1	82.157%	66.174%	70.598%	91.826%	89.299%
	Mining	0	-	-	-	-	-
	Property	3	1.012%	3.019%	5.054%	5.728%	1.165%
	Other	3	12.694%	10.666%	7.771%	6.832%	11.678%
2016	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	1	-2.277%	1.460%	-0.026%	-0.389%	-1.510%
	Other	1	16.212%	12.131%	14.253%	19.657%	21.835%
2017	Financial	2	-1.652%	-1.433%	-4.321%	-3.807%	-4.230%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	4	5.420%	7.427%	5.923%	5.944%	8.255%
2018	Financial	1	22.722%	17.906%	20.466%	20.315%	21.544%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	2	2.263%	2.030%	1.075%	-3.934%	-5.566%
2020	Financial	1	-15.559%	-23.593%	-23.040%	-17.534%	-19.961%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	1	25.168%	25.897%	24.314%	21.761%	20.979%
2011-2021	Financial	7	13,986%	10,098%	10,226%	13,760%	14,218%
	Mining	2	0.786%	3.356%	3.927%	0.311%	1.205%
	Property	11	5.730%	6.327%	5.362%	5.109%	3.132%
	Other	16	7.551%	7.507%	6.377%	5.883%	6.673%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Table 12:
Sector analysis relative to the J403 index:

Year	Sector	Number of IPOs	J403 Market-adjusted returns (%)				
			1	5	10	15	20
2011	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	1	-0.462%	2.811%	2.522%	6.369%	4.757%
2012	Financial	1	-0.952%	-3.328%	-7.111%	-6.112%	-1.764%
	Mining	0	-	-	-	-	-
	Property	1	5.087%	3.780%	2.057%	3.000%	4.249%
	Other	1	9.428%	10.672%	5.532%	4.431%	1.869%
2013	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	3	10.435%	9.888%	7.269%	6.153%	4.628%
	Other	1	1.584%	7.269%	-3.050%	-2.157%	-4.454%
2014	Financial	1	12.493%	16.074%	18.698%	13.448%	17.311%
	Mining	2	0.630%	3.524%	4.196%	0.211%	0.664%
	Property	3	8.729%	8.311%	6.706%	6.287%	5.080%
	Other	2	2.207%	4.201%	3.822%	2.611%	1.078%
2015	Financial	1	82.486%	65.100%	69.700%	91.421%	87.923%
	Mining	0	-	-	-	-	-
	Property	3	0.763%	2.277%	3.982%	5.238%	1.396%
	Other	3	12.432%	10.569%	7.550%	6.581%	11.193%
2016	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	1	-2.432%	0.640%	-0.258%	-0.145%	-0.911%
	Other	1	15.842%	12.897%	14.800%	20.546%	22.022%
2017	Financial	2	-1.595%	-1.519%	-4.277%	-3.604%	-4.192%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	4	5.321%	7.384%	6.051%	5.817%	7.634%
2018	Financial	1	22.857%	17.351%	19.369%	19.023%	20.238%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	2	2.071%	2.210%	1.139%	-3.719%	-5.833%
2020	Financial	1	-15.120%	-21.632%	-21.009%	-15.241%	-17.188%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	1	25.227%	25.600%	24.430%	25.189%	22.045%
2011-2021	Financial	7	14,082%	10,075%	10,156%	13,619%	14,019%
	Mining	2	0.630%	3.524%	4.196%	0.211%	0.664%
	Property	11	5.676%	5.986%	5.061%	5.081%	3.332%
	Other	16	7.422%	7.508%	6.313%	5.949%	6.303%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Table 13:

Sector analysis relative to the J2EQ index:

Year	Sector	Number of IPOs	J2EQ Market-adjusted returns (%)				
			1	5	10	15	20
2011	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	1	-0.660%	2.678%	2.919%	6.526%	4.116%
2012	Financial	1	-0.918%	-3.269%	-7.176%	-5.276%	-0.377%
	Mining	0	-	-	-	-	-
	Property	1	5.331%	3.642%	2.350%	3.429%	4.518%
	Other	1	9.380%	10.675%	5.183%	3.894%	1.527%
2013	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	3	10.387%	9.768%	7.202%	6.271%	4.499%
	Other	1	1.758%	-5.447%	-1.508%	-0.361%	-2.486%
2014	Financial	1	12.392%	16.001%	19.548%	14.475%	18.723%
	Mining	2	0.688%	4.000%	4.839%	0.919%	2.120%
	Property	3	8.527%	8.402%	6.964%	6.442%	5.434%
	Other	2	2.134%	4.318%	3.881%	2.408%	0.351%
2015	Financial	1	82.708%	65.662%	69.976%	91.680%	91.112%
	Mining	0	-	-	-	-	-
	Property	3	0.754%	1.879%	3.762%	4.676%	1.525%
	Other	3	12.463%	10.722%	7.985%	7.312%	11.572%
2016	Financial	0	-	-	-	-	-
	Mining	0	-	-	-	-	-
	Property	1	-2.315%	1.059%	-0.681%	-0.399%	-0.327%
	Other	1	16.372%	13.159%	15.193%	20.613%	22.636%
2017	Financial	2	-1.610%	-1.050%	-3.268%	-2.712%	-3.692%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	4	5.484%	7.599%	6.768%	7.076%	9.219%
2018	Financial	1	22.270%	19.119%	20.629%	20.542%	22.043%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	2	2.463%	3.437%	2.978%	-2.364%	-2.682%
2020	Financial	1	-15.605%	-21.037%	-19.765%	-13.770%	-19.845%
	Mining	0	-	-	-	-	-
	Property	0	-	-	-	-	-
	Other	1	26.203%	25.859%	23.726%	23.920%	23.956%
2011-2021	Financial	7	13,947%	10,625%	10,954%	14,604%	14,896%
	Mining	2	0.688%	4.000%	4.839%	0.919%	2.120%
	Property	11	5.638%	5.895%	5.041%	5.018%	3.506%
	Other	16	7.598%	7.812%	6.891%	6.557%	7.292%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Table 14:
Sector standard deviation analysis:

Year	Sector	Number of IPOs	J303 adjusted standard deviation (%)				
			1	5	10	15	20
2011-2021	Financial	7	30.501%	26.769%	29.005%	34.660%	33.865%
	Mining	2	1.840%	1.465%	6.796%	7.926%	5.552%
	Property	11	6.048%	4.777%	5.699%	5.205%	5.485%
	Other	16	9.442%	8.620%	9.013%	9.933%	11.598%

Year	Sector	Number of IPOs	J403 adjusted standard deviation (%)				
			1	5	10	15	20
2011-2021	Financial	7	30.544%	26.097%	28.364%	34.199%	32.990%
	Mining	2	1.917%	1.372%	6.809%	7.423%	5.466%
	Property	11	6.140%	5.099%	5.814%	5.201%	5.204%
	Other	16	9.352%	8.457%	9.093%	10.494%	11.896%

Year	Sector	Number of IPOs	J2EQ adjusted standard deviation (%)				
			1	5	10	15	20
2011-2021	Financial	7	30.647%	26.241%	28.219%	33.916%	34.172%
	Mining	2	1.488%	1.437%	7.100%	7.914%	5.405%
	Property	11	6.041%	5.114%	5.852%	4.995%	4.668%
	Other	16	9.584%	8.438%	8.790%	10.005%	11.613%

4.1.5. Offer price analysis

The results of the offer price analysis are displayed in Tables 15, 16 and 17 below. The tables contain the market-adjusted returns relative to the three market benchmark indices that were used in this study. As the results relative to each benchmark are largely consistent, the analysis makes overarching comments regarding the performance relative to the offer price. Where there are noticeable differences between the different market indices in the analysis, this is specifically pointed out. An analysis per offer price was not performed in Van Heerden and Alagidede (2012) or Agathee et al. (2012).

As demonstrated by Tables 15, 16 and 17 below, it is evident that shares priced below R10 per share are subject to the highest market-adjusted returns, likely caused by significant underpricing. Additionally, shares priced below R10 per share

experienced their highest market-adjusted return on the 1st trading day post-IPO. These shares experienced the highest average market-adjusted return for all the trading days that were analysed.

Shares priced between R10 and R20 per share as well as shares priced above R20 per share experienced similar returns in the 1st trading day. Interestingly, shares priced above R20 per share outperformed the shares priced between R10 and R20 per share for all trading days.

Analysing the results on a year-on-year basis, the shares priced below R10 per share obtained the highest average market-adjusted return, except for the years where there were no IPOs that fell within this category of offer price.

On average, all shares that are priced below R10 outperform the market regardless of the year in which they were listed. The only instances of negative average market-adjusted returns occurred when shares were priced at more than R10 per share, such as in 2014, 2016 and 2018.

The average offer price per share has steadily risen from 2012 until 2020 as can be seen in Graph 1 below. There was only one IPO in 2011 that fell within the parameters of this study and therefore this single instance does not provide enough evidence to provide any insight for the sharp decrease in average offer price from 2011 to 2012. It is more informative to examine the upward trend in offer price over the period under study.

The average offer price per share over the entire period under study was R15.55 per share while the median offer price was R10.50 per share with a standard deviation of R11.54 per share. The maximum offer price was R53.65 and the minimum offer price was R4.5 per share.

The fact that the median is lower than the mean suggests that the offer price data is positively skewed where there are some very high offer prices pushing the average upwards. There is a high standard deviation indicating a wide range of offer prices which is emphasised by the large range between the maximum and minimum offer prices.

Table 15:

Offer price analysis relative to the J303 index:

			J303 Market-adjusted returns (%)				
Year	Offer price per share (in Rands)	Number of IPOs	1	5	10	15	20
2011	Less than 10	0	-	-	-	-	-
	Between 10 and 20	0	-	-	-	-	-
	More than 20	1	-0.561%	2.639%	2.882%	7.429%	5.358%
2012	Less than 10	3	4.633%	4.089%	0.542%	0.590%	1.470%
	Between 10 and 20	0	-	-	-	-	-
	More than 20	0	-	-	-	-	-
2013	Less than 10	2	10.321%	10.011%	6.569%	5.446%	4.225%
	Between 10 and 20	2	6.037%	1.863%	2.248%	2.419%	-0.344%
	More than 20	0	-	-	-	-	-
2014	Less than 10	3	12.785%	12.783%	15.212%	12.491%	12.929%
	Between 10 and 20	4	1.744%	3.963%	2.829%	2.136%	1.351%
	More than 20	1	-0.515%	2.320%	-0.879%	-5.294%	-2.721%
2015	Less than 10	4	24.051%	20.385%	20.802%	24.773%	26.543%
	Between 10 and 20	3	9.024%	8.563%	8.622%	10.137%	7.219%
	More than 20	0	-	-	-	-	-
2016	Less than 10	0	-	-	-	-	-
	Between 10 and 20	1	16,212%	12,131%	14,253%	19,657%	21,835%
	More than 20	1	-2.277%	1.460%	-0.026%	-0.389%	-1.510%
2017	Less than 10	2	4.209%	6.858%	-0.442%	-1.812%	0.072%
	Between 10 and 20	2	1.625%	2.300%	3.139%	3.941%	5.490%
	More than 20	2	3.355%	4.262%	4.828%	5.952%	6.719%
2018	Less than 10	0	-	-	-	-	-
	Between 10 and 20	1	-1.747%	-2.337%	-6.499%	-13.064%	-11.491%
	More than 20	2	14.497%	12.151%	14.557%	12.755%	10.952%
2020	Less than 10	0	-	-	-	-	-
	Between 10 and 20	0	-	-	-	-	-
	More than 20	2	4.805%	1.152%	0.637%	2.114%	0.509%
2011-2021	Less than 10	14	12.680%	11.850%	10.195%	10.400%	11.283%
	Between 10 and 20	13	4,911%	4,589%	4,285%	4,482%	3,669%
	More than 20	9	4.662%	4.617%	4.669%	4.821%	4.165%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Table 16:

Offer price analysis relative to the J403 index:

			J403 Market-adjusted returns (%)				
Year	Offer price per share (in Rands)	Number of IPOs	1	5	10	15	20
2011	Less than 10	0	-	-	-	-	-
	Between 10 and 20	0	-	-	-	-	-
	More than 20	1	-0.462%	2.811%	2.522%	6.369%	4.757%
2012	Less than 10	3	4.521%	3.708%	0.159%	0.440%	1.451%
	Between 10 and 20	0	-	-	-	-	-
	More than 20	0	-	-	-	-	-
2013	Less than 10	2	10.370%	9.903%	6.722%	5.546%	4.754%
	Between 10 and 20	2	6.074%	1.968%	2.657%	2.606%	-0.040%
	More than 20	0	-	-	-	-	-
2014	Less than 10	3	12.659%	12.674%	14.771%	11.973%	12.205%
	Between 10 and 20	4	1.775%	3.971%	2.789%	1.768%	0.655%
	More than 20	1	-0.726%	2.554%	-0.618%	-5.038%	-3.201%
2015	Less than 10	4	23.998%	20.161%	20.351%	24.535%	25.685%
	Between 10 and 20	3	8.693%	7.665%	7.630%	9.579%	7.650%
	More than 20	0	-	-	-	-	-
2016	Less than 10	0	-	-	-	-	-
	Between 10 and 20	1	15,842%	12,897%	14,800%	20,546%	22,022%
	More than 20	1	-2.432%	0.640%	-0.258%	-0.145%	-0.911%
2017	Less than 10	2	4.260%	6.667%	-0.855%	-2.149%	-0.319%
	Between 10 and 20	2	1.669%	2.323%	3.920%	4.472%	5.568%
	More than 20	2	3.117%	4.259%	4.759%	5.708%	5.827%
2018	Less than 10	0	-	-	-	-	-
	Between 10 and 20	1	-1.571%	-1.725%	-6.201%	-12.970%	-11.590%
	More than 20	2	14.285%	11.748%	13.924%	12.277%	10.081%
2020	Less than 10	0	-	-	-	-	-
	Between 10 and 20	0	-	-	-	-	-
	More than 20	2	5.053%	1.984%	1.710%	4.974%	2.428%
2011-2021	Less than 10	14	12.628%	11.638%	9.852%	10.155%	10.899%
	Between 10 and 20	13	4,841%	4,510%	4,292%	4,426%	3,620%
	More than 20	9	4.588%	4.665%	4.714%	5.234%	4.146%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

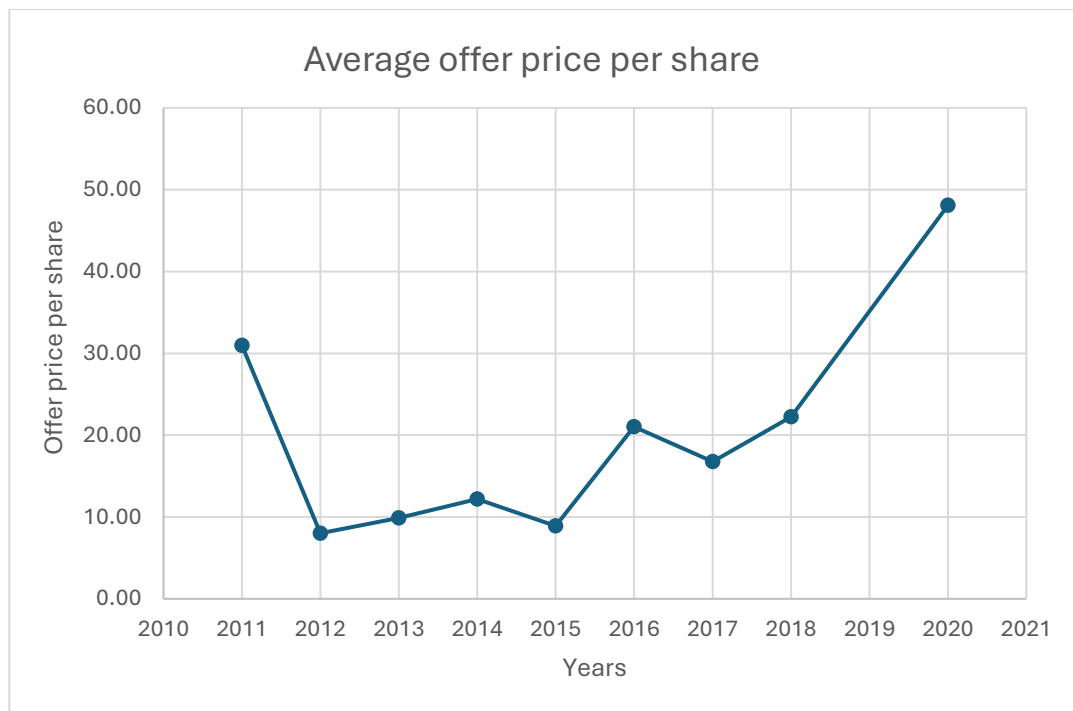
Table 17:

Offer price analysis relative to the J2EQ index:

			J2EQ Market-adjusted returns (%)				
Year	Offer price per share (in Rands)	Number of IPOs	1	5	10	15	20
2011	Less than 10	0	-	-	-	-	-
	Between 10 and 20	0	-	-	-	-	-
	More than 20	1	-0.660%	2.678%	2.919%	6.526%	4.116%
2012	Less than 10	3	4.598%	3.683%	0.119%	0.682%	1.889%
	Between 10 and 20	0	-	-	-	-	-
	More than 20	0	-	-	-	-	-
2013	Less than 10	2	10.464%	9.723%	6.755%	5.725%	4.252%
	Between 10 and 20	2	5.996%	2.205%	3.294%	3.500%	1.254%
	More than 20	0	-	-	-	-	-
2014	Less than 10	3	12.527%	12.836%	15.487%	12.258%	12.578%
	Between 10 and 20	4	1.600%	4.087%	2.900%	2.090%	0.984%
	More than 20	1	-0.365%	2.984%	-0.182%	-4.677%	-1.702%
2015	Less than 10	4	24.015%	20.375%	20.642%	25.023%	27.167%
	Between 10 and 20	3	8.767%	7.321%	7.549%	9.183%	7.245%
	More than 20	0	-	-	-	-	-
2016	Less than 10	0	-	-	-	-	-
	Between 10 and 20	1	16,372%	13,159%	15,193%	20,613%	22,636%
	More than 20	1	-2.315%	1.059%	-0.681%	-0.399%	-0.327%
2017	Less than 10	2	4.227%	7.021%	-0.614%	-2.144%	0.726%
	Between 10 and 20	2	1.720%	2.863%	5.514%	6.201%	6.223%
	More than 20	2	3.412%	4.263%	5.369%	7.383%	7.797%
2018	Less than 10	0	-	-	-	-	-
	Between 10 and 20	1	-1.945%	-1.225%	-4.888%	-11.739%	-9.096%
	More than 20	2	14.571%	13.609%	15.736%	13.776%	12.888%
2020	Less than 10	0	-	-	-	-	-
	Between 10 and 20	0	-	-	-	-	-
	More than 20	2	5.299%	2.411%	1.981%	5.075%	2.056%
2011-2021	Less than 10	14	12.629%	11.753%	10.119%	10.434%	11.573%
	Between 10 and 20	13	4,812%	3,935%	4,782%	4,937%	4,167%
	More than 20	9	4.803%	5.254%	5.359%	5.991%	5.285%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Graph 1:
Average offer price per year:



4.1.6. Volume of new shares analysis

The results of the volume of new shares analysis are displayed in Tables 18, 19 and 20 below. The tables contain the market-adjusted returns relative to the three market benchmark indices that were used in this study. As the results relative to each benchmark are largely consistent, the analysis makes overarching comments regarding the performance relative to the volume of new shares issued. Where there are noticeable differences between the different market indices in the analysis, this is specifically pointed out.

It is important to note that this analysis refers specifically to the new shares that were issued and not the total number of shares that the company listed on the stock exchange. The reason for this is to focus on the valuation of the offer price and its links to underpricing. The total number of shares listed would include shares held by pre-existing investors and therefore does not relate to the process of raising new capital which is the primary goal of an IPO.

The threshold of 100 000 000 shares was chosen as this is close to the median and is the most effective to categorise the IPOs from a new shares issued perspective.

When looking at the market-adjusted returns for the 11-year period as a whole, there do not appear to be any significant differences in underpricing related to the volume of new shares issued. This is evident by the fact that the 20th trading day for each of the indices has the largest difference between when more than 100 000 000 shares are issued and when less than 100 000 shares are issued. The maximum difference is 1.2%, 1.4% and 2.45 as can be seen in Tables 18, 19 and 20 respectively. The most significant difference between listings of different share issue volumes occurs on the 20th trading day.

Analysing the results in Tables 18, 19 and 20 on a year-on-year basis, it is evident that there is no consistent trend that emerges. In 2013 and 2015, IPOs that issued less than or equal to 100 000 000 new shares outperformed IPOs that issued more than 100 000 000 new shares. The converse is however true in 2012, 2016, 2017 and 2020. This illustrates that there is no consistent trend regarding the volume of new shares issued and short-term market-adjusted returns.

This is in slight contrast to the findings of Van Heerden and Alagidede (2012) which found that companies with a larger share issue are more underpriced compared to companies with a smaller issue. Van Heerden and Alagidede (2012) found a consistent trend of this across the period they studied from 2006 to 2010.

Table 18:

Volume of new shares analysis relative to the J303 index:

			J303 Market-adjusted returns (%)				
Year	Number of new shares issued	Number of IPOs	1	5	10	15	20
2011	More than 100,000,000	0	-	-	-	-	-
	Less than or equal to 100,000,000	1	-0.561%	2.639%	2.882%	7.429%	5.358%
2012	More than 100,000,000	1	5.183%	4.457%	2.838%	3.139%	4.215%
	Less than or equal to 100,000,000	2	4.357%	3.905%	-0.606%	-0.685%	0.097%
2013	More than 100,000,000	1	3.997%	6.818%	2.660%	3.247%	3.967%
	Less than or equal to 100,000,000	3	9.573%	5.643%	4.991%	4.160%	1.265%
2014	More than 100,000,000	0	-	-	-	-	-
	Less than or equal to 100,000,000	8	5.602%	7.065%	7.009%	5.090%	5.184%
2015	More than 100,000,000	3	4.040%	4.596%	5.813%	6.362%	6.446%
	Less than or equal to 100,000,000	4	27.789%	23.360%	22.909%	27.605%	27.123%
2016	More than 100,000,000	1	16,212%	12,131%	14,253%	19,657%	21,835%
	Less than or equal to 100,000,000	1	-2.277%	1.460%	-0.026%	-0.389%	-1.510%
2017	More than 100,000,000	4	4.295%	6.164%	4.701%	5.374%	7.305%
	Less than or equal to 100,000,000	2	0.599%	1.093%	-1.878%	-2.666%	-2.329%
2018	More than 100,000,000	3	9.082%	7.322%	7.539%	4.149%	3.471%
	Less than or equal to 100,000,000	0	-	-	-	-	-
2020	More than 100,000,000	1	25.168%	25.897%	24.314%	21.761%	20.979%
	Less than or equal to 100,000,000	1	-15.559%	-23.593%	-23.040%	-17.534%	-19.961%
2011-2021	More than 100,000,000	14	7,651%	7,836%	7,352%	7,202%	7,855%
	Less than or equal to 100,000,000	22	8.009%	7.154%	6.251%	6.656%	6.054%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Table 19:

Volume of new shares analysis relative to the J403 index:

Year	Number of new shares issued	Number of IPOs	J403 Market-adjusted returns (%)				
			1	5	10	15	20
2011	More than 100,000,000	0	-	-	-	-	-
	Less than or equal to 100,000,000	1	-0.462%	2.811%	2.522%	6.369%	4.757%
2012	More than 100,000,000	1	5.087%	3.780%	2.057%	3.000%	4.249%
	Less than or equal to 100,000,000	2	4.238%	3.672%	-0.790%	-0.841%	0.052%
2013	More than 100,000,000	1	3.965%	6.488%	2.587%	3.053%	4.127%
	Less than or equal to 100,000,000	3	9.641%	5.752%	5.390%	4.417%	1.767%
2014	More than 100,000,000	0	-	-	-	-	-
	Less than or equal to 100,000,000	8	5.544%	7.057%	6.856%	4.744%	4.504%
2015	More than 100,000,000	3	3.842%	4.199%	5.230%	6.341%	6.860%
	Less than or equal to 100,000,000	4	27.636%	22.760%	22.151%	26.964%	26.278%
2016	More than 100,000,000	1	15,842%	12,897%	14,800%	20,546%	22,022%
	Less than or equal to 100,000,000	1	-2.432%	0.640%	-0.258%	-0.145%	-0.911%
2017	More than 100,000,000	4	4.318%	6.274%	4.894%	5.314%	6.910%
	Less than or equal to 100,000,000	2	0.410%	0.702%	-1.963%	-2.596%	-2.743%
2018	More than 100,000,000	3	9.000%	7.257%	7.215%	3.862%	2.857%
	Less than or equal to 100,000,000	0	-	-	-	-	-
2020	More than 100,000,000	1	25.227%	25.600%	24.430%	25.189%	22.045%
	Less than or equal to 100,000,000	1	-15.120%	-21.632%	-21.009%	-15.241%	-17.188%
2011-2021	More than 100,000,000	14	7,566%	7,731%	7,199%	7,404%	7,802%
	Less than or equal to 100,000,000	22	7.959%	7.060%	6.153%	6.508%	5.806%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

Table 20:

Volume of new shares analysis relative to the J2EQ index:

Year	Number of new shares issued	Number of IPOs	J2EQ Market-adjusted returns (%)				
			1	5	10	15	20
2011	More than 100,000,000	0	-	-	-	-	-
	Less than or equal to 100,000,000	1	-0.660%	2.678%	2.919%	6.526%	4.116%
2012	More than 100,000,000	1	5.331%	3.642%	2.350%	3.429%	4.518%
	Less than or equal to 100,000,000	2	4.231%	3.703%	-0.997%	-0.691%	0.575%
2013	More than 100,000,000	1	4.159%	7.036%	3.061%	3.318%	4.601%
	Less than or equal to 100,000,000	3	9.587%	5.607%	5.679%	5.044%	2.137%
2014	More than 100,000,000	0	-	-	-	-	-
	Less than or equal to 100,000,000	8	5.452%	7.230%	7.235%	5.057%	4.996%
2015	More than 100,000,000	3	3.895%	4.042%	4.993%	6.202%	7.539%
	Less than or equal to 100,000,000	4	27.669%	22.834%	22.559%	27.259%	26.947%
2016	More than 100,000,000	1	16.372%	13.159%	15.193%	20.613%	22.636%
	Less than or equal to 100,000,000	1	-2.315%	1.059%	-0.681%	-0.399%	-0.327%
2017	More than 100,000,000	4	4.296%	6.480%	5.521%	5.981%	8.215%
	Less than or equal to 100,000,000	2	0.767%	1.187%	-0.774%	-0.523%	-1.683%
2018	More than 100,000,000	3	9.066%	8.665%	8.862%	5.271%	5.560%
	Less than or equal to 100,000,000	0	-	-	-	-	-
2020	More than 100,000,000	1	26.203%	25.859%	23.726%	23.920%	23.956%
	Less than or equal to 100,000,000	1	-15.605%	-21.037%	-19.765%	-13.770%	-19.845%
2011-2021	More than 100,000,000	14	7.723%	8.124%	7.713%	7.830%	9.133%
	Less than or equal to 100,000,000	22	7.930%	7.204%	6.549%	7.025%	6.177%

NB: There were no IPOs on the JSE in 2019 and 2021 that fall within the parameters of this study.

4.2. Long-term performance – research question 2

This section provides an in-depth analysis of the results of the long-term cumulative average benchmark-adjusted share price returns (CAARs) for IPOs on the JSE during the period from 2011 to 2021. This analysis attempts to answer research question 2:

- 2) Did IPOs on the JSE underperform in the long term relative to market benchmarks?

Monthly benchmark-adjusted returns are calculated as the monthly raw return on a share minus the monthly benchmark return for the corresponding monthly period. For each issuing firm's share, the following benchmarks are used:

- The Capped All Share Index (J303)
- The Shareholder-Weighted All Share Index (J403)
- Equally weighted Top 40 Index (J2EQ)

Each of these benchmarks, to some extent, compensates for the resource effect and thus would be the most suitable market benchmarks for the purposes of this study as per Chipeta and Jardine (2014).

The following hypothesis was tested:

H0. The post-IPO CAAR is equal to zero.

H1. The post-IPO CAAR is different from zero.

Statistically significant and positive CAARs imply IPO long-run outperformance relative to the respective benchmark. Statistically significant and negative CAARs imply IPO long-run underperformance relative to the respective benchmark. Essentially, a finding of statistically insignificant CAARs would imply that IPO shares did not perform significantly differently compared to the relevant benchmark.

A test of normality was performed to determine whether the data was parametric or non-parametric as this would impact the statistical test chosen. Due to the results of the test of normality illustrating the data was non-parametric, a one-sample Wilcoxon signed-rank test was performed to determine the statistical significance of the CAARs relative to zero.

4.2.1. CAARs for long-term performance of IPOs:

In order to determine which statistical test was most appropriate to determine the statistical significance of the cumulative abnormal returns, a test for outliers as well as a test of normality was performed.

The CAARs contained both outliers and extreme points in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths and 3 box-lengths from the edge of the box respectively. Additionally, cumulative abnormal returns were not normally distributed, as assessed by the Shapiro-Wilk's test ($p < .05$) and visual inspection of a Normal Q-Q plot. Consequently, the t-test could not be performed to determine the statistical significance of the cumulative abnormal returns because the presence of outliers and extreme points as well as the non-parametric nature of the data could significantly impact the results if a t-test was to be performed.

Therefore, due to the presence of extreme points and the fact that the cumulative abnormal returns are not normally distributed, the one-sample Wilcoxon-signed rank test was performed to determine the statistical significance of the cumulative abnormal returns as reported in Table 21 below.

Table 21:

Cumulative Average Abnormal Returns (CAARs) for the full sample of IPOs:

Benchmark	CAAR (1,36)	z-stat
The Capped All Share (J303)	-3.318%	-0.660
The Shareholder-Weighted All Share (J403)	-2.148%	-0.503
Equally weighted Top 40 (J2EQ)	5.162%	0.204

Table 21 presents the CAARs for the full sample of IPOs for the 36-month period post-listing. These CAARs are reported relative to the respective benchmarks that were used. The results suggest that IPOs on the JSE that occurred from 2011 to 2021 underperformed the All Share related market benchmarks over the 36-month period post-listing. The extent of this underperformance relative to the J303 and J403 indices is not large as demonstrated by the CAARs of -3.318% and -2.148%

relative to the respective benchmarks. The findings of negative CAARs relative to the JSE All Share related benchmarks aligns with Chipeta and Jardine (2014) however the extent of underperformance found by Chipeta and Jardine (2014) was significantly greater than the findings of this research report. This is as evidenced by the -52.01% CAAR relative to the JSE All Share index found by Chipeta and Jardine (2014) compared to the CAARs of -3.318% and -2.148% relative to the respective JSE All Share benchmarks (J303 and J403) found in this research report.

In contrast, the IPOs in the sample outperformed the Top 40 related J2EQ index by 5.162% over the 36-month period post-listing. These findings are in stark contrast to Chipeta and Jardine (2014) which found CAARs of -53.43% relative to the JSE Top 40 index.

A Wilcoxon signed-rank test was conducted to determine if the IPO shares performed statistically significantly differently compared to the relevant benchmark. The results of the Wilcoxon signed-rank test are shown in Table 21 in the z-stat column. This implies that IPO shares did not perform statistically significantly differently compared to all relevant benchmarks at the 5% significance level or below. Consequently, we fail to reject the null hypothesis that the post-IPO CAAR is equal to zero.

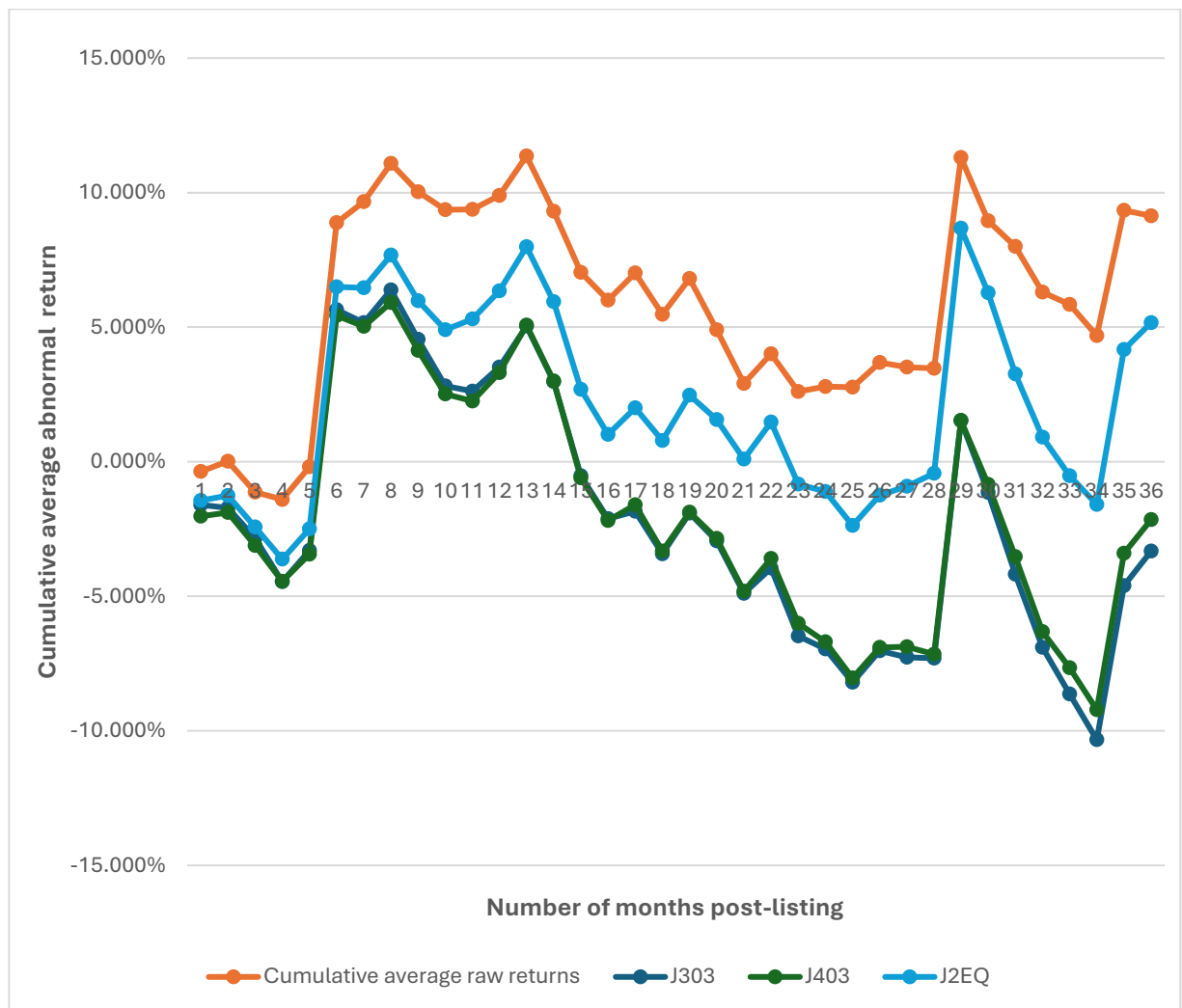
Therefore, these findings are partially in line with Chipeta and Jardine (2014) from a directional performance perspective as IPOs shares were also found to underperform the relevant benchmarks in the long-term. It is however noticeable that the magnitude of the negative CAAR's found in this research report is of a significantly smaller magnitude than the negative CAAR's as per Chipeta and Jardine (2014) which found statistically significant CAARs of -52.01%, -53.43%, -44.06% and -33.91% for the All Share, Top 40, Mid Cap and Small Cap JSE indices respectively. Although the indices used are not identical, their compositions are not significantly different enough to explain the entire difference in the magnitude of CAAR's found between Chipeta and Jardine (2014) and this research report.

Additionally, the results shown in table 21 indicate that IPO shares did not consistently exhibit CAARs different to zero relative to all three benchmarks analysed. Additionally, the extent of this abnormal return relative to the relevant benchmarks is not statistically significant. This means that there is insufficient evidence in this sample period to conclude that IPO shares' post-listing performance relative to the benchmarks is not due to random variation. In other words, this suggests that IPO shares' performance is broadly in line with the

benchmarks over the period analysed. Therefore, any observed differences are likely due to random variation.

Graph 2:

Cumulative average abnormal returns (CAARs) for the full sample of IPOs:



Graph 2 graphically displays the time series pattern of the CAARs (relative to the respective benchmarks used), as well as the cumulative average raw (unadjusted) returns for the full sample of IPOs over the 36-month period post-listing. There are a number of observations that were made regarding Graph 2.

Firstly, the cumulative average raw (unadjusted) returns indicate that IPOs delivered a cumulative average raw return over the 36-month period of 9.137%. This indicates that on average, investing in an IPO during the sample period would

have generated a positive return. When examining the trends over the whole period, it is evident that in the first 5 months of the analysis (where month 0 refers to the month in which the IPO occurred), the IPOs in the sample, on average, generated slightly negative returns. From trading month 6 onwards, the IPOs experienced positive cumulative raw returns on average. This finding is consistent with Chipeta and Jardine (2014) which found a cumulative average raw return of 6.52%.

From a market-adjusted perspective however, Graph 2 shows that the full sample of IPOs, on average, underperformed the J303 and J403 benchmarks which are most representative of the JSE's overall performance. This suggests that IPOs did not grow as much as the broader market over the 36-month post-listing period. When examining the trends over the whole period, it is evident that in the first 5 months of the analysis (where month 0 refers to the month in which the IPO occurred), the IPOs in the sample, on average, generated negative returns. IPOs then provided positive CAARs from months 6 to 14. For the rest of the 36-month period after month 14, the IPOs, on average, underperformed the J303 and J403 respectively with the worst market-adjusted cumulative returns being found in month 34 post-listing. This is consistent with the findings of AlShiab (2018) which found that IPOs in the Middle East generally produced negative cumulative abnormal returns 12 months after the IPO date onwards with this negative performance even occurring up to 5 years after the IPO date.

Interestingly, Graph 2 shows that the full sample of IPOs, on average, outperformed the Equally weighted Top 40 index (J2EQ). This implies that IPOs, on average, performed better than the Top 40 shares on the JSE which comprised large established companies. These findings are contradictory to the findings as per Chipeta and Jardine (2014) which found CAARs of -53.43% relative to the JSE Top 40 index. When examining the month-on-months trends over the whole period, it is evident the same trends as the J303 and J403 are present for the CAARs relative to the J2EQ index up until month 14. Despite this, it is clear that IPOs largely outperformed relative to the J2EQ benchmark over the period from month 14 to month 36 except for a few months where the cumulative adjusted return became slightly negative.

These results are in slight contrast to the findings of Chipeta and Jardine (2014) which found a consistent decrease in CAARs relative to all indices over the 36-month post-listing period. Of particular note is the contrast in results found relating to the Top 40 index. Chipeta and Jardine (2014) documented that the performance of IPOs was shown to be the weakest against the Top 40 index while this research report found that the IPOs, on average, performed better than the Top 40 shares

on the JSE which comprised large established companies over the periods under study.

These findings are in line with Murthy and Kumar (2025) which found that IPOs generally experience a share price correction phase which ultimately results in the underperformance of the IPO relative to the market benchmarks as a whole over a three to five year period post-listing.

4.2.2. Median CARs for long-term performance of IPOs:

The median cumulative abnormal return is also reported in Table 22 below as the data is non-parametric due to the presence of outliers and extreme points in the data. The median is less affected by extreme points than the average, making it a more representative measure of central tendency for skewed data which is the case in this study. This ensures that the impact of outliers is minimised.

Illustrating both the cumulative average abnormal return (CAAR) as well as the median cumulative abnormal return (CAR) provides a more well-rounded analysis of the data. The median is more effective than the average in providing a perspective of the 'typical' IPO in the sample.

Table 22 presents the median Cumulative Abnormal Returns (CARs) for the full sample of IPOs for the 36-month period post-listing. These median CARs are reported relative to the respective benchmarks that were used. Similar to the CAARs mentioned above, the results of the median CARs suggest that IPOs on the JSE that occurred from 2011 to 2021 underperformed the market benchmark over the 36-month period post-listing for all three of the reported market benchmarks. This aligns with the findings of Ritter (1991) which suggests that IPOs tend to underperform the market benchmarks over the long term.

The median CARs are less affected by extreme points than the CAARs, making the median CAR a more representative measure of central tendency for non-parametric data. Examining the median CAR ensures that the impact of outliers and extreme values is minimised.

Table 22:

Median Cumulative Abnormal Returns (CARs) for the full sample of IPOs:

Benchmark	Median CAR (1,36)	z-stat
The Capped All Share (J303)	-13.340%	-0.660
The Shareholder-Weighted All Share (J403)	-12.870%	-0.503
Equally weighted Top 40 (J2EQ)	-2.059%	0.204

The extent of IPO underperformance relative to the market benchmark when looking from a median CARs perspective in Table 22 presents clear differences to the CAARs that were reported in Table 21.

The median CAR relative to the J303 benchmark is -13.340% compared to the CAAR relative to the J303 benchmark of -3.318%. This suggests that the data is positively skewed and that a few high-performing IPOs are disproportionately increasing the average. This is confirmed through the inspection of the Wilcoxon signed-rank test histogram. The difference between -13.340% and -3.318% indicates that the median stock has performed much worse than the CAAR. This suggests that the majority of the IPOs experienced a greater level of market underperformance than the average market underperformance for the J303 benchmark.

The same findings are evident when considering that the median CAR relative to the J403 benchmark is -12.870% compared to the CAAR relative to the J403 benchmark of -2.148%. As was explained for the J303, this suggests that the majority of the IPOs experienced a greater level of market underperformance than the average market underperformance for the J403 benchmark. Interestingly, the median CAR for the J403 benchmark experienced a greater level of market underperformance than the median CAR for the J303 benchmark.

Conversely, the median CAR relative to the J2EQ benchmark is -2.059% compared to the CAAR relative to the J2EQ benchmark of 5.162%. This suggests that the data relative to the J2EQ benchmark is positively skewed. The difference between -2.092% and 5.162% indicates that the median stock has performed worse than the CAAR.

A Wilcoxon signed-rank test was conducted to determine if the IPO shares performed statistically significantly differently compared to the relevant benchmarks. The results of the Wilcoxon signed-rank test are shown in Table 22 in the z-stat column. This implies that IPO shares did not perform statistically significantly differently compared to all relevant benchmarks at the 5% significance level or below.

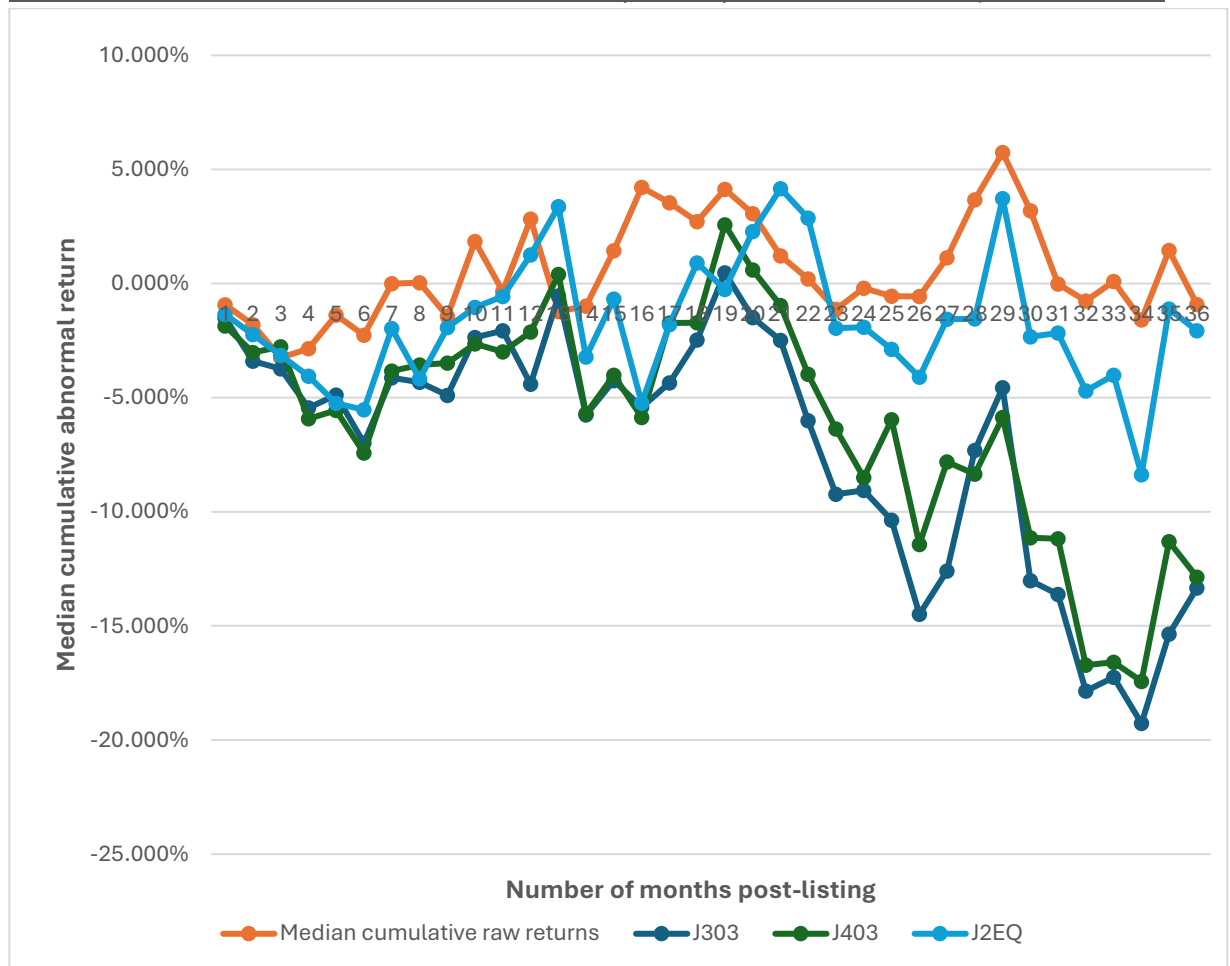
This indicates that while IPO shares exhibit negative median CARs relative to all three benchmarks analysed, the extent of this underperformance is not statistically significant. This means that there is insufficient evidence in this sample period to conclude that IPO shares' underperformance relative to the benchmarks is not due to random variation. In other words, this suggests that IPO shares' performance is

broadly in line with the benchmarks over the period analysed. Therefore, any observed differences are likely due to random variation.

Graph 3 below graphically displays the time series pattern of the median CARs as well as the median cumulative raw (unadjusted) returns, for the full sample of IPOs over the 36-month post-listing period. Firstly, the median cumulative raw returns indicate that the median IPO delivered a cumulative abnormal return over the 36-month period of -0.910%. This indicates that the median IPO generated a negative cumulative return over the 36-month post-listing period. When examining the trends over the whole period, it is evident the median cumulative raw return does not exhibit consistent negative or positive returns but rather fluctuates between small positive and small negative returns. This suggests that the typical IPO did not deliver significant gains or losses to investors over the 36-month post-listing period.

Graph 3:

Median Cumulative Abnormal Returns (CARs) for the full sample of IPOs:



Graph 3 also illustrates that the median IPOs underperformed the J303 and J403 benchmarks quite considerably over the 36-month period. This suggests that IPOs did not grow as much as the broader market over the 36-month post-listing period. When examining the trends over the whole period, it is evident that the median CAR relative to the J303 and J403 was negative for the entire 36-month period, except for months 19 and 20 for the J403 which has very small positive median CARs. This suggests that the median IPOs consistently underperformed the J303 and J403 benchmarks which are most representative of the JSE's overall performance.

Interestingly, Graph 3 shows that the median IPOs slightly underperformed the Equally weighted Top 40 index (J2EQ). This implies that the median IPOs performed slightly worse than the Top 40 shares on the JSE. When examining the trends over the whole period, it is evident that the median IPO relative to the J2EQ largely exhibits small negative CARs with some months of positive CARs.

The difference between the CAARs and the median CARs demonstrates that individual IPO long-term performance varies quite drastically and that a few high-performing IPOs appear to be increasing the CAARs disproportionately. The presence of these high-performing IPOs indicates that there are IPOs that experience very high growth in the 3 years post-listing which is often the allure that investors chase when investing in IPOs in the first place.

Confounding event analysis:

The analysis of confounding events for long-term share price performance was done by performing further investigation into all instances of outliers and extreme points that were identified during the analysis of the long-term share price returns for the population of IPOs under study.

There were outliers identified relating to two of the IPOs within the sample that was investigated within this report. Three IPOs in the sample had at least 1 monthly data point that was identified as an extreme point. The investigation into the outliers and extreme points that were identified did not note any particular events that specifically caused the outlier or extreme data points in the data. For all of the instances where outliers or extreme points were identified in the long-term share

price performance, it was concluded that unknown causes resulted in these outliers and extreme points.

Upon further investigation into the instances of outliers and extreme points, it was determined that due to the presence of outliers and extreme points, the one-sample Wilcoxon-signed rank test was performed. The Wilcoxon-signed rank test was chosen because it does not rely on the assumption of normality and is also less sensitive to extreme values compared to parametric alternatives like the one-sample t-test (Ayinde et al., 2016). As a result, it provides a more robust and reliable measure of whether the median of the sample differs significantly from the hypothesised value, even in the presence of outliers and extreme points.

4.3. Determinants of long-term underperformance – research question 3

This section provides an in-depth analysis of the results of the panel regression performed for IPOs on the JSE during the period from 2011 to 2021. This analysis attempts to answer research question 3:

- 3) What are the effects of pre-listing firm-level characteristics and market conditions on the aftermarket performance of IPOs on the JSE?

The panel regression that was performed made use of the following panel regression equation as per Chipeta and Jardine (2014):

$$R_{i,t} = VOL_t + SIZE_{i,t} + APPLIST_{i,t} + AGE_{i,t} + REVF_{i,t} + LISTCOST_{i,t} + BS_{i,t} + DOM_i + INVBANK_i + AUDITQ_i + CONT_i + IPO1_t + IPO2_t + IPO3_t + e_i \quad (13)$$

The dependent variable is denoted by $R_{i,t}$ which represents the aftermarket performance of the IPO. Two operating performance measures were used, and three different share price performance measures were used to capture the share price performance.

The operating performance measures are $ROA_{i,t}$ and $ROE_{i,t}$. $ROA_{i,t}$ is the Return on Total Assets for firm i at time t and is calculated as total comprehensive income attributed to ordinary shareholders divided by total assets. $ROE_{i,t}$ is the Return on Total Equity for firm i at time t and is calculated as total comprehensive income attributed to ordinary shareholders divided by the book value of total equity.

The three share price performance measures that were used are:

- (i) Three-year buy and hold returns,
- (ii) Three-year market-adjusted buy and hold returns using the Capped All Share Index (J303) as the market benchmark,
- (iii) The three-year size-adjusted buy and hold returns, using the Shareholder-weighted All Share Index (J403) as the market benchmark,
- (iv) Three-year Top 40-adjusted buy and hold return, using the Equally weighted Top 40 index (J2EQ) as the market benchmark.

The Hausman (1978) specification test was performed to determine if the Fixed Effects or Random Effects regression model was a better fit for the panel data

obtained. The results of the Hausman (1978) specification test showed that the difference between the Fixed Effects estimator and the Random Effects estimator was not significantly different from zero. This provides evidence that the individual effects are random and therefore this is why the Random Effects regression model was used.

There were two companies which delisted within the three-year post-listing period. To mitigate a possible survivorship bias, the sample specifically included these firms that delisted within the three-year period post-listing. Both companies were delisted in the third year of their respective post-listing period. Therefore, the operating performance metrics of $ROA_{i,t}$ and $ROE_{i,t}$ were not available in the 3rd year as both companies did not publicly issue annual financial statements in the year in which they delisted. Therefore, the regression results for $ROA_{i,t}$ and $ROE_{i,t}$ in the third year do not include these two companies. The Buy-and-Hold returns were still calculated up to the month in which the companies delisted and therefore the regression results for the share price performance metric do include these two companies.

4.3.1. Descriptive statistics analysis

Table 23:

Average values for selected pre-listing variables:

Selected variables:	Average values:	Median values:
<i>Age</i>	22 years	13 years
<i>Number of new shares approved for listing</i>	124 570 282 shares	68 250 000 shares
<i>Board size</i>	8,75 directors	8 directors
<i>Listing costs</i>	R66 714 355	R33 193 948
<i>Revenue forecast</i>	289%*	36%

**Please see the discussion below which elaborates on the revenue forecasts for this sample.*

Table 23 illustrates the average and median values for selected pre-listing variables. The average number of directors on the company's board was 8,75 directors which is higher than the 8,02 directors found by Chipeta and Jardine (2014) and considerably higher than the findings of Baker and Gompers (2003) who reported an average of 6 directors for a sample of 1 116 IPO firms in the United States of America. The median number of directors was eight, indicating that board sizes were fairly consistent, as evidenced by the small difference between the average and median.

The average listing costs were R66 714 355 and the median listing costs were R33 193 948. This suggests that some IPOs experienced very high listing costs which increased the average. This demonstrates that, on average, average listing costs have increased significantly from prior studies as evidenced by the fact that Chipeta and Jardine (2014) found that the average listing costs incurred for IPOs on the JSE from 1996-2010 was R8 033 725. The substantial increase in listing costs for IPOs on the JSE over time raises potential concerns regarding the affordability of going public. Further analysis of the listing costs is discussed in section 4.3.2.

It is notable that there was a significant increase in listing costs for IPOs in 2019 and 2020. incurred by the entity that is listing an overall trend of increasing

The average revenue forecast for the IPOs examined was a 289% increase in revenue from the companies which presented a revenue forecast in their prospectus. The median revenue forecast for the IPOs in the sample was 36% which demonstrates that a few IPOs with high revenue forecasts substantially increased the average. Therefore, the median is more representative of the sample studied in this research report from a revenue forecast perspective.

It is also important to note that only half of the companies in the sample (18 of the 36 companies) provided revenue forecasts for the year after listing. Therefore, the results found regarding the revenue forecast for the sample are unlikely to be representative of the sample as a whole.

Table 24:

Average values of performance metrics for the post-listing period:

	Operating performance metrics		Share price performance metrics			
Years post-IPO	ROA	ROE	BHR	BHRJ303	BHRJ403	BHRJ2EQ
Year 1	6,574%	18,179%	8,480%	2,021%	1,764%	4,927%
Year 2	6,988%	17,831%	-6,866%	-9,884%	-9,460%	-6,694%
Year 3	6,144%	15,265%	3,421%	0,675%	1,825%	3,625%

Table 24 shows the average values of performance metrics for the post-listing years. The IPO firms, on average, obtain consistent ROA values with the highest average ROA being achieved in Year 2 post-listing. A similar trend is found with ROE however the IPO firm's ROE that are nearly three times as high as the ROA in Year 1 post-listing. The ROE steadily declines in Year 2 and Year 3 while still retaining an average ROE of 15,265% in Year 3.

When considering the average share price performance metrics, Table 24 shows that for all the share price performance metrics the IPO firms in the sample achieved their highest Buy-and-Hold return in Year 1 post-listing. This corresponds with the results of research question 2 which showed positive returns at the end of Year 1 post-listing. The IPO firms, on average, performed very poorly in Year 2 post-listing with large negative Buy-and-Hold returns. Once again, this corresponds to the results from research question 2 which showed a decrease in returns especially in Year 2 post-listing. Interestingly, the downward trend does not continue from Year 2 into Year 3 as illustrated by the positive Buy-and-Hold returns for all the share price performance metrics in Year 3.

4.3.2. Cross-sectional performance of IPOs:

Executive summary of findings regarding the cross-sectional performance of IPOs:

Overall, the lack of statistical significance at the 10 per cent level or lower for many of the independent variables examined below indicates that the observed effects for those independent variables might be due to random chance rather than underlying relationships between the examined variables and the performance metrics of the entity. Additionally, the lack of statistical significance for various independent variables could indicate that the sample size used in this study is too small to detect meaningful results however Chipeta and Jardine (2014), which used a sample of 154 IPOs on the JSE, also found that many of the variables did not indicate statistical significance. This suggests that the observed effects for those independent variables are more likely due to random chance rather than underlying relationships. This is also potentially reflective of the fact that operating and share price performance of IPOs in the long-run are a consequence of a large number of firm-level characteristics and market conditions out of the entity's control.

Detailed analysis of the cross-sectional performance of IPOs:

To investigate and analyse the cross-sectional patterns in IPO performance post-listing, a Random Effects regression was performed. The results of the regressions that were performed are presented in Table 25 below. The results are reported for each of the dependent variables that were discussed above.

Table 25:

Regression output for the determinants of IPO long-term performance:

	ROA	ROE	BHR	BHAR_{J303}	BHAR_{J403}	BHAR_{J2EQ}
VOL	0,703	-0,394	-0,898	-0,723	-0,669	-0,688
SIZE	-0,174	1,672	0,657	0,561	0,460	0,445
APPLIST	0,903	1,610	-1,634	-1,432	-1,425	-1,403
AGE	-0,142	0,876	2,099**	2,065**	2,083**	2,134**
REVF	-2,316**	-1,960*	-0,632	-0,644	-0,496	-0,739
LISTCOST	-1,350	-0,809	-0,799	-1,106	-1,136	-1,120

BS	-2,319**	-4,186****	-3,025****	-2,805****	-2,783****	-2,839****
DOM	-0,242	0,431	-0,027	-0,176	-0,305	-0,357
INVBANK	-0,707	-1,504	-1,087	-0,546	-0,546	-0,633
AUDITQ	-1,102	-1,658	-1,374	-1,349	-1,246	-1,282
CONT	-1,428	-1,020	-1,203	-1,062	-0,994	-0,924
IPO1	1,317	0,625	0,052	-0,606	-0,756	-0,768
IPO2	1,880*	0,084*	-1,083	-1,764*	-1,858*	-1,831*
IPO3	_^	_^	_^	_^	_^	_^

Model summary:

R	0.760	0.658	0.536	0.514	0.514	0.524
R Squared	0.578	0.433	0.288	0.264	0.264	0.275
Adjusted R squared	0.411	0.249	0.056	0.025	0.025	0.039

^No coefficients are provided for IPO3 as the regression output did not provide any coefficients for this variable.

Guide for statistical significance of t-Statistic:
Significant at the 1% significance level = ****
Significant at the 2% significance level = ***
Significant at the 5% significance level = **
Significant at the 10% significance level = *

Interpretation of R squared values:

The R squared values shown in Table 25 indicate how well the independent variables per the regression equation used (as per Chipeta and Jardine (2014)) explain variations in each respective dependant variable. The dependant variables are the performance metrics respectively.

The regression model for the ROA regression explains 57.8% of the variance in the ROA which indicates that the independent variables are reasonably good predictors of the IPO's return on assets (ROA) in the long-term. The R squared

values for the ROE regression (43.3%) suggest that the regression equation used (as per Chipeta and Jardine (2014)) provides weaker explanatory power for IPOs long-term performance from a ROE perspective.

All market-based performance metrics (BHR regression and all three BHAR regressions) had low R squared values which suggests that the independent variables examined do not adequately explain a large percentage of the variance in these market-based performance metrics.

Interpretation of adjusted R squared values:

As per Table 25, the adjusted R squared values are significantly lower than the R squared values, particularly for the BHR and BHAR regressions. This suggests that the model's explanatory power is weak for BHR and BHAR regressions. Therefore, this indicates that the independent variables in the regression equation used (as per Chipeta and Jardine (2014)) are not necessarily strong predictors of stock market behaviour.

VOL variable:

When examining the VOL variable, it indicates that firms that list in years where there is a high volume of IPOs compared to the rest of the sample period tend to underperform in the long term. This is consistent with the “fads and overoptimism” hypothesis as suggested by Aggarwal and Rivoli (1990) and Ritter (1991). This also aligns with Ibbotson and Jaffe (1975) and the “hot issue market” theory suggests that IPOs that occurred during “hot issue markets” experience initial optimism followed by long-term underperformance relative to the market. All performance measures indicate a negative coefficient except the ROA. It is important to note that none of these results are statistically significant at the 10 per cent level or lower.

SIZE variable:

The impact of the size of the asset base, which is representative of the overall size and scale of the business's operations, is demonstrated in the SIZE variable. The coefficient against all the performance metrics, except for the ROA regression, had positive coefficients with the SIZE variable. This indicates that larger companies at listing date tended to perform better than smaller companies.

This finding is in contrast to the Fama-French 3-factor model which suggests that smaller firms tend to outperform larger firms over the long run (Fama and French, 1993). This difference may be due to investor preferences at the IPO stage where larger firms are perceived as more stable and therefore less risky for investors (Wei Leong and Sundarasan, 2015). This decrease in risk makes larger firms more attractive for investors when compared to smaller firms which are less stable and therefore riskier. Additionally, institutional investors may play a role in driving demand for larger IPOs, further influencing the performance of larger firms when compared to small firms (Gompers and Metrick 2001).

When looking at Buy-and-Hold returns more specifically, it is evident that companies with bigger asset bases outperform the market over the three-year post-listing period. This finding is consistent with earlier studies such as Ritter (1991) as well Chipeta and Jardine (2014) that report that larger firms tend to have more robust long-term performance.

In contrast, the coefficient on the ROA regression is negative. This might be because larger companies often make larger investments in fixed assets post-IPO and these large capital investments may be reducing the ROA for these larger companies (Damodaran, 2009).

None of the coefficients for the SIZE variable are found to be statistically significant at the 10 per cent level or lower. This suggests that within the context of this research report, there is insufficient evidence to suggest a meaningful relationship between the size of the entity prior to listing and the long-term performance of the entity, both from a share price and operating performance metrics perspective.

APPLIST variable:

The APPLIST variable shows the number of new shares approved for listing. This variable focuses specifically on the impact of the new shares that are issued during the IPO and not on the total number of shares that are listed. The focus is specifically on the effect of the capital raising component of the IPO process. From the results shown in Table 25, it is evident that the number of new shares issued has a positive coefficient for the operating performance measures of ROA and ROE but a negative coefficient for all the share price performance measures. None of the coefficients found are statistically significant at the 10 per cent level or lower.

The positive relationship between the number of new shares issued and the ROA and ROE indicates that companies that issue more new shares tend to achieve

better operating performance. Issuing more shares usually results in the raising of more capital and these regression results may demonstrate that the larger amounts of capital are being used more effectively to enhance profitability.

The negative relationship between the number of new shares issued and the share price performance metrics suggests that companies that issue more new shares tend to perform worse from a share price perspective. One potential reason for this may be due to the expiry of the lock-up period. After an IPO, most companies have a lock-up period during which pre-IPO investors and the underwriter cannot sell their shares. Prior research indicates that once this lock-up period expires, some pre-IPO investors and the underwriter may decide to sell their shares to realise short-term gains received due to initial underpricing (Bradley et al., 2001). This sell-off by pre-IPO investors and the underwriter can ultimately drive down demand for the share and therefore result in poor long-term share price performance.

AGE variable:

Table 25 illustrates a small negative coefficient on the ROA regression while a positive coefficient was found on the ROE regression. This indicates that older firms have a negative relationship with ROA, although this relationship is small. In contrast, IPO firms that have been operating for more years demonstrate a positive relationship with ROE. Both figures are not statistically significant at the 10 per cent level or lower.

A small negative coefficient on the ROA regression suggests that older firms appear to be slightly less effective in generating returns on their assets compared to younger firms (Janardhanan and Uma, 2020). These findings are in contrast to Chipeta and Jardine (2014) which found a small positive coefficient on their ROA regression.

From an ROE perspective, the positive coefficient suggests that older firms might benefit from an established capital structure which helps generate better returns on equity when compared with smaller firms. This aligns with the findings of Chipeta and Jardine (2014) from an ROE perspective.

There is a positive coefficient which is statistically significant at the 5% significance level for all share price performance metrics. This suggests that firms that have operated for more years prior to undergoing an IPO perform better from a Buy-and-Hold share price perspective than younger firms.

In a similar way that investors prefer to invest in companies with a larger asset base (as discussed previously regarding the SIZE variable), the Buy-and-Hold share price results suggests that the market tends to perceive firms with a more established track history as more stable and therefore less risky. Stinchcombe (2013) concept of “liability of newness” can be used to explain these results. The concept of “liability of newness” explains that older firms benefit from accumulated experience, established processes and reputational capital. These factors might explain the results for all share price performance metrics.

REVF variable:

There is a negative coefficient for all the performance metrics relative to the REVF variable. This indicates that firms that provide high revenue forecasts perform worse in the long term than firms with more conservative revenue forecasts. The negative coefficients on the ROA and ROE regressions are statistically significant at the 5% and 10% significance levels respectively. The coefficients for the share price performance metrics are insignificant.

This relationship between high revenue forecasts and subsequent underperformance corresponds with the “fads and overoptimism” theory as suggested by Aggarwal and Rivoli (1990) and Ritter (1991). Very high revenue forecasts are often unrealistic and the subsequent failure to achieve these forecasts may result in poor share price performance. From an operating performance perspective, the statistically significant negative coefficients for the ROA and ROE regressions suggest that more aggressive revenue forecasts are linked with worse operating performance metrics.

Interestingly, although firms with high revenue forecasts experience poor operating performance results, the market does not immediately, or fully, reflect the poor operating performance in the firms’ share price. This suggests that while the market ultimately values operating performance metrics such as ROA and ROE, investor sentiment and market dynamics can obscure these effects. This aligns with Baker and Wurgler (2007) which documents that individual investors are prone to overreact or underreact to past returns or fundamentals of the firm.

LISTCOST variable:

There is a negative coefficient for all the performance metrics relative to the LISTCOST variable. This suggests that the IPO firms that have listing costs that make up a larger percentage of their market capitalisation underperform in the long

term. The coefficients for all the performance measures relative to the LISTCOST variable are statistically insignificant. These results are in line with the findings of Chipeta and Jardine (2014) which also found a negative relationship between listing costs and aftermarket performance, both from an operating and share price performance perspective.

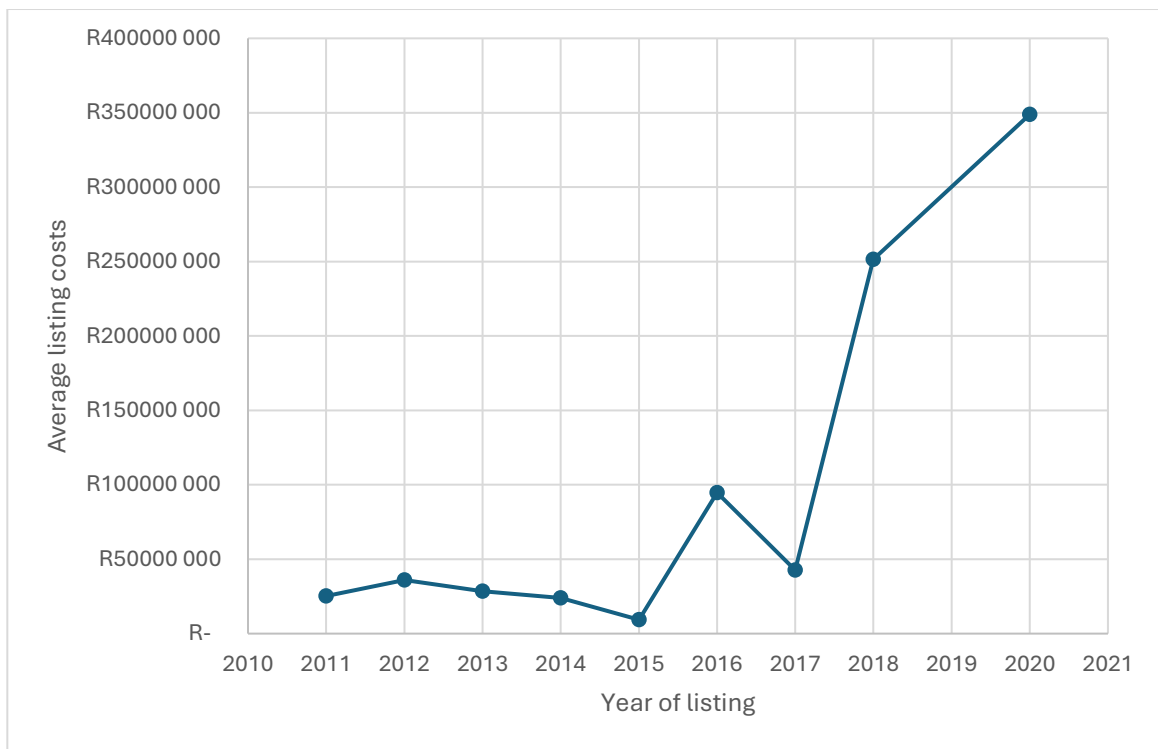
As can be seen in Graph 4, there has been a significant increase in the average listing cost per IPO over the sample period especially in 2018 and 2020. It is important to note however that the listing cost incurred by a company is affected by the complexity and size of the entity trying to IPO. In other words, a large company that is trying to raise a large amount of capital is likely going to need to incur more expenses relating to its listing than a company that is not trying to raise a large sum of money.

Pagano et al. (1998) explains that large and complex firms incur higher absolute costs when going public; however, as these firms also have higher market capitalisations, their relative listing costs represent a smaller percentage of their overall value. This is evident from Graph 5 which shows that listing costs as a percentage of the company's market capitalisation at the listing date have experienced a steady decline from 2012 to 2017. There was a spike in average listing costs in 2018 and 2020, but this is likely just due to the complexity of the listings that occurred in these years¹.

¹ Of the five IPOs that occurred between 2018 and 2020, four of the entity's that underwent an IPO in this sample period were components of a larger group of companies where the ultimate parent company of each listing respectively was a listed entity. Therefore, these four IPOs had a high level of complexity involved with their IPO which ultimately resulted in very high listing costs.

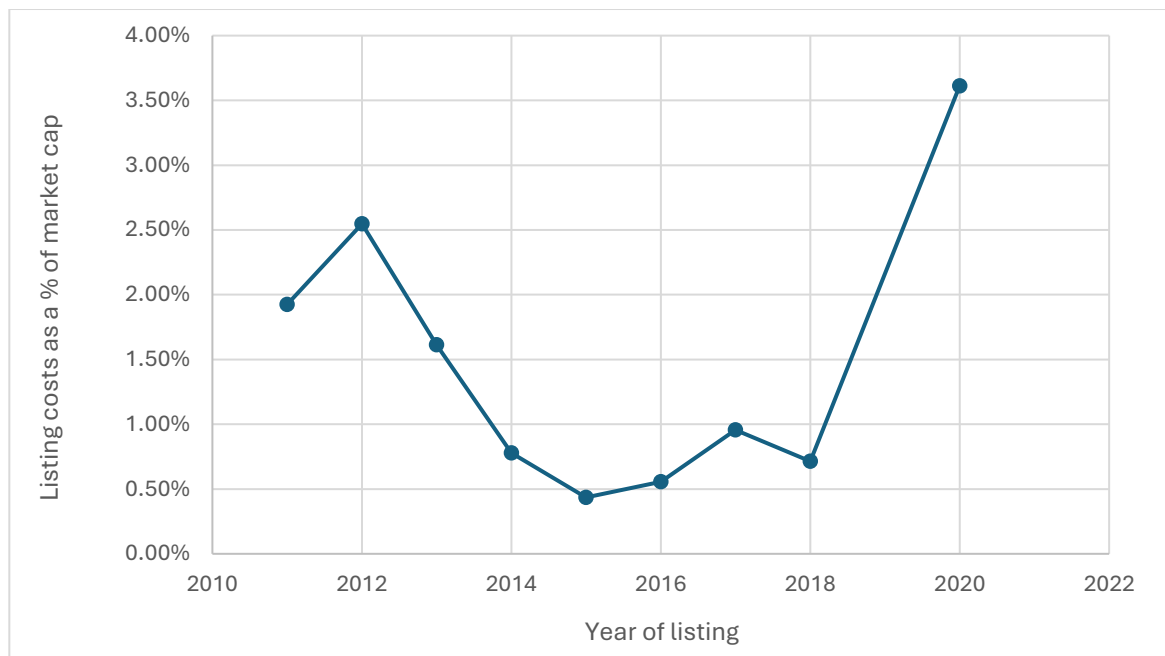
Graph 4:

Average listing costs per year for IPOs on the JSE from 2011 to 2021:



Graph 5:

Average listing costs as a percentage of market cap:



BS variable:

The BS variable represents the number of board members at the time of listing and is used as a proxy for the level of corporate governance in the IPO firm. It is evident from Table 25 that there is a negative coefficient relative to all the performance metrics. The coefficient for the ROA regression is significant at the 5% significance level. The coefficient for the ROE regression is significant at the 0,2% significance level. The coefficient for all the share price performance metrics is significant at the 1% significance level. These results indicate that firms with larger boards perform worse in the long term. This is in contradiction to Chipeta and Jardine (2014) that found a positive relationship between board size and long-term performance.

Additionally, Flaherty et al. (2007) found that for a sample of Fortune 200 companies, larger board are effective in reducing information asymmetry. This suggests that companies with larger boards may experience enhanced transparency and market liquidity. Although Flaherty et al. (2007) suggests that optimal board sizes can help improve market perceptions and investor confidence, it is important to note that this does not necessarily result in improved share price performance. Therefore, the findings of negative coefficients relative to all the

performance metrics illustrates how improved transparency does not necessarily result in improved performance metrics.

The relationship between corporate governance and firm performance is a complex and multidimensional area of research. Prior literature has shown that board size alone is a limited proxy for effective corporate governance. For example, Yermack (1996) provides evidence that firms with smaller boards tend to achieve higher market valuations, suggesting that smaller boards may be more effective at monitoring management than larger boards. Similarly, Coles, Daniel and Naveen (2008) argue that while board size can influence the firm performance, its effect is nuanced as the quality and composition play crucial roles in determining governance outcomes. Therefore, these studies that simply increasing the number of board members does not necessarily translate into more effective corporate governance.

Therefore, it is important to note that the BS variable used in this study represents a very basic proxy of corporate governance. The negative coefficient found suggests that the mere presence of more directors on a company's board does not ensure good long-term performance, both from an operating performance perspective and a share price perspective. This variable is likely an oversimplification of the impact of good corporate governance on long-term performance. As Dalton et al. (1998) notes, there are various aspects, such as number of independent directors, director expertise and experience, and director engagement that culminate in effective corporate governance.

Graph 6 below also illustrates that the average number of board members has not been consistent per year and there has been no consistent trend regarding the number of board members for IPO firms. In line with the prior research mentioned above, there are various factors to consider when an entity determines its board size and this is likely to differ on an entity-by-entity basis which explains the lack of a consistent trend.

Graph 6:

Average number of board members at listing date:



DOM variable:

The DOM variable represents the domicile of the company. The results of the regression in Table 25 illustrate a negative coefficient for the ROA regression while having a positive coefficient for the ROE regression. The coefficients for all the share price performance metrics are negative.

The negative coefficient for the ROA regression means that foreign companies tend to perform worse from an ROA perspective than South African companies. In contrast, the positive coefficient for the ROE regression suggests that foreign companies tend to outperform South African companies from an ROE perspective over the long term. Both of these findings regarding the operating performance metrics examined align with the findings of Chipeta and Jardine (2014).

Additionally, the negative coefficients for the share price performance metrics examined indicate that foreign companies tend to have worse share price performance than South African companies. The same relationship between company domicile and share price performance was observed by Chipeta and Jardine (2014).

All the coefficients relating to company domicile are statistically insignificant and therefore, these are unlikely to explain the performance of IPOs in the long run.

INVBANK variable:

The INVBANK variable is a proxy used to determine the impact of the investment bank's global reach on the performance of the IPO firm in the long run. The coefficient on the INVBANK variable is negative for all the performance metrics analysed however the coefficients are statistically insignificant. This suggests that the involvement of foreign investment banks with a larger global reach might have a negative effect on the performance of the IPO in the long run. This is in contrast to the findings of Chipeta and Jardine (2014) which found that positive coefficients regarding the INVBANK variable suggesting that IPOs that are underwriter and backed by international investment banks perform well in the long run.

A potential reason for the negative coefficient found in this analysis may be due to the higher listing costs that are involved when dealing with a foreign investment bank. These higher listing costs result in the IPO firm receiving less capital than they would have if they had used a South African-based investment bank which subsequently diminishes their ability to perform well in the long-term.

Additionally, foreign investment banks have a wider global reach and are therefore more likely to attract foreign investors to participate in the IPO. The negative coefficients found in this analysis regarding long-term performance appear to align with the findings of Yip, Su and Boon Ang (2009) which found that IPOs that were underwritten by leading international investment banks performed badly in the long-run. Yip, Su and Boon Ang (2009) also found that the expiration of the lock-out period also coincided with the beginning of the poor long-term performance.

This suggests that large international investment banks are capable of attracting foreign shareholders that may have a lower risk tolerance than local South African shareholders. Therefore, these foreign shareholders are more likely to sell their shares in the company during times of higher risk thus leading to worse share price performance in the long run. Moreover, these foreign shareholders appear to often invest in order to obtain the profits received initially due to underpricing but then these shareholders subsequently sell their shareholdings when the lock-up period expires.

AUDITQ variable:

Companies that are audited by one of the Big 4 audit firms (Deloitte, PWC, EY or KPMG) tend to perform worse in the long-term than those firms audited by a non-Big 4 audit firm as demonstrated by the negative coefficients for all the performance metrics analysed. These findings are in contrast to Chipeta and Jardine (2014) which found that firms audited by Big 4 audit firms tend to outperform those firms that were audited by non-Big 4 audit firms. It is important to note however that the findings regarding AUDITQ variable are not statistically significant at the 10% level or lower.

CONT variable:

The coefficient for the CONT variable is negative for all the performance metrics analysed however these coefficients are statistically insignificant. This suggests that having a contingent liability disclosed in the IPO firm's prospectus negatively influences the performance of the company in the long-term post-listing both from an operating performance and share price performance perspective.

These findings align with Chipeta and Jardine (2014) which also found that IPOs with contingent liabilities at listing date performed worse in the long-run than those IPOs with no contingent liabilities at listing date.

This indicates that uncertain future risks, which contingent liabilities normally represent, have a negative effect on the performance of the company although this relationship is statistically insignificant. In a similar way, Loughran and Ritter (1994) suggests that the content and tone of the risk information in the prospectus can influence the long-term performance of the entity.

IPO1 and IPO2 variables:

The coefficient for the IPO1 and IPO2 variables are positive for both the ROA and ROE regressions with the coefficients relating to the IPO2 variable being statistically significant at the 10% significance level. This suggests that IPO firms might see improving operational performance metrics over time with the improvement becoming statistically significant 2 years post-IPO. In other words, this finding can be interpreted as an indication that the benefits of going public might require some time to materialise in a statistically significant way.

The coefficients for both the IPO 1 and IPO2 variables are largely negative, except for the BHR regression for IPO1, with all the coefficients relating to the Buy-and-Hold adjusted return regressions being statistically significant at the 10%

significance level. This indicates that IPOs tend to underperform both in the 1st and 2nd year post-listing especially when considering their market-adjusted returns. The reason for the positive coefficient for the BHR regression for IPO1 might related to the positive raw return that was found in section 4.2 which examined the long-term share price performance.

A key takeaway is that IPO firms appear to demonstrate improving accounting-based performance, as shown by the positive coefficients for the ROA and ROE regressions, but this does not necessarily translate into stronger share price performance as evidenced by the largely negative coefficients for the share price performance metric regressions. This also aligns with the 'Fads and overoptimism theory (Aggarwal and Rivoli, 1990, Ritter, 1991) demonstrating that share price performance of an IPO does not normally accurately reflect the underlying reality of the accounting metrics relevant for that entity.

This might be due to the initial underpricing of the IPO causing positive short-term share price performance, which is subsequently followed by a correction in share price in the long term despite positive ROA and ROE performance over that same period.

5. Conclusions and recommendations

5.1. Initial underpricing – research question 1

The analysis of IPO performance on the JSE from 2011 to 2021 highlights several key findings regarding initial underpricing and short-run return of the IPO. It was found that IPOs on the JSE were subject to initial underpricing with average market-adjusted returns of 7.494% on the 1st trading day. The underpricing phenomenon persisted beyond the first trading day, with the IPOs continuing to yield positive average market-adjusted returns over 5, 10, 15 and trading days post-listing.

The highest average market-adjusted return occurred on the 1st trading day, whilst the highest median market-adjusted return occurred on the 5th trading day suggesting the results were positively skewed by a few IPOs experiencing very high initial returns. This differs from the results found by Agathee et al. (2012), which reported findings on Mauritian IPOs, as well as Van Heerden and Alagidede (2012), which both found that the 15th trading day had the highest return.

Variability in returns amongst IPOs was demonstrated by high standard deviations of returns and underscores the diverse spectrum of performance of IPOs with some IPOs experiencing much higher levels of underpricing than others.

The IPOs examined consistently outperformed the market, regardless of which of the three market benchmarks were used. The statistical significance of these results over the 11-year period as a whole supports the conclusion that IPO underpricing was the primary driver of why IPOs outperformed the market in the short term. Therefore, the null hypothesis was rejected. The analysis of wealth relatives provided corresponding results.

Sector-by-sector analysis revealed that IPOs in the financial sector achieved the highest average market-adjusted returns driven by a few very high-performing IPOs. The property sector demonstrated the most consistent performance across the study period. Returns also varied by offer price, with IPOs priced below R10 per share experiencing the highest market-adjusted returns. These high returns are likely largely driven by significant underpricing.

The findings regarding the offer price correspond to prior research such as Ibbotson et al. (1994) which found that underpricing was much larger when the offer price was lower. They found the average initial return on IPOs with an offering price of \$3.00 or more to be 8.6%, while the average initial return on IPOs with an offering price of less than \$3.00 to be 42.8%.

From a South African perspective, M'kombe and Ward (2002) as well as Van Heerden and Alagidede (2012) both found that the extent of underpricing was higher for shares with lower offer prices. The results of this study, as demonstrated in section 4.1.5, illustrate that these prior findings are consistent with the IPOs on the JSE from 2011 to 2021 with IPOs priced below R10 per share experiencing the highest market-adjusted returns.

Overall, the results confirm the typical IPO phenomenon of short-term outperformance relative to the market, which is driven by initial underpricing. Despite this, it is evident that the extent of the underpricing of IPOs on the JSE from 2011 to 2021 is significantly lower than the results reported by Van Heerden and Alagidede (2012). The average market-adjusted return of 108.3% on the 1st trading day that is reported in Van Heerden and Alagidede (2012) significantly differs from the average market-adjusted return of 7.494% (relative to the J303 market benchmark) on the 1st trading day that is reported in this study.

A potential reason for a portion of this difference is due to the difference in market benchmarks used. Van Heerden and Alagidede (2012) made use of the JSE All Share index as its market benchmark. The slight difference in the composition of the JSE All Share index and the three market indices used in this study, namely the J303, J403 and J2EQ market indices, are unlikely however to contribute a significant amount to explain the large extent of the difference that was found.

Another contributing factor to less extensive underpricing than prior research may be due to a more effective bookbuilding process. One factor causing this may be due to the advances in information gathering and sharing which has made the bookbuilding process more accurate (Chen et al., 2014).

When examining the results on a year-on-year basis, it is evident that IPO performance was particularly high in 2015. The IPOs in 2015 experienced much higher returns than the other years in the sample period from both an average raw return as well as an average market-adjusted return perspective. The returns in 2015 were more than double the average returns for the 11-year period as a whole. There are various factors which may have been at play causing this increased underpricing in 2015.

Firstly, the IPO in the population which experienced the highest extent of underpricing occurred in 2015. This undoubtedly increased the average returns for 2015 significantly and largely explains this high extent of underpricing relative to the other years in the sample period. The average market-adjusted returns in 2015 when this aforementioned IPO is excluded was 6.853% (relative to the J303 index) on the 1st trading day as compared to 17.611% (relative to the J303 index) on the 1st trading day when the aforementioned IPO was included.

A potential cause of the unusually high underpricing in 2015 may be due to a higher-risk environment within South Africa from the end of 2014 and into 2015. In general, a higher-risk environment requires firms to underprice their IPO to compensate investors for that higher risk. This is commonly referred to as “leaving money on the table” as per Ritter and Welch (2002). There were numerous factors that may have contributed to a higher-risk environment in 2015.

Another factor may have been the decrease in mineral resource prices that occurred in 2015. Morema and Bonga-Bonga (2020) illustrate the volatility of the share prices for securities listed on the JSE due to mineral resource price fluctuations. South Africa’s economy is heavily reliant on the sale of mineral resources and therefore commodity price fluctuations can significantly impact the economic outlook of the South African economy (Morema and Bonga-Bonga, 2020). Therefore, price decreases in mineral resources such as platinum, palladium and gold created increased risk regarding the South African economy during 2015 and may have contributed to the large extent of underpricing that was observed in 2015 (Bruwer and Van Den Berg, 2017). Lastly from a macro-economic perspective, 2015 was the first year in which South Africa experienced significant load shedding which further increased risk in the economy (Obalade et al., 2024). These various factors may have contributed to the unusually high underpricing in 2015.

The impact of the COVID-19 pandemic appears to be minimal as the results reported for IPOs in 2020 were not flagged as outliers as assessed by inspection of a boxplot for values greater than 1.5 box lengths. There does appear to have been more volatility in 2020 as evidenced by the standard deviation in 2020 being the highest of any year in the sample.

5.1.1. Recommendations from the initial underpricing analysis:

This study demonstrates that IPOs on average outperform the market in the short-term and can be an effective investment in the short-term. Therefore, investors would, on average, make a much higher return, in the short-term, by investing in an IPO rather than the market index. There is certainly a large degree of variability in this regard as demonstrated by the high standard deviation discussed in the analysis and therefore caution should be taken by investors when deciding which IPO to invest in.

Future studies could incorporate share introductions and Special Purpose Acquisition Company's (SPAC's) into the study to determine whether the initial performance experienced by these different types of listings is different to the short-term performance of IPOs. This could shed some light on the impact of the type of listing on the extent of underpricing and short-term share price performance. Future studies could also compare the performance of IPOs on the JSE with IPOs in a developed country to determine the similarities and differences that exist.

5.2. Long-term performance – research question 2

The results of research question 2 provided a comprehensive analysis of the long-term performance of IPOs that listed on the JSE from 2011 to 2021. The findings demonstrated that IPOs, on average, underperformed the Capped All Share Index (J303) and the Shareholder-Weighted All Share Index (J403) market indices over the 36-month post-listing period. In contrast, IPOs, on average outperformed the Equally weighted Top 40 Index (J2EQ) over the 36-month post-listing period.

The results align partially with the existing body of literature, such as Ritter (1991) and Chipeta and Jardine (2014) as the results discussed above suggest that IPOs tend to underperform the market benchmarks over the long term. The negative CAARs and negative Median CARs found in this research report support this well-studied phenomenon of long-term underperformance relative to the market. However, the extent of underperformance relative to the benchmarks is not as pronounced as what had been found in prior studies.

More specifically, Chipeta and Jardine (2014) found CAARs of -52.01% relative to the JSE All Share index, while the results of this research report found CAARs of -4.231% relative to the Capped All Share Index (J303). It is important to note that the market benchmark used in each study is slightly different. Chipeta and Jardine (2014) made use of the JSE All Share index which is subject to the resource effect [see Maritz (2003)] while this research report made use of the Capped All Share Index (J303) and the Shareholder-Weighted All Share Index (J403) market indices as they are effective in minimising the impact of the resource effect. There is a very large difference between the JSE All Share related CAARs of -52.01%, per Chipeta and Jardine (2014), and CAARs of -3.318% relative to the Capped All Share Index (J303) per this research report. This large difference suggests that the slight difference in benchmark used cannot solely explain this large difference in cumulative average abnormal return.

From a macro-economic perspective, after the 2008 financial crisis, global and South African interest rates followed a downward trend as the South African Reserve Bank and central banks around the world implemented low-interest rate based monetary policies to support economic recovery. The implementation of quantitative easing injected liquidity into financial markets and provided a low-interest rate environment in the economy. Lower interest rates result in lower costs of capital for businesses which likely enabled the

companies which had their IPO during the first half of the 2010s to invest in growth opportunities at a relatively low cost of capital. The low-interest rate environment for a significant portion of the sample period may have been a contributing factor to why the extent of underperformance was not as extensive as per the prior literature.

Additionally, this research report found positive CAARs of 5.162% relative to the Equally weighted Top 40 Index (J2EQ) which indicates that the IPOs in the sample performed better than the Top 40 shares on the JSE. These findings are in stark contrast to Chipeta and Jardine (2014) which found that the greatest negative CAARs of -53.43% were found when comparing the IPO's cumulative returns against the JSE Top 40 index. In other words, Chipeta and Jardine (2014) found that IPOs had the most pronounced underperformance when compared to the JSE Top 40 index. The large difference in these results relative to the Top 40 index may be due to various factors.

Firstly, the difference in benchmarks used might be contributing to a portion of this difference. This research study made use of the Equally weighted Top 40 Index (J2EQ), to account for the resource effect, while Chipeta and Jardine (2014) made use of the normal Top 40 index. The fact that Chipeta and Jardine (2014) did not use an equally weighting index could have resulted in high-performing resource companies' returns disproportionately affecting the abnormal return relative to the Top 40 index.

Secondly, Graph 7 below shows the FTSE/JSE Precious Metals and Mining index over the sample period of 2011 to 2024 (as this includes the 3 years post-listing for an IPO in 2021) illustrating that mining companies on the JSE experienced negative returns from 2011 until March 2020. These negative returns were likely due to a variety of factors within the resources sector but most specifically the low global price of various precious metals over the sample period was likely a big contributing factor to the sector's poor performance.

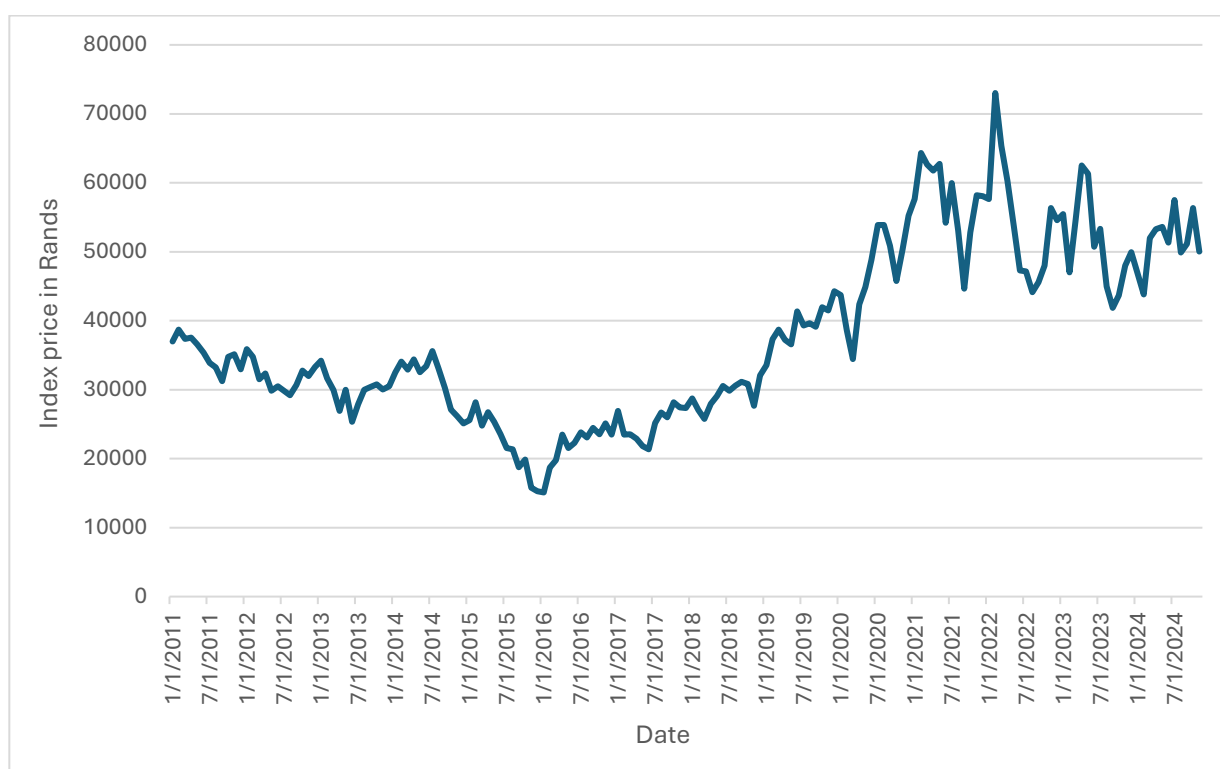
Consequently, the impact of the resource effect may be a factor behind the results found relative to the J2EQ benchmark. The resource effect refers to the high concentration of resource companies on the JSE, with an especially high concentration on the JSE Top 40 index. Due to the resource effect, it appears that the performance of the Top 40 index was likely being weighed down considerably by the poor performance of companies in the resource sector over a significant portion of the study's sample period. This poor performance by companies within the resource sector could be a large contributing factor

behind why the IPOs in the sample, on average, performed better than the Equally weighted Top 40 Index (J2EQ).

Lastly, the outperformance relative to the J2EQ index suggests that smaller and mid-cap companies might have performed better than large-cap companies over the sample period. This could be due to differences in market conditions and stagnation within the Top 40 index over the sample period.

Graph 7:

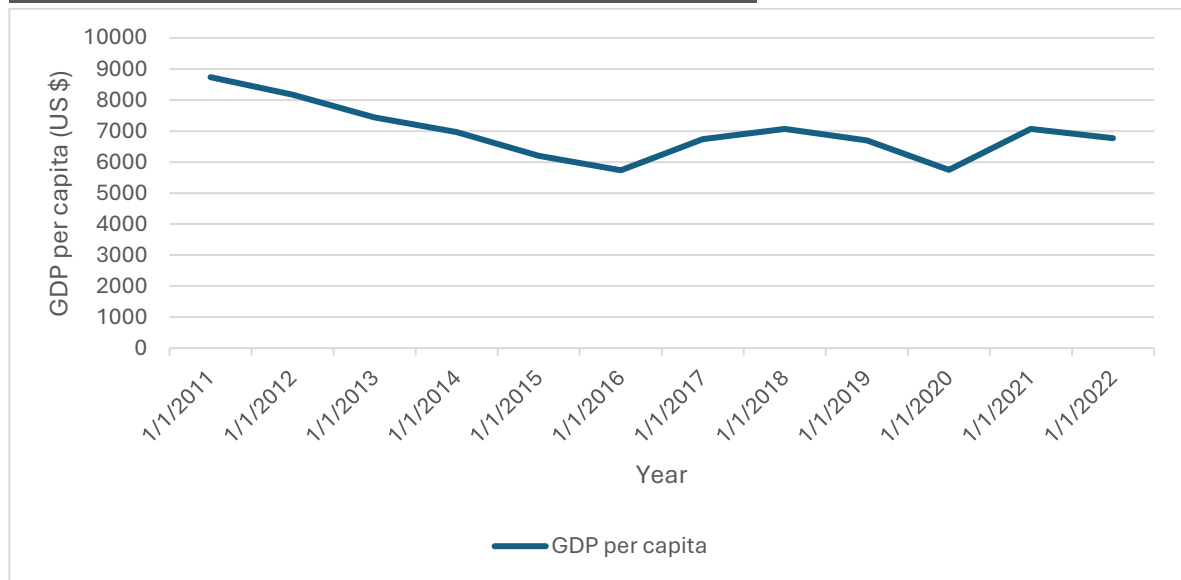
FTSE/JSE Precious Metals and Mining Index from 2011-2024:



Source: Index share price data obtained from IRESS and graph created using Microsoft Excel

The lack of statistically significant results, as demonstrated by the Wilcoxon signed-rank test, differs from prior studies such as Ritter (1991) and Chipeta and Jardine (2014) which found CAARs to be statistically significant. This may be due to the relatively smaller sample size that was used for this study when compared to the large sample used in the aforementioned studies. Ritter (1991) examined 1526 IPOs over the 10-year period from 1975 to 1984. Chipeta and Jardine (2014) examined 154 IPOs over the 15-year period from 1996 to 2010. This illustrates that the small sample of 36 IPOs that were used in this study, due to the decreased frequency of IPOs on the JSE in the last 15 years, was likely a big factor in why the results were not deemed statistically significant.

Graph 8:
South African GDP per capita from 2011-2022:



Source: Macrotrends.net²

Another potential cause of long-term underperformance of IPOs could be due to the wider microeconomic challenges faced by South Africa over the period studied of 2011 to 2021. As can be seen in Graph 8 above, South African has experienced a decreasing GDP per capita during the period under study from 2011 to 2021. A lower GDP per capita often signals weaker economic conditions including reduced consumer spending, lower level of business investment and slower economic growth. This can lead to lower corporate profits which creates a challenging environment for companies to grow. For IPOs, this might have resulted in newly listed companies struggling to generate expected returns for investors, resulting in poor long-term share price performance. Additionally, low investor confidence that was present in South Africa over the period under study from 2011 to 2021 usually leads to greater market volatility and less favourable conditions for stock price appreciation in the long run.

The noticeable differences between the CAARs and the Median CARs suggest that a few exceptionally high-return IPOs elevated the average. This appears to indicate that some of the IPOs successfully capitalised on growth opportunities or operated in booming sectors.

² Macrotrends LLC *South Africa GDP per capita 1960-2025*, MacroTrends. Available at: <https://www.macrotrends.net/global-metrics/countries/zaf/south-africa/gdp-per-capita> (Accessed: 30 March 2025).

Initial investor over-optimism regarding the growth prospects of the IPO coupled with the initial high returns caused by underpricing may have led to shares being traded at unreasonable share prices at the end of the month in which the IPO occurred. The subsequent market correction appears to have consistently occurred in the first 6 months of trading post-IPO as demonstrated and discussed in Graphs 2 and 3.

5.2.1. Recommendations regarding long-term performance:

The results suggest that IPOs on the JSE underperform the market as a whole as illustrated by the negative CAARs relative to the J303 and J403 market indices. Despite this, it does appear that from a cumulative raw returns perspective, investing in an IPO, on average, will result in positive cumulative raw returns. Consequently, although IPOs do, on average, return a positive cumulative return, an investment in the broader market indices such as the J303 and J403 indices would provide a higher return than the average IPO over the 36 months post-listing.

Additionally, it is evident due to the presence of large outliers and extreme points, that there is a large degree of variability when it comes to IPO returns over the long-term. Therefore, investors need to consider the macro-economic trends, industry factors as well as the fundamentals of the company before investing in its IPO. The presence of large positive outliers and the positively skewed data show that a few IPOs in the sample period experienced very high returns. The allure of obtaining an astronomically high return in the long term by investing in a promising IPO is still likely a driving force behind the IPO market.

Future studies could incorporate share introductions and Special Purpose Acquisition Company's (SPAC's) into the study to determine whether the long-term performance experienced by these different types of listings is different to the long-term performance of IPOs. This could shed some light on the impact of the type of listing on the long-term share price performance of IPOs. Future studies could also compare the performance of IPOs on the JSE with IPOs in a developed country to determine the similarities and differences that exist.

Furthermore, future studies could increase the time frame over which long-term performance is examined to 5 years which might be able to provide further insights regarding long-term share price performance of IPOs. A comparison between stock exchanges in different countries could also provide an interesting comparison between a developed and developing countries IPO market.

5.3. Determinants of long-term underperformance – research question 3

The findings of this study offer valuable insights into the effects of pre-listing firm-level characteristics on the long-term performance of IPOs on the JSE from 2011 to 2021. The findings are consistent with the “fads and overoptimism” hypothesis (Aggarwal and Rivoli, 1990, Ritter, 1991) as well as the “hot issue market” theory (Ibbotson and Jaffe, 1975) as IPOs issued during high-volume years underperformed in the long term. This supports the theory that market overoptimism during these periods of high IPO volume may lead to overvaluation and therefore subsequent underperformance in the long run.

Additionally, firms with high revenue forecasts performed worse which further reinforces the “fads and overoptimism” theory that inflated and unrealistic forecasts in the pre-listing prospectus leads to subsequent long-term underperformance. The failure to meet these optimistic forecasts is likely to have caused shareholders to lose confidence and subsequently sell their shares. This is a potential cause of the long-term underperformance of the IPO firms in the long-term.

IPO firms that issue a larger number of new shares tend to perform well from an operating performance perspective however they exhibit negative share price performance in the long-term. One potential reason for this may be due to the expiry of the lock-up period. Prior research indicates that once this lock-up period expires, some pre-IPO investors and the underwriter may decide to sell their shares to realise short-term gains received due to initial underpricing (Bradley et al., 2001). This is shown in Table 24 as well as section 4.1 relating to short-term share price performance of the entity. Therefore, the larger the number of new shares sold, the higher the chance of a post-lock-up period selloff especially by the underwriter.

The positive and statistically significant coefficients with regard to the AGE variable aligns with Chipeta and Jardine (2014) findings that more established firms benefit from greater market confidence and operational stability which reflects in their share price performance in the long run. The negative impact of large board sizes which was found in this study challenges the prior findings of Chipeta and Jardine (2014).

This suggests that having more directors does not necessarily translate to better performance both from an operating and share price perspective. Although Flaherty et al. (2007) suggests that optimal board sizes can help improve market

perceptions and investor confidence. It is important to note that this does not necessarily result in improved share price performance. Therefore, the findings of negative coefficients relative to all the performance metrics illustrates how improved transparency does not necessarily result in improved performance metrics.

The negative effect of international investment banks and Big 4 audit firms on the long-term performance of IPO firms is in contradiction to the findings of Chipeta and Jardine (2014). The negative impact of the investment bank and Big 4 audit firm might be due to increased costs relating to foreign investment banks and audit firms respectively. Additionally, foreign investors, who are more likely to become shareholders if a foreign investment bank is involved in the IPO, might exhibit more conservative behaviour during volatile periods.

Although the coefficients relating to the INVBANK and AUDITQ variables were not statistically significant, the results still suggest that the characteristics of the entity itself, such as firm age and asset base, are more important determinants of positive long-term performance than the investment bank and audit firm used by the IPO firm. This does not mean that auditor's reputation is irrelevant as many studies have been done that focus specifically on audit quality such as Ado et al (2020) which found an insignificant relationship between audit quality and long-term performance. Therefore, the findings of this report relating to audit firm suggest that the quality of the audit firm is important from a reputation perspective.

High listing costs relative to the IPO firm's market capitalisation tend to result in poor performance of the IPO in the long term. This may be due to the inability of smaller firms to offset these high listing costs with robust post-IPO performance. It is interesting to note that the large majority of the listing expenses incurred by IPO firms relate to costs associated with the investment bank and legal advisors involved. This indicates that the fees charged by the JSE itself are not the driving factor behind the high listing costs which can make listing on the stock exchange undesirable for some companies (Oesterle, 2006).

The decline in share price performance in Year 2 post-listing aligns with the findings of research question 2. This may be due to IPO lock-up periods expiring which might subsequently trigger a sell-off in the shares by investors to cash in on the positive returns that are obtained in Year 1 post-listing.

The presence of a contingent liability demonstrates increased risk for investors and tends to result in negative performance in the long run both from an operating perspective and a share price perspective. The realisation of the contingent liability

could be causing a negative relationship with the operating performance metrics. Similarly, the realisation of a contingent liability may significantly change the risk profile of the company causing investors to sell their shares causing the negative share price performance of IPO firms in the long run.

It is also noticeable that on average, IPO firms exhibit positive ROA and ROE for all 3 years of the post-listing period that was examined yet this strong accounting-based performance does not translate directly to positive share price performance in the long term.

5.3.1. Recommendations regarding the determinants of long-term performance:

The results suggest that there are some firm-level characteristics, such as the age of the company and asset base, that demonstrate positive relationships with long-term IPO performance. The IPOs on the JSE from 2011 to 2021 appear to be somewhat consistent with the “fads and overoptimism” hypothesis (Aggarwal and Rivoli, 1990, Ritter, 1991) as well as the “hot issue market” theory (Ibbotson and Jaffe, 1975) as illustrated by the results found regarding the volume of IPOs and revenue forecasts.

Overall, the lack of statistical significance at the 10 per cent level or lower for many of the independent variables examined indicates that the observed effects for those independent variables might be due to random chance rather than underlying relationships. Additionally, the lack of statistical significance for various independent variables could indicate that the sample size used in this study is too small to detect meaningful results. However, it must be noted that Chipeta and Jardine (2014), which used a sample of 154 IPOs on the JSE, also found that many of the variables did not indicate statistical significance which indicates that the observed effects for those independent variables are more likely due to random chance rather than underlying relationships.

Future studies could incorporate share introductions and Special Purpose Acquisition Company's (SPAC's) into the study to determine whether the determinants of long-term performance experienced by these different types of listings is different to the long-term performance of IPOs. Future studies could also compare the performance of IPOs on the JSE with IPOs in a developed country to determine the similarities and differences that exist.

Additionally, the impact of certain determinants on post-IPO performance could be more specifically studied. For example, the impact of changes in board composition after the IPO on the post-IPO performance of IPO firms could be studied more directly to highlight the influence of good corporate governance on IPO performance. Similarly, a further area of research could include doing a more in-depth analysis regarding the impact that the number of non-executive directors has on the long-term share price performance of the company.

The conducting of a mixed methods study into specific IPOs could help to provide more clarity regarding which pre-listing firm-level characteristics have a greater impact on long-term performance of IPOs in the long-term.

Moreover, the rapid increase in average listing costs from 2018 to 2021 is an area of potential future research. Listing costs are made up of various elements, such as JSE related fees, underwriter fees and legal fees. Understanding the proportional impact of each of the elements of listing costs incurred by the listing entity can provide more insight into what raises the most concerns for listing entity's regarding the affordability of going public.

Future research could research in in-depth regarding what impact the audit firm, and any changes to the chosen audit firm, may have on the long-term share price performance of the entity. This could help shed some light regarding whether investors any attention to the auditing firm which is appointed to audit the company undergoing an IPO.

6. Overall conclusion

This study found that initial public offerings (IPOs) on the Johannesburg Stock Exchange (JSE) from 2011 to 2021 were generally underpriced, with an average market-adjusted return of 7.494% on the 1st trading day post listing date. The effect of underpricing persisted over subsequent trading days with the highest average return being found on the 1st trading day whilst the highest median return was found to be on the 5th trading day. These findings differs from the results found by Agathee et al. (2012) and Van Heerden and Alagidede (2012), which both found that the 15th trading day had the highest return.

The IPOs that formed part of this study consistently outperformed the market benchmarks examined (J303, J403 and J2EQ indices) in the short-term, confirming that underpricing was the main factor causing the initial strong share price performance. An analysis on a sector-by-sector basis revealed that industry related factors appear to play a role in the extent of underpricing. Moreover, IPOs priced below R10 per share tended to yield the highest market-adjust returns in the short-term. This further provides evidence that supports prior research which found that lower offer prices are associated with a larger extent of underpricing.

Compared to prior studies, such as Van Heerden and Alagidede (2012) which reported a 108.3% first day return, the extent of underpricing on the JSE from 2011 to 2021 was considerably lower than what was found in that prior research. This may be partially due to the use of slightly different market benchmarks and improvements in the bookbuilding process.

A year-on-year analysis showed that IPO performance peaked in 2015 however that appears to be due to a combination of one highly underpriced IPO and broader economic factors that increased the general economic risk associated with the economy and stock market. Factors such as loadshedding in South Africa and falling mineral resource prices culminated in increased market risk in South Africa which consequently resulted in underpricing being intensified in order to compensate investors for the additional risk that was present.

Long-term performance over a 36-month period post-IPO provided mixed results. On average, IPOs underperformed when measured against the Capped All Share index (J303) as Shareholder-Weighted All Share index (J403) while the IPOs outperformed the Equally-Weighted Top 40 index (J2EQ). These findings partially align with prior research findings, such as Chipeta and Jardine (2014), regarding long-term IPO underperformance but suggests that the underperformance relative

to the market is not as large as what was identified by prior research. Short-term over-optimism and high initial returns on average lead to market rebalancing within the first six-months post-IPO.

Firm-level characteristics play a key role in long-term performance as evidenced by the findings per this research report that older and more established companies performed better over the long-term. Similarly, large board sizes and higher listing costs relative to market capitalisation tended to result in worse long-term performance. Moreover, the use of an international investment bank or a Big 4 audit firm was linked to lower long-term market-adjusted share price returns.

The expiration of lock-up periods often tends to trigger sell-offs of that share, contributing to a decline in performance during the second year of listing. Despite showing positive operating performance, many firms that underwent an IPO in the sample period were not able to translate those initial gains into sustained share price increases.

In summary, IPOs on the JSE between 2011 and 2021 demonstrates initial underpricing which resulted in short-term market outperformance for IPOs on the JSE. In the long-term, IPOs underperformed the broader market whilst still offering a better return than the JSE Top 40 related index that was tested. A combination of market corrections, firm-specific characteristics and broader economic factors result in modest long-term gains that generally did not outperform the market indices.

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8. Appendices

8.1. Appendix A:

Sector classification per this study:	JSE sector classification:
Financial	Financial services
	Speciality finance
	Equity investment instruments
	Asset managers
Mining	General Mining
Property	Real Estate Holding and Development
	Diversified REITs
	Retail REIT
	Industrial and Office REITs
	Residential REIT's
	Speciality REITs
Other	Apparel retail
	Industrial machinery
	Pharmaceuticals
	Food Products
	Support services
	Business Support Services
	Food Retailers and Wholesalers
	Building Material & Fixtures
	Food and drug retailers
	Farming, Fishing & Plantations
	Broadline retailers
	Computer services
	Speciality retailers
	Software and computer services

8.2. Appendix B: List of tables, figures and graphs

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Graph 8	South African GDP per capita from 2011-2022

8.3. Appendix C: List of abbreviations

Abbreviation	Explanation of abbreviation
IPO	Initial Public Offering
JSE	Johannesburg Stock Exchange
JSE AltX	Johannesburg Stock Exchange Alternate Exchange
ROA	Return on assets
ROE	Return on equity
US (or USA)	United States of America
UK	United Kingdom
J303	JSE Capped All Share Index
J403	JSE Shareholder-Weighted All Share Index
J2EQ	JSE equally-weighted Top 40 index
NPV	Net present value
SPAC	Special Purpose Acquisition Company
IRESS	Integrated Real-time Equity System
MASRP	Market-adjusted short-run performance
WR	Wealth relative
CAPM	Capital asset pricing model
CAAR	Cumulative Average Abnormal Return
CAR	Cumulative Abnormal Return
BHR	Buy-and-hold return
BHAR	Buy-and-hold abnormal return
FTSE index	Financial Times Stock Exchange index
GDP	Gross domestic product