THE SURVIVAL OF INITIAL PUBLIC OFFERINGS IN AUSTRALIA

Andre Paul Lamberto
Subhrendu Rath, Curtin University

ABSTRACT

This paper examines the survival of Australian initial public offerings (IPOs). The Cox proportional hazards model is used to test the value of the information available at the time of listing and whether this information foreshadows the likelihood of survival or failure of an IPO. The number of risk factors listed in the prospectus and the size of the firm are found to be negatively related to survival of the firm. The size of the offering and the forecast dividend yield are found to be positively related to firm survival. The likelihood of survival is also found to vary with industry and firms in the finance and natural resources industries are more likely to survive than firms in other industries.

JEL: J23

KEYWORDS: Survival analysis, Cox proportional hazards model, IPO, Australia

INTRODUCTION

For owners and managers of an unlisted firm, the decision to take the firm public is not made without thorough consideration yet the failure rate among firms that debut on stock exchanges is still relatively high. Previous studies of American IPOs have shown that about 30% of IPOs delist within the first five years (Jain and Kini, 1999). Of the sample of Australian IPOs used in this paper, 20% fail within first five years and 29% fail within the first seven years. Despite these failure rates there is a distinct lack of analysis of the survival of IPOs in the Australian capital market. Owners of listing firms are eager to maximise the value of their financial stake in the company and are presumably concerned with the subsequent post-listing performance and ultimate survival. For company managers, ensuring survival is a dominant factor in protecting and enhancing their financial interests in the company. The firm's survival also has implications regarding the protection of managerial, reputational, capital, and career prospects. Survival is a simple measure but is also the ultimate assessment of long run performance because it offers a clear test of whether a firm has performed well enough to survive, given the competitive nature of the capital markets. From a business strategy perspective, it also indicates whether a firm has performed well enough to maintain its corporate identity.

In capital markets, investor expectations and investment decisions are based on all publicly available information. In the case of IPOs, the majority of available information is contained in the prospectus. IPO prospectuses provide information relating to both the firm (including financial and governance information) and the offering (including size and structure) and in case of Australian firms, forecasts regarding the future prospects of the firm. These prospectuses also act as legal documents that ensure all the material facts of the public offering issue are available to investors. Even though IPO prospectuses are meant to serve as reliable and important indicators of the future performance and survival of firms, there is a limited amount of published research examining the effectiveness of the information contained in these prospectuses to anticipate future survival. To our knowledge, this paper is the first to examine the long-term survivorship of Australian IPOs.

In this paper, we examine the relative survival of firms following their stock exchange listing using a Cox proportional hazards model, which utilises publicly available information available in IPO prospectuses.

We test a central hypothesis of whether the information available at the time of offering is related to the relative mortality of a firm. In further analysis, we examine specific characteristics in order to provide evidence about whether certain characteristics of an IPO are informative about a firm's chances of survival.

This paper makes several important contributions to the understanding of IPOs in Australia. Firstly, we document that there is a high rate of failure among Australian IPOs within the first five or seven years of their listing date. Secondly, we provide an Australian perspective of the survival of firms. By conducting such a study in the Australian context, it provides a robust check of empirical findings regarding survival of firms since the Australian capital market setting differs in some respects (tax, listing requirements, and industry concentration) from that of the U.S. Lastly, we provide an insight into the informational value of the data provided in IPO prospectuses. To the extent that investors can determine the significance of factors listed in IPO prospectuses in relation to the future performance and survivorship of firms, this paper provides an understanding of the relative importance of these factors.

The remainder of the paper is set out as follows. Section 2 provides a brief account of the prior literature related to survival analysis of IPOs and provides an understanding of characteristics of firm and the issue chosen in this paper. Section 3 discusses the data and the methodology of Cox proportional hazards model. Section 4 examines the empirical results and Section 5 concludes the paper.

LITERATURE REVIEW

There is a limited amount of published research into the survival of firms following their IPO. Many papers include survival as a side issue rather than the focus of the paper, others choose to focus on specific groups of IPOs, and this limits the application of the results. Differences in definitions as to what constitutes survival and non-survival and non-conformity in the length of the observation period are also apparent. It should also be noted that of the papers which analyse survival, only a few use the Cox proportional hazards model with most papers using regression models. The most relevant literature to this paper can be categorised as research into the survival of firms following IPOs, research into long run performance of IPOs (due to the intuitive relationship between survival and long run performance) and research into the characteristics of IPOs in Australia (since this paper is concerned with the informational value of the prospectus).

The research of Hensler, Rutherford and Springer (1997) into survival is significant. Using a Cox proportional hazards model for a sample of American IPOs listed between 1976 and 1984, they examine the relationship between certain firm characteristics and the probability of survival. Hensler, Rutherford and Springer (1997) find that age at listing, size of the offering, percentage of shares owned by insiders and the level of IPO activity in the overall market are all positively related to survival. Their results also indicate that the survival time following an IPO decreases with the number of risk factors listed in the prospectus and also with the general market level at the time of listing. Hensler, Rutherford and Springer (1997) also find that the industry in which the firm operates is also significant to their survival which complements the findings of a similar study of Portuguese firms. Mata and Portugal (1994) found that for a sample of Portuguese firms, survival varied positively with start up size, the number of plants operated, and the industry growth rate but was negatively related to the extent of entry into the industry.

Jain and Kini (1999) examine the life cycle of IPOs in the U.S. between 1977 and 1990. Classifying firms into three categories of survivor, non-survivor and acquired, Jain and Kini (1999) examine factors influencing the transition into one of these three categories following the IPO. Using multinomial logistic regression, they establish that size, pre-IPO operating performance and investment banker prestige are positively related while firm risk, industry barriers to entry and industry concentration are negatively related to future survival. Using a regression model Platt (1995) analyses the survival of American firms

for the following three years after issue, concentrating on bankruptcy as the only reason for non-survival and focusing on the importance of capital structure to IPOs and their endeavours to avoid bankruptcy. Testing for a group of financial ratios Platt (1995) finds that some operating financial ratios (long-term debt, interest expense to cash, and inventory to cash flow) are positively related to the likelihood of failure.

The effect of the form of the offering on the survival of a firm is investigated by Shultz (1993). Relying on the agency cost argument that a bundled share and option provides opportunities for managers to avoid capital market scrutiny in subsequent capital offerings Shultz (1993) find that firms which conduct bundled offerings consisting of a share and option are less likely to survive than firms which issue shares alone. However, in a similar study of Australian IPOs, How and Howe (2001) found no significant difference between the survival of firms issuing 'packaged' offerings and straight share offerings. They attribute the difference in finding, among other factors, to 'differences in opportunity set faced by Australian firms compared to U.S. companies'.

Bhabra and Pettway (2003) examine the value of information contained in prospectuses in their analysis of the financial and operating performance of IPOs. Their findings suggest that while prior profitability, firm size, relative offer size and the degree of underpricing are related to one-year abnormal returns, there is no evidence to suggest a relationship between prospectus information and long run performance. However, as a complement to their study between prospectus information and performance they examine survival. Using a logistic regression model which classifies a firm depending upon whether or not it fails or delists within five years, relative offer size, spending on research and development, the size of the firm and the number of risk factors in the prospectus are found to be significant.

Ritter (1991) investigated the long run under-performance of IPOs by analysing the three year buy and hold returns for companies which listed between 1975 and 1984 and found that the relative under-performance of IPOs, when compared to matched firms, was greatest for firms with small offer sizes. Ritter (1991) also found a strong positive monotonic relationship between the age of the firm going public and its corresponding aftermarket performance. Lee, Taylor and Walker (1996) document the long run under-performance of Australian industrial IPOs listed between 1976 and 1989. They find that there is some evidence to suggest that smaller issues and issues that are fully subscribed and listed relatively quickly are not associated with under-performance. An examination of Australian mining IPOs between 1979 and 1990 (How, 2000) finds that is no significant evidence of under-performance during the three year period after listing and when contrasted with the results of Lee, Taylor and Walker (1996) provides evidence that the relative performance of IPOs varies with industry.

Concentrating instead on the operating performance of firms after an IPO Jain and Kini (1994) found a positive relationship between managerial ownership retention and post-issue operating performance (consistent with both the agency theory hypothesis and signalling theory hypothesis). Balatbat, Taylor and Walter (2004) found during their investigations into the operating performance of Australian IPOs between 1976 and 1993 that operating performance is related to ownership structure and corporate governance characteristics.

An investigation into the board characteristics of Australian IPOs between 1994 and 1997 was conducted by Da Silva Rosa, Izan and Lin (2001) while Dimovski and Brooks (2003) examined financial and offer characteristics of Australian IPOs which listed between 1994 and 1999. Da Silva Rosa, Izan and Lin (2001) find that less than a third of the boards consist of a majority of independent directors and also find that only about half of the boards have an independent chairman, suggesting that there is a tendency for IPOs not to follow what is considered ASX best practice. Dimovski and Brooks (2003) examine the structure of the offerings and find that 22% had options attached, 82% were underwritten and 67% had an independent accountant that was one of the big-five accounting firms. They also examine issue price,

issue size, forecast earning to offer price ratio and forecast dividend to offer price yield and find that for each of these factors the difference between the mean and the median is significant in size, whilst the range (difference between the maximum and minimum) is also relatively large. The significant differences in the types of firms, the non-conformance of the statistics to a tighter spread (as highlighted by Dimovski and Brooks (2003)), and the relatively high rate of failure of IPOs suggest that relationships exist between these characteristics and the likelihood of survival.

OFFER AND FIRM CHARACTERISTICS OF IPOs AND FUTURE SURVIVAL

The fundamental hypothesis of this paper is that the information contained in the prospectus foreshadows the likelihood of survival or failure for an IPO. Similar to studies cited earlier, we conjecture that the characteristics of an IPO at the time of listing have an influence on the future operational well being of the firm. In the case of IPOs, the majority of available information is contained in the prospectus. Later in this paper, we extract several firm characteristics from IPO prospectuses and provide comparisons of relative survival amongst firms with different characteristics. A brief explanation of the justification behind each characteristic used and its expected relationship with the probability of future survival (shown in parentheses) follows.

Age at Offering (+): It is expected that the age at offering of the IPO is positively related to its likelihood of survival. Established firms, as measured by age at the time of offering, are expected to be more stable and are more likely to survive, while younger firms are considered unproven in their business model. Further, it is likely that more information is available for older firms and, as a result, less uncertainty and risk is associated with older firms.

Offer Price (+): The offer price of the firm is expected to be positively related to survival. Low issue prices are associated with speculative stocks. On the Australian Stock Exchange the minimum issue price is $0.20.

Size of Offering (+): The size of the offering is expected to be positively related to the survival of the firm. Apart from the fact that larger offerings are associated with larger firms, larger offerings are also indicators of market confidence. Large offerings, ceteris paribus, are subject to more capital market scrutiny and are favoured by institutional investors (Hensler, Rutherford and Springer, 1997; Jain and Kini, 1999) and performance (Ritter, 1991).

Ownership Retained (+): It is expected that the percentage of equity retained by the original owners should be positively related to survival. The level of ownership acts as a signal about the quality of the issue and its future prospects. A larger share of ownership net of the offerings, reduces agency costs and provides incentive for the original owners to use in future the funds raised in the most value maximising way.

*Attachment of Options to the Offer (-)***:** It is expected that bundled IPOs (a common share bundled with a warrant) will be negatively related to the likelihood of survival. According to agency theory, bundled offerings provide an incentive for management to avoid capital market scrutiny for future investments and increase the likelihood of cash being squandered on unprofitable opportunities.

Underwriter Backing (+): It is expected that firms with underwriter backing are more likely to survive than firms without backing. The reliance of underwriters on their reputation to attract future clients means that it is in the underwriter's best interest to endorse firms with sound prospects. This coupled with the fact that most underwriters invest in the offers they underwrite, is a signal of positive future prospects.

Issue Costs as a Percentage of the Offer Proceeds (-): The percentage of issue costs to the offer size should be negatively related to the survival of the firm. This is based on the notion that issue costs, associated with marketing the issue and underwriting are incurred in order to ensure the issue is fully subscribed and that the maximum amount of capital is raised. It is reasonable to assume that, ceteris paribus, a firm with good prospects will be able to launch an IPO with lower issuing costs than otherwise.

Auditor in the Big-Five (+): The use of an auditor from one of the big-five accounting firms (PricewaterhouseCoopers, KPMG, Arthur Anderson, Deloitte Touche Tohmatsu and Ernst and Young) should add credibility to the information contained in the prospectus. While the well documented public demise of Arthur Anderson has detracted from this credibility, the large accounting firms are recognized for their name and reputation by the common investor and serve as a signalling mechanism. As a result, it is contended that the accounting information emanating from the big-five accounting firms is of better quality contributing to a better future for the firm.

Earnings to Price Ratio (-): The ratio of the forecast earnings per share to the offer price (E/P ratio) should be negatively related to survival. Since E/P ratio is a measure of the expected return of the company, speculative firms associated with increased risk and uncertainty and therefore higher E/P ratios, are less likely to survive than stable firms.

Forecast Dividend Yield (+): Dividends are typically associated with firms which have a stable income stream and therefore more confidence and certainty about their future prospects.

Number of Risk Factors in the Prospectus (-): With the requirement of disclosure of all material information, Australian firms are required to list and describe risk factors in the prospectus. The informational value of risk factors in the prospectus is considered significant (Hensler, Rutherford and Springer (1997) and Bhabra and Pettway (2003)).

Non-Executive Chairman (+): A non-executive chair is associated with good governance policy of a corporation. The expectation that a non-executive chair will increase the likelihood of survival is based on the argument that a board led by an independent leader will better represent the interests of the shareholders and more effectively monitor the managers of the company. A reduction in agency costs and an improvement in operating performance should translate to an improved probability of survival.

Number of Directors (+): The number of directors should be positively related to survival. Guidelines of good governance endorse larger board sizes based on the notion of greater accountability. Greater monitoring should reduce agency costs and discourage the misallocation of funds, ensuring that the decisions are value maximising.

Percentage of Independent Directors (+): The level of independence of the board of directors is also expected to be positively related to the survival of the IPO. A board that comprises of a majority of independent members should be a more effective monitor. Technically, there is a slight difference between a non-executive director and an independent director but for the purposes of ease of measurement, this paper assumes that all non-executive directors are independent.

Industry (?): Just as the level of relative performance varies with industry, the rate of survival should also vary with industry. It is expected that industries with small barriers to entry and more competitive industry environment, should be negatively related to survival. Therefore, we classify each firm according to industry and control over empirical analysis for this factor.

*Leverage (-)***:** The trade-off theory of capital structure postulates that the financing decisions made by a firm balance the benefits (tax shields) and costs (financial distress) of debt. As the level of debt increases,

the likelihood of financial distress becomes greater. Thus it is expected that the survival of the firm is negatively related to its level of leverage.

Profitability (+): The profitability of the firm is a key survival factor. Firms, which are more profitable from the beginning of their public life, are likely to be so in future and thus profitability is positively associated with survival.

Size of the Firm (Total Assets) (+): Larger firms are better positioned than smaller firms to weather tough economic periods or recover from past mistakes in strategy and direction. Therefore, firms that have a larger asset base have a better ability to prolong survival than firms with a smaller asset base.

Liquidity of Assets (+): Liquidity of assets ensures that a firm's assets are flexible while liquidity is also a measure of efficiency. Firms, which have liquid assets, are better positioned to use their resources to maximum effect in order to avoid financial distress or bankruptcy. Hence liquid firms are more effectively able to prolong survival. The more liquid the firm's assets are, the greater the firm's likelihood of survival.

Total Asset Turnover (+): Total asset turnover is a measure of efficiency in utilisation of assets. The efficiency of a firm contributes to its competitiveness and ultimately its survival (Trimbath, Frydman and Frydman, 2001). As a result, it is expected that this ratio should be positively related to survival.

A list of above characteristics, as they were measured as well as their predicted relationship to survival probability is summarised in Table 1.

Table 1: Definitions of Firm Characteristics and Their Expected Relationship to Survival Probability

Firm Characteristic	Definition and measurement	Expected relationship to survival
Age at Offering	The difference between the year in which the prospectus was lodged and the year in which the company was founded.	+
Offer Price	The offer price listed in the prospectus, or the midpoint of the price range.	+
Size of the Offering	The size of the offering listed in the prospectus, or the minimum subscription amount.	+
Ownership Retained	The difference between the market capitalization of the company after listing and the size of the offering, divided by the market capitalization of the company after listing.	+
Attachment of Options to the Offer	A value of 1 was attributed to offerings which had options attached, and a value of 0 otherwise.	-
Underwriter Backing	IPOs which had an underwriter recorded a value of 1 and a value of 0 otherwise.	+
Issue Costs	The ratio of the issue costs of the offering to the size of the offering as a percentage of the offer proceeds	-
Auditor in the Big 5	IPOs which had an auditor belonging to one of the Big 5 Accounting firms recorded a value of 1, and a value of 0 otherwise.	+
Earnings to Price Ratio	The ratio of the forecast first full year earnings to the offer price.	-
Forecast Dividend Yield	The ratio of the forecast first full year dividends to the offer price.	+
Number of Risk Factors in the Prospectus	The number of risk factors listed in the prospectus.	-
Non-Executive Chairman	If the Chairman listed in the prospectus is a non-executive director then a value of 1 is recorded, and a value of 0 otherwise.	+
Number of Directors (Including Chairman)	The number of directors (including the Chairman) listed in the prospectus.	+
Percentage of Independent Directors	The ratio of the number of non-executive directors to the number of directors, as listed in the prospectus.	+
Industry	The industry of the IPO.	?
Leverage	The ratio of long term debt to total assets for the first available full year results after listing.	-
Profitability	The ratio of EBIT to Total Assets for the first available full year results after listing.	+
Size of the Firm	The total assets of the firm according to the first available full year results after listing.	+
Tangibility of Assets	The ratio of the value of Plant, Property and Equipment to Total Assets according to the first available full year results after listing.	+
Total Asset Turnover	The ratio of Total Revenue to Total Assets for the first available full year results after listing.	+

METHODOLOGY AND DATA

The Cox Proportional Hazards Model

This paper uses the Cox proportional hazards model to examine the survival of IPOs. In this section, we briefly explain the methodology and features of this model. The probability of survival from one time period to the next is taken as a function of the force of mortality or the hazard rate. The hazard rate is the rate at which a life, alive at time t, is dead at time t + h, where h is a very small time interval. Thus the hazard rate can be considered as the instantaneous rate of change from a state of survivor to the state of non-survivor. Therefore, the lower the force of mortality the more likely the entity under observation (in this case the IPO) will survive.

The model takes the form:

$$\lambda (t; z_i) = \lambda_0 (t) \times \exp (\beta z_i^T) \quad (1)$$

In the above equation $\lambda (t; z_i)$ is the hazard rate at time t of the entity i and $\lambda_0 (t)$ is the baseline hazard function of t (the hazard rate at time t for an entity with z_i values equal to 0) and is independent of the variables. In the model β represents a $1 \times p$ vector of regression parameters for the variables ($\beta_1, \beta_{2,..,} \beta_p$), z_i is a $1 \times p$ vector of covariates.

Thus the hazard rate at time t of an IPO is a function of an underlying baseline hazard function (describing the expected time to failure of the sample of IPOs) and a vector of factors which have been hypothesised as affecting the future survival. While some papers have assumed a distribution for the baseline hazard, for the purposes of this paper such an assumption is not necessary.

The proportional hazards model takes the form:

$$\lambda (t; z_i) / \lambda (t; z_j) = \exp (\beta z_i^T) / \exp (\beta z_j^T) \quad (2)$$

The proportional hazards model allows for the relative mortality of two entities to be examined (in this case IPO_i and IPO_j). Note that in above formulation it removes the need for parametric assumptions about the distribution of the baseline hazard as the hazard rate is relative. Since the Cox proportional hazards model allows for β to be estimated without any assumption about the distribution of the baseline hazard, the model is semi-parametric. This formulation also effectively allows for censored and whole lifetime data to be used in the construction of the model and is another advantage of using this model. Censoring refers to IPOs which survive for the period of the observation, while whole lifetime data refers to those IPOs which fail during the set sample period.

The values for the regression parameters (β) are estimated using the maximum likelihood procedure:

$$L (\beta) = \prod \exp (\beta z_i^T) / \sum \exp (\beta z_j^T) \quad (3)$$

The above likelihood equation is the product of the force of mortality of the IPO which dies at time t_j, divided by the total force of mortality for the IPOs which are at risk of dying at time t_j. Thus by taking logs and differentiating with respect to β the maximum likelihood estimate of each of the regression parameters is obtained.

The sign and magnitude of these regression parameters indicate the relationship of the variable to survival. As stated earlier, the lower the force of mortality the more likely it is that the entity will survive. Negative values of β_i indicate that the ith factor in the model is positively related to survival, while a

positive value of β_i will increase the force of mortality and indicate a negative relationship to survival. A step log-likelihood model is used to determine whether variables should be included in the model or not.

Data

We obtain an initial sample of firms from the *Connect-4 Company Prospectuses* database. We collect a sample of firms that issued a prospectus in the years 1995, 1996 or 1997. For these firms we obtain listing information from the *Aspect Huntley Financial Analysis* database to ensure that the prospectus was for an IPO (since the *Connect 4* database does not differentiate between initial and seasoned public offerings prior to 1999). The date of listing was also obtained and IPOs in the sample, which did not list at least seven years prior to 31 December 2004, were excluded from the sample with seven years being chosen to represent a full business cycle. The industry classification of these firms was obtained from the *Aspect Huntley* database and firms classified as Listed Property Trusts (LPT) were removed from the sample as they are subject to different listing rules. This exclusion of LPTs from our sample is consistent with the practice of excluding REITs (Real Estate Investment Trusts) in other studies.

Our final sample consists of 154 IPOs that listed on the Australian stock exchange between 1995 and 1997 and for each of these 154 IPOs we collect from their prospectuses and the *Aspect Huntley* information for each of the factors listed in the previous section. The trading status, date of delisting and reason for delisting is cross-checked from information on the delisted website (delisted.com.au).

Similar to Bhabra and Pettway (2003), this paper defines a survivor as simply any firm which is not delisted at the end of seven years meaning that firms which are delisted, suspended, acquired or merged within seven years of their listing date are classified as non-survivors. This is based on the belief that as long as the stock continues to be listed, an upside potential for the stock price exists. The classification of acquired or merged firms as non-survivors is consistent with Welbourne and Andrews (1996) who found that seven out of eight merged firms experienced declining stock prices prior to the merger. Further, acquired and merged firms no longer possess the same corporate structure as non-survivors. The inclusion of suspended firms is based on the notion that suspension from trading merely foreshadows the company being delisted in the future.

The observation period of our sample is seven years after the date of issue or until the firm is delisted. Of our final sample of 154 IPOs 110 survive at least seven years. All results reported in this paper are based on this seven-year sample. We also repeat this procedure and all analysis for a five-year survival period to create another sub sample which has 123 IPOs surviving after five years. The results for the five-year observation period are similar to the seven-year observation period. In this paper, we report our findings of the seven-year period analysis.

RESULTS

Table 2 shows descriptive statistics of the characteristics of the firms in the sample. Variables which have indicator variables are shown as percentages of the sample. These indicator characteristics are: attachment of options to the offer, underwriter backing, use of an auditor in the big-five and the classification of the chairman as a non-executive. The median age of firms in the sample is 3.5 years and the median size of the offering is around $8 million indicating that the majority of IPOs in Australia are relatively young and small. It is also interesting to note that the mean and median percentage of equity ownership retention is around 50% and hence the original owners retain majority control of the company on average. There is a considerable variation on the type of offering amongst the sample of these 154 firms. In this sample, 22% have options attached to their shares to raise additional capital later, 76% use an underwriter and 56% have an auditor which is one of the big-five accounting firms. The cost of offering the issue appears to be relatively high as a percentage of offer proceeds (average 9.14%), while

the average firm has a forecasted rate of return of around 5.5% (E/P ratio) and a forecast dividend yield of 2.7%.

Table 2: Firm and Offer Characteristics

	Mean	Median	Std. Deviation	Min	Max	25%	75%
Age at Offering (years)	15.010	3.500	27.660	0	157.00	1.000	14.000
Offer Price ($)	4.250	0.500	40.260	0.200	500.00	0.250	1.200
Log of Offering Size ($)	16.480	15.890	1.770	13.820	23.40	15.200	17.670
Ownership Retained (%)	49.570	50.780	26.260	0	99.52	35.180	67.760
Attachment of Options (%)	22.080	-	-	-	-	-	-
Underwriter Backing (%)	75.970	-	-	-	-	-	-
Issue Costs as % of Offer (%)	9.140	7.810	9.310	.000	73.02	4.390	10.580
Auditor in the Big 5	56.490	-	-	-	-	-	-
Earnings to Price Ratio	0.055	0.034	0.068	-0.120	0.234	0.000	0.109
Dividend Yield	0.027	0.000	0.038	0.000	0.140	0.000	0.055
Number of Risk Factors	11.377	11.000	5.444	0.000	30.000	7.000	14.000
Non-Executive Chairman (%)	66.880	-	-	-	-	-	-
Num of Dir including chair	5.110	5.000	1.686	3.000	12.000	4.000	6.000
Percentage of Independent Dir (%)	56.360	60.000	23.540	0.000	100.000	48.210	75.000
Leverage	0.076	0.007	0.137	0.000	0.648	0.000	0.079
Profitability	-0.017	0.000	0.184	-1.406	0.509	-0.050	0.060
Log of Total Assets ($)	17.330	17.000	2.010	12.740	24.220	15.780	18.670
Liquidity of Assets	0.234	0.114	0.273	0.000	0.971	0.016	0.353
Total Asset Turnover	0.501	0.120	1.020	0.000	3.164	0.015	0.477

All values are obtained from IPO prospectuses and annual reports. Description and measurements of variables are contained in the data section.

It is also interesting to note that not all IPOs follow the ASX recommendations for good governance principles. While it is not compulsory for firms to follow ASX recommendations it is required that the company address each of the breaches in their annual report. Consistent with Da Silva Rosa, Izan and Lin (2004) the majority of IPOs have less than the recommended number of six directors (the mean number of directors is 5.11) while only 25% of IPOs have more than the recommended six directors on the board. However, 67% have a non-executive as a chair and the majority of firms have a board that could be considered independent, on which the non-executive directors outnumber the executive directors on the board. One way to interpret these findings is that for many IPOs, the perceived benefits associated with corporate governance have been outweighed by the cost of compliance. Another noticeable aspect is that for many of the factors there is a distinct difference between the mean and the median. Such a pronounced difference suggests that the collected data is skewed in distribution. In order to address this issue, we employ non-parametric tests for both the difference in means and medians.

Table 3 shows the life-table of survival of the 154 firms in the sample, from year zero (time of issue) to year seven and a breakdown of terminations by year of age. The life table indicates that of the 154 firms in the sample 31 are classified as non-survivors by the end of year five while 44 are classified as non-survivors by the end of year seven. This corresponds to probabilities of 20% and 29% that a firm will effectively fail within five and seven years of listing, respectively. While the differences in characteristics for survivors and non-survivors are discussed in more detail later, the results are similar to that of Lee et al (1996) who found that 17% of Australian firms listed between 1976 and 1989 did not survive for more than three years. For American firms listed between 1977 and 1990 Jain and Kini (1999) found that 31% of IPOs did not survive more than five years.

Table 3: Life Table

Interval Start Time	Number Entering Interval	Number Terminating	Proportion Terminating	Proportion Surviving	Cum. Proportion Surviving at End of Interval	Std. Error of Cumulative Proportion Surviving at End of Interval	Probability Density	Std. Error of Probability Density	Hazard Rate	Std. Error of Hazard Rate
0	154	0	0.00	1.00	1.00	0.00	0.000	0.000	0.00	0.00
1	154	5	0.03	0.97	0.97	0.01	0.032	0.014	0.03	0.01
2	149	8	0.05	0.95	0.92	0.02	0.052	0.018	0.06	0.02
3	141	10	0.07	0.93	0.85	0.03	0.065	0.020	0.07	0.02
4	131	8	0.06	0.94	0.80	0.03	0.052	0.018	0.06	0.02
5	123	8	0.07	0.93	0.75	0.04	0.052	0.018	0.07	0.02
6	115	5	0.04	0.96	0.71	0.04	0.032	0.014	0.04	0.02

Life table is constructed using the proportional hazard model with the starting and ending number of observations determined by actual sample sizes.

In order to gain an insight into whether firm characteristics affect survival, the differences between the two samples are of interest. Before we apply the hazard model to estimate the probability of survival, we employ simple difference in means and medians to see if the characteristics of survivor firms are different from that of the non-survivors. As noted earlier, in order to address the skewness in distribution of characteristics, we employ non-parametric tests which do not rely on the assumption that characteristics are normally distributed. We employ the non-parametric Kruskal-Wallis test for difference in means and medians to detect differences in distribution location between the two sub-samples (Webster (1995)).

The comparison between survivors and non-survivors at time seven shows that there is a significant difference between the mean and median of the two groups for the number of risk factors, total assets (firm size) and the degree of leverage at the time of listing. The mean and median of non-survivors for these characteristics exceed the corresponding statistics for the survivor group. Consistent with the results of Hensler, Rutherford and Springer (1997) and Bhabra and Pettway (2003), our findings support the hypothesis that the number of risk factors listed in the prospectus should be negatively related to survival. Firms with greater levels of risk are more likely to suffer operational losses, which over time erode their asset base and financial resources. However, contrary to expectation, firm size (as measured by total assets) is found to be larger for the non-survivor group. This result contradicts the hypothesis that larger firms which have greater asset bases may better able to weather tougher economic periods or recover from mistakes in strategy or direction. As for leverage, the implied relationship between the level of long term debt and survival, is consistent with increased financial distress costs leading to failure.

Results contained in Table 4 provide evidence that the number of risk factors, the size of the firm (value of total assets), and the leverage of a firm provide a basis to identify firms likely to survive for more than seven years. It may come as surprise that of the chosen 19 characteristics only three are significantly different across the survivor and non-survivor groups. Possible reasons for lack of distinguishing characteristics would be due to lack of industry classification and precision in mortality rates. To the extent that survival characteristics vary across industry, these differences are not apparent in Table 4. To control for the industry variable, we include an industry variable in our analysis later allowing for more definitive conclusions regarding the factors affecting survival.

Table 4: Difference of Means and Medians

	Mean					Median				
	Survivors	Non-Survivors	Simple Difference	Kruskal-Wallis Chi-Square Difference	KW Asymptotic significance of diff.	Survivors	Non-Survivors	Simple Difference	Kruskal-Wallis Chi-Square Difference	KW Asymptotic significance of diff.
Age at offering (years)	15.03	14.98	-0.05	0.05	0.213	4	2	-2	2.04	0.154
Offer price ($)	5.35	1.49	-3.86	2.44	0.119	0.5	1	0.5	2.19	0.139
Size of Offering ($, in Log)	16.49	16.45	-0.04	0.02	0.893	15.89	16.12	0.23	0.84	0.359
Ownership retained (%)	47.38	55.02	7.64	2.42	0.12	50.22	56.77	6.55	1.15	0.285
Attachment of option (%)	24.55	15.91	-8.64	1.35	0.245	0	0	0	1.36	0.243
Underwriter backing (%)	73.64	81.82	8.18	1.15	0.285	100	100	0	-	-
Issue costs[a] (%)	8.95	9.61	0.66	0.5	0.479	8.08	6.78	-1.3	1.15	0.285
Auditor in big-5[a] (%)	56.36	56.82	0.46	0	0.959	100	100	0	-	-
E/P ratio (%)	5.36	5.72	0.36	0.37	0.545	0	4.98	4.98	3.19	0.44
Forecast div. yield (%)	2.8	2.61	-0.19	2.4	0.877	0	0	0	0.59	0.44
Number of risk factors	10.58	13.36	2.78	7.57***	0.006	10	12.5	2.5	13.61***	0.00
Non-exec chairman[a] (%)	67.27	65.91	-1.36	0.03	0.871	100	100	0	-	-
Number of directors	5.07	5.23	0.16	0.95	0.33	5	5	0	0.78	0.379
Independent directors (%)	58.13	51.95	-6.18	1.29	0.256	60	60	0	0.95	0.330
Leverage	0.0657	0.1057	0.04	4.19**	0.041	0	0.0268	0.0268	3.993**	0.046
Profitability	-0.0194	-0.0097	0.0097	0.62	0.804	0	0.0015	0.0015	0.003	0.956
Total assets ($, in Log.)	17.15	17.82	0.67	3.56*	0.059	16.73	17.44	0.71	2.59	0.108
Liquidity	0.237	0.2236	-0.0134	0.022	0.881	0.1044	0.1193	0.0149	0.003	0.959
Total asset turnover	0.4971	0.5102	0.0131	0.962	0.327	0.1098	0.2214	0.1116	1.488	0.223

[a] *All values are less than or equal to median. Median tests can not be performed.*

The results of the Cox proportional hazards model are presented in Table 5, which censors survivors at the end of year seven. We employ three models and an overall best-fit model. Model 1 represents the Cox proportional hazards model with 14 factors, which are available in the prospectus at the time of listing. Model 2 adds industry variables to Model 1 for firms belonging to the natural resource, finance, business services or manufacturing industries. Model 3 includes financial characteristics. Model 4 is the model of best fit overall and is determined by using a backward likelihood ratio technique to minimize the overall significance level of the model.

An examination of the overall significance of the models shows that the inclusion of industry factors and the financial characteristics improves the significance level of the estimation. When observing the survival of IPOs over a seven-year-time period the level of significance improves from 35% (Model 1) to about 0.7% (Model 3). The model of best fit (Model 4) is well below the 1% level of significance and produces seven factors that are significant at a significance level of 10%. These factors include the size of the offering, underwriter backing, forecast dividend yield, number of risk factors listed in the prospectus, size of the firm and whether or not the firm is in the finance or natural resources industries.

Table 5: Cox Proportional Hazards Model

Characteristics	Model 1 β	Model 1 Sig.	Model 1 Exp (β)	Model 2 β	Model 2 Sig.	Model 2 Exp (β)
Age at Offering	0.0033	0.7066	1.0033	-0.0008*	0.9303	0.9992
Offer Price	-0.0107	0.8162	0.9893	-0.0132	0.8596	0.9869
In (Size of Offering)	-0.0678	0.6746	0.9345	-0.1620	0.3816	0.8504
Ownership Retained	1.2085	0.1863	3.3483	0.5449	0.5585	1.7245
Attachment of Options=1	-0.6580	0.2176	0.5179	-0.5751	0.3112	0.5627
Underwriter Backing = 1	0.7872	0.1180	2.1972	0.9628**	0.0738	2.6189
Issue Costs	-0.1770*	0.9374	0.8378	-1.4477	0.5838	0.2351
Auditor in the Big 5 = 1	0.0719	0.8440	1.0746	0.0277	0.9421	1.0281
Earnings to Price Ratio	0.9921	0.7980	2.6970	-1.5341	0.6842	0.2157
Forecast Dividend Yield	1.5523	0.8213	0.2118	-6.4883	0.3618	0.0015
Number of Risk Factors	0.0734**	0.0327	1.0761	0.0675**	0.0596	1.0698
Non-Exec Chair = 1	0.2794	0.5258	1.3223	0.3425	0.4520	1.4085
Num. of Directors (incl. Chair)	0.0272	0.8558	1.0275	0.0208	0.8984	1.021
Percentage Independent Directors	-0.5361	0.5250	0.5850	-0.6880	0.4191	0.5026
Business Services				-0.7366	0.3065	0.4787
Finance				-0.8000	0.2617	0.4493
Manufacturing				-0.3671	0.5399	0.6927
Natural Resource				-1.6854***	0.0047	0.1854
Overall Score		**Model 1**			**Model 2**	
- 2 Log Likelihood		327.6303			318.18	
Chi Square		15.4047			25.781	
df.		14.0000			18.0000	
Sig		0.3511			0.1049	

Characteristics	Model 3 β	Model 3 Sig.	Model 3 Exp (β)	Model 4 β	Model 4 Sig.	Model 4 Exp (β)
Age at Offering	-0.0020	0.7830	0.9980			
Offer Price	-0.0140	0.8000	0.9860			
In (Size of Offering)	-0.9440	0.0060	0.3890	-0.4245*	0.0059	0.6541
Ownership Retained	-0.8560	0.4320	0.4250			
Attachment of Options=1	-0.7840	0.2010	0.4570			
Underwriter Backing = 1	0.9150	0.1060	2.4970	0.8428	0.0914	2.3229
Issue Costs	-5.3740	0.1010	0.0050			
Auditor in the Big 5 = 1	-0.4240	0.3570	0.6540			
Earnings to Price Ratio	-0.7070	0.8710	0.4930			
Forecast Dividend Yield	-10.9000	0.1690	0.0000	-9.4857*	0.0689	0.0001
Number of Risk Factors	0.0250	0.4960	1.0260	0.0534*	0.0722	1.0549
Non-Exec Chair = 1	0.4850	0.3120	1.6240			
Num of Directors (incl. Chair)	-0.0730	0.6820	0.9300			
Percentage Independent Directors	-0.6150	0.4950	0.5410			
Business Services	-0.2530	0.7450	0.7760			
Finance	-2.0450	0.0360	0.1290	-1.1742*	0.0821	0.3091
Manufacturing	-0.3080	0.6250	0.7350			
Natural Resource	-1.6010	0.0120	0.2020	-1.0966**	0.0257	0.3340
Leverage	0.6720	0.6920	1.9590			
Profitability	-1.3130	0.3430	0.2690			
In (Total Assets)	0.9220	0.0040	2.5140	0.4455**	0.0108	1.5613
Liquidity	-0.3600	0.6390	0.6970			
Total Asset Turnover	-0.2910	0.2160	0.7480			
Overall Score		**Model 3**			**Model 4**	
- 2 Log Likelihood		305.10**			317.51***	
Chi Square		42.7957			28.1847	
df.		23.0000			7.0000	
Sig		0.0073			0.0002	

Hazard rates, β, are coefficient estimates from Cox proportional model and exp (β) are relative hazard rates of non-survivors. A negative value of β reduces the hazard rate and indicates that the factor is positively related to survival, while a positive value of β indicates that the factor is negatively related to survival. The relative hazard rate value is represented by Exp (β). Exp(β) being less than 1 indicates that the factor is positively related to the likelihood of survival, while an Exp(β) which is greater than 1 indicates a negative relationship to survival.

As indicated by the negative value of the β coefficient and a relative hazard rate value of *exp (β)* being less than one the size of the offering is negatively related to the likelihood of failure. This relationship is consistent with the hypothesis that the size of the offering should be positively related to survival because larger offerings are a signal of market confidence. After all, it is harder to raise a large amount of capital for a company unless there is strong investor support. This is consistent with the findings of Hensler, Rutherford and Springer (1997).

It is also evident that firms classified as belonging to the natural resource or finance industries are more likely to survive than IPOs in other sectors. This result supports of the importance of the mining industry in the Australian economy and the relationship between survival and performance. The research of Lee, Taylor and Walter (1996) found evidence of the post-issue under-performance of Australian industrial IPOs, while Australian mining IPOs consistently outperform the market (How, 2000). Taken together with the evidence presented here, it implies that investors with investment horizons of less than seven years should choose firms in the finance or mining industries.

The significance of the number of risk factors listed in the prospectus was foreshadowed by the difference in means and medians presented in Table 3 and so it is not surprising that the number of risk factors is a significant factor in the proportional hazards model. Consistent with expectations, the number of risk factors is negatively related to survival and supports the notion that the number of risk factors is an appropriate proxy for the risk of a firm. Firms with a bigger list of risk factors are more likely to incur operational losses over time. The high informational value of the risk factor section in the prospectus is consistent with the findings for American IPOs of Hensler, Rutherford and Springer (1997) and Bhabra and Pettway (2003).

Dividend yield is strongly and positively related to survival. If a firm forecasts to pay a dividend in its first year this implies strong profitability from the beginning of its publicly traded life. However, it may also mean that because the firm is established and stable there is a limited amount of growth opportunities. In terms of minimizing risk, profitability and stability are favourable characteristics. Therefore, the evidence presented here strongly suggests that the forecast dividend yield of an IPO provides valuable information.

It is also worth noting that contrary to expectations, underwriter backing is negatively related to the survival of IPOs. The negative relationship between the use of an underwriter and survival should be treated carefully because it may be explained by the inability of the methodology employed here to differentiate between a reputable underwriter or otherwise. The results of the survival analysis indicate that some of the information available at the time of listing is valuable to investors concerned with the duration of their investment. However, the implications to the decisions of owners and management of factors which are not significant should also be considered. For example, such factors as the age of the firm at offering, the attachment of options, ownership retained and the board composition characteristics are found to have no significant effect on survival.

CONCLUSION

In this study, we examine the survival of Australian IPOs which lodged prospectuses in 1995, 1996, or 1997. We find that there is high failure rate among Australian IPOs with 20% and 29% of firms delisting within five and seven years of their listing date. The value of the public information available IPO prospectuses at the time of listing is tested using the Cox proportional hazards survival model and the results suggest that the size of the offering and the forecast dividend yield are positively related to survival, while the number of risk factors listed in the prospectus is negatively related to survival. Firms in the finance or natural resource industries are also more likely to survive than other firms. The implications of these results to investors are that they should invest in firms that have a low number of

risk factors, a large offer size, a forecast dividend yield for the first full year after issue and which are either in the finance or natural resource industries. There is also some evidence to suggest that contrary to expectations, the size of the firm (as measured by total assets) and the use of an underwriter are negatively related to survival. Further research is needed to explain why firms with many assets are more likely to fail. Meanwhile, the distinction between underwriters based on reputation may also be helpful in explaining this result. However, some of the firm characteristics, offer characteristics, financial characteristics and corporate governance characteristics were found to have no significant impact on survival.

REFERENCES

Balatbat, M. & Taylor, S. & Walter, T. (2004) ''Corporate governance, insider ownership and operating performance of Australian initial public offerings", *Accounting and Finance*, Vol. 44, pp.299-328

Bhabra, H. & Pettway, R. (2003) ''IPO Prospectus Information and Subsequent Performance', *Financial Review*, Vol. 38, pp.369-397

Da Silva, R. & Rosa, H. & Lin, M. (2004) ''Board Characteristics of Australian IPOs: An Analysis in Light of the ASX Best Practice Recommendations", *Australian Accounting Review*, Vol. 14, No. 1, pp.25-32

Dimovski, W. & Brooks, R. (2003) ''Financial characteristics of Australian initial public offerings from (1994 to 1999", *Applied Economics*, Vol. 35, pp.1599-1607

Hensler, D. & Rutherford, R. & Springer, T. (1997), ''The Survival of Initial Public Offerings in the Aftermarket", *Journal of Financial Research*, Vol. 20, No. 1, pp.93-110

How, J. (2000) ''Initial and Long-Run Performance of Mining IPOs in Australia", *Australian Journal of Management*, Vol. 25, No. 1, pp.95-118

How, J. & Howe, J. (2001) ''Warrants in Initial Public Offerings: Empirical Evidence", *Journal of Business*, Vol. 74, No. 3, pp.433-57

Jain, B. & Kini, O. (1994), ''The Post-Issue Operating Performance of IPO Firms", *Journal of Finance*, Vol. 49, No. 5, pp.1699-1726

Jain, B. & Kini, O. (1999), ''The Life Cycle of Initial Public Offerings", *Journal of Business Finance and Accounting*, Vol. 26, pp.1281-1307

Jain, B. & Kini, O. (2000) ''Does the Presence of Venture Capitalists Improve the Survival Profile of IPO Firms?", *Journal of Business Finance and Accounting*, Vol. 27, pp.1139-1176

Lee, P. & Taylor, S. & Walter, T. (1996) "Australian IPO pricing in the short and long run", *Journal of Banking and Finance*, Vol. 20, pp.1189-1210

Lee, P. & Stokes, D. & Taylor, S. & Walter, T. (2003) "The association between audit quality, accounting disclosures and firm-specific risk: Evidence from initial public offerings", *Journal of Accounting and Public Policy*, Vol. 22, pp. 377-400

Mata, J. & Portugal, P. (1994) "Life Duration of New Firms", *Journal of Industrial Economics*, Vol. 42, No.3, pp.227-245

Platt, H. (1995) ‘‘A Note on Identifying Likely IPO Bankruptcies: A Symphonic Paradox”, *Journal of Accounting, Auditing and Finance*, Vol. 10, No. 1, pp.71-81

Ritter, J. (1991) ‘‘The Long Run Performance of Initial Public Offerings”, *Journal of Finance*, Vol. 46 No.1, pp.3-27

Shultz, P. (1993) ‘‘Unit initial public offerings”, *Journal of Financial Economics*, Vol. 34, pp.199-229

Trimbath, S. & Frydman, H. & Frydman, R. (2001) ‘‘Cost Inefficiency, Size of Firms and Takeovers”, *Review of Quantitative Finance and Accounting*, Vol. 17, No. 4, pp.397-420

Webster, A. (1995) “Applied Statistics for Business and Economics”, 2nd Ed., Irwin, United States

Welbourne, T. & Andrews, A. (1996) ‘‘Predicting the Performance of Initial Public Offerings: Should Human Resource Management Be in the Equation?” *Academy of Management Journal*, Vol.39, No. 4, pp.891-919

ACKNOWLEDGEMENT

The authors wish to thank seminar participants at the Curtin University of Technology and AFAANZ conference for useful comments and suggestions.

BIOGRAPHY

Andre Lamberto: Andre Lamberto graduated from Curtin University in 2005 with a Bachelor of Science (Actuarial Science) and a Bachelor of Commerce (Finance) (Honours). He is an Associate member of the Institute of Actuaries of Australia and is currently studying Part 3 of the through the Institute of Actuaries of Australia. Andre currently works for the Retirement Incomes and Asset Consulting division of PricewaterhouseCoopers Australia. Email: andre101@iprimus.com.au

Subhrendu Rath: Subhrendu Rath is an Associate Professor at the Curtin University of Technology, Australia. Subhrendu’s research interests are in the areas of Corporate Finance and Market Microstructure. His publications have appeared in the *International Journal of Business Studies, Emerging Markets Finance and Trade, and Applied Financial Economics.* Subhrendu is the editor of the *Asia Pacific Journal of Economics and Business* and serves on the editorial board of the *Journal of Entrepreneurial Finance and Business Ventures.* Email: s.rath@curtin.edu.au