DETERMINANTS OF IPO SURVIVAL ON THE JOHANNESBURG SECURITIES EXCHANGE

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Abstract

The purpose of this paper was to establish the determinants of IPO survival on the Johannesburg Securities Exchange (JSE). Using the Kaplan-Meier test, this study established that firms less than five years prior to listing on the JSE have a significant smaller mean survival time; firms with a gross proceed less than the median have a significant shorter mean survival time; overpriced IPOs have a significant higher survival time; IPOs listed during the hot market period on the JSE have a significant smaller mean survival time and IPOs with return on asset, operating profit margin, and return on equity less than or equal to zero have a low mean survival time. Also, being in the internet industry significantly shortens the mean survival time of an IPO. Moreover, based on the Cox Proportional Hazard model, it was established that the determinants of IPO survivability on the JSE are the firms' age, size, market period, return on equity and operating profit margin are. These findings provide investors and companies in the JSE with empirical evidence of the determinants of IPO survivability of the JSE. As such, investors are advised to consider these factors when selecting their portfolios.

Keywords: IPOs, JSE, IPO survival, IPO characteristics

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1. Introduction

The survivability of newly listed firms is a research domain that has surprisingly attracted little attention from African financial markets. The question of how long an initial public offering (IPO) will survive and be successful on a stock exchange places important implications for a firm's stakeholders. For example, while investors (owners) are interested in the likelihood of an IPO firm's exit from the stock exchange because it provides them with an additional dimension on stock valuation; companies and policy makers on the other hand are interested in IPO survival because as long as a company remains listed, it can raise funding from public markets. Also, regulators can use IPO survival as one of the benchmarks to measure the success of the rules they impose on firms that plan a listing. Moreover, ex ante, information on how long an IPO stock is likely to continue being listed on a stock exchange can help the market to evaluate a stock's cash-flow profile and hence price it efficiently (Espenlaub *et al*., 2010).

Empirical evidence (Hensler *et al*., 1997; Demers and Joos, 2007) reveals that the most critical stage of a new firm in the market is the time shortly after going public. This is because when a new firm enters the financial market, the IPO is accompanied by both expectations and uncertainty. Also, assessing the IPO factors/characteristics at the time of the IPO is expected to provide useful information on the expected survival time (Peller, 2013). Studying the survival times of IPO companies in the aftermarket has gained increasing interest as, Fama and French (2004) accentuate that over the past decades, there has been a dramatic decline in the survival rates of newly listed firms both in absolute terms and relative to seasoned firms as the number of defaulting companies have increased. For investors, it is vital to assess the IPO's potential and risk before investing and one dimension of examining the IPO's aftermarket performance is the expected survival time. Audretsch and Lehmann (2005) propose that a suitable measure of performance for IPO firms is their ability to survive over time. Prior studies (Welbourne and Andrews 1996; Caves, 1998) have also viewed a firm's survival as a measure of firm performance. An IPO company's survival time denotes the time a newly listed company survives in the capital market. This is a considered a basic but vital way of performance measurement. Yang and Ding (2012) define an IPO's failure to survive as delisting from the trading exchange for negative reasons. According to Peller (2013), the delisting of an IPO company from a stock exchange due to negative reasons is mostly accompanied with serious financial distress or even bankruptcy.

A vast amount of prior studies (Peller, 2013; Ahmad, 2012; Santos, 2011; Demers and Joos, 2007; Kooli and Meknassi, 2007; Carpentier and Suret, 2011; Thomadakis, Gounopoulos and Nounis, 2011; Peristiani and Hong, 2004; Gounopoulos, 2011; Boubakri, Kooli and L'Her, 2005), have produced a mixed bag of results across different stock markets, with both financial and non-financial factors (e.g. firm age, market capitalization, timing of issue, leverage, profitability, offer size, gross proceeds, price to book value (P/B), market to book value (M/B) and insider ownership) having different influences on IPO survivability in different stock markets. In South Africa, IPO studies on the JSE have mainly focused on the short and long run IPO performance (in terms of IPO returns) across different time period (Neneh and Smit; 2014; Neneh and Smit, 2013; Van Heerden, and Alagidede, 2012; Alli et al., 2010) with little or no studies examining the survivability of the IPOs. As such, this study focuses on this critical aspect of the process of going public, namely, the survival of IPO firms in the aftermarket on the JSE. This study investigates which factors/ characteristics can improve the survival profile of IPOs on the JSE. The rational for this study is that over the years while some IPOs studies on the JSE have provided information on different aspects of the post-IPO long run performance, the survival profiles of IPO companies on the JSE have not been studied. Also, studies on IPO survivability across different studies markets have produced mixed results. As such, information on the survival profile of IPOs on the JSE will provide very valuable information on IPOs on the JSE, as findings from this paper will help investors to better assess their risks to returns portfolios more properly, and also enable the issuing firms to take better decisions when going public.

2. Literature review

2.1. IPO survival

Literature studies on IPO survival have been carried out in an attempt to ascertain the reasons as to why a new firm actually fails in the market. According to Peller (2013), studies on IPO survival is strongly related to that of firm survival in general. The resource-based theory has been used to provide explanations as to why some firms find it difficult to survive (Esteve-Pe´rez and Man˜ez-Castillejo, 2008). The resource-based view of a firm places emphasis on the internal characteristics (resources and capabilities) of the firm as an underlying factor that enables them to make different strategic choices that result in different outcomes (Seedee *et al*., 2009). The resource-based view is of great relevance, as it argues that the long-term survival of firm depends on its distinctive resources and capabilities, and the development of this distinctiveness over time through nurturing the firm's core competencies (Kelliher and Reinl, 2009). Therefore, the ability of a firm to develop distinct resources and capabilities increases its ability to adapt and adjust to the changing competitive environment and thus helps to improve its survival prospects.

Research on IPO survival has also adopted the literature on bankruptcy prediction models such as that of Beaver (1966), Altman (1968), and Ohlson (1980) in the United States, Inman (1991) in the United Kingdom, and Cybinski (2001) in Australia. These studies identified characteristics and factors (accounting information, company's age, timing of issue (hot and cold market periods), financial ratios, leverage, profitability, offer size, gross proceeds, market capitalization, price to book value (P/B), venture capital, underwriters, role of information intermediaries, market to book value (M/B), insider ownership, deal-related variables) to be key determinants of IPOs survival across different stock markets, although some of these studies differing continually, while others produce inconclusive empirical results.

Hence, in order to find out the determinants of IPO survival on the JSE, this study classifies IPO characteristics into firm specific characteristics (firm's age, firm's size, and industry); issue related characteristics (IPO market periods, and initial performance); and Profitability ratios.

2.2. Firm specific characteristics

2.2.1. Firm's Age

The age of an IPO firm has been considered as an underlying risk proxy (Carpentier and Suret 2011; Demers and Joos 2007; Hensler *et al*., 1997; Jain and Martin 2005; Ritter, 1991), as it is expected that companies with more experience before going public have lower failure rates than young companies. Peristiani and Hong (2004) found a firm's age to be a fairly good predictor of aftermarket survival. Amini and Keasey (2011) indicated that older British IPOs had a longer mean survival time than younger ones. Hensler *et al.* (1997) pointed out that a firm's age at the time of listing is positively related to its long run survival. Contrary to these studies, Yang and Ding (2012) found that the age of the firm had no significant relationship with its aftermarket survival. Nonetheless, following the outcome from most studies (Hensler *et al*, 1997; Demers and Joos 2007; Amini and Keasey, 2011) we expected that the firm's age at offering should be positively related to the likelihood of survival of IPOs on the JSE.

2.2.2. Firm Size

Prior research (Amini and Keasey, 2011; Jain and Martin, 2005) have revealed that the size of offering captures the extent of information asymmetry surrounding the IPO. As such it is expected that firms

with a larger issue size should have less information asymmetry and uncertainty regarding the future prospects of the company. Accordingly, studies by (Carpentier and Suret, 2007; Lamberto and Rath, 2008; Demers and Joos, 2006; Hensler *et al.*, 1997) established that the size of IPO was positively related to the survival rates of new issues. Also, Kooli and Meknassi (2007:39) found that the sized of IPOs is positively related to the survival rate. However, Yang and Ding (2012) failed to find any significant relationship between IPO size and its aftermarket survivability. In line with the majority of studies, we expect a positive relationship between firm size and an IPO firm's likelihood of survival on the JSE. Similar to prior studies (Carpentier and Suret, 2007; Lamberto and Rath, 2008) firm size is measured in terms of gross proceeds.

2.2.3. Industry (Internet vs Non-Internet)

Several studies (Botman et al., 2009; Bhattacharya et al., 2006; Bartov et al., 2002) have indicated that there are significant differences between internet IPOsand IPOs from other industries. Studies (Bootman et al., 2009; Bhattacharya et al, 2006; Peristiani and Hong, 2004) from the US have shown that IPO firms in the internet industry are high risk IPOs because they have a higher probability of failure than other firms. Hamza and Kooli (2010) and Botman et al. (2009) have shown that internet firms have a significant negative impact on IPO survival. According to Botman et al. (2009), IPOs in the internet sector present a high risk to investors and are different in nature thus making them an important sector to examine. Given that internet firms are considered a high risk, we expect following prior studies (Hamza and Kooli, 2010; Botman et al., 2009) that internet IPOs in the JSE will have a negative impact on IPO survivability.

2.3. Issue related characteristics

2.3.1. IPO market periods

IPO markets follow cyclical patterns with dramatic swings called hot and cold markets. Hot market periods are periods of rising initial returns and increasing numbers of IPOs, and are characterized by extremely high initial returns and by an extraordinarily high variability of initial returns (Doeswij *et al*., 2006; Altl, 2005). Cold market periods on the other hand are characterized by less underpricing, lower issuance, fewer instances of oversubscription, and larger offerings (Helwege and Liang, 2002). Several studies (Carpentier and Suret, 2007; Boubakri, Kooli and L'Her, 2005, Demer and Joos, 2006) have established that IPOs issued during hot market periods have low survival rates and high failure rates than IPOs issued during the cold market periods. Likewise, Ritter (1991) and Loughran and Ritter (2004) found a negative relationship between hot market periods and IPO survival. This results from the fact that high initial returns lead to excessive demand for IPOs and thus create favourable market conditions for issuers who can raise capital at lower costs (Demers and Joos, 2007). This then entices lower quality issuers to take advantage of investor sentiment and go public regardless of the danger of not being able to perform and survive in the long run (Kooli and Meknassi, 2007). Consequently, we expected that IPOs issued during the cold market period to have a higher survival rate than IPOs issued during the hot market.

2.3.2. Initial Performance

According to Ahmad (2012), good quality issuer reduces uncertainty and signals their quality by underpricing the IPOs. Therefore, from a signaling perspective, it is expected that underpricing should have a positive relationship with IPO survival. Consistent with this prediction, Demers and Joos (2007) established a positive relationship between the initial returns and long term survival of high-internet IPOs. Hensler *et al*. (1997) found that IPOs with higher positive initial returns have a high probability of survival. Conversely, Hamza and Kooli (2010) observed that higher level of underpricing increases the likelihood of failure. While, Espenlaub *et a.l* (2010) did not find any significant impact of initial returns on the survival of IPOs on the AIM stock exchange. Following the signaling perspective, we expect a positive relationship between initial returns and the survival of IPOs on the JSE.

2.4. Profitability ratios

Profitability ratios measure a company's ability to generate earnings. The profitability of the firm has been identified by Lamberto and Rath (2008) as a key survival factor. These authors elucidate that firms that are more profitable at the beginning of their public life are likely to remain profitable in future and thus hypothesize that a firm's profitability is positively related to its survival. Chancharat *et al*. (2009) established that firms with a high profitability ratio have more likelihood to survival. Similarly, Espenlaub *et al*. (2010) established that pre-IPO return on asset (ROA) had a statistically significant positive impact on IPO survival. Conversely, Peristiani and Hong (2004) found a strong and statistically significant negative relationship between pre ROA and IPO survival. As a proxy for profitability ratio, this study utilizes ROA, return on equity (ROE), and operating profit margin (OPM) as a measure of profitability ratio of the firms. In line with Lamberto and Rath (2008), we expect that firms with a high profitability ratio should have a high likelihood of survival for IPOs on the JSE.

3. Methodology

3.1. Sample and data collection methods

The sample for this study comprises of a 310 IPO companies that were listed on the JSE during the period of 1996 to 2007. The information was sourced from McGregor-BFA database. Information on the explanatory variables (Table 1) was also sourced from McGregor-BFA database.

Table 1. Definition of explanatory variables

Variable	Definition
Firm Specific Characteristics	
Age	Age is calculated as the number of years since incorporation of the IPO firm measured at the time of going public
Size	The size is the gross proceeds (GP) raised at IPO
Industry (Internet Dummy)	The Internet dummy takes a value of 1 if an IPO company is an internet IPO and 0 otherwise. Classification of an IPO based on internet and non-internet follows from prior studies (Knauff *et al*., 2003; and Botman, *et al*., 2009; Hamza and Kooli, 2010).
Issue Related characteristics	
Market Dummy	Market dummy takes a value of 1 if the IPO firm was listed during a hot market period and 0 otherwise. Classification of an IPO into hot or cold market period is based on the cumulative number of IPO companies that were listed in the given period when the firm was listed. This is in line with prior studies (Doeswij et al., 2006; Neneh & Smit, 2013).
Initial Performance	The market adjusted abnormal return (MAAR) at the first day of trading.
Profitability ratios	
ROA	The Pre IPO ROA of the IPO firm
NPM	The Pre IPO ROA of the IPO firm
ROE	The Pre IPO ROA of the IPO firm

3.2. IPO Survival

It is a generally acceptable scenario that an IPO company has survived if it is still listed on the stock exchange at the end of an observation period (Lamberto & Rath, 2008; Botman et al., 2009; Amini & Keasey, 2011; Demers & Joos, 2007; Wagner & Cockburn, 2010). As such, non-survivors are firms delisted from the stock exchange for any reason (e.g. suspension, liquidation, merger/acquisition etc.). In this study, IPO companies in the sample are tracked from their listing date until the end of 2013. For example, a company that went public in 1996 is tracked for 17 years while a company that went public in 2007 is tracked for only six years. Tracking firms in this way is vital as it helps in ensuring that the survival analysis fully captures the two key issues which are the risk set and hazard rate (LeClere, 2000). The risk set refers to the subset of a sample that is a risk of the event occurring at a specified time period while the hazard rate refers to the probability of the event occurring to any member of the sample at a given point in time (LeClere, 2000). The event in this study is defined as the subset of IPO firms that are delisted from the JSE for performance reasons. Since non-survivors also comprise of merger and acquisition, these group were treated as censored survivors.

The survival rates of the IPOs were estimated using the Kaplan-Meier estimator. IPO groups were segmented based on the explanatory variables in Table 1 and the survival distribution function for each group estimated. The Kaplan-Meier estimator is defined as follows:

$$\hat{S}(t) = \prod_{t_i<t} \frac{n_i - d_i}{n_i}$$

Where $\hat{S}(t)$ is the estimated survival function in month t, t_i and d_i represent the number of IPO companies that actually experience the event (delisting for performance reasons) at time t, while n_i represent the number of IPOs in the study that are still listed at the start of month t. For each of the IPO strata for which the survival function is estimated, a log rank test is used to test the homogeneity of the survival distribution across the strata.

In order to determine the factors that affect IPO survival on the JSE, the Cox Proportional Hazard model is used. The Cox proportional hazard model is defined as follows:

$$h(t|X) = h_0(t)\exp(X^T\beta)$$

Where $h(t|X)$ is the conditional delisting for performance reasons of an individual IPO company from the JSE with characteristic X representing the probability that the event occurs in a short time period given that the IPO firm survived until the beginning of the interval (Jain & Kini 2000). $h_0(t)$ represents the baseline hazard, t the duration in months from listing to when the event occurs, and X is the vector of explanatory variables while β is the unknown regression estimate. The Cox proportional hazard model has been widely used in survival analysis (Kauffman & Wang, 2001; Cockburn & Wagner, 2007; Kauffman & Wang, 2007; Amini & Keasey, 2011; Espenlaub et al., 2009) because it has a distinctive advantage over other hazard model due to the fact that with the Cox Proportional hazard model, there is no assumption about the distribution of the hazard baseline (Carpentier and Suret, 2011).

4. Results

4.1. Descriptive information

This section presents the descriptive statistics of the explanatory variables and the correlation between the variables. Based on the results in Table 2, it is seen that the mean age for the IPO firms in the sample prior to going public is 9.9 years while the mean gross proceeds is R16.55 million. The mean first day initial return is 77.74% which similar to that of prior studies (Neneh and Smit, 2013; Van Heerden and Alagidede, 2012). The correlation matrix indicates that there is a significant positive relationship between firm age and Size. Firm age also has a negative relationship with internet dummy showing that most internet IPOs list very early in after creation compared to non-internet firms.

Table 2. Descriptive statistics and correlation matrix

Descriptive Statistics			Correlation Matrix							
Variables	Mean	Std. Dev.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1)	9.90	16.76	1							
(2)	16.55	51.61	0.185***	1						
(3)	0.20	0.403	-0.129**	-0.085	1					
(4)	0.79	0.405	0.028	-0.043	0.159***	1				
(5)	77.74	379.98	-0.002	-0.048	0.041	0.091	1			
(6)	6.95	104.37	0.082	0.006	-0.055	0.033	0.056	1		
(7)	-3.42	191.18	0.040	0.007	-0.015	-0.003	0.194***	0.419***	1	
(8)	-35.57	278.35	0.073	0.048	-0.164***	-0.054	-0.003	0.161***	0.082	1

(1) Age (in years); (2) Size (GP in millions of Rand); (3) Internet Dummy; (4) Market dummy; (5) MAAR (%) (6) ROA; (7) OPM; and (8) ROE

4.2. Kaplan-Meier survival analysis of IPOs on the JSE

This section presents results from the computed survival functions based on the Kaplan-Meier test. The numerical findings are presented in Table 3 while the graphs of the survival functions are presented in Figures 1 to 8.

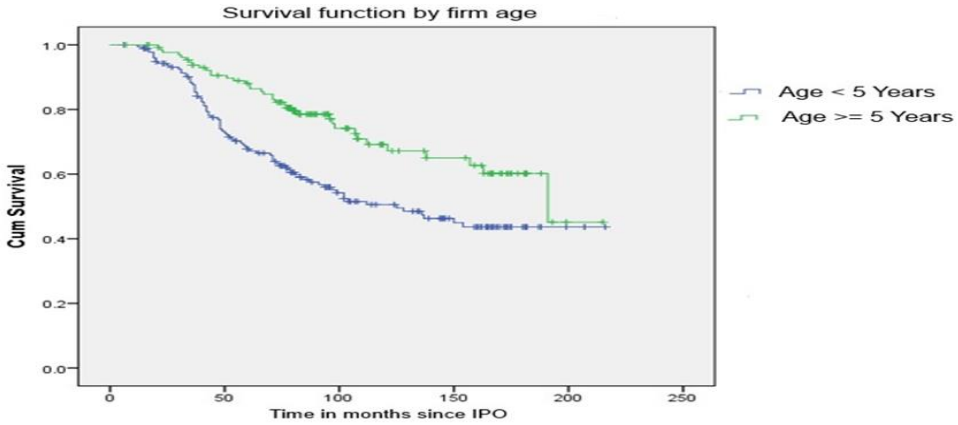
The results from Table 3 indicate that firms less than five years prior to listing on the JSE have a significant smaller mean survival time (130.87 months) compared to firms older than or equal to five years (159.93 months). Also, a larger percent (46.63%) of the younger firms delist for poor performance on the JSE compared to the older firms (28.03%). The survival distribution function in Figure 1 also indicates that from the early months of listing on the JSE, the survival probability of younger firms seems to be consistently lower than that for older firms. The results are significant on the 1% level based on the Log-rank test presented in Table 3. These findings are in line with the findings of Amini and Keasey (2011) which indicated that older British IPOs had a longer mean survival time than younger ones. Prior studies (Ritter, 1991; Laitinen, 1992) have indicated that younger firms suffer from a higher financial distress due to lack of capital and cash flow generation. As such, younger firms are considered to be a high risk investment which is supported by the findings of this study as they have a high probability of delisting for poor performance.

Table 3. Kaplan-Meier non parametric analyses of the time to delist for poor performance on the JSE

Explanatory variables		Number of issues	Number of events (percentage)	Mean survival time in months	Log rank test (p-value)
Firm specific characteristics:					
Firm Age	Age < 5 years	178	83 (46.63)	130.87	11.501
	Age >= 5 years	132	37 (28.03)	159.93	(0.001)***
Firm Size	GP< median	155	84 (54.19)	113.14	25.65
	GP >= median	155	36 (23.23)	170.00	(0.000)***
Industry	Internet Companies	63	36 (57.14)	103.82	13.183
	Non-Internet Companies	247	84 (34.01)	151.50	(0.000)***
Issue Related characteristics					
Market Period	Hot Market	246	108(43.90)	125.65	14.903
	Cold Market	64	12(18.75)	182.86	(0.000)***
Initial Performance	MAAR <=0	81	22(27.16)	153.93	5.003 (0.025)**
	MAAR > 0	229	98(42.79)	136.24	
Profitability					
ROA	ROA <= 0	46	19	123.49	1.121
	ROA > 0	249	89	150.06	(0.290)
Operating Profit margin (OPM)	OPM<=0	31	17	100.72	7.772
	OPM > 0	227	79	152.50	(0.005)***
ROE	ROE <= 0	83	42	111.80	6.365
	ROE > 0	225	77	150.52	(0.012)**

This table depicts the results of the non-parametric analysis of the time to delist as a result of poor performance on the JSE based on different IPO categories. The IPO categories are divided into two strata for each of the independent variables. The key information reported include the number of IPO companies in each stratum, the number and percentage of companies in the stratum that delisted due to poor performance on the JSE, the mean time to delist for poor performance, and the Log-rank test which indicates whether any differences observed in the survival functions across the strata are statistically significant as well as the level of significance.
N.B. Although the sample comprise of 310 IPOs, it is seen that the total number of IPOs in the Strata for ROA, OPM, and ROE is less than 310. This is because data for these variables was not available for some of the IPO companies and so they were eliminated during the analysis for that strata by the Kaplan-Meier test**.**

Figure 1. Survival function by firm age



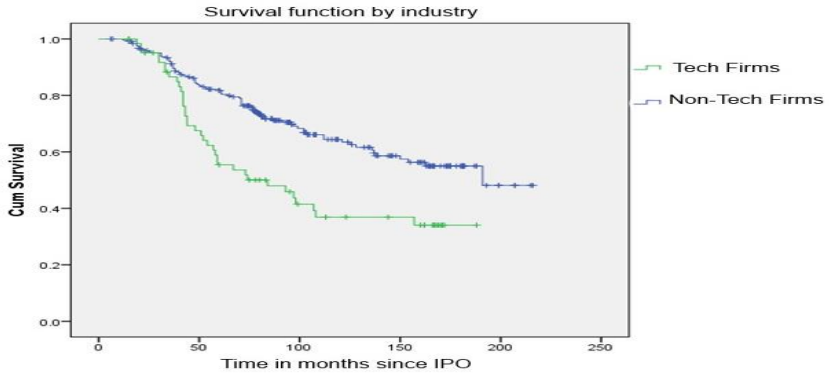
With regards to firm size, the results in Table 3 indicate that smaller firms (gross proceed less than the median) have a significant shorter mean survival time compared to larger firms (113.14 vs 170.00 months). The probability of failure for smaller firms is also considerably higher than for larger firms. The survival function in figure two indicates that from the early months of listing, the probability of survival for younger firms is consistently smaller than for older firms and the findings are significant at the 1% level. This finding is consistent with prior studies by Amini and Keasey (2011) which showed that firms with a

higher than median gross proceed had a significantly higher mean time to failure and that the survival function of firms with a higher than median gross proceed is for most of the time above those with a lower than median gross proceed.

Figure 2. Survival function by firm size (gross proceeds)

Prior studies have indicated IPO performance differences among companies in the internet and non-internet sectors. The results in Table 3 support these prior studies by indicated a significant difference in the mean survival time for IPOs between the internet and non-internet sectors. The results show that internet companies have a significantly shorter mean survival time (103.82 months) as compared to internet companies (151.5 months). The results also indicate that a higher percentage of internet companies delist for performance reasons compared to non-internet companies. This finding is consistent with studies by Demers and Joos (2007), which found a significant higher failure rate amongst high internet firms. The survival function in Figure 3 indicates that during the first few months after listing, no single trend is dominant as sometimes survival probability is higher for internet firms and sometimes it is higher for non-internet firms. However, after about the 35-40 months of trading, the survival probability of internet firms becomes consistently lower than for non-internet firms. This trend is significant at the 1% level as indicated by the Log-rank test.

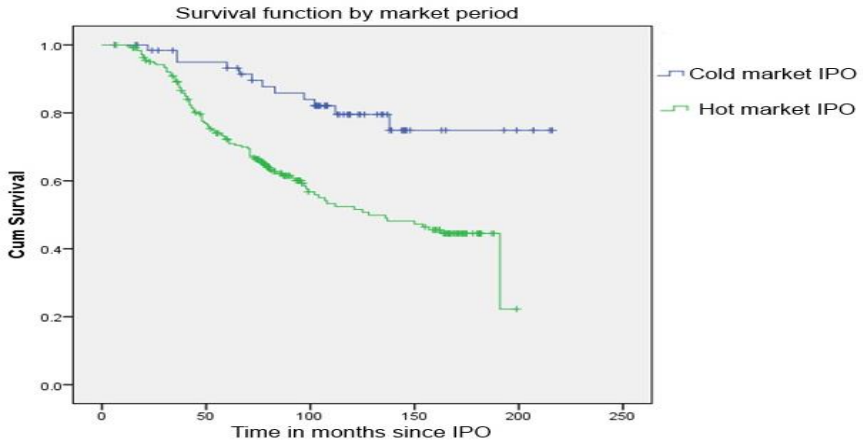
Figure 3. Survival function by industry



Moreover, with regards to market period, the results on Table 3 show that IPOs listed during the hot market period on the JSE have a significant smaller mean survival time (125.65 months) compared to IPO listed during the cold market period (182.86 months). Also, 43.90% of IPOs listed during the hot market period delisted for poor performance on the JSE compared to the 18.75% of IPO listed during the cold market period. This finding is consistent with studies by Amini and Keasey (2011) which showed that firms going public during hot IPO markets have a significantly lower mean time to failure which is indicative of the lower quality of firms going public during hot periods (Loughran and Ritter 2004). This is because during the hot market period, investors are more optimistic about the firm's growth prospects, which makes it easy for new firms to go public (Demers and Joos, 2007). Moreover, looking at the survival function in Figure 4 indicates that from the early months of listing, no single trend is dominant as sometimes survival probability is higher for cold market IPOs and sometimes it is higher for hot market

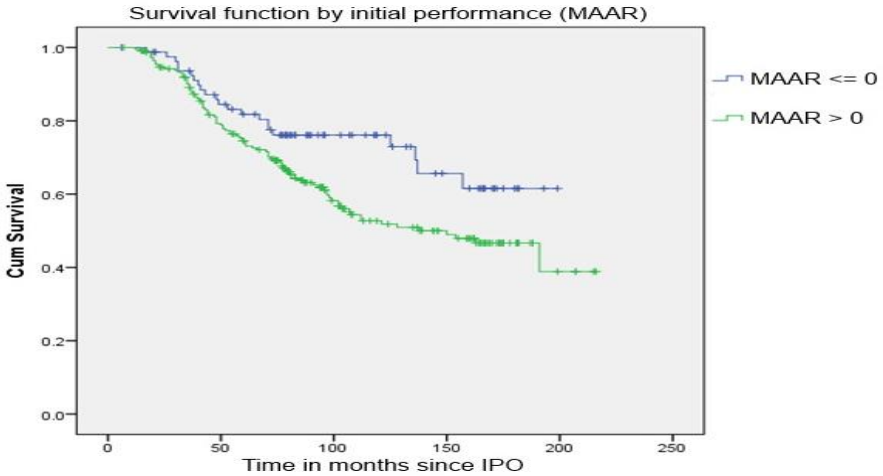
IPOs; however after the 25 month, the survival probability of cold market IPOs becomes consistently lower than hot market IPOs. This finding contradicts studies by Amini and Keasey (2011), which established that the survival functions for firms going public during hot market periods are not always below that of firms going public in cold market periods. This trend is significant at the 1% level as indicated by the Log-rank test.

Figure 4. Survival function by market period



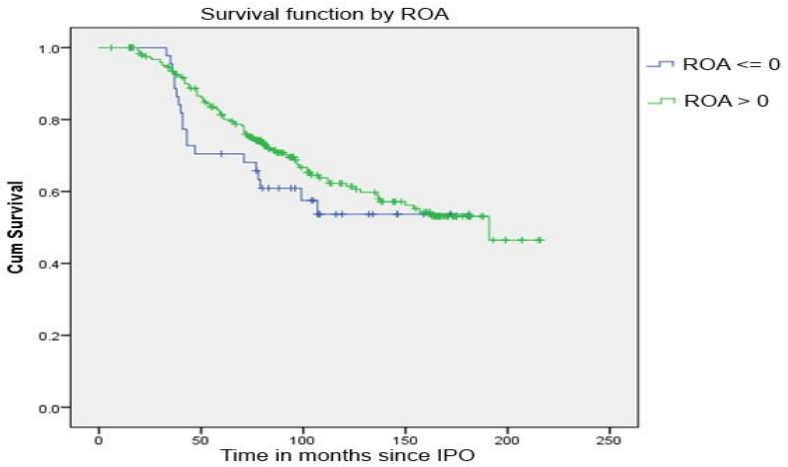
With regards to initial performance, the results in Table 3 show that overpriced IPOs have a significant higher survival time (153.93%) compared to underpriced IPOs on the JSE (136.24%). Also, a larger percent (42.79%) of the underpriced IPOs delist for poor performance on the JSE compared to 27.16 % of overpriced IPOs. Moreover, looking at the survival function in Figure 5 shows the early months of listing, the probability of survival for underpriced firms is consistently smaller than for overpriced firms and the findings are significant at the 5% level.

Figure 5. Survival function by initial performance



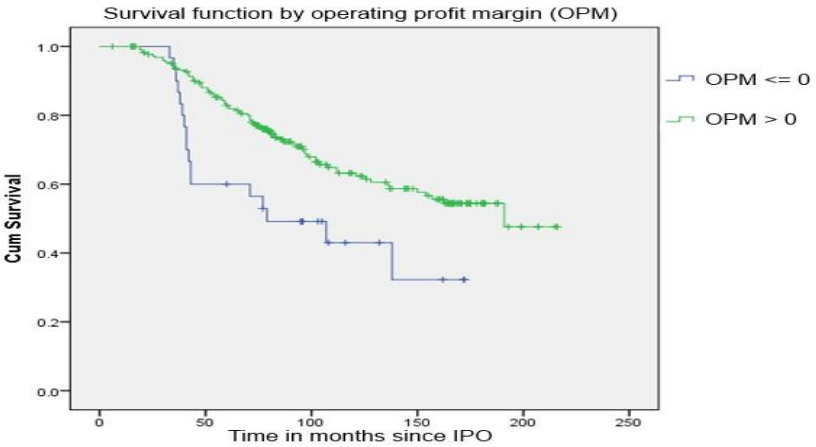
With regards to the ROA, the results in Table 3 indicate that although the mean survival time for firms with an ROA less than or equal to zero, is less than that for IPO with an ROA greater than zero, the difference is not significant based on the Log-rank test. The survival function in Figure 6 indicates mixed trends between the IPOs in the two ROA strata. In the first few months after listing, IPOs with an ROA greater than zero have a lower probability of survival, however, around the 30th to 40th trading month, the survival probability for IPOs with an ROA less than or equal zero receives a step fall and go below than of IPOs with an ROA greater than zero. The trend continues till around the 150th trading month where the survival rate of both stratums becomes almost the same.

Figure 6. Survival function by ROA



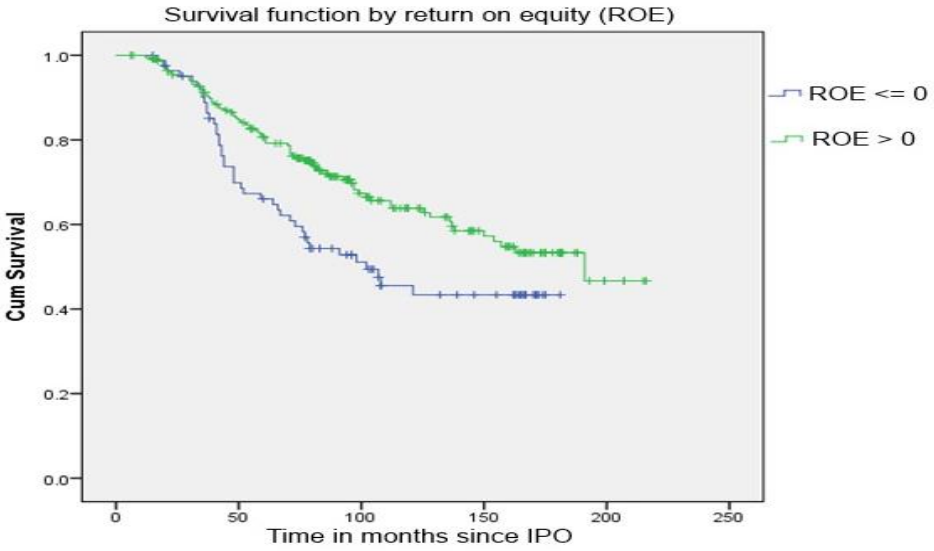
For the OPM, the results in Table 3 indicate that the mean survival time for IPOs with an OPM less than or equal to zero is significantly lower than that for IPOs with an OPM greater than zero (100.72 vs. 152.50). The survival function in Figure 7 indicates that the survival trend between the two strata is more visible from about the 40th trading month. Here it is seen that at this time, the survival probability for IPOs with an OPM greater than zero is consistently higher than that for IPOs with and OPM less than or equal to zero. The findings are significant at the 1% level based on the Log-rank test.

Figure 7. Survival function by OPM



With regards to the ROE, the results in Table 3 indicate that the mean survival time for IPOs with an ROE greater than zero is significantly higher than that for IPOs with an ROE less than or equal to zero (150.52 vs. 118.80). However, the survival function in Figure 8 indicates that the trend is not consistent for the first 50 months of trading. The trends only emerges after about the 50th trading month where the survival probability of firms that had an ROE greater than zero is consistently higher than that for firms with an ROE less than or equal to zero. The results are significant at the 5% level based on the Log-rank test.

Figure 8. Survival function by ROE



4.3. Cox Proportional Hazard Model

In this section, the Cox Proportional Hazard model is used to determine the explanatory variables that have a significant impact on the survivability of IPOs on the JSE. Based on the correlation results in Table 2, it is seen that the correlation coefficients for all the explanatory variables is low indicating that there will be little or no effect of multicollinearity when including the variables in the cox regression model. The Cox Proportional Hazard is presented in Table 4 below.

Table 4. The determinants of IPO survival on the JSE based on the Cox Proportional hazard model

Variable	Model A			Model B			Model C		
	Coef.	P-Value	Hazard Ratio	Coef.	P-Value	Hazard Ratio	Coef.	P-Value	Hazard Ratio
Log(1+Age)	-0.506	0.005**	0.603	-0.610	0.001**	0.543	-0.663	0.003**	0.515
Log(Size)	-0.679	0.000**	0.507	-0.687	0.000**	0.503	-0.730	0.000**	0.482
Internet Dummy	0.413	0.046*	1.511	0.259	0.218	1.296	0.336	0.207	1.399
Market _D				1.099	0.001**	3.000	1.262	0.001**	3.532
IR				0.000	0.418	1.000	-0.001	0.212	0.999
ROA							0.000	0.892	1.000
OPM							-0.006	0.019*	0.994
ROE							-0.004	0.012*	0.997
Total Observations	310			310			310		
Number of Events	120			120			120		
-2 Log-Likelihood	1212.965			1197.346			834.582		
Chi-square (Sig.)	44.222 (0.000)***			54.841 (0.000)***			74.721 (0.000)***		

This Table presents the results of the Cox Proportional Hazard Model. Three models are depicted in the table based on selected explanatory variables. Model A is based on the firm specific characteristics. In model B, in addition to the firm specific characteristics, market related characteristics are included. Model C includes all the variables in model B, plus the profitability variables.

The results of the Cox Proportional hazard model are presented in Table 4 for models A, B, and C. For each model, the coefficients, p-value and hazard ratio are presented. The dependent variable is based on hazard rate of IPOs (i.e. IPO firms that have been delisted for poor performance on the JSE). For each of the variables in the model, a positive coefficient increases the hazard rate and decrease the survival time for an IPO firm, while a negative coefficient decreases the hazard rate and increases the survival time. The Chi-square statistics for all three models shows that all models are highly significant.

In model A, all three variables significantly affect the hazard rate of IPOs in the JSE. Firm age and size have a negative coefficient indicating that the older or larger a firm is at the time of IPO

significantly reduces the risk of the firm being delisted from the JSE due to poor performance. The findings are in line with prior studies which have indicated that firm age (Peristiani & Hong, 2004; Amini & Keasey, 2011; Hensler et al., 1997) and firm size (Hensler et al., 1997; Espenlaub, Khurshed and Mohamed, 2009) are significant predictors of IPO survival. These results however contradict the findings of Yang and Ding (2012) who found that firm age and size did not have a significant effect of IPO survival. Nonetheless, the results confirm the arguments of many researchers (Carpentier and Suret 2011; Demers and Joos 2007; Hensler et al. 1997; Jain and Martin 2005; Ritter 1991) that firm age is a valuable underlying risk proxy for IPO firms. The positive coefficient for the internet dummy indicates that being an internet firm increases the hazard rate of the IPO Company. This finding is congruent with prior studies (Hamza and Kooli, 2010; Botman et al., 2013) that document a significantly higher failure rate for internet sector IPOs.

In model B, we include the effect of the market period and initial returns to the three variables of model A. The results in Model B indicate that when taking all five variables into consideration, firm age and size still have a negative significant effect on IPO survival; however, the effect of the industry becomes insignificant. This indicates that adding the market period and the initial return eliminates the effect of whether an IPO firm is an internet or non-internet firm. This is contrary to the findings of Hamza and Kooli (2010) who found the relationship between internet firms and survival to be significant with the effect of market period captured in the model. For the included market variables, the initial returns of the IPO firm has no significant relationship with the survival rate of the IPO, however, the market period significantly affects the survival rate of the IPO. The findings for the initial returns are contrary to studies by Espenlaub, et al, 2010 and Hensler et al. (1997) who elucidated that initial returns are positively related to the survivability of IPOs. Nonetheless, it supports the findings of Amini and Keasey (2011) who found that initial returns did not significantly affect IPO survivability. The significant effect of market period on IPO survivability confirms the findings of prior studies (Carpentier & Suret, 2007; Boubakri et al., 2005, Demer & Joos, 2006). The positive coefficient confirms the view that the survivability of an IPO company is significantly reduced when it is listed during the hot market. Converse to these results, the Cox proportional hazard model for British IPOs by Amini and Keasey (2011) showed that the market period had no significant effect on the survivability of British firms.

In Model C, three financial ratios (ROA, NPM, and ROE) are added to the explanatory variables in model B. After including the financial variables, variables such as the age, size, and market period still maintain a significant relationship with IPO survivability on the JSE. For the included financial variables in the model, only the ROA did not significantly influence the survivability of the IPOs. This contradicts findings by Espenlaub et al (2010) who established that pre ROA had a highly statistically significant, positive impact on IPO survival. Also, Peristiani and Hong (2004) found a strong and statistically significant negative relationship between pre ROA and IPO survival. Both the NPM and ROE have a negative coefficient indicating that the higher the NPM or the ROE of a firm, the higher its survival on the JSE.

5. Conclusion

The purpose of this paper was to establish the determinants of IPO survival on the JSE. Using the Kaplan-Meier test, this study established that firms less than five years prior to listing on the JSE have a significant smaller mean survival time; firms with a gross proceed less than the median have a significant shorter mean survival time; overpriced IPOs have a significant higher survival time; IPOs listed during the hot market period on the JSE have a significant smaller mean survival time and IPOs with ROA, OPM and ROE less than or equal to zero have a low mean survival time. In addition, being in the internet industry significantly shorten mean survival time. These findings are consistent with other international studies across different stock markets. This provides empirical evidence on the JSE for which investors and companies can base their investment decisions.

In establishing the determinants of IPO survival on the JSE, the results from the cox proportional hazard model showed that across all three models (A, B and C), the predominant factors identified were the firms age, size, and market period as the all had a significant relationship with IPO survivability on the JSE. Also, ROE and OPM were also found to have significant relationship with IPO survivability on the JSE, while factors such as the initial return and ROA did not significantly influence the survivability of the IPOs based on model C. It is therefore recommended that investors should consider these factors when predicating a company's likelihood of survival on the JSE. Future studies could focus on the survivability of Penney stocks in the JSE Alternative exchange (AltX) and examine their oath to success into the JSE main board.

References

1. Ahmad, W. (2012), "*Lockup Agreements and Survival of IPO Firms"*. [Online], retrieved from: http://efmaefm.org/0EFMAMEETINGS/EFMA%20ANNUAL%20MEETINGS/2012-Barcelona/phd/Lockup%20Agreements%20and%20Survival%20of%20IPO%20Firms.pdf. [Accessed 22 April, 2013].
2. Alli, L.K., Subrahmanyam, V. and Gleason, C.K. (2010), "Short- and Long-Run Performance of Initial

Public Offerings in Post-apartheid South Africa", Journal of African Business, Vol.11. pp. 1-25.
3. Alti, A. (2005), "IPO market timing", *Review of Financial Studies*, Vol. 6, pp.1681-1709.
4. Altman, E.I. (1968), "Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy", *Journal of Finance*, Vol. 23 No. 4, pp. 589-609.
5. Amini, S. and Keasey, K. (2011), "The Survivability of Small British IPOs" [Online], retrieved from: http://69.175.2.130/~finman/Istanbul/Papers/The_survivability_of_small_British_IPOs.pdf [Accessed 14th March, 2013].
6. Audretsch, D.B. and Lehmann, E.E. (2005). "The effects of experience, ownership, and knowledge on IPO survival: Empirical evidence from Germany", *Review of Accounting and Finance, pp.*413-33.
7. Bartov, E., Mohanram, P. and Seethamraju. C. (2002), "Valuation of Internet Stocks - An IPO Perspective", *Journal of Accounting Research*, Vol. 40, pp. 321–46.
8. Beaver, W.H. (1966). "Financial ratios as predictors of failure", *Journal of Accounting Research*, Vol. 4, pp.71-111.
9. Bhattacharya, N., Demers, E.A. and Joos, P. (2006), "Learning from History to Predict Failures in Nascent Stage Industries." Working paper, Insead, Tilburg, and Southern Methodist University
10. Botman, M., van der Goot, T. and van Giersbergen, P. (2009), "What Determines the Survival of Internet IPOs?", *Applied Economics*, Vol. 41 No.5, pp. 547-561.
11. Boubakri. N., Kooli, M. and L'Her, J. (2005), "Is there any life after going public? Evidence from the Canadian market", *Journal of Private Equity*, pp.1-12.
12. Carpentier, C. and Suret, J. (2007). The survival and success of penny stock IPOs: Canadian Evidence. [Online], retrieved from: https://www.eurofidai.org/fr/en/en/Carpentier_2007.pdf. [Accessed 20 June, 2014].
13. Carpentier, C. and Suret, J. (2011), "The survival and success of Canadian penny stock IPOs", *Small Business Economics*, Vol. 36, pp.101–121.
14. Caves, R.E. (1996), Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge
15. Chancharat, N., Krishnamurti, C. and Tian, G. G. (2009), When the going gets tough: board capital and survival of new economy IPO firms. Asian Finance Association 2009 International Conference (pp. 1-40), Brisbane, Australia: University of Queensland.
16. Cybinski, P. (2001), "Description, explanation, prediction: the evolution of bankruptcy studies?" *Managerial Finance*, Vol. 27 No.4, pp. 29-44.
17. Demers, E. and Lewellen, K. (2003), "The Marketing Role of IPOs: Evidence from Internet Stocks", *Journal of Financial Economics*, Vol. 68, pp. 413-437.
18. Demers, E. and Joos, P. (2007), "IPO Failure Risk", *Journal of Accounting Research*, Vol. 45 No.2, pp. 333-371.
19. Doeswij, R.Q., Hemmes, H.S. and Venekamp, R.H. (2006), "25 years of Dutch IPOs: an examination of frequently cited IPO anomalies within the main sectors and during hot and cold issue periods", *De Economist*, Vol. 154, pp.154-405.
20. Drobetz, W., Kammerman, M. and Wälchli, U. (2005), "Long-run performance of Initial Public Offerings: The evidence for Switzerland", *Schmalenbach Business Review*, Vol. 57 No.3, pp.253-275.
21. Espenlaub, S., Khurshed, A. and Mohamed, A. (2009), "A study of the survival of new listings on the UK Alternative Investment Market (AIM)" [Online], retrieved from: https://research.mbs.ac.uk/accounting-finance/Portals/0/docs/IsAIMaCasinoAstudyofthesurvivalofnewlistings.pdf. [Accessed 12 July, 2014].
22. Espenlaub, S., Khurshed, A. and Mohamed, A. (2010), "IPO Survival in a Reputational Market", *Journal of Business Finance & Accounting*, Vol. 39 No. 3, pp. 427-463.
23. Esteve-Pe´rez, S. and Man˜ez-Castillejo, A. J. (2006), "The Resource-Based Theory of the Firm and Firm Survival", *Small Business Economics*, Vol. 30, pp.231–249
24. Fama, E.F. and French, K.R. (2004), "Newly listed firms: Fundamentals, survival rates, and returns", Journal of Financial Economics, Vol.73 No.2. pp. 169–229.
25. Gounopoulos, D. (2011). *Insights into the Performance of Dutch IPOs.* [Online], retrieved from: http://www.academia.edu/729843/Insights_into_the_Performance_of_Dutch_IPOs. [Accessed 5th May, 2014].
26. Hamza, O. and Kooli, M. (2010). Does Venture Capitalists Reputation Improve the Survival Profile of IPO Firms? Working Paper.
27. Helwege, J. & Liang, N. 2002. *Initial public offerings in hot and cold markets. Working paper*. [Online], retrieved from: http://www.federalreserve.gov/pubs/feds/2003/200304/200304pap.pdf. [Accessed 5th June, 2014].
28. Hensler, D.A., Rutherford, R.C. and Springer, T.M. (1997). The survival of initial public offerings in the aftermarket. *Journal of Financial Research*, Vol. 20 No. 1, pp.93-110
29. Inman M.K. (1991), "Z-Scores and Recent Events: Do they shed any light?", *Management Accounting, pp.* 44-48.
30. Jain, B., & Martin, C. 2005. The association between audit quality and post-IPO performance: A survival analysis approach. *Review of Accounting and Finance*, 4(4), 50-75.
31. Knauff, P., Roosenboom, P. and van der Goot, T. (2003), "Is accounting information relevant to valuing European internet IPOs?" *New Venture Investment: Choices and Consequences, pp.* 1-301.
32. Kooli, M. and Meknassi, S. (2007), "The survival profile of U.S. IPO issuers 1985-2005", *Journal of Wealth Managemen*t, pp.37-52.
33. Laitinen, E.K. (1992), "Prediction of failure of a newly founded firm", Journal of Busines Venturing, Vol. 11 No. 4, pp. 323-340.
34. Lamberto, A. P. and Rath, S. (2008). The survival of initial public offerings in Australia, *Working Paper*, Curtin University of Technology.
35. LeClere, M. J. (2000), "The occurrence and timing of events: Survival analysis applied to the study of financial distress" *Journal of Accounting Literature*, Vol. 19, pp.158-189.
36. Loughran, T. and Ritter, J. (2004), "Why Has IPO Underpricing Changed Over Time?" *Financial Management*, Vol. 33, pp.5-37.
37. Neneh, B.N. and Smit, A.V.A. (2013), "Underpricing of IPOs during hot and cold market periods on the South African Stock Exchange (JSE)", *International*

Journal of Social, Human Science and Engineering, Vol. 7 No.7, pp.112-119.

38. Neneh, B.N. and Smit, A.V.A. (2014), "Do IPOs underperform in the long run: evidence from the Johannesburg Securities Exchange (JSE)", *African Review of Economics and Finance? Forth Coming*
39. Ofek, E. and Richardson, M. (2003). "Dot Com Mania: The Rise and Fall of Internet Stock Prices", *Journal of Finance*, Vol. 58, pp.1113-1137.
40. Ohlson, J.A. (1980), "Financial ratios and the probabilistic prediction of bankruptcy", *Journal of Accounting Research*, Vol. 18, pp.109-131.
41. Peller, A. (2013), Survivability and Intra-Industry Effects of Initial Public Offerings: An Empirical Analysis. PHD dissertation submitted at the University of St.Gallen, School of Management, Economics, Law, Social Sciences and International Affairs, Germany.
42. Peristiani, S. and Hong, G. (2004). Pre-IPO financial performance and aftermarket survival. *Current Issues in Economics and Finance*, Vol. 10 No.2, pp.1-8.
43. Ritter, J.R. (1991), "The long-run performance of initial public offerings", Journal of Finance,Vol. 46, No. 1, pp. 3-27.
44. Santos, F. (2011). *Essays in financial economics*. A dissertation submitted to the department of graduate school of business and the committee on graduate studies of Stanford University in partial fulfillment of the requirements for the degree of doctor of philosophy.
45. Thomadakis, S., Gounopoulos, D. and Nounis, C. (2011), "The long term performance of Initial Public Offerings in the Athens Stock Exchange", *European Financial Management*, Vol. 18, pp.117-141.
46. Van Heerden, G. and Alagidede, P. (2012). "Short run underpricing of initial public offerings (IPOs) in the Johannesburg Stock Exchange (JSE)", Review of Development Finance, Vol.2 No.3-4. pp. 130-138.
47. Wagner S., Cockburn I. (2010), "Patents and the survival of Internet-related IPOs" *Research policy*, Vol. 39, pp.214-228.
48. Welbourne, T. M. and Andrews, A. O. (1996), "Predicting the performance of initial public offerings: Should human resource management be in the equation?" *Academy of Management Journal*, Vol.39, pp.891–919.
49. Yang, C. and Ding, X. (2012), "The Survival of Initial Public Offerings in China", [Online], retrieved from: http://asianfa2012.mcu.edu.tw/fullpaper/10319.pdf. [Accessed 14th April, 2014].