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What Determines the Survival of Internet IPOs?

Abstract

This paper investigates the determinants of survival, acquisition and non-survival for internet firms that have gone public at the NASDAQ stock exchange from December 1996 through February 2001. We analyze two models, survivors *versus* non-survivors and survivors *versus* acquired firms with the help of the Cox proportional hazard method. We have selected all internet firms that went public during the internet bubble. The paper presents a model that includes a number of new and earlier examined, explanatory variables simultaneously that are often studied separately and for non-internet firms in other studies. The key issue of the study is that our models provide a prediction of the rate of non-survival or acquisition of internet firms.

The empirical results provide evidence that compared to both acquired firms and non-survivors, survivors' owners retain a larger share in the firm at IPO. Our study presents a number of novel findings. Survivors differ significantly from non-survivors in the number of risk factors in the IPO prospectus and underwriter reputation. Furthermore, our results are consistent with risk factors indicating the economic fundamentals of an internet IPO rather than being a mechanism against legal liability. Although internet firms belong to a relatively young branch of industry, the outcome provides evidence that top bracket lead managers are successful in selecting high quality internet IPOs. Also, our empirical results document that during the last phase of the internet bubble the industry was turning into a hot market with weaker firms going public due to reduced scrutiny of investors. Our findings hold under a number of robustness checks.

Keywords: internet firms, financial and market information, initial public offering
JEL codes: G1, M4

What Determines the Survival of Internet IPOs?

1. Introduction

This paper studies internet firms that have gone public at the NASDAQ stock exchange during the period December 1996 through February 2001. Due to the relatively high market values of internet firms during the internet bubble years 1998-1999 and the sharp decline of their market valuations from early 2000 onwards, prior research on internet firms has focused on explaining pre and post downturn market values and the internet stock downturn phenomenon itself. The contribution of this paper is that it investigates the rate of non-survival or acquisition of internet firms directly. Survivors are classified as firms that remain listed on the exchange from the time of IPO (initial public offering) throughout the studied period. Acquired firms are firms, which after IPO are acquired by an existing firm or taken private. Non-survivors are classified as firms that are delisted from the exchange.

Our research design was specifically chosen to focus on the key issue of this study: the variables that predict the rate of success, failure, and acquisition of firms in the internet industry. We use both financial and non-financial information that is available to investors from the IPO prospectuses. The effect of financial information is measured through several financial multiples, such as net sales over assets and operating income over assets. In addition to financial information, we

examine firm-specific non-financial information, such as firm risk, lead investment bank reputation, and insider ownership retention. Finally, we control our results for a number of different sub-sectors of the internet industry. Although many papers have analyzed internet firm value (for instance Bartov *et al*, 2002; Demers and Lev, 2001; Demers and Lewellen, 2003; Johnston and Madura, 2002; Knauff *et al*, 2003; Ljungqvist and Wilhelm, 2003; Loughran and Ritter, 2002 and 2003), to the best of our knowledge, this paper is the first that focuses on the analysis of survival determinants for internet firms only. Also, our model incorporates a number of new and earlier examined, explanatory variables simultaneously that are often studied separately and for non-internet firms in other studies.

Due to the structure of the data involved, *i.e.* having a duration dependent variable where some survival periods are censored (see section 4 hereafter), we use the Cox (1972) proportional hazard method to investigate, which variables determine the rate of success and failure of internet firms. In addition to comparing mean differences, which can be classified as a two-sample analysis, we account for all cross-correlations between the explanatory variables by using Cox regression model. The Cox proportional hazard method is used because of its flexibility. This method does not assume a particular parametric baseline hazard function, since economic theory does not provide a parametric specification. Instead, the method provides the impact explanatory variables have on the hazard rate, whatever functional form the hazard rate may have. In this paper, the hazard rate gives an indication of the likelihood that an internet firm will be non-surviving or acquired.

The remainder of the paper is organized as follows. Section two describes our data sample and the related statistics. Section three discusses our hypotheses on internet firm survival. The fourth section presents the Cox proportional hazard method. Section five contains the empirical results, and the final section summarizes and concludes the paper.

2. Data and Descriptive Statistics

2.1 Sample Selection

This paper studies the survivability of U.S. internet IPOs that went public during the period December 1996 through February 2001. Following Hand (2000), internet firms are defined as firms obtaining more than fifty percent of their revenues through or because of the internet. Since this definition does not rule out arbitrariness, we have compiled our sample from two sources of internet IPOs. Our first source is a list of 527 internet-related offerings used by Loughran and Ritter (2003), who obtained their data by merging and amending internet identifications of *Thomson Financial Securities Data*, *Dealogic* and *IPOmonitor.com*. Next, we matched this list against the firms marked as internet-related by our second source, www.edgar-online.com. IPOs documented by both sources are included in our initial sample, which contains 382 firms.

In order to be included in the final sample, firms have to meet two criteria. First, firms must be listed at the NASDAQ stock exchange exchange to create equal delisting norms throughout the sample. Second, the final prospectus must be available at www.sec.gov, including annual accounts covering a full fiscal year. Furthermore, unit offerings and financial institutions are excluded from the sample, as the characteristics of these IPOs differ significantly from other offerings.

From our initial sample, 13 firms were excluded because they were issued at an exchange other than the NASDAQ. Two firms are left out as their final prospectus is not available. For 31 firms the annual accounts accompanying the prospectus do not cover a full year. A further eight firms are financial institutions and two more firms are left out of the sample as, on closer inspection, the company description in the prospectus does not justify the status of internet related IPO according to the aforementioned definition. After the exclusion of those 56 firms, our final sample consists of 326 internet offerings. Figure 1 illustrates the time distribution of these internet IPOs, with peaks in 1999 and the beginning of 2000.

<Insert Figure 1 about here>

Many variables used in our analysis have been hand-collected (for instance, the number of risk factors, underwriter reputation, valuation uncertainty, and the financial ratios) from the final offering prospectuses of the issuing firms, which are available at www.sec.gov. The date of the first trading day has been obtained from www.edgar-online.com.

Following Jain and Kini (1999b), we have segmented our sample into three different aftermarket states: survivors, acquired firms and non-survivors. These states of the internet firms in the aftermarket are determined as of April 22, 2003, using data from www.nasdaq.com and www.sec.gov. Survivors are internet IPOs that remain listed on the NASDAQ stock exchange from the time of issue throughout the studied period. Acquired firms are firms that after their IPO are acquired by a public or private firm or taken private through a leveraged buy-out (LBO). Non-survivors are classified as internet firms delisted from the NASDAQ stock exchange due to negative reasons. With respect to our sample, those reasons include both failing firms and firms moving to other exchanges with less strict listing criteria[1], such as the NASDAQ Small Caps market or the Bulletin Board (OTCBB).

Compared to firms remaining listed and firms delisted for non-negative reasons Shumway and Warther (1999) find negative returns for firms delisted from the NASDAQ stock exchange for negative reasons. With respect to acquired firms, Andrews and Welbourne (1996) and Jain and Kini (2000) document that these firms underperform compared to surviving firms in the period prior to acquisition. Therefore, we designate survival as more desirable than being acquired from an investor and issuer perspective. Figure 2 illustrates the time allocation of delistings and acquisitions of the firms studied in this paper. Although there are concentrations of delisted firms in some quarters, the burst of the internet bubble of spring 2000 is not evident from these statistics.

< Insert Figure 2 about here>

[1] We refer to www.nasdaq.com for delisting requirements.

Figure 3 provides the distribution of the aftermarket IPO status by year of issuance. As the aftermarket status of our sample firms has been determined on the same date for all firms (April 22, 2003), the examined period differs per firm, depending on its offering date. Firms with a short trading history would be expected to have the highest survival rates and the lowest rates for acquisition and non-survival. However, the figure shows an inverse relation between the trading history and non-survivors. This seems to support the notion that during the last phase of the period examined the internet industry was turning into a hot market, with weaker firms going public due to reduced scrutiny of investors (see Ritter, 1984). Another explanation is provided by Schultz and Zaman (2001), who argue that early issuing firms had a first mover advantage in a highly competitive market, which was characterized by consolidation.

<Insert Figure 3 about here>

2.2 Sub-sectors of the Internet Industry

Based on Knauff *et al* (2003), we divide the internet industry into the following sub-sectors: internet services providers (ISPs), content/portals, e-commerce products, E-commerce services, IT-infrastructure networks, IT-infrastructure equipment, licensed internet software, server-based internet software, professional internet services and internet advertising services. The firms' sub-sectors are based on their primary source of revenues. A brief description per sub-sector follows.

<Insert Table 1 about here>

ISPs provide consumers and businesses with access to the public internet by supplying IP-based connections to their networks. Their revenues consist of charges for access and/or direct or indirect charges for internet usage. Content providers offer information about products and services free of charge on their internet sites. Portals are entry points or starting sites for the internet, aiming to provide a personal home base for their audience with features such as web-guides, news headlines and chat rooms. Content providers and portals are grouped together as they mainly generate revenues by selling advertisement space on their sites.

Firms engaging in e-commerce are vendors of products and/or services, creating revenues by entering into commercial transactions over a digital infrastructure with consumers as well as businesses. IT-infrastructure firms provide the physical hardware used to enable data exchange over the internet, including network lines, satellites, antennas, routers, switches, modems *et cetera*. Network infrastructure firms generate revenues by selling network capacity, data center capacity and/or hosting services. Firms delivering equipment generate revenues by selling, and in some cases also installing, their merchandise. Internet software firms provide a variety of programs used to operate internet-related computers and other devices. Revenues can be generated either by licensing the software to clients for a fixed period of time, or by charging per executed transaction. Firms employing the last mentioned revenues model generally keep the software on their own servers, to which clients have to connect. Finally, the group of internet services firms consists of companies providing professional internet services and internet advertisement agencies. The former create revenues by charging an hourly fee for their consulting services, while the latter receive a commission on the advertising income generated by their clients.

Table 1 provides the allocation of survivors, non-survivors and acquired firms by sub-sector. The distribution indicates the failure rate is relatively high for firms in the ISP, content/portals, e-commerce products and IT-infrastructure network sub-sectors. Furthermore, the internet services market seems to be characterized more by consolidation compared to other sub-sectors.

2.3 Summary statistics of the independent variables

In this section we describe the independent variables used to explain the three post-issue states of the Internet IPOs. Table 2 lists the explanatory variables and provides a description of each of them. Table 3 presents the summary statistics of the explanatory variables. The IPO prospectuses mention 31.4 (31.0) risk factors, on average (median). The percentage of underwriters with a high prestige is 89.0. The non-logged average (median) firm size is USD 85.3 (64.0) million. Investor demand has an average (median) value of 25.7 (23.1) percent. Insider ownership retention is 80.6 (81.6) percent, on average (median). The operating history of an IPO firm's internet activities is on average (median) 29.29 (28.30) months or 2.44 (2.36) years.

<Insert Tables 2 and 3 about here>

The Pearson correlation matrix of the explanatory variables is in the appendix. Regarding the IPO firms' financial ratios the correlation matrix shows high correlations between several ratios. As can be seen in the appendix, these concern the following variables: net income over assets, operating income over assets, operating cash flow over assets, total liabilities over total assets, and net working capital over assets. Consequently, we have not included those correlated variables in our model simultaneously. Furthermore, after analyzing the correlation matrix of the subset of the survivors and acquired firms (not reported) we found a relatively high correlation between the variables firm size and investor demand. Because the effect of investor demand for acquired firms is of less importance

than firm size at the moment of acquisition, we have only included firm size and omitted investor demand in our regression of survivors *versus* acquired firms.

Table 4 presents the mean differences of the explanatory variables for the three aftermarket states examined. In general, a majority of the mean differences regarding the offering and firm characteristics are significant, whereas those of the financial ratios except for the net sales over assets and receivables over total assets are not. These findings are consistent with the small relevance of accounting information for the internet industry reported by a number of authors (for instance, see Hand, 2001; Rajgopal *et al*, 2003; and Trueman *et al*, 2000). As can be seen in table 4, surviving firms have the highest percentage of underwriters from the high reputation bracket (96.7 percent). Further, the average values of firm size, investor demand, insider ownership retention, IPO market level, and offer-to-book ratio of survivors are larger than those of the non-survivors and acquired firms, respectively.

<Insert Table 4 about here>

3. Hypotheses

In this section, we discuss the hypotheses examined. With the exception of hypothesis H3, we use the same hypotheses regarding a firm's hazard rate for both models, *i.e.* the survivors *versus* non-survivors model as well as the survivors *versus* acquired firms model.

A common way to quantify firm specific risk is using the standard deviation of aftermarket returns. However, before the offering stakeholders do not know aftermarket returns. Therefore, we follow Beatty and Welch (1996), Hensler *et al* (1997) and Van der Goot (2003) by using the number of risk factors reported in the IPO prospectus as a direct measure for *ex ante* firm-specific risk. Hence, the first hypothesis is:

H1: There is a positive relation between the number of risk factors and the hazard rate of a firm.

Investment banks, also referred to as underwriters, depend on their reputation capital to generate new business. The investment banks with the highest reputation are considered to be more successful at performing activities, such as taking firms public. This creates an incentive to be selective at picking firms for offering, to monitor firms after the offering and to create interest for the firms' stocks by distributing analyst reports (see Hansen and Torregrosa, 1992; Macklin *et al*, 1992; Jain and Kini, 1999a and Aggarwal, 2000). The measure we use for investment bank reputation is based on the relative placement of underwriters in tombstone advertisements, as originally developed by Carter and Manaster (1990) and Carter, Dark and Singh (1998) and later updated and amended by Loughran and Ritter (2003) for the period 1980 through 2000. All authors assign higher scores to higher reputation underwriters, and *vice versa*. We assign a value of 1 to offerings taken public by investment banks with reputations of 8 or 9; a value of 0 is assigned to an IPO if the reputation of the lead manager is lower.

H2: A high reputation of the lead manager is inversely related to a firm's hazard rate.

Our third hypothesis is based on the notion that larger firms have better access to the capital market and are better equipped to withstand rough market conditions and adverse outcomes of investment decisions. Many studies document a higher risk of failure for smaller firms (Schultz, 1993; Hensler *et al,* 1997; Jain and Kini, 1999b). However, Banz (1981) reports that the size effect is most pronounced among the smallest NASDAQ firms. Shumway and Warther (1999) argue that this relationship is a consequence of a delisting bias of the NASDAQ data. After correcting for this delisting bias Shumway and Warther (1999) do not find a significant relation between a firm's size and its performance. Since we account for delisting due to acquisition, on the one hand, and non-survival for negative reasons (see section 2.1 before), on the other, we do not expect an association between firm size and non-surviving firms, but we do expect an association between firm size and acquired

firms. Because a small firm is easier to acquire than a large one, we expect an inverse association between acquired firms and firm size. We use the logarithm of the dollar amount of the gross offering proceeds as a measure of size. Therefore, we test two hypotheses:

H3.1: Regarding non-survivors, there is no relationship between firm size and its hazard rate.

H3.2: Regarding acquired firms, there is an inverse relationship between firm size and its hazard rate.

Before an IPO takes place, an investment bank sets a preliminary price range and conducts road shows to market the offering. During the road show, the investment bank receives signals about investors' interest in the offering. Guided by these signals, an investment bank may decide to adjust the initial price range, where upward adjustments indicate high investor demand. Following Hanley (1993), the measure of this investor demand is the price change of the final offer price as percentage of the average value of the initial price range, where we also correct for changes in the number of shares offered. As aforementioned, in the correlation matrix of the subset of surviving and acquired firms, there is a high correlation between firm size and investor demand. Therefore, we have included the latter variable in the model of survivors *versus* non-survivors only.

H4: A firm's survival is an increasing function of investor demand.

Investment banks start the process of marketing an IPO by setting an initial price range as required by the regulatory authorities. At that time, there are only limited indications regarding investors' interest in the firm. Consequently, investment banks are depending on their own judgment for setting the preliminary price range. High uncertainty about firm valuation, for instance, due to a limited operating history or the infant industry argument, is likely to result in relatively large spreads of the initial price range. Jain and Kini (1999b) relate this valuation uncertainty to uncertainty about a firm's performance after the offering. They measure valuation uncertainty as the dollar spread of the

initial price range divided by the average value of the initial price range. The authors find a negative relationship between valuation uncertainty and firm survival. Therefore, the prediction is:

H5: A firm's hazard rate is an increasing function of valuation uncertainty.

Leland and Pyle (1977) argue that a firm's owners can signal quality in equity markets by retaining equity. Consistent with their signaling theory, a high percentage of insider ownership retention at IPOs serves as a certification that managerial decisions will coincide with the outside shareholders' interest, which results in better firm performance after the offering (Jensen and Meckling, 1976), and a longer survival period (Hensler *et al*, 1997). Insider ownership retention is measured as the number of shares held by the original owners as percentage of the total number of shares outstanding after the offering.

H6: A firm's hazard rate is inversely related to the percentage of insider ownership retention at the offering.

Several authors (for instance, Ritter, 1991; Jegadeesh *et al*, 1993; Hensler *et al*, 1997) document the relation between a firm's age at the time of offering and its risk. The rationale behind this finding is twofold. First, older firms are more mature and in a more steady state and, therefore, have less uncertainty about future operating performance. Second, management of mature firms is in a better position to reduce information asymmetry at the time of offering when a firm has a longer operating history. We examine total firm age as well as the age of its internet activities at the time of offering to capture the fact that several non-internet firms have transformed their business model to become internet firms.

H7: A firm's hazard rate is a decreasing function of both its whole operating history and the duration of its internet activities at the time of offering.

Managers recognize periods, in which equity market levels are relatively high, *e.g*. due to over-optimism about the earnings potential of young growth companies. They take advantage of these 'windows of opportunity' by taking their firms public, which results in IPO volume peaks (Lowry and Schwert, 2002). Firms, which have gone public during these peaks, underperform relative to other offerings. This can be attributed to lower quality issuers being unable to withstand periods of economic downturn (Ritter, 1991). This finding is confirmed by Hensler *et al* (1997), who report a negative relation between market level at the IPO and firm survival. Market level is measured as the average value of the NASDAQ Composite Index during the month of offering.

H8: There is a positive relationship between market level at the time of offering and a firm's hazard rate.

Further, we examine the relation between a firm's hazard rate and the log of its offer-to-book ratio. The underwriter sets the IPO offering price at a high level when he meets much interest from sophisticated investors during the book-building period. A high price can be seen as an indication of an internet IPO's high growth opportunities. Therefore, a large offer-to-book ratio is a signal of a relatively high quality internet IPO. In addition, when the offering price is high the firm receives a larger amount of money in its IPO with which it can survive longer. Hence, we hypothesize that the firm's hazard rate is a decreasing function of its offer-to-book ratio.

H9: There is a negative relation between a firm's hazard rate and its offer-to-book ratio.

Finally, we test the hypothesis that an internet firm's accounting performance prior to the offering affects its survival (for instance, Jain and Kini, 1994; Jain and Kini, 1999b, and Bhabra and Pettway, 2002). Therefore, we have included in our model financial figures hand-collected from the IPO prospectuses. Those figures are net sales over assets, operating income over assets, operating cash flow over liabilities, and receivables over total assets. When an internet firm uses its total assets measured by its net sales over assets more efficient, we expect that its rate of survival will be greater.

Furthermore, more profitable firms are assumed to stay longer in business. Hence, we hypothesize surviving firms have a greater profitability measured by its income over assets. Finally, we expect a positive relationship between an internet firm's survival and its short term liquidity measured by operating cash flow over liabilities and receivables over total assets, respectively. As reported earlier, we have accounted for correlated financial ratios (see Appendix).

H10: There is a negative relation between a firm's hazard rate and its net sales over assets, its operating income over assets, operating cash flow over liabilities and receivables over total assets, respectively.

Because it is widely acknowledged that firm performance and survivability differ across industries (for instance, Ritter, 1991; Hensler *et al*, 1997 and Knauff *et al*, 2003), we control for industry-specific survivability by including dummies for the different sub-sectors of the internet industry, which are described in detail in section 2.2.

4. Methodology

This section describes the methods used to analyze our data. We begin by illustrating the characteristics of our dependent variable. Thereafter, we conduct both nonparametric and semiparametric estimates of the hazard function. These estimates enable plotting of the hazard curve and investigation of the effects of our explanatory variables, respectively.

4.1 Characteristics of the Dependent Variable

The dependent variable in this study is the survival time or *duration* of internet firms on the NASDAQ stock exchange. The duration of acquired firms and non-survivors is measured as the number of months from the IPO through the date of subsequent acquisition or delisting, respectively, dependent on which comes first. The duration of survivors is measured by the number of months from the IPO through the end of the measurement period, April 22, 2003, as their duration has not been completed up to that point.

Duration is completed once an event has occurred that marks a definite end for the duration, *i.e.* a delisting or acquisition. As these events are still to occur for surviving firms, the completed durations for these firms cannot be measured, and instead, only uncompleted durations are observed. These uncompleted durations are called right-censored observations[2]. Models can be estimated with or without censored data, although models including censored data are considered more efficient. Figure 4 graphically illustrates some examples of durations.

We use the Kaplan-Meier methodology (without explanatory variables) for nonparametric estimation of the hazard function. The semiparametric Cox proportional hazard model is used to incorporate explanatory variables. For an extensive theoretical discussion of hazard models, we refer to Kalbfleisch and Prentice (1980), Kiefer (1988) and Lancaster (1990). We refer to delistings and acquisitions as *events* for the remainder of this section.

<Insert Figure 4 about here>

[2] Left-censoring occurs when durations have started before the beginning of the measurement period, which is not applicable to our sample data.

4.2 Nonparametric Estimation of the Hazard Function

As a preliminary analysis, we estimate the shape of the hazard function by the nonparametric Kaplan-Meier (product limit) estimator; see Kaplan and Meier (1958). Let T be a random variable measuring the duration of an offering at the NASDAQ stock exchange, with duration distribution function[3] $F(t) = Pr\,(T < t)$ and density function $f(t) = \mathrm{d}F(t)/\mathrm{d}t$. When the distribution function of T is specified alternatively, we obtain the survival function $S(t) = 1 - F(t) = Pr\,(T \geq t)$, being the probability that random variable T will equal or exceed the value t. Now, our duration data can be characterized in terms of the hazard function, i.e. the probability that an event occurs during an infinitesimal small time interval $\mathrm{d}t$, given that it has survived up to t:

$$\lambda(t) = \frac{f(t)}{S(t)} \approx \frac{Pr(t \leq T < t + \mathrm{d}t \mid T \geq t)}{\mathrm{d}t}. \qquad (1)$$

Let $t_1, t_2, t_3, ..., t_n$ denote either the completed or censored durations of the n firms in our sample. Suppose we order the completed durations from smallest to largest, $t_{(1)} < t_{(2)} < \ ... < t_{(K)}$, and let h_j be the number of events after $t_{(j)}$ months, while m_j is the number of firms censored between months $t_{(j)}$ and $t_{(j+1)}$. If $n_j = \sum_{i \geq t(j)}^{t(K)} (m_i + h_i),$ the nonparametric Kaplan-Meier estimator for the firms' hazard rate per month is given by

$$\hat{\lambda}(t) = \frac{h_j}{\tau_j n_j}, \qquad (2)$$

for $t_{(j)} \leq t < t_{(j+1)}$, where $\tau_j = t_{(j+1)} - t_{(j)}$. Equation (2) provides an unconditional estimate of the firms' hazard rate at time $t_{(j)}$. Figure 5 presents a smoothed plot of this estimation for non-survivors and acquired firms. With respect to non-survivors, the figure illustrates an increasing hazard rate from the

[3] Note that this definition is slightly different from the ordinary statistical terminology, *i.e.* cumulative distribution function $G(t) = Pr\,(T \leq t)$.

offering through around the third year of listing, after which the hazard rate decreases. The peak hazard rate is around two percent per month or around 25 percent annualized. Regarding acquired firms, the figure shows a similar shape. However, the hazard rate peaks earlier compared to the non-survivors, at a rate of little more than one percent per month or around 15 percent annualized.

<Insert Figure 5 about here>

4.3 Semiparametric Estimation of the Hazard Function

As we do not have strong a priori reasons for imposing a particular functional form on the dependence of a firm's hazard rate on its age, we model this particular relationship nonparametrically. In contrast, the effects of the explanatory variables on the hazard rate are modeled parametrically. The semiparametric Cox proportional hazard model can be written as:

$$\lambda_i(t) = \lambda_0(t)\exp(\beta' x_i), \qquad (3)$$

where x_i denotes a vector of explanatory variables for the i-th firm with unknown coefficients β, and $\lambda_0(t)$ is the baseline hazard function. Cox (1972) has shown that β can be estimated by maximum likelihood. Although the method is semiparametric in nature, it is still able to deliver accurate estimates, *i.e.* the loss of efficiency is small in comparison to a fully parametric hazard model (see, for instance, Efron, 1977). When accounting for censoring, it can be shown that the log-likelihood function is given by (for instance, see Kalbfleisch and Prentice, 1980)

$$\log L(\beta) = \sum_{i=1}^{n} \delta_i \left\{ \beta' \ x_i - \log \sum_{l \in R(t_{(j)})} \exp \ (\beta' x_l) \right\}, \qquad (4)$$

where δ_i is the censoring indicator, which has a value of 0 for censored durations and 1 for completed durations, and $R_{(j)}$ is the set of all firms that have remained listed and are uncensored just prior to $t_{(j)}$. To account for ties[4], we have used the Breslow (1974) approximation. Maximum likelihood estimates of β can be obtained through numerical methods.

The significance of the explanatory variables in the model can be measured by the likelihood ratio statistic, given by $-2\ (\log(L_0) - \log(L_n))$, where $\log(L_0)$ denotes the maximum log-likelihood value under the restriction $\beta = 0$, and $\log(L_n)$ denotes the maximum log-likelihood of the unrestricted estimated model. The likelihood ratio statistic is asymptotically $\chi^2(k)$ distributed, where k denotes the dimension of β.

This semiparametric estimation of the hazard function does not allow us to differentiate between survivors, acquired firms and non-survivors in a single regression. Therefore, in order to be complete in our analysis, the next section discusses two regressions: survivors *versus* non-survivors and survivors *versus* acquired firms.

5. Empirical Results

Table 5 presents the results for the two Cox regression models of the duration of internet IPO non-survival and acquisition, respectively. As can be seen in the table, the Likelihood Ratio statistic is significant at the 1 percent level for the survivors *versus* non-survivors model. The regression for survivors *versus* acquired firms is significant at the 5 percent level. The columns labeled *Hazard Ratio*

[4] A tie is the occurrence of more than one event, in this case a delisting or acquisition, within a single time interval *t*.

in table 5 provide the impact on the hazard rate, given a unit change of the explanatory variable[5]. Since several financial ratios under investigation are highly correlated (see Appendix), we do not include net income over assets, operating cash flow over assets, liabilities over assets and net working capital over assets in our regressions. Regressions containing these variables generate qualitatively similar results. In sections 5.1 and 5.2 we will discuss the regressions of both the survivors *versus* non-survivors, and survivors *versus* acquired firms models. In section 5.3 we will report a number of additional analyses.

5.1 Survivors versus Non-survivors

The regression estimate of survivors *versus* non-survivors shows that non-survivors have more firm-specific risk, more valuation uncertainty, and a higher market level when they went public. Further, non-survivors are related to lower prestigious underwriters, lower investor demand, less insider ownership retention, lower offer-to-book ratio and ditto operating cash flow over liabilities, all at a statistically significant level. All significant independent variables have the predicted sign. Additionally, three sub-sectors of the internet industry, E-commerce products, network related IT-infrastructure and internet software on server, have a significant effect on the probability of survival.

Furthermore, table 5 illustrates that several hypothesized relations are not significant in the model for survivors *versus* non-survivors. Supportive for both the study by Shumway and Warther (1999) and hypothesis H3.1 our regressions show there is no significant size effect for internet firms. Although directionally consistent with our prediction, we do not find a significant relationship between firm age and survivability. Opposite to the hypothesis H7 the empirical results show that firm survival is a decreasing, not significant function of the operating history of a firm's internet activities. An explanation for the latter two findings could be that the hypothesized advantage of a mature firm is offset by the first mover advantage of a younger IPO, as described by Schultz and Zaman (2001).

[5] For instance, when looking at the regression for survivors *versus* non-survivors, an increase of Firm Risk with one risk factor effects the hazard rate with a factor 1.033 (or a 3.3 percent *increase*). Similarly, a one unit increase of Investor Demand affects the hazard rate with a factor 0.238 (equal to a *decrease* of 76.2 percent).

Only one of the four financial ratios (operating cash flow over liabilities) is significant and in line with our hypothesis H10. The outcome supports that the internet firms' financial statements prior to the IPO has a limited relation with firm survival. This is consistent with the findings of Trueman *et al* (2000) that accounting information has been of limited use to investors in valuing internet firms.

To illustrate the estimated proportional hazard model, figure 6 shows two estimated survivor functions for different values of the explanatory variables. The value of the survivor function can be obtained by the equation

$$S(t \mid x) = S_0(t)^{\exp(\beta' x)}, \tag{5}$$

where $S_0(t)$ denotes the baseline survivor function and x denotes a vector containing the explanatory variables. The curve with triangles in figure 6 is obtained by setting x equal to the means of these variables for all non-survivor firms issued before the year 2000, while the dotted curve is obtained by setting x equal to the means of the explanatory variables for all non-survivor firms issued in the year 2000. Figure 6 clearly shows that, on average, the non-surviving firms gone public in 2000 have a smaller rate of survival than non-surviving firms issued before 2000. This difference is mainly due to a substantial decrease in the level of investor demand and a significant increase in the market level (numbers not reported). Intuitively, these two independent variables measure characteristics related to investor behavior. Apparently, the market conditions before the year 2000 were different from the conditions during 2000, which in our model lead to a considerable lower surviving rate. Note that the decreasing survival rate through time shown in figure 6 partially explains the phenomenon shown in figure 3, *viz*. the non-survival rate observed in the year 2000 is not smaller than the non-survival rate observed before the year 2000.

<Insert Table 5 and Figure 6 about here>

5.2 *Survivors versus Acquired Firms*

As reported earlier, we have found a relatively high correlation between firm size and investor demand. Because after the IPO the effect of investor demand for acquired firms is of less importance than firm size, we have only included firm size in our regression of survivors *versus* acquired firms. The significant and inverse relation between firm size and a firm's hazard rate is consistent with the greater likelihood of small internet firms of being acquired. Furthermore, the regression estimate of survivors *versus* acquired firms illustrates that insider ownership retention is less for acquired firms. With respect to insider ownership retention, there may be an additional explanation for acquired firms, apart from the signaling hypothesis aforementioned. It is consistent with one of the possible motives for going public, namely the subsequent sale of the firm (Zingales, 1995; Field, 1998 and, Jain and Kini, 1999b).

Opposite to our hypothesis H7, there is a significant and positive relation between the likelihood that a firm is acquired and the operating history of its internet activities. This finding seems to indicate that firms with a long operating history possess a greater level of experience that is more valuable to the acquirer. Furthermore, supporting hypothesis H9, the likelihood that a firm will be acquired is inversely related to its offer-to-book ratio. The latter is consistent with lower quality firms, and therefore, cheaper firms, are acquired. In addition, two sub-sectors of the internet industry, service related E-commerce and server-based internet software, significantly and positively affect the probability of survival.

The regression results for survivors *versus* acquired firms show the majority of the regression coefficients is not significant. Although table 4 illustrates that several independent variables differ significantly between surviving and acquired firms, these differences have limited explanatory power in the survivors *versus* non-survivors model.

5.3 Robustness

After controlling for outliers the mean differences from table 4 are qualitatively similar. Furthermore, in order to check the robustness of both our models we have run the regressions presented in table 5 using the significant explanatory variables only. Again, the results of both regressions were qualitatively similar to the results of table 5.

Since the hazard rate is modeled, the usual diagnostic procedures with respect to the residuals cannot be applied to identify outliers in the proportional hazard model. However, there is a way to determine if any of the observations has a disproportionate influence on the estimated parameters. By comparing the estimate based on the full sample, say $\hat{\beta}$, to the estimated parameter that is obtained by deleting the *i*-th observation, say $\hat{\beta}^{(i)}$, we are able to examine the influence of the *i*-th observation on the estimate. The difference $\hat{\beta} - \hat{\beta}^{(i)}$ is known as 'dfbeta' in the literature. Note that 'dfbeta' is a vector having the same dimension as the number of explanatory variables in the model. To get an idea of influential observations, a one-dimensional influence index was constructed by summing the absolute value of the standardized 'dfbetas'. Both proportional hazard models were re-estimated by leaving out observations that could be classified as influential, *i.e.* observations with high values on the one-dimensional influence index (12 observations of the survivors *versus* non-survivors model and 13 observations of the survivors *versus* acquired firms model). For the non-survivor *versus* survivors regression, the same variables remain significant. However, for the acquired *versus* survivors regression, one additional variable (receivables over total assets) became significant at the 5% level. Further investigation showed that the insignificance on the full sample was the result of only 3 observations (1 acquired firm and 2 survivors). Hence, it appears that receivables over total assets are at least partially useful in explaining the likelihood of being acquired.

In addition to the analyses above, we have run a number of Cox regressions using alternative explanatory variables (not reported). With respect to underwriter reputation, we varied the reputation indicators to be included in our dummy variable. Also, we have run regressions using a number of alternative variables for firm size, such as the log of total offer value and the log of the number of

employees. As an alternative for insider ownership retention, we have modeled management ownership retention. Finally, in addition to market level at the time of offering, we have controlled for the year and quarter of the year of the offering by including dummies. All those alternative model specifications provided qualitatively similar results.

6. Conclusions

This study analyses the determinants of survival and acquisition of internet firms that have gone public at the NASDAQ stock exchange from December 1996 through February 2001. We examine both financial and non-financial information that is available to investors from the IPO prospectuses.

We investigate two models, survivors *versus* non-survivors and survivors *versus* acquired firms using Cox proportional hazard method. Both models include simultaneously a number of new and earlier examined, explanatory variables that are often studied separately and for non-internet firms in other studies. By taking the correlations between the variables into account, our analysis is safeguarded against spurious relationships. The results show that two explanatory variables, insider ownership retention and the offer-to-book ratio, are significant in both models. Consistent with the hypothesis both non-surviving and acquired internet firms have an inverse relationship between their hazard rate and offer-to-book ratio. Furthermore, compared to both acquired firms and non-survivors, survivors' owners retain a larger share in the firm at IPO. Retainend ownership serves as a certification that managerial decisions will coincide with outside shareholders' interests.

One would expect firms with a short period of listing to have a higher survival rate and, hence, a lower rate of being acquired or non-surviving. However, figure 3 shows a somewhat inverse relation between the period of listing and non-surviving. In addition, figure 6 provides further evidence that during the last phase of the period examined the internet industry was turning into a hot market with weaker firms going public due to reduced scrutiny of investors. Also, consistent with Schultz and Zaman (2001) it appears that early issuing firms have a first mover advantage in a highly competitive market.

Our findings document that non-surviving internet firms can be detected in many ways. In addition to insider ownership retention, survivors differ significantly from non-survivors with respect to a number of offering and firm characteristics as well as financial ratios. The empirical results provide evidence that surviving firms are associated with lower risk, higher underwriter reputation, higher investor demand, lower valuation uncertainty, higher insider ownership retention, a lower NASDAQ market level, and a higher offer-to-book ratio. The findings are consistent with the number of risk factors reported in the prospectuses indicating the firms´ economic fundamentals rather than being a way of reducing legal liability. Furthermore, the latter is supportive for high reputation lead managers being successful in selecting high quality internet firms.

Regarding the survivors *versus* acquired firms model it appears that, opposite to our prediction, acquired firms have a smaller firm size and a longer operating history in the internet industry. An explanation for the former finding could be that smaller firms can be easier acquired, whereas the latter outcome is consistent with firms of having more experience in the internet industry. Their relatively lower offer-to-book ratio (table 4) is an indication of acquired firms being cheaper and, therefore, are more apt to be acquired. Since we account for delisting due to acquisition, on the one hand, and non-survival for negative reasons, on the other, we do not find a significant relation between a firm's size and its non-survival. The latter outcome is supportive for Shumway and Warther (1999). Furthermore, the other explanatory variables in the survivors *versus* acquired firms model are not significant. As can be seen in table 5, the number of significant variables is less in the survivors *versus* acquired firms than in the survivors *versus* non-survivors model. The latter is consistent with information asymmetry of acquired firms being smaller.

We have two concluding remarks regarding variables that are not significant in our models. First, the absence of a significant relationship between the age of the IPO firm and its survival rate may be attributed to the fact that non-internet related activities prior to becoming an internet firm are less relevant. Second, the financial ratios regarding the internet firms' performance prior to IPO only have a limited effect on firm survival and acquisition. An explanation is that internet firms have been far from steady state at the time of offering. Another explanation could be that the internet IPO market was 'hot'. Irrespective of a firm's economic fundamentals investors were willing to buy the shares

from the offering. As a consequence, accounting variables played a minor role regarding a firm's future performance.

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Appendix

Pearson correlation matrix of the explanatory variables.

	Firm risk	*Underwriter reputation*	*Firm size*	*Investor demand*	*Valuation Uncertainty*	*Ownership retention*	*Age firm*	*Age internet activities*	*IPO market level*	*Net sales over assets*	*Operating income over assets*	*Net income over assets*	*Operating cash flow over assets*	*Operating cash flow over liabilities*	*Total liabilites over total assets*	*Net working capital over assets*	*Receivables over assets*	*Logged offer-to-book ratio*	*Internet service providers*	*Content / portals*	*E-commerce - products*	*E-commerce - services*	*IT-infrastructure - networks*	*IT-infrastructure - equipment*	*Internet software - licenced*	*Internet software - on server*	*Porfessional internet services*	*Internet advertising services*
Firm risk																												
Underwriter reputation	0.17																											
Firm size	0.20	0.27																										
Investor demand	0.05	0.10	0.44																									
Valuation Uncertainty	0.07	-0.04	-0.17	0.06																								
Ownership retention	0.16	0.41	0.27	0.15	-0.07																							
Age firm	-0.19	-0.04	-0.05	-0.08	-0.06	-0.10																						
Age internet activities	-0.05	-0.03	-0.04	-0.08	-0.09	-0.06	0.22																					
IPO market level	0.20	0.08	0.26	0.13	0.01	0.12	0.12	0.08																				
Net sales over assets	-0.12	-0.16	-0.14	-0.07	-0.02	-0.13	0.26	0.09	-0.10																			
Operating income over assets	-0.07	0.02	0.02	0.05	-0.14	0.16	0.10	0.15	0.05	-0.22																		
Net income over assets	-0.07	0.02	0.02	0.05	-0.15	0.17	0.10	0.14	0.05	-0.23	**1.00**																	
Operating cash flow over assets	-0.05	0.04	0.01	0.03	-0.12	0.13	0.10	0.14	0.04	-0.04	**0.94**	**0.93**																
Operating cash flow over liabilities	-0.17	-0.06	0.06	0.00	-0.10	-0.07	0.25	0.19	0.03	0.27	0.17	0.16	0.26															
Total liabilites over total assets	-0.03	-0.14	-0.08	-0.10	0.05	-0.28	0.04	-0.02	-0.06	**0.61**	**-0.67**	**-0.69**	-0.49	0.22														
Net working capital over assets	0.02	0.11	0.04	0.09	-0.08	0.24	-0.05	0.03	0.06	**-0.60**	**0.68**	**0.70**	**0.50**	-0.20	**-0.96**													
Receivables over assets	-0.11	-0.04	-0.05	0.08	0.00	-0.04	0.22	0.07	0.03	0.23	0.01	0.01	0.00	0.13	0.10	-0.09												
Logged offer-to-book ratio	0.08	0.11	0.10	0.14	0.00	0.20	-0.10	-0.06	0.05	-0.21	0.24	0.26	0.20	-0.19	-0.48	0.42	-0.10											
Internet service providers	-0.02	-0.06	0.26	-0.03	-0.09	-0.09	-0.03	0.20	-0.08	-0.05	0.02	0.02	0.01	0.11	0.05	-0.06	-0.12	-0.12										
Content / portals	0.17	0.07	-0.08	-0.06	0.13	-0.05	-0.09	0.03	-0.09	-0.12	-0.14	-0.15	-0.16	-0.25	-0.03	0.01	-0.11	-0.05	-0.10									
E-commerce - products	0.13	-0.11	0.04	0.01	0.08	-0.02	-0.08	-0.11	-0.07	0.13	-0.02	-0.02	-0.02	-0.10	-0.01	0.01	-0.02	0.05	-0.13	-0.13								
E-commerce - services	0.03	-0.08	-0.08	-0.09	-0.02	-0.15	0.01	0.05	0.00	0.08	-0.02	-0.02	0.03	0.10	0.13	-0.10	-0.03	-0.15	-0.12	-0.11	-0.15							
IT-infrastructure - networks	-0.04	0.03	0.16	-0.02	-0.04	0.02	-0.10	-0.11	0.01	-0.10	0.06	0.06	0.06	-0.04	-0.07	0.04	-0.11	0.05	-0.07	-0.07	-0.09	-0.08						
IT-infrastructure - equipment	-0.03	0.09	0.11	0.11	-0.20	0.15	0.01	-0.13	-0.05	0.00	0.03	0.04	0.02	-0.04	-0.05	0.07	0.02	0.09	-0.08	-0.08	-0.11	-0.10	-0.06					
Internet software - licenced	-0.11	0.06	-0.12	0.09	0.08	0.10	0.16	-0.04	0.09	-0.03	0.01	0.01	-0.02	0.03	-0.01	0.03	0.18	0.03	-0.18	-0.17	-0.23	-0.21	-0.12	-0.15				
Internet software - on server	0.03	0.00	-0.11	-0.02	0.02	0.00	-0.05	-0.01	0.07	-0.03	-0.02	-0.02	-0.02	-0.03	-0.01	0.01	-0.06	0.07	-0.09	-0.09	-0.12	-0.11	-0.07	-0.08	-0.17			
Porfessional internet services	-0.18	0.05	-0.02	-0.03	-0.08	0.09	0.13	0.18	0.12	0.03	0.10	0.10	0.11	0.16	-0.05	0.04	0.09	0.07	-0.08	-0.08	-0.10	-0.09	-0.05	-0.07	-0.14	-0.07		
Internet advertising services	-0.01	-0.02	-0.06	0.00	0.03	-0.05	-0.01	-0.04	0.00	0.05	0.03	0.03	0.05	0.09	0.01	-0.01	0.07	-0.01	-0.08	-0.08	-0.11	-0.10	-0.06	-0.07	-0.15	-0.08	-0.07	

Figure 1 Distribution over time of internet IPOs by month.

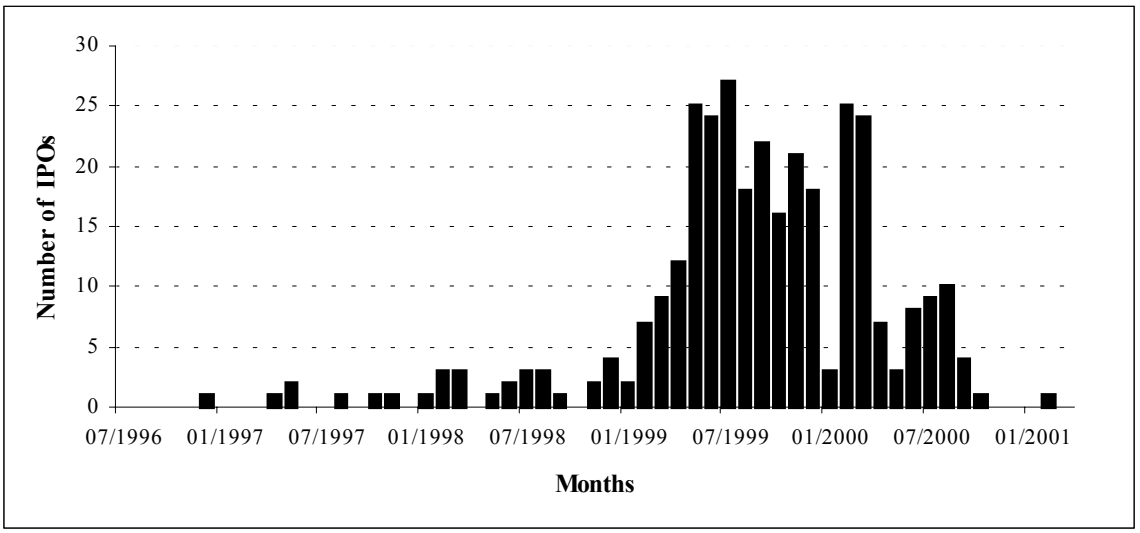


Figure 2 Distribution over time of delisted and acquired internet firms by quarter.

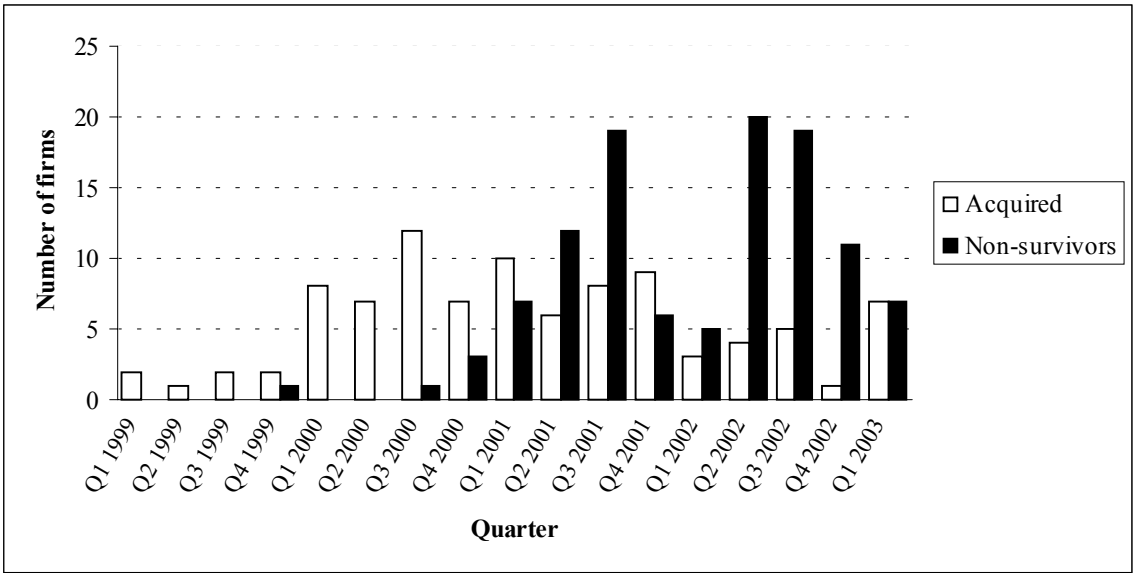


Figure 3 Distribution of aftermarket IPO status by year of issuance

In order to include all firms in this figure, one IPO from December 1996 is added to the column for 1997 and one IPO from February 2001 is included in the column for 2000. The number of firms per segment is given in the columns.

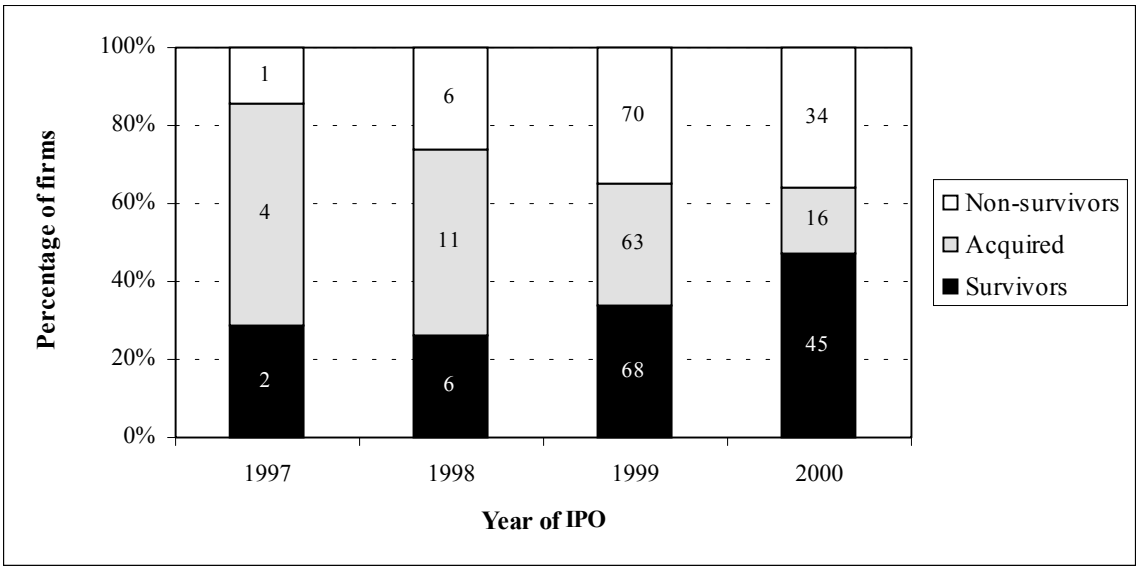
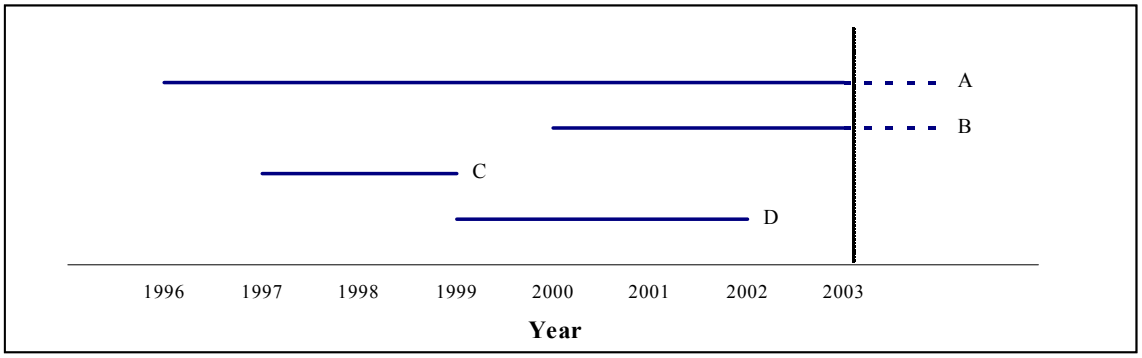


Figure 4 Examples of Durations.



The durations A, B, C and D in the figure can be described as follows:

A) Censored observation, a firm that issued in 1996 and still trades at the 22nd of April 2003
B) Censored observation, a firm that issued in 2000 and still trades at the 22nd of April 2003
C) Uncensored observation, a firm that issued in 1997 and has been acquired or delisted in 1999
D) Uncensored observation, a firm that issued in 1999 and has been acquired or delisted in 2002

Figure 5 Smoothed hazard function using Kaplan-Meier estimate.

The estimated nonparametric hazard curve (the thin line) is highly volatile due to the limited number of completed durations in our sample. Therefore, the curve has been smoothed using a polynomial regression (the thick line).

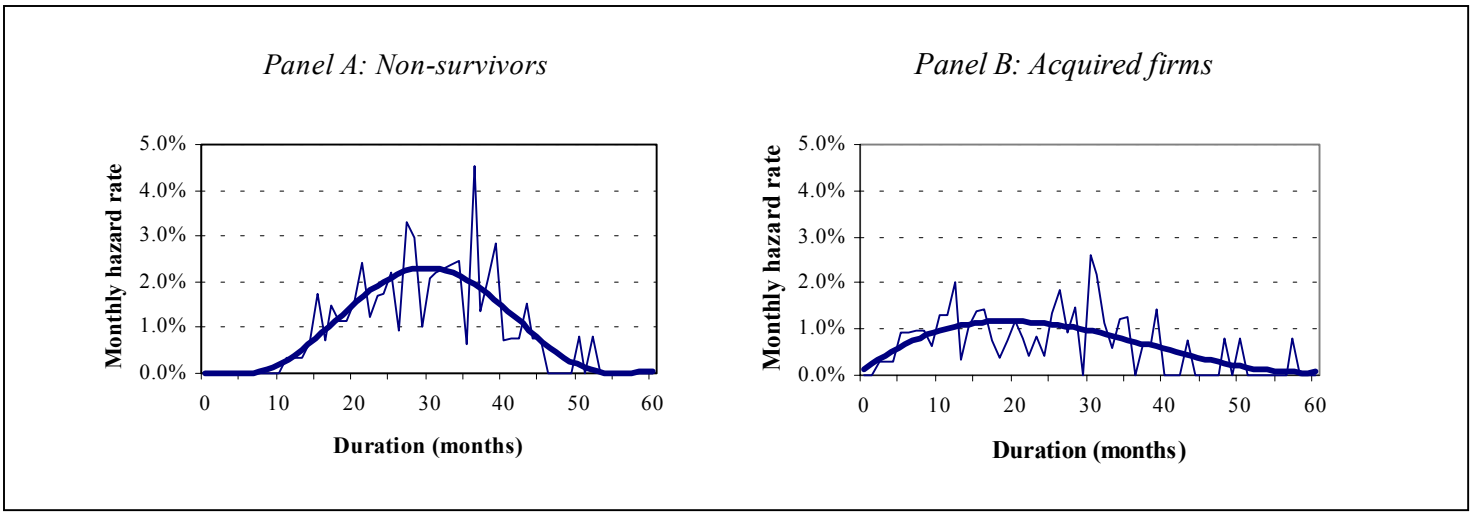


Figure 6 Estimated survivor functions.

The triangle curve is obtained by setting the values of the explanatory variables (*i.e. x*) equal to the means of these variables for all non-survivor firms issued before the year 2000, while the dotted curve is obtained by setting *x* equal to the means of the explanatory variables for all non-survivor firms issued in the year 2000.

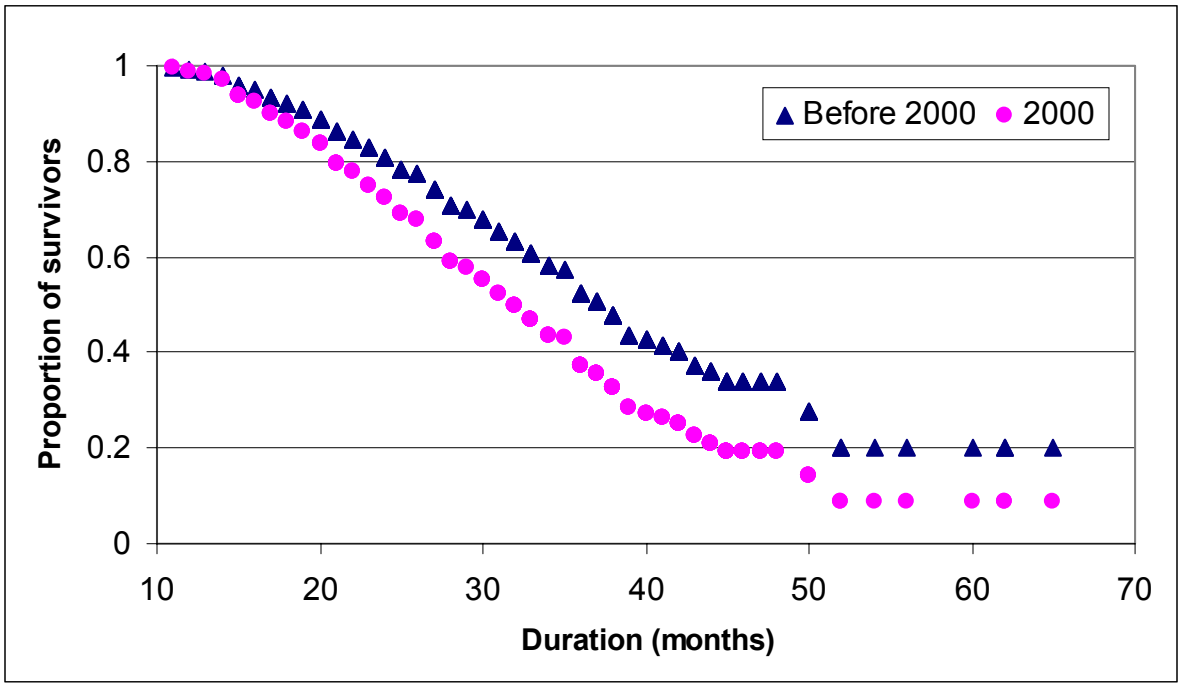


Table 1 Aftermarket status of internet firms segmented by sub-sector.

Industry	*Number (percentage) of IPO aftermarket states split by sub-sector*			*Percentage of total number of firms by sub-sector*
	Survivors	*Acquired*	*Non-survivors*	*N*
ISPs	4 (13.8%)	8 (27.6%)	17 (58.6%)	29 8.9%
Content / portals	7 (25.0%)	8 (28.6%)	13 (46.4%)	28 8.6%
E-commerce - products	12 (25.5%)	13 (27.7%)	22 (46.8%)	47 14.4%
E-commerce - services	19 (48.7%)	13 (33.3%)	7 (18.0%)	39 12.0%
IT-infrastructure - network	3 (20.0%)	3 (20.0%)	9 (60.0%)	15 4.6%
IT-infrastructure - equipment	13 (59.1%)	6 (27.3%)	3 (13.6%)	22 6.8%
Internet software - licensed	36 (46.2%)	20 (25.6%)	22 (28.2%)	78 23.9%
Internet software - server	15 (55.6%)	5 (18.5%)	7 (25.9%)	27 8.3%
Professional internet services	4 (21.1%)	8 (42.1%)	7 (36.8%)	19 5.8%
Internet advertising services	8 (36.4%)	10 (45.5%)	4 (18.2%)	22 6.8%
Total	121 (37.1%)	94 (28.8%)	111 (34.1%)	326 100.0%

Table 2 Description of explanatory variables.

Description	*Measure*
Offering and Firm Characteristics	
Firm risk	Number of risk factors listed in prospectus
Underwriter reputation	Binary: 1 if underwriter reputation scale 8 or 9; 0 otherwise
Firm size	Log of gross dollar offering proceeds at the offering price
Investor demand	(Offer price - average value price range) / average value price range
Valuation uncertainty	(Price range spread / average value of price range) x 100
Insider ownership retention	Percentage of firm ownership retained by insiders after the offering
Age of IPO firm	Number of months from firm foundation to its IPO
Age of internet activities	Number of months from start of internet activities to its IPO
IPO market level	Average NASDAQ Composite Index in offering month
Log of offer-to-book ratio	Log of (Firm value at offer price / book value of equity)
Financial Ratios	
Net sales over assets	Net sales / total assets
Operating income over assets	Operating income / total assets
Operating cash flow over liabilities	Operating cash flow / total liabilities
Receivables over total assets	Accounts receivable / total assets
Sub-sectors of Internet Industry	
Internet service providers	Binary: 1 if element of sub-sector; 0 otherwise
Content / portals	Binary: 1 if element of sub-sector; 0 otherwise
E-commerce - products	Binary: 1 if element of sub-sector; 0 otherwise
E-commerce - services	Binary: 1 if element of sub-sector; 0 otherwise
IT-infrastructure - networks	Binary: 1 if element of sub-sector; 0 otherwise
IT-infrastructure - equipment	Binary: 1 if element of sub-sector; 0 otherwise
Internet software - licensed	Binary: 1 if element of sub-sector; 0 otherwise
Internet software - on server	Binary: 1 if element of sub-sector; 0 otherwise
Professional internet services	Binary: 1 if element of sub-sector; 0 otherwise
Internet advertising services	Binary: 1 if element of sub-sector; 0 otherwise

Table 3 Summary statistics of explanatory variables.

Independent variable N = 326	*Mean*	*Std. Dev.*	*Median*	*Minimum*	*Maximum*
Offering and Firm Characteristics					
Firm risk	31.448	6.446	31.000	11.000	50.000
Underwriter reputation [1])	0.890				
Firm size	18.032	0.584	17.974	16.524	21.372
Investor demand	0.257	0.374	0.231	-0.494	2.000
Valuation uncertainty	17.282	3.364	17.267	0.000	35.290
Insider ownership retention	0.806	0.072	0.816	0.512	0.946
Age of IPO firm	53.226	48.616	37.500	5.100	354.700
Age of internet activities	29.290	15.090	28.300	0.300	115.100
IPO market level (in thousands)	3.115	0.869	2.808	1.225	4.803
Log of offer-to-book ratio	2.029	3.851	3.427	-9.016	11.990
Financial Ratios					
Net sales over assets	0.948	1.506	0.529	0.000	16.078
Operating income over assets	-0.870	1.621	-0.601	-23.992	0.718
Operating cash flow over liabilities	-1.185	1.455	-0.774	-11.497	1.135
Receivables over total assets	0.183	0.176	0.118	0.000	0.863

[1]) Because Underwriter reputation is a binary variable we present the value of its mean only.

Table 4 Mean differences of explanatory variables.

Independent variables	*Survivors (121 firms)*	*Acquired (94 firms)*	*Non-surv. (111 firms)*	*Surv. vs. Non-surv.*	*Surv. vs. Acquired*	*Acquired vs. Non-surv.*
	Mean	*Mean*	*Mean*	*T-test of difference*	*T-test of difference*	*T-test of difference*
Offering and Firm Characteristics						
Firm risk	31.835	30.255	32.036	(0.236)	(1.806)*	(1.983)**
Underwriter reputation	0.967	0.872	0.820	(3.667)***	(2.473)**	(1.042)
Firm size	18.133	17.894	18.038	(1.148)	(3.576)***	(1.755)*
Investor demand	0.366	0.215	0.173	(3.898)***	(2.884)***	(0.886)
Valuation uncertainty	17.035	16.978	17.802	(1.654)*	(0.138)	(1.753)*
Insider ownership retention	0.826	0.793	0.794	(3.360)***	(3.320)***	(0.118)
Age of IPO firm	55.274	55.801	48.814	(0.977)	(0.076)	(1.213)
Age of internet activities	27.484	30.767	30.007	(1.254)	(1.689)*	(0.343)
IPO market level (in thousands)	3.242	2.874	3.179	(0.553)	(3.098)***	(2.613)***
Log of offer-to-book ratio	2.631	1.541	1.787	(1.717)*	(2.079)**	(0.430)
Financial Ratios						
Net sales over assets	0.905	1.186	0.792	(0.613)	(1.215)	(1.924)*
Operating income over assets	0.787	0.832	0.993	(0.847)	(0.309)	(0.630)
Operating cash flow over liabilities	1.099	1.133	1.324	(1.238)	(0.173)	(0.865)
Receivables over total assets	0.191	0.205	0.154	(1.693)*	(0.578)	(2.055)**
Sub-sectors of Internet Industry						
Internet service providers	0.033	0.085	0.153	(3.159)***	(1.567)	(1.515)
Content / portals	0.058	0.085	0.117	(1.587)	(0.776)	(0.751)
E-commerce - products	0.099	0.138	0.198	(2.116)**	(0.869)	(1.147)
E-commerce - services	0.157	0.138	0.063	(2.320)**	(0.381)	(1.764)*
IT-infrastructure - networks	0.025	0.032	0.081	(1.899)*	(0.313)	(1.547)
IT-infrastructure - equipment	0.107	0.064	0.027	(2.496)**	(1.149)	(1.239)
Internet software - licensed	0.298	0.213	0.198	(1.760)*	(1.424)	(0.256)
Internet software - on server	0.124	0.053	0.063	(1.604)	(1.861)*	(0.299)
Professional internet services	0.033	0.085	0.063	(1.059)	(1.567)	(0.601)
Internet advertising services	0.066	0.106	0.036	(1.044)	(1.027)	(1.923)*

The t-statistic in parentheses is calculated as the ratio of the coefficient estimate to its standard error; all t-tests are two-tailed.

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level .

Table 5 Regression results of Cox hazard model on the duration of IPOs.

Independent variables	*Survivors vs. Non-survivors*			*Survivors vs. Acquired firms*		
	Coefficient Estimate	*T-Statistic*	*Hazard Ratio*	*Coefficient Estimate*	*T-Statistic*	*Hazard Ratio*
Offering and Firm Characteristics						
Firm risk	0.033 **	(1.902)	1.033	0.014	(0.705)	1.015
Underwriter reputation	-0.695 **	(1.963)	0.499	-0.373	(0.892)	0.689
Firm size	0.103	(0.578)	1.109	-0.517 **	(1.878)	0.597
Investor demand	-1.436 ***	(4.430)	0.238			
Valuation uncertainty	0.054 **	(1.849)	1.055	-0.023	(0.607)	0.977
Insider ownership retention	-3.336 **	(1.995)	0.036	-3.221 **	(1.950)	0.040
Age of IPO firm	-0.001	(0.392)	0.999	-0.001	(0.235)	0.999
Age of internet activities	0.007	(0.872)	1.007	0.013 *	(1.493)	1.013
IPO market level (in thousands)	0.256 **	(1.961)	1.292	-0.126	(0.853)	0.882
Log of offer-to-book ratio	-0.049 **	(1.669)	0.952	-0.049 *	(1.488)	0.953
Financial Ratios						
Net sales over assets	-0.030	(0.315)	0.970	-0.035	(0.359)	0.966
Operating income over assets	0.002	(0.032)	1.002	-0.024	(0.161)	0.976
Operating cash flow over liabilities	-0.154 **	(1.713)	0.857	-0.040	(0.466)	0.961
Receivables over total assets	-0.552	(0.617)	0.576	0.493	(0.655)	1.638
Sub-sectors of Internet Industry						
Internet service providers	0.737	(0.315)	2.089	0.480	(0.915)	1.616
Content / portals	0.151	(0.032)	1.163	-0.063	(0.126)	0.938
E-commerce - products	0.599 *	(1.713)	1.821	-0.019	(0.045)	0.982
E-commerce - services	-0.985	(0.617)	0.374	-0.852 *	(1.818)	0.426
IT-infrastructure - networks	1.184 *	(1.669)	3.267	0.162	(0.190)	1.176
IT-infrastructure - equipment	-0.016	(0.315)	0.984	-0.312	(0.570)	0.732
Internet software - licensed	0.258	(0.032)	1.295	-0.564	(1.392)	0.569
Internet software - on server	-0.454 *	(1.713)	0.635	-1.063 *	(1.852)	0.345
Professional internet services	1.209	(0.617)	3.349	0.560	(1.018)	1.750
Likelihood Ratio Statistic		82.793 ***			39.489 **	
Number of Firms		232			215	

The t-statistic in parentheses is calculated as the ratio of the coefficient estimate to its standard error. Since hypotheses H1-H10 are one-sided, the significance of all t-tests related to these hypotheses are based on one-sided *p*-values. All other *p*-values are two-sided.

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level .