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Stairway to heaven or gateway to hell?

A competing risk analysis of delistings from Hong Kong's Growth Enterprise Market

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ABSTRACT

A competing risk hazard model is employed to examine the reasons for Hong Kong's Growth Enterprise (GEM) companies transferring to the Main Board (MB) in the period 2000-2012. In our sample during the period 21 companies or 15% of the original stock moved up to the MB. The modal life expectancy of a GEM company was about eight years. Companies that did not move up to the MB were at a small risk of delisting due to long term suspension or liquidation, but the great majority just remained where they were. Regarding the factors behind transfer to the MB, of the 129 companies listed on the GEM in the period, we find that companies with higher net profit and greater product market power were more likely to graduate in the following year. However, companies with lower growth, higher financial risk and those audited by more prestigious partnerships were more likely to delay transfer to the MB by another year and hence more likely to liquidate. We also find evidence that VC backing is economically important: it increases the hazard of promotion six-fold. Thus, a listing on the GEM in this period was, for a significant minority of companies a 'stairway to heaven' and for much smaller proportion a 'gateway to hell'.

GEL classifications: G24, G32, G38

Key words: IPO, new listing, survival, delisting, GEM.

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1. Introduction

A large body of literature suggests that small, young and particularly high tech firms wishing to grow are constrained by imperfections in debt markets (Cressy, 2011). As a result firms with fast growth potential tend to raise equity via venture capital in the first instance or go directly to the secondary markets set up for this purpose: in the US, the Nasdaq; in the UK, the AIM; in France, the CAC; in Hong Kong, the GEM; and so on. Expectation is that, after having reached a sufficient level of operations and a sufficiently low level of risk, these firms may graduate to one of the Main markets to gain access to a wider range of financial instruments at premium rates. A growing body of literature, however, shows that a significant proportion of IPOs fail to do this and either linger on in the secondary markets or end their lives in bankruptcy. The reasons for failure in Western markets, particularly the US and Canada, are now quite well documented: being too young, small, or financially risky, having insufficient growth, poor advisers, and facing too much competition, may all lead firms down the slippery slope to market delisting and liquidation. (See the literature summary in Appendix 1 to the paper). The alternative and possibly more important outcome, namely promotion from the secondary to the primary market, has, however, scarcely been studied[i], and the reasons behind such promotions are thus unknown. In theory, these two risks are in *competition* with one another: failure to transfer up ('heaven') may result ultimately in transfer down ('hell'). We believe therefore that it is crucially important to know the reasons behind success or failure of quoted secondary market firms because the large firms these promotions facilitate produce a high percentage of a country's output, profits and jobs[ii].

The present paper helps plug this gap in the literature by explaining some of the empirical drivers of transfers to the Main from the secondary markets. It focuses uniquely on data from Hong Kong's GEM (Growth Enterprise Market) and its Main Board, over the period 1999-2012. We study this market because of its geographical distinctiveness (Eastern rather than Western - the focus of all other studies of delistings), also because no study of delisting from this market has been done to

date and finally as a prelude to an analysis of the Mainland China markets of Shanghai and Shenzen. Bearing in mind the competing nature of the two identified risks we use, again uniquely in the literature, a competing hazards (CH) model, as our primary tool of analysis. This, like the well known Cox proportional hazards model, allows for the history of company performance and current characteristics to influence its current hazard rate but allows also for the fact that occurrence of one of the two outcomes may *pre-empt* the other[iii].

So, what are our main findings? We show that several of the factors explaining failure identified in the literature operate *in reverse* to explain the hazard of transfer from GEM to the Main board. Thus, higher profits, higher sales growth and lower financial risk, long run competitive advantage and a good macro environment all conspire to elevate firms to the Main board and to propel it away from bankruptcy and liquidation. VC backing enhances the hazard of promotion some six-fold in a given year but is mitigated by the firm capturing long run competitive advantage. These results we believe are both interesting and add significantly to the literature. The results we establish, moreover, accord with intuition and common sense and may serve as input to policy decisions on the Hong Kong Stock Exchange.

The rest of the paper is organised as follows. In section 2 we provide a literature review and in section 3 the hypotheses for subsequent testing. This is followed in section 4 by a description of the institutional context of the study. Section 5 introduces the data and provides some descriptive statistics. Section 6 explains the competing hazards model and is followed by section 7 which reports the empirical findings. A final section reviews the outcomes and concludes.

2. Literature review

In an early study, Hensler et al. (1997) found that survival rates on the NASDAQ in the period 1975-84 were increasing in the age and size of company at IPO but also in IPO initial (first day) returns and in the extent of insider ownership. The role of insider ownership in survival may be related to the incentives to management performance provided by a larger stake in the company[iv]. Jain and Kini (1999), studying US SDC data, found that survival (defined as non-delisting) varied with calendar time and was higher for those with more inside ownership, better pre-IPO operating performance and more prestigious investment bankers. In a subsequent paper, (Jain and Kini, 2000) they also showed that VC involvement in the IPO process increased the survival rates of IPOs. Interestingly, VC-backed IPOs also carried out significantly more investment in R&D and relied on more prestigious analysts and investment bankers by comparison with their non-VC backed counterparts. It is, they argue, the VC's ability to influence management with regard to the strategic resource allocation that enhances their investee companies post-IPO survival rates. In other words, VC strategic technological advice is important in company survival.

Fama and French (2001) in a study of US Nasdaq companies also found that the number of new listings varied over time, sharply increasing from 156 during the period 1973-1979 to 549 during the period 1980-2001. However, in a later paper, Fama and French (2004) examined the impact of newly listed firms' characteristics on their survival and disappearance in mergers, versus their delisting for poor performance. The two main characteristics they identified as affecting delistings were profitability and company growth rates. In a subsequent study, Fama and French (2004) concluded that the decline in cost of

equity encouraged small firms to go public and it is this that explains the higher failure rates observed.

Bhabra and Pettway (2003) found that, as compared with subsequent equity offerings or acquisitions by the firm, the quality of information provided in the IPO prospectus had a fundamental role in predicting the survival and failure of IPOs. However they also noted that the value of this information declines rapidly with time following IPO: more recent information is more valuable. Kooli and Meknassi (2007) investigated the impact of issuing characteristics and the information contained in the prospectus on the probability that an IPO firm survives in the long run. Using an Accelerated Failure Time (AFT) model on the survival profile of new issues on the US SDC in the period 1985-2005, they, like Jain and Kini(1999), concluded that the probability of survival increased with VC involvement and with the degree of underpricing. Moreover, they found that a larger size of IPO was associated with a lower delisting risk.

Finally, a positive impact of underwriter reputation on the probability of survival could be identified. Jain and Kini (2008) investigated the effect of the strategic investment choices at the time of the IPO on operating performance and the likelihood of failure for the newly public US companies. They found a positive relation between the changes in post-issue operating performance, the extent of diversification and industry-adjusted capital expenditure intensity. Interestingly, they also found that companies with high commitment to R&D and pre-issue diversified product lines were more likely to survive. This fact seems to adumbrate the impact of VCs strategic investment in R&D discussed above. Van der Goot et al., (2009) analysed the survival determinants of Internet companies doing IPOs on the US NASDAQ during the period 1996-2001. Using a Cox proportional hazard model, they found that the average number of risk factors mentioned in the IPO prospectus (e.g. credit

risk , competition risk and industry risk), for the internet IPOs was four times higher than non-internet IPOs. Moreover, the survival of Internet IPOs was smaller (2.4 years) compared with the non-Internet IPOs (10 years). In a related study, Bhattacharya et al. (2010) found accounting information could be used to predict the failure rate of Internet IPOs. Demers and Joos (2006) analysed the main determinants of IPO failure in US over the period 1980-2000 and estimated an out-of-sample IPOs failure forecasting model with data on both the characteristics of the intermediaries and accounting information. They found that forecasts were negatively associated with one-year post-IPO abnormal returns. There were also significant differences between non-tech and high-tech IPOs in the US with these differences driven by investments in intangible assets, operating performance and financial leverage. They concluded that IPO long-run returns anomalies may persist over significant periods of time.

Cumming and Johan (2010) model VC exit decisions in terms of the marginal benefits and costs of exit over time. They then use hazard rate analysis to examine the factors determining the time to exit for 557 Canadian and 1,607 US VC-backed firms over the period 1991-2004. They allow for three different types of exit for the VC: IPO, private (acquisitions, secondary sales and buybacks), and write-offs. Investment duration is measured by the number of days from the first VC investment to the VC exit (date of IPO, private exit or write-off). They find that expansion stage investments and large deals are exited more quickly than the rest and that corporate VC investments are of much shorter duration than private independent VCs. Higher previous stock market returns just before exit also enhance the chances of immediate profitable exit as marginal returns to exiting increase relative to marginal costs. They also identify country factors in the duration of VC investments, with Canadian VCs exiting through IPO significantly faster than US VCs. Finally,

and interestingly for our analysis to follow, the hazard of a writeoff is higher for smaller investments and lower when market conditions are good[v].

Johan(2010), in a paper with particular relevance to our study, examines various measures of IPO performance (short and long run returns, trading volume and time to IPO after announcement) for a sample of firms on the Toronto Stock Exchange's junior and senior markets. She finds that the high tech market (TSX-V) IPOs are significantly more underpriced than the senior markets (TSX) and that the senior market companies have shorter times to IPO from the IPO announcement, suggesting better preparation for IPO than their high tech counterparts. Unlike the observable company characteristics (size of company and share offering) and presence of VC backing (limited partnerships), the senior market dummy (TSX) has no explanatory power. Thus she concludes that rather than the formal listing requirements of the different markets, it is the company characteristics that explain first year stock performance. Listing standards, however, help to ensure companies are IPO-ready and thereby signal quality to public investors.

Cumming and Dai(2011) develop a model of VC backed firm valuation based on size of VC fund and limited attention of VC investors. Theory predicts that as fund size rises for a given number of VC personnel (limited attention) firm valuations will fall because less time is devoted to monitoring and harvesting individual investments. Firm valuations are therefore predicted to be a declining function of fund size. This is what the authors confirm in the data which consists of all US VC investments in the period 1991 to 2006 and comprising 9,266 rounds with post-money valuations. Using as measures of attention fund size divided by the number of partners in the fund they find that where more attention can be devoted to monitoring, advising and harvesting, investee company valuations are higher. Meanwhile, larger funds are associated with lower valuations for given attention. They also

use probit regressions on the data before 2003 to examine factors determining the probability of successful exit, defined as exit via IPO or acquisition before 2007. In this case, size and limited attention, contrary to expectation, have little explanatory power. What seems to count is their measure of VC prestige (VC IPO share) and investee firm maturity measured by stage of the investment, both of which significantly increase the chances of successful exit.

Espenlaub et al(2012) on a sample of 896 UK Alternative Investment Market (AIM) companies listed in the years 1995-2004 and followed until 2010, found that there was an important role for Nominated Investment Advisors (NOMADS) in the survival of these companies. They found that companies fostered by prestigious NOMADS survived on average 2 years longer than the rest. They also found that survival was enhanced by greater age and size of company at IPO, by company sales and by insider ownership. Issues made in 'hot' markets were also significantly *less* likely to survive. Interestingly, VC backing was found to have no significance in all but one of their three models, and in this model, the effect is to *reduce* the survival rate.

Carpentier and Suret(2011) investigated the survival of a large sample (2,373) of 'penny' (small and unprofitable) IPOs in Canada over the period 1986-2003. They found that the failure rate for these IPOs was smaller compared with comparable companies in the US and attributed this finding to lax delisting rules and the market's capacity to refinance non-profitable firms. They also found that the characteristics of the IPOs (e.g. the disclosure of revenues at the IPO date, size, profitability, auditor and investment banker reputation and VC backing) are the main determinants of the survival of new issuers. Results showed finally that there was no relation between the promotion to the senior/main market and the financial conditions obtaining at IPO for these penny stocks.

In summary, there is a substantial literature on the survival of IPOs, mainly based on US data. The main findings are summarised in tabular form in Appendix 1. These studies exclusively examine single risks. Only one such study (Carpentier and Suret, 2011) examines simultaneously promotion from the secondary to the primary market. To the best of our knowledge, no work has been done at all on the success and failure of firms on the Hong Kong GEM, the subject matter of the present study. We are thus entering new territory. However, as the literature review shows, many of the variables influencing survival may be relevant to the hazard of promotion which now allows that a firm may fail as an alternative to being promoted to the Main Board or remaining put.

3. Hypotheses: Competing hazards of delisting

The literature reviewed focuses on the determinants of failure (delisting for reasons of bankruptcy/liquidation). Our primary interest in this paper is in factors that determine whether the firm gets promoted from GEM to the Main Board. However, we believe these are two sides of the same coin. We therefore hypothesise, in view of the findings from the literature and the available data (see below), the following:

H1: Profit

The higher the net revenues generated by the company the lower the hazard of failure and the higher the chances of promotion. The level of company profits is central to promotion from the GEM as indicated in the rules for promotion promulgated by the HK Stock Exchange. We have several measures of profits including net cash flow (*cf*), profit before tax (*Pbt*), net profit (*Np*) and earnings per share (*Epsb*). We run regressions for only one of these, namely net profit.

H2: Financial risk

The lower a firm's leverage the lower its financial risk and cost of capital; hence the higher the chances of promotion to the MB where the cost of capital is lower, and the lower the chances of bankruptcy. In particular, firms raising equity finance on GEM tend to lower their debt ratio and hence are more likely to be promoted to the MB.

H3: VC presence

With respect to US biotech IPOs in the period of the internet boom, VCs (particularly experienced VCs) were associated either with greater caution or with delays to maximise capital gains in a rising market (Cressy and Remer, 2013). Thus, on this evidence, the presence of a VC will be associated with a retained equity share in the company (Cumming and Mackintosh, 2003), a greater early growth in equity value on the GEM and a *lower* chance of immediate promotion to the MB but a higher later chance of promotion. For firms that are already quoted on the stock market, VC backing may therefore accelerate their chances of promotion by providing early strategic advice and incentive schemes to enhance profitability and growth. We should expect this effect to diminish at the margin over time as VCs have a limited horizon in which to liquidate their investments.[vi] [vii]

H4: Sales growth

GEM companies exhibiting higher sales growth, for given profits, offer more potential (future value) to the investor on the MB and therefore are more likely to be imminently transferred upwards. Lower sales growth by contrast is likely to lead to the firm losing market share to competitors and to early chances of bankruptcy.

H5: Long run competitive advantage

Long run competitive advantage reduces the cost of capital to a firm (Cressy,1995). This makes the firm more attractive to the Main Board in which firms are associated with higher credit ratings and lower cost of capital. Thus, we expect greater market power to enhance a firm's chances of promotion to the MB. VCs are also often associated with investments possessing long run competitive advantage (via patents etc) so that if a VC combines with a company already possessing a more protected market the effect of the VC on promotion is weakened[viii].

H6: Counsellors

Counsellors are firms (often law firms) that advise GEM companies after listing. Some are more experienced than others. We hypothesise that experienced counsellors, aware of the issue of premature promotion, are more likely to be conservative and delay transfers to the MB until the firm is considered 'ripe' for it. Hence the more experience a counsellor has the less likely he is to be associated with promotions to the MB.

H8: Auditors

Auditors also provide a break on promotion by ensuring that the firm's accounts correctly represent its financial position. Any queries over whether a firm matches the standards of the MB will decrease the hazard of promotion. More prestigious auditors (defined as the top 5 – see below) will break harder. Finally, problems with the accounts of firms in financial distress are more likely to be picked up by highly qualified or prestigious auditors. Thus we expect more prestigious auditors to delay promotion to the MB.

H9: Market-wide factors

Cumming and Johan(2010) found, as mentioned above, that the hazard of exit into bankruptcy was lower when market conditions were good. Market-wide factors in our study are represented by the level of the Hang Seng index, HS. We therefore expect that in any given year when market values are rising (higher HS), the hazard of promotion to the MB in is higher and that of descent into bankruptcy lower. [ix]

4. Background: the GEM

The Hong Kong Growth Enterprise Market (henceforth GEM), introduced in 1999, was aimed at satisfying the demands of high growth, technologically-oriented companies for quick access to equity capital despite shorter operating histories and lower profitability levels than that required by the Main Board. Table 1 below provides aggregate data for both markets covering the period 2007-2012.

The GEM market exhibited considerable initial growth over the period 1999-2001, measured by listings, but then fell into decline as the number of IPOs went down and the number of exits from the market increased. These delistings were largely due to transfers to the Hong Kong Main Board, but a small percentage exited for reasons of bankruptcy. In a sample of 129 companies from the GEM we find that 21 or 15% delisted in the period 2000-2012. We believe that part of the explanation of this market's 'decline' lies in its *efficiency* in promoting quality companies to the Main Board (MB). As we show later, such companies tend to be more profitable, are less financially risky and have more protected markets for their products than non-promoted companies. More prestigious auditors, by contrast, are found to provide a brake on attempts at premature exit to the MB. Higher quality management and incentives to performance may also play a role in the promotion process, as attested by the fact VC presence enhances the hazard of exiting to the MB some five-fold.

We can see from Table 1 that numbers on the MB display moderate growth over the six years covered, facilitated in part by transfers upwards from the GEM. These transfers in the period 2008-2011, for example, were both significant and more than counterbalanced the effects of MB delistings on the stock of MB companies.

Table 1: Main Board and GEM Summary Statistics

	2007	2008	2009	2010	2011	2012
No. of listed companies						
Main Board	1048	1087	1145	1244	1326	1368
GEM	193	174	174	169	170	179
No. of delistings						
Main Board	9	8	10	7	6	10
GEM	7	21	5	12	12	3
Transfer of listing from GEM	4	18	4	12	12	2
Total market capitalisation						
Main Board (HK$bn)	159,300	79,819	138,053	162,330	135,895	170,628
GEM (HK$mil)	1,249,517	351,597	816,061	1,043,910	658,676	611,628
Total annual turnover value						
Main Board (HK$bn)	166,825	137,014	119,951	132,363	133,084	103,504
GEM (HK$mil)	1,940,421	1,257,612	2,301,590	3,464,258	2,223,149	1,207,708
Average dividend yield (%)						
Main Board	2.21	5.38	2.33	2.31	3.31	2.81
GEM	0.68	2.76	0.77	0.95	0.52	0.88
Average P/E ratio						
Main Board	22.47	7.26	18.13	16.67	9.68	10.50
GEM	44.91	8.01	38.98	31.10	22.16	18.38
Average book value ratio						
Main Board	2.81	1.17	1.91	1.99	1.41	1.50
GEM	3.47	0.81	1.99	2.52	1.39	1.57
S&P/HKEx Index						
Main Board	33708	17891	25564	27392	22252	27082
GEM	1349.64	385.47	677.01	810.52	474.80	381.51

Source: **Hong Kong Stock Exchange (HKEx) *Fact Books*.**

5 The data

Our analysis sample is taken from the GTA's *Hong Kong Listed Company Research Database* with additional information on VC backing provided by *Thomson One Banker* and covers the period 1999 to 2012. The dataset consists of 769 *firm-years* (observations) on 129 companies[x] and constitutes an unbalanced panel of companies listed on the GEM with

generally different starting (IPO) and ending (delisting) dates. All went to IPO in the period 1999-2012. Some exited to the Main Board over time and some delisted for reasons of bankruptcy. For many companies listed on the GEM the outcome is not known at the end of the sample period as the companies are continuing operations and remain listed. These are so-called *censored* observations.

5.1 Delistings and their reasons

Over the period 28 delistings from the GEM occurred[xi]. Up to 9 different reasons for delisting encountered in this period are identified in the database, although in our sample, several of these categories are empty. Delisting reasons are identified in Table 2 below. The remaining 112 companies were still listed on GEM at the cutoff point of the study, 2012. We note in Table 2 below that the modal frequency of upwards delistings is for reasons 7 and 8: Introductions and Transfers to the MB. There were no delistings due to voluntary cancellations (reason 1), and only four due to long term suspensions or to pre-emption (reasons 3 and 4). No GEM companies were merged or taken over in the period (reason 6) and reason 2 (omitted) refers to privatisations of public companies, so cannot be considered as delistings in the way that the other reasons are.

Table 2: Reasons for company delisting and their frequencies

Reasons	Frequency
0: Company did not delist in period	104
1: voluntary cancellation of listing	0
2: privatisation	[3]
3: Cancellation due to long term suspension	3
4: Cancellation of listing due to pre-emption	1
5: Cancellation of listing due to Voluntary Liquidation	0
6: Cancellation of listing due to merger, acquisition and asset restructuring	0
7: Voluntary cancellation of listing on GEM and listing on the Main Board by Introduction	1
8. Transfer of Listing from GEM to Main Board(MB)	20
9. Other [Applicable to companies listed on the MB only]	0
Total	129[132]
Table reports delisting frequencies by delisting type from the GTA database sample. See later for a discussion of data sources. 104 companies in our sample remained on the GEM at the end of the period of study, 2012.	

In the competing hazards model below we shall model the risk of transfer/intro to the MB (described henceforth as transfer or promotion) as the primary delisting outcome and failure (reasons 3 and 4) as the 'competing' risk. These exits are contrasted with censored outcomes where the failure has not yet occurred (and may never occur), namely, reason 0. The remaining variables used in the analysis are defined in Table 3 below.

5.2 Descriptive Statistics

The descriptive statistics are presented in Table 4. We display median as well as mean values because the distributions are quite positively skewed with median values usually well below the means. Panel s A and B offer descriptives for time-varying and for time-invariant covariates respectively.

Financials

The mean and median firm size over the period, measured by operating sales (*oprev*), was HKD30 and HKD7.6 respectively. The typical firm in our sample had mean and median net profits[xii] in an

Table 3: Defnitions of variables

Variable	Definition
IPOyr(i)	Year of the company's IPO on GEM
Delistwhy(i)	Reason for delisting of stock from GEM (see Table 3 for details)
Heaven(i)	=1 if the firm was promoted at some time in the period;=0 else
Debtrat(i,t)	Debt/total assets
Oprev(i,t)	Operating revenue HKD millions
Goprev(i,t)	Annual growth of operating revenue
Aud5(i)	=1 if company's auditors are in the top 5
Expc10(i)	=1 if counselling firm advised at least 10 GEM companies
Np(i,t)	Net profit (i.e. profit after tax) in HKD millions
Herf(i,j,t)	Herfindahl index of industrial concentration for firm i in industry j at time t
VCXherf(i,t)	VC*herf
HS(t)	Hang Seng index at time t
Note: table provides definitions of company-specific variables constant over time (with i subscript only), company specific variables that vary over time (subscript i,t) and those (Herfindahl only) that vary with firm, industry and time (ijt).	

average year of HKD462,000 and HKD25,800 respectively, though there is much dispersion around these figures with some firms making losses of HKD80m and others profits of HKD143m. Whilst median net profits *declined* at 18% per annum (*gNp*), at the top end of the distribution some firms' profits grew vertiginously at over 150% pa. The median leverage of the sample (*debtrat*) is .49 which indicates that about half of the typical firm's assets were financed by debt[xiii].

Competition

As regards product market competition the median Herfindahl index of .13 tells us that the typical firm faced the equivalent of 7 or 8 equal-sized (listed) competitors in any year in the period. We do not have data on non-listed competitors, so this represents a minimum degree of competition.

Market index

The Hang Seng index is used to represent the level of the stock market as a whole. In this period it attained a mean value of 15,628 whilst demonstrating a rising trend from 10,321 to 23,700.

Table 4: Whole sample summary statistics for regressors

Panel A: Time-varying covariates

variable	N	Mean	Median	min	max
Np	769	.4620	.0258	-80.43	143.0
Oprev	769	30.47	7.648	.0101	1260.6
Goprev	634	1.203	.1626	-.9985	197.7
Debtrat	766	2.537	.4925	.0036	336.4
TL	766	23.25	7.831	.0422	758.9
TA	769	42.22	14.34	.1254	1154.8
Herf	769	.2482	.1315	.0600	1
HS	769	15628	14402	10321	23700

Descriptive statistics for the whole sample over the period 2000-2012 for variables with Within variation. Mean and median figures are overall means and medians for each variable across both firms and years. N is the number of firm-years. Value figures are in $US millions. For definitions of variables see Table 3. Note that leverage values (*debtrat*) above 1 indicate negative book value of equity. Only firms with two years of data or more are included in anticipation of the hazard rate analysis to follow.

Panel B: Time-invariant covariates

Variable	N	Mean	Median	Std. Dev.	Min	Max
expc10	135	.3926	0	.4901	0	1
Aud5	135	.1852	0	.3899	0	1
VC	134	.1045	0	.3070	0	1
IT	135	.2963	0	.4583	0	1
Consgds	135	.2222	0	.4173	0	1
Services	135	.1555	0	.3638	0	1

Descriptive statistics for the sample over the period 2000-2012 for variables with no Within variation. Number of observations, N, is the number of firms. Note that N=134 or 135 which exceeds the number used in the survival analysis as there is missing data on individual regressors and firms for which there is only one year of data are of necessity excluded from the hazard rate analysis. For definitions of variables see Table 3.

Market index

The Hang Seng index is used to represent the level of the stock market as a whole. In this period it attained a mean value of 15,629 growing some 130% from 10,321 to 23,700.

Sectors

We present data for the three most frequent industrial sectors, namely, IT (30%), Consumer Goods (consgds)(22%) and Services (16%). These jointly account for two thirds of the companies in our sample.

Industrial concentration

Industrial concentration is measured by the Herfindahl index for industry j in year t, H_{jt}, is the sum of the squared shares in operating revenue in that industry:

$$H_{jt} = \sum_{i=1}^{I} s_{ijt}^2$$

where

s_{ijt} = share of firm i in operating revenue of listed firms in industry j at year t

This index varies between 0 (perfect competition) and 1 (monopoly) with higher values associated with more market power and less competition. In the present data we can see that at 25%, the typical firm in a given year operates in a moderately competitive environment, equivalent to a market with four equal sized firms[xiv]. However, the index varies over all firm-years between 6% (17 equal-sized firms) and 1 (one firm or monopoly).

Auditors

About 1 in 5 companies had auditors in 'the international top 5', a set of presigious auditors (defined here as PWC, KPMG, Deloittes,Ernst and Young and Grant Thornton).

Counsellors

Each company on GEM must have a Counsellor or advisor to its operations. A set of counsellors was selected with above average experience in either the GEM or the MB. Using

the criterion of whether it had advised more than 10 companies in the period, we ended up with 10 counsellor-specific dummies for analysis. We then defined a dummy, *expc10*, equal to one if firm i is in the 'experience set' and zero elsewhere.

VC backing

Our proxy for the role of the VC is simply a dummy variable[xv]. One in ten companies listed on GEM in the period had VC backing at some stage.

5.3 Multicollinearity: Condition number

We address the question of co-linearity of the regressors in the regressions that follow by calculating the condition number (CN) of the data matrix of the regressors (Belsley, Kuh and Welch, 1980). 'Degenerating' co-linearity amongst the regressors (resulting in an unstable data matrix) is associated with a CN greater than 30. The CN for our regressors, including quadratic terms and depending on the covariate set chosen, varies between 2.5 and 17.35. So collinearity is not a problem for our analysis.

6 Hazard rate modelling

The hazard rate in the standard Cox Proportional Hazards model is defined as the probability that a firm will transfer to the main market next year given that it has not done so up to the current year. Any other outcome is treated as 'censored' (i.e. we do not know the outcome in the period of the study). Formally, if T is the time at which company transfers then the hazard of transfer, *h(t)*, is written

$$h(t) = Pr(t \leq T < t + \Delta t | T \geq t) = f(t)\Delta t / [1 - F(t)] \qquad (1)$$

where $f(t)\Delta t$ is the probability that the event will occur in a 'small' time interval Δt and F(t) is the corresponding cumulative distribution function. Implicitly, the conditioning also includes a set of covariates that may influence the position of the hazard function. The Cox hazard function for firm j, takes the specific form:

$$h_j(t) = h_0(t)\exp\left(x_{jt}\beta\right) \quad (2)$$

where $h_0(t)$ is an unspecified *baseline* hazard function of time, and x_{jt} is a vector of covariates for firm j that may be time-varying[xvi]. β is a vector of fixed coefficients. Whilst $h_0(t)$ is initially unknown it is possible to estimate it *ex post*, as we shall see.

To enable the modelling of competing risks the Cox model is modified as follows. Define

$$h_i(t) = \lim_{\Delta t \to 0} \frac{\Pr\left(t \leq T < T + \Delta t, exit\ for\ reason\ i\ |T \geq t\right)}{\Delta t} \quad (3)$$

as the hazard of exit for reason i, with T is the time to *first* exit from *any* cause. Regardless of whether the reasons in question are independent, the total risk of any event occurring, the overall hazard rate, is

$$h(t) = \sum_i\ h_i(t) \quad (4)$$

Once exit has occurred however, the exit is for reason i with probability

$$h_i(t)/h(t) \quad (5)$$

In the present analysis we have two causes of exit: transfer to the main market and bankruptcy.

7 Empirical Results

7.1 MB Transfer function

Table 5 and Chart 1 show the *upwards* delisting process with the time origin set at each company's IPO year (*IPOyr*) so that analysis time=current year-IPO year. We start with 129

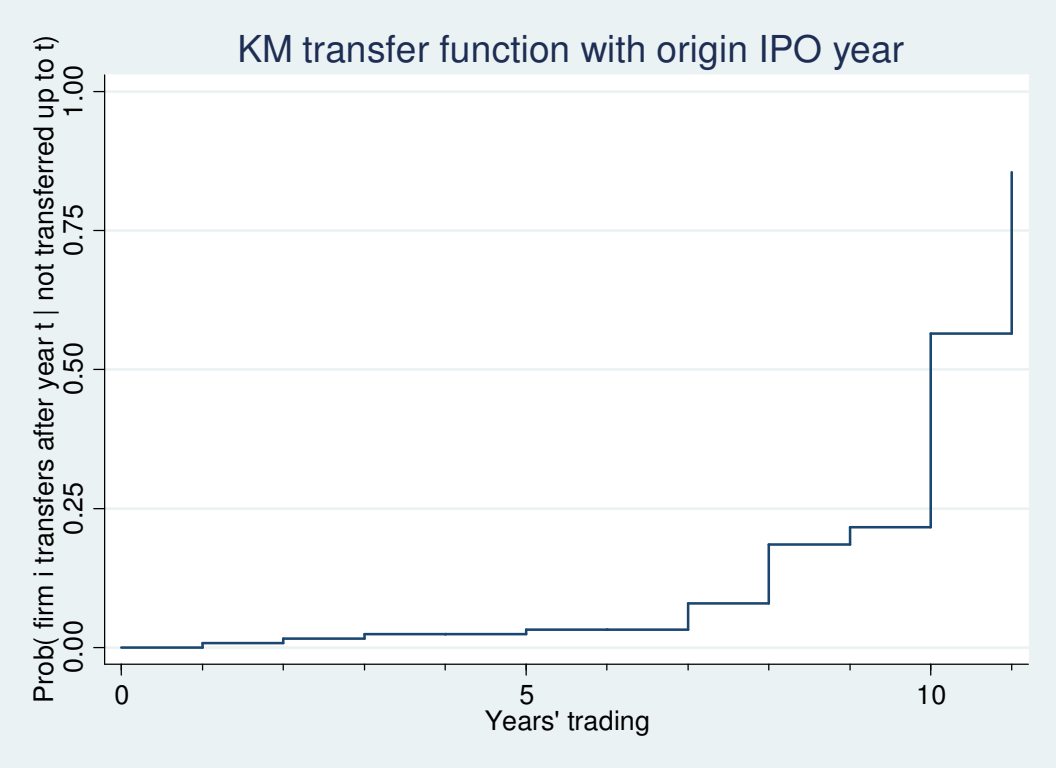
Table 5: Transfer function using as origin IPO year

Time (years)	Beg. Total	No. Transf.	Net Lost	Transfer Function	Std Error.
1	129	1	1	0.0078	0.0077
2	127	1	4	0.0156	0.0109
3	122	1	3	0.0236	0.0135
4	118	0	4	0.0236	0.0135
5	114	1	11	0.0322	0.0159
6	102	0	19	0.0322	0.0159
7	83	4	27	0.0788	0.0273
8	52	6	20	0.1851	0.0474
9	26	1	16	0.2165	0.0550
10	9	4	2	0.5647	0.1333
11	3	2	1	0.8549	0.1265

Table shows the Kaplan-Meir 'failure' function with 'failure' here defined as transfer to the Main Board. It ignores downward exits due to bankruptcy. Including these would result in a final transfer probability of one. 'Net lost' refers to attrition due to censoring. Time is measured in years since IPO year.[xvii]

firms 'at risk' of promotion. Then firms progressively exit to the MB or their data are censored (it reaches the end of the calendar time period, 2012). The MB *transfer function* represents the probability of a firm transferring to the MB after year t *given* its not having transferred up to year t[xviii]. We can see clearly from Chart 1 that there is little change in this function over the first six years. However, it jumps significantly upwards between years six and seven and again between years nine and ten of trading. By year eleven the chances of transfer rise to 85%. The 'staircase to heaven' thus ensures, almost with certainty, that if it it is going to exit, by year 11 of a firm's life it will have reached 'heaven' (Main Board), or with only 15% probability that it will exit to 'hell' (Bankruptcy).

Chart 1: Kaplan-Meir MB Transfer function for GEM

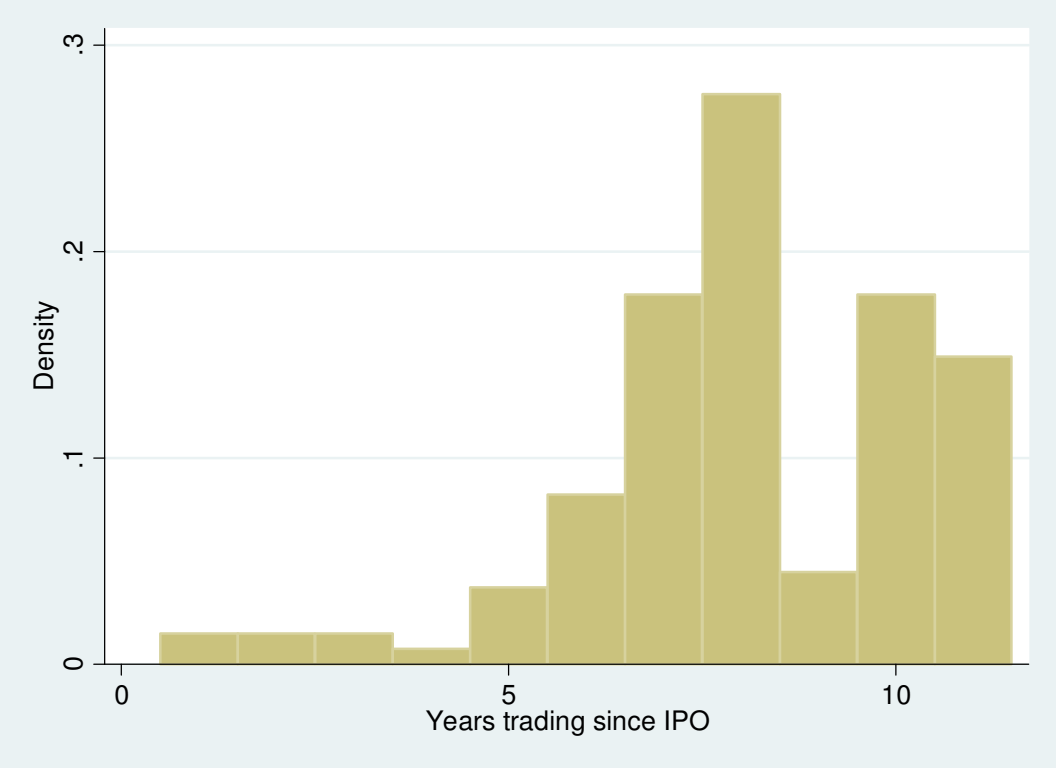


7.2 Lifespan

Defining the lifespan of a listed company as the difference between the year of delisting and the year of IPO we can plot the distribution of lifetimes. Chart 2 shows that lifespans of companies on the GEM, defined as the time between IPO and transfer to MB, are somewhat dispersed. Whilst the mode is around 8 years, some transfer as quickly as 1 year and some take up to 11 years to achieve promotion.

Our next question then, is to uncover the factors affecting lifespan on the GEM, bearing in mind that in reality, and mirrored in our modeling process, promotion is juxtaposed to failure as a reason for delisting. To answer this question we avail ourselves of a competing hazards model which allows that a firm may exit in any period for one of these two reasons, and of course once exited, exit for the other reason is precluded.

Chart 2: Lifespan of GEM-listed companies, 2000-2012



a. Bivariate comparisons

Table 6 examines the descriptive statistics of the data by comparing firms that go to heaven (*delistwhy*=7, 8) versus the rest. We note that firms moving to the MB are much more profitable (*Np*), have slower[xix] but less variable sales growth (*goprev*[xx]), have much lower leverage (*debtrat*), are more likely to be VC-backed (*VC*), are more likely to be audited by a firm in the top 5[xxi]. They also had more product market power (*herf*) and better market conditions in which to operate (*HS*).

Table 6: Heavenbound: GEM transfers to the Main Board, 2000-2012

Heaven=0					
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Np	748	.1257***	11.89	-80.43	143.0
Goprev	613	1.220	11.23	-.9985	197.7
Debtrat	745	2.608***	16.47	.003590	336.5
VC	745	.09396**	.2920	0	1
Herf	748	.2436***	.2220	.06004	1
expc10	748	.4613	.5943	0	1
Aud5	748	.1858	.3892	0	1
HS	748	15456***	4594	10321	23700
Heaven=1					
Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Np	21	12.44***	18.79	-2.911	80.16
Goprev	21	.7306	.7321	-.4248	2.569
Debtrat	21	.3436***	.1665	.03444	.6253
VC	21	.2381**	.4364	0	1
Herf	21	.4110***	.1911	.2466	1
expc10	21	0	0	0	0
Aud5	21	.0476	.2182	0	1
HS	21	21747***	2153	17118	23700

Table reports descriptive statistics for firms going to heaven (MB) i.e. delistwhy=7 or 8 versus those not, allowing for differences in variances between the populations. *,** and * indicate differences between the two groups significant at the 1%, 5% and 10% respectively. The continuous variable differences are tested using Welch's method which does not assume equal variances. The binary variables' significance test employed is a standard one of difference in proportions. We note that there are no advisers in the set transferring with 10 firms' experience behind them. This variable is henceforth dropped from the analysis.**

7.3 Hazard rate regressions

Table 6 below presents the regression results. We provide estimates in fact of six different models, namely the Cox Proportional Hazards (CPH or model 1), Competing Hazards (CH or model 2), Weibull hazard (WH or model 3), Gompertz hazard (GH or model 4), Logistic (model 5) and Rare Events Logit(RE or model 6)[xxii]. In the CH model we specify the dependent variable as follows:

Delistwhy=7 or 8 defines the exit event to the MB ('heaven')

Delistwhy=1, 3, 4 or 5 defines the competing risk of bankruptcy/liquidation ('hell')[xxiii]

Delistwhy=0 is a censored observation i.e. one for which the outcome not known at the end of study period ('limbo')

Thus, for the Competing Hazards model, either the firm moves up (positive delisting), moves down (negative delisting) or remains listed on GEM (jury is out). Bankruptcy is the competing hazard for promotion and continuation on the GEM is a censored observation. For the remaining models our binary outcome in any year is either transfer (heaven=1 or equivalently delistwhy =7 or 8) or non-transfer (heaven=0 or equivalently delistwhy=0,1,3,4 or 5) so that failure is treated as a non-transfer from GEM in that year.

In examining Table 7, note firstly that the models fitted are all highly significant (Wald Chi2 or F-stat p-value=0.0000) so that they identify significant influences on the promotion hazard[xxiv]. The coefficients also generally have the predicted signs and are consistent across models, exceptions being in the second order terms (quadratics and interactions) where significance levels vary. The results for the CPH and CH models (models 1 and 2) produce hazard/cumulative incidence functions most consistent with the Kaplan-Meir functions shown earlier. Thus greater net profits, higher growth, less financial risk, less competition and lower tier (less permissive) auditors all predict a higher chance of graduating next year, as does a higher stock market index[xxv]. Note that the effects of VC presence are significant in three out of the four models. However, the effects on promotion rely to some degree on the interaction of VC presence and market power. The direct effect of a VC is to increase the chances of promotion in the next year. However, the *marginal* impact of the VC on the hazard of promotion depends on the level of concentration *(herf)*. For low values of *herf*, the marginal impact of the VC is positive. However, a more protected

market (higher Herfindahl index) reduces the effectiveness of the VC - presumably the firm is in less need of a VC if e.g. it has plenty of valuable patents protecting its product markets. We note that the coefficients for the CPH and CH models differ very little which suggests that those companies moving to the MB versus those descending into bankruptcy are not significantly competing risks[xxvi]. In other words, firms that are likely to delist for reasons of bankruptcy are, *at the margin*, driven by the same factors as firms that are likely to graduate to the Main Board. This conclusion is moreover, consistent with earlier American studies. Finally, for robustness we estimated a Rare Events logit (*relogit*) model to allow for the possibility that the population proportions for the dependent variable may differ from those in the sample[xxvii]. As can be seen, the significance and signs of the key variables remain as in the logistic model.

Thus our theoretical predictions may be considered vindicated by the data and the CH and CPH models seems to support the data best, as measured by the shape of the CP hazard function in Chart 3. The economic significance of the various variables varies substantially[xxviii]. [xxix]The market index plays a central role with a 10% increase in the Hang Seng multiplying a firm's hazard of promotion 47-fold at the mean and 35-fold at the median: clearly, the market timing of applications for promotion (as with IPOs) is central to their chances of immediate success. At firm level, however, VC backing was critical, multiplying the promotion hazard five-fold in any one year. By contrast a shift of auditor to one in the top 5 *reduced* the chances of immediate promotion by three quarters: auditors place quite a powerful brake on premature ascent to the pearly gates. Less spectacularly, but still very important, a 10% increase in sales growth or financial risk led to a one third increase or decrease respectively in a firm's promotion chances in the next year. Product

market power, interestingly, also had significant economic effects, with a 10% increase in the Herfindahl index for a firm leading to a 25% increase in its promotion hazard. Finally, and surprisingly, net profits of the company, whilst having a statistically significant and positive on promotion, only increased the hazard of an upward movement by about half a percent. This likely reflects, in a time of stock market boom, the sacrifice of profits to sales growth as an arbiter of future performance.

The CPH smoothed proportional hazards function is presented in Chart 3 below. We note that it is increasing in the time trading on the GEM, at first at an increasing, then after about year six, at a decreasing rate. The hazard in any one year never exceeds 20%.

Chart 3: The smoothed Cox Proportional Hazard function

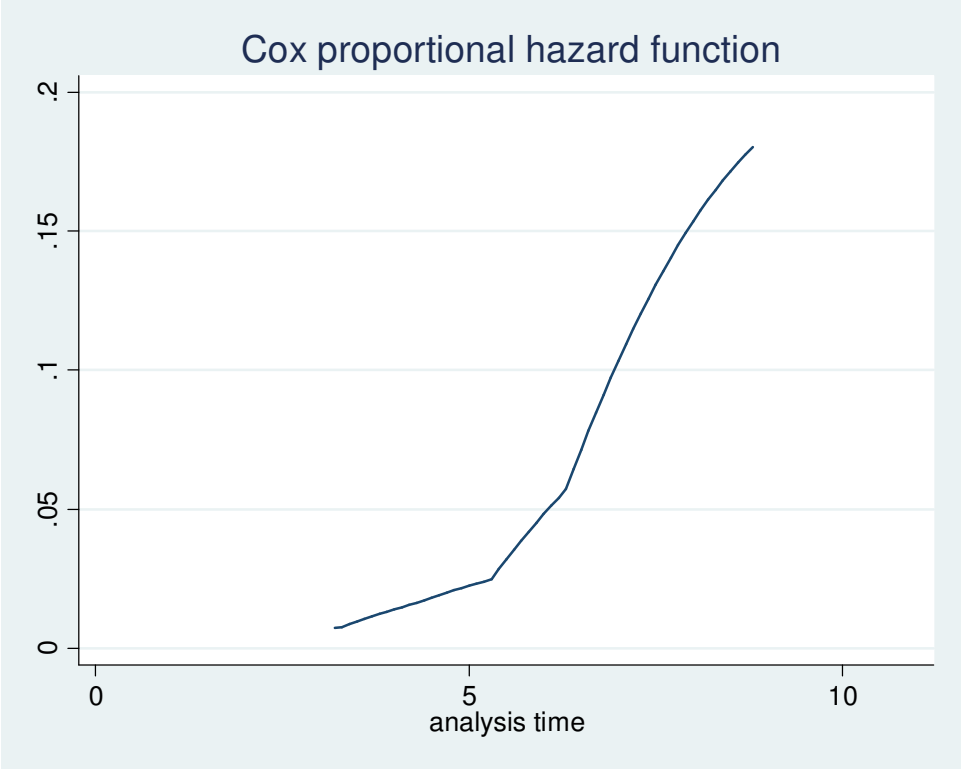


Table 7: Cox hazard, competing hazard and other models of promotion

	Model 1: Cox Single hazard (CPH)	Model 2: Competing Hazards (CH)	Model 3: Weibull Hazard (WH)	Model 4: Gompertz hazard (GH)	Model 5: Logistic	Model 6: RElogit
Np	.1249 (0.000)	.1249 (0.000)	.1133 (0.000)	.1095 (0.000)	.2091 (0.000)	.1590 (0.003)
Np2	-.001382 (0.001)	-.001382 (0.001)	-.001279 (0.005)	-.001216 (0.005)	-.002349 (0.003)	-.001704 (0.047)
Goprev	2.515 (0.061)	2.515 (0.061)	1.972 (0.001)	2.232 (0.015)	3.468 (0.003)	2.885 (0.008)
goprev2	-.6059 (0.110)	-.6059 (0.110)	-.5042 (0.025)	-.5613 (0.080)	-.9719 (0.017)	-.7453 (0.059)
Debtrat	-1.491 (0.055)	-1.491 (0.055)	-2.356 (0.003)	-1.994 (0.010)	-2.782 (0.014)	-2.231 (0.045)
VC	1.823 (0.095)	1.823 (0.095)	1.9367 (0.075)	1.601 (0.127)	3.508 (0.089)	1.846 (0.034)
VCXherf	-5.351 (0.261)	-5.351 (0.261)	-2.856 (0.070)	-3.709 (0.108)	-3.701 (0.512)	..
Herf	9.207 (0.004)	9.207 (0.004)	10.03 (0.000)	9.3934 (0.000)	13.92 (0.033)	13.61 (0.038)
herf2	-7.206 (0.100)	-7.206 (0.100)	-5.799 (0.013)	-6.163 (0.016)	-8.720 (0.408)	-10.93 (0.202)
Aud5	-1.472 (0.022)	-1.472 (0.022)	-1.842 (0.032)	-1.860 (0.013)	-1.738 (0.012)	-.6821 (0.367)
HS	.002463 (0.001)	.002463 (0.001)	.0001165 (0.005)	.0000485 (0.381)	.004485 (0.019)	.003190 (0.067)
HS2	-5.85e-08 (0.003)	-5.85e-08 (0.003)	-11.65 (0.002)	..	-1.04e-07 (0.027)	-7.43e-08 (0.082)
Const	..	..	-11.65 (0.002)	-10.32 (0.000)	-54.65 (0.006)	-34.47 (0.056)
Chi2(df)	181.1(12) (0.0000)	181.4(12) (0.0000)	110.7(11) (0.0000)	129.8(11) (0.0000)	59.29 (0.0000)	..
Ln(p)	..	..	.8695 (0.260)	..	..	..
gamma	..	..	..	.5481 (0.054)	..	..
Pseudo R2	..	..	..	..	.5918	..
N obs	605	605	605	605	630	632
N firms	125	125	125	125	125	125
N proms	21	21	21	21	21	21
N compete	..	3	..	..	..	..

Table reports estimates of the Cox PH, Competing risks, Weibull and Gompertz hazard models along with The Logistic and Rare events logistic (RElogit) models. Chi2 and Pseudo-R2 are not reported by STATA for the RElogit. P-values are in brackets and are based on robust standard errors. The Relogit corrects for selection on the dependent variable using the method of priors. A robustness check performed on the CPH model tests of the Proportional Hazards assumption using Schoenfeld residuals. This test failed to reject the Null of proportionality of hazards (p=.85).

8 Summary and conclusions

In this paper we used a competing risk and a range of other survival models to examine the reasons for Hong Kong's Growth Enterprise (GEM) companies transferring to the Main Board (MB) in the period 2000-2012. Over this period 21 companies or 15% of the 2002 stock had moved up to the MB. The modal life expectancy of a GEM company (time from entry to exit for those that did exit) was about eight years. Companies that did not move up to the MB were at a small risk of delisting due to long term suspension or liquidation, but the vast majority we found just remained where they were. We were able to identify the factors behind those that did transfer to the MB: the market index(+), VC backing(+), choice of auditor(-), company financial risk(-), sales growth (+), product market power(+) and net profit(+). From a quantitative perspective, market effects dominated: a 10% increase in the Hang Seng led to a 35-fold increase in the annual hazard of promotion. At the firm level, however, we were able to quantify other important factors in promotion: VC backing was found (at the mean) to increase the firm's hazard six-fold in any year, whilst a 10% increase in sales growth this year raised the chances of 'graduation' by one third in the next. By contrast, the choice of a Top 5 auditor reduced the chances of promotion in the next year by three quarters and a 10% increase in its leverage (financial risk) reduced it by one third. Interestingly, product market dominance paid dividends in terms of promotion to the main board: a 10% increase in product market power led to a 25% increase in the firm's hazard ratio. Finally, and surprisingly, net profit, was found to be economically relatively unimportant, with a 10% increase leading to only about one half of one percent increase in its chances of immediate promotion. In such booming times (the Hang Seng increased on

average 16% each year) current profit seems, therefore, to have been sacrificed to current growth potential of the company in the promotion stakes.

In conclusion, a listing on the GEM in this period was, for a significant minority of companies a ‘stairway to heaven’ and only for a very small and disparate minority a ‘gateway to hell’. Common factors behind a company’s path to the heavenly gates or descent into the inferno of bankruptcy were readily identified, with the level of the market and VC backing to the company central to a heavenly ascent.

Appendix 1: Summary of the main findings of the literature							
Authors	**Year of Publication**	**Study characteristics**			**Analysis method**	**Influences**	
		Country & market	**Period, sample size**	**Panel?**	**Hazard rate?**	**Survival**	**Promotion**
Hensler et al	1997	US, Nasdaq	1975-1984, N= 741	Yes	Yes, AFT	Age(+), size(+), day1retn(+), insider ownership(+)	NA
Jain and Kini	1999	US, SDC	1977-1990, N= 877	Yes	Multinomial Logit	VC backing(+), pre-IPO operating performance(+), insider ownership(+), prestigious investment bankers(+), strategic R&D(+)	NA
Bhaba and Petty	2003	US	1987-1991	No	Cross section	Prospectus info.	NA
Fama and French	2004	US, Nasdaq?	1973-2001, N=705	No	Cross section	Profitability(+), growth rate(+)	NA
Cumming	2006	Canada	Venture capital funds, N=214	No	Cross section	NA	NA
Demers and Joos	2006	US, SDC	1980-2000, N=1516	Yes	Logit	Characteristics of intermediaries, accounting info, technological type	NA
Cumming	2006						
Kooli and Meknassi	2007	US, SDC	1985-2005, N=7957	Yes	Yes, AFT	VC backing(+),degree of underpricing(+), Ipo size(+),underwriter reputation(+)	NA
Jain and Kini	2008	US	1980-1997, N=6922	Yes	Yes, CPH	Strategic investment(+), post-IPO operating performance(+),	NA

						diversification(+), capex(+)	
Van der Goot et al	2009	US, Nasdaq	1996-2001, N=326	Yes	Yes, CPH	Credit risk(-), competition risk(-) Industry risk(-)	NA
Cumming and Johan	2010	Canada, US VC investments exiting via IPO, Private methods and Writeoffs	1991-2004 N=557, Canada N=1607, US	Yes	Yes, CPH	Duration influenced by stage(-) and size(-) of investment, stock market returns(-), country factors	NA
Johan	2010	Canada, Toronto Stock Exchanges, Junior and Senior markets.	1997-2005 N=196 and 215 IPOs	Yes	Yes, CPH	TSX (main market) companies are better prepared & so take less time to go to IPO, starting from the date of the preliminary prospectus, than TSX-V (high tech) companies.	NA
Carpentier and Suret	2011	Canada, Toronto stock exchange	1986-2003, N=2,373	Yes	Yes, CPH	Revenues@IPO(+), profitability(+), auditor and investment banker reputation(+), VC backing(+)	Yes
Cumming and Dai	2011	US, NA	1991-2006 N=9,266 VC investment rounds	No	No, Logit	Firm maturity (later stage of investment) and VC prestige increase chance of successful exit (IPO/acquisition).	NA
Espenlaub et al	2012	UK, AIM	1995-2004, N=896	Yes	Yes, AFT	Advisors (NOMADS)(+), age@IPO(+), size@IPO(+), insider	NA

	ownership(+)@IPO, VC backing(-)

Appendix 2: Marginal impacts

To examine the economic effects of the variables on the hazard of promotion, note that the hazard rate for the CPH model can be written

$$h(t|x_1, x_2, \dots, x_k) = h_0(t)\exp\left(\beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_j x_j + \cdots . . + \beta_k x_k\right)$$

If x_j is a dummy variable and we change $x_j = 0$ to $x_j = 1$ then the hazard changes to

$$h\big(t\big|x_1, x_2, \dots, x_j + 1, \dots . x_k\big) = h_0(t)\exp\left(\beta_1 x_1 + \beta_2 x_2 + \cdots \beta_j[x_j + 1] + \cdots + \beta_k x_k\right)$$

and the ratio of the hazards is now

$$\exp\left(\beta_j\right)$$

For example, if we have , $x_j = VC$ then the ratio of the hazards is

$$\exp\left(\beta_{VC}\right) = \exp(1.823658) = 6.1945$$

which implies that the chances of a VC backed company being promoted *in the next year* are six times that of a non-VC backed company.

For continuous variable x_j an increment of 1 may not make much sense. For example, the Herfindahl index *herf* has a value between 0 and 1, a mean of about 25% and a median of about 13%. The coefficient of *herf* however, is 9.207. If we exponentiate this we get (!)

$$\exp\left(\beta_{herf}\right) = \exp(9.207) = 9966.65$$

This does not even make sense since we cannot increase the H index by 1 (unless it is zero) in any case. So if we consider increasing the index proportionately by say 10% we'd find that the ratio of the hazards would now be

$$\exp\left(\beta_{herf}(.1)x_j\right) = \exp\left\{(9.207)(.1)x_j\right\}$$

which clearly is a function of x_j. So to make this meaningful we might evaluate the function at the mean or median value. This gives

$$\exp\{(9.207)(.1)(.25)\} = 1.26 \quad \text{or} \quad \exp\{(9.207)(.1)(.13)\} = 1.13$$

which implies that a 10% proportional increase in the H index results in a 26% increase in the hazard of promotion at the mean, and a 13% increase at the median. A lot more plausible! Adopting this approach for the two types of variables we find (ignoring quadratic terms) the following effects on the hazard ratios (Table A1):

Table A1: Marginal effects on the hazard ratios of regressors in model 1

Variable		Statistic	Coefficient	Marginal effect on hazard ratio	% increase/ decrease in hazard ratio	Rank	
						|Median|	|Mean|
Np	mean	.4620	.1249	1.006	.6		7
	median	.0258		1.0003	.03	7	
goprev	mean	1.203	2.515	1.353	35		4
	median	.1626		1.042	4.2	6	
Debtrat	mean	2.537	-1.491	.685	-31.5		5
	median	.4925		.929	-7.1	5	
VC	0	NA	1.824				
	1	NA		6.197	519.7	2	2
Herf	mean	.248	9.207	1.0463	25.7		6
	median	.131		1.0243	12.9	4	
Aud5	0	NA	-1.472				
	1	NA		.229	-77.1	3	3
HS	mean	15628.7	.00246	46.74	4574		1
	median	14402		34.57	3357	1	

Table calculates the marginal effect of variation in each variable on the hazard ratio. For binary variables we calculate the effect of a change from 0 to 1; for continuous variables we calculate the effect of a 10% increase at the median or mean of the distribution. The last column shows the rank of the variables' impact using absolute values.

REFERENCES

Belsley, D.A., Kuh, E. and Welsch, R.E., 1980, *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity,* John Wiley

Bhabra HS and Pettway RH (2003) IPO prospectus information and subsequent performance. *The Financial Review* 38, 369-397.

Bhattacharya, N., E. Demers and P. Joos (2010), 'The Relevance of Accounting Information in a Stock Market Bubble: Evidence from Internet IPOs', *Journal of Business Finance & Accounting* , 37, 291–321

Carpentier, C. and J. Suret (2011), 'The Survival and Success of Penny Stock IPOs: Canadian Evidence', *Small Business Economics*, 36, 101–21.

Cressy, R., 1995, 'Firm's Cost of Capital and Market Power: the Effect of Dispersion and Entry Barriers on Market Equilibrium', *Small Business Economics* 7(3), June: 205-212

Cressy, R., 2011, "Funding gaps", in *Oxford Handbook of Entrepreneurial Finance*, Ed D. Cumming

Cressy, R., and Remer, S., 2013, A cautionary tale: VC experience confronts the irrational exuberance of the market, *Working Paper*, Department of Accounting and Finance, University of Birmingham

Cumming, D. J., and Mackintosh, J.G., 2003, A cross-country comparison of full and partial venture capital exits, *Journal of Banking & Finance 27*, 511-548

Cumming, D.J., 2006. "The Determinants of Venture Capital Portfolio Size: Empirical Evidence" *Journal of Business 79,* 1083-1126.

Cumming, D.J., and S.A. Johan, 2010. "Venture Capital Investment Duration", *Journal of Small Business Management 48,* 228-257

Cumming, D.J., and S.A. Johan, 2013. *Venture Capital and Private Equity Contracting: An International Perspective, 2nd Edition*, Elsevier Science Academic Press.

Cumming, D.J., and N. Dai, 2011. "Limited Attention, Fund Size and the Valuation of Venture Capital Backed Companies", *Journal of Empirical Finance 18(1),* 2-15.

Demers, E. and P. Joos (2007), 'IPO Failure Risk', *Journal of Accounting Research*, 45, 333–71.

Espenlaub, S., Khurshed, A., and Mohamed, A., 2012, IPO survival in a reputational market, *Journal of Business Finance and Accounting 39(3)*, 427-463

EIASM, 1996, *A European Observatory for SMEs*, European Commission

Fama, E., French, K., 2001. Disappearing dividends: changing firm characteristics or lower propensity to pay? *Journal of Financial Economics* 60, 3–43.

Fama, F. and K. French (2004), 'New Lists: Fundamentals and Survival Rates', *Journal of Financial Economics*, 73, 229–69.

Hensler, D., R. Rutherford and T. Springer (1997), 'The Survival of Initial Public Offerings in the Aftermarket', *Journal of Financial Research*, 20, 93–110.

Jain, B. and O. Kini (1999), 'The Life Cycle of Initial Public Offerings', *Journal of Business Finance & Accounting* , 26, 1281–307.

——— ———(2000), 'Does the Presence of Venture Capitalists Improve the Survival Profile of IPO Firms?' *Journal of Business Finance & Accounting* , 27, 1139–76.

——— ——— (2008), 'The Impact of Strategic Investment Choices on Post-Issue Operating Performance and Survival of US IPO Firms', *Journal of Business Finance & Accounting*, 35, 459–90.

Johan, S., 2010. "Listing Standards as a Signal of IPO Preparedness and Quality*", International Review of Law and Economics, 30 (2) June,* 128-144.

King, G., and Zeng, L., 1999a, Logistic regression in rare events data", Department of Government, Harvard University

King, G., and Zeng, L., 1999a,Estimating absolute, relative and attributable risks in case-control studies, Department of Government, Harvard University

Kooli, M. and S. Meknassi (2007), 'The Survival Profile of U.S. IPO Issuers: 1985–2005', *Journal of Wealth Management*, 10, 105–19.

Tomz, M., King, G., Zeng, L., 1999, *RELOGIT: Rare events logistic regression, version 1.1,* Cambridge, MA.

van der Goot T., van Giersbergen N. and Botman, M., (2009) 'What determines the survival of internet IPOs?' *Applied Economics*, 41, 547–561.

Endnotes

[i] See Carpentier and Suret(2011) for an exception.

[ii] For European data on the relative contribution of small and large firms, see the various reports of the European Observatory for SMEs(see EIASM, 1996), and for the US, reports of the Small Business Administration (SBA, 2012).

[iii] Needless to say, a company that is bankrupt in the current year cannot transfer to the Main board in the coming year.

[iv] Cumming and MacIntosh(2003) (CM)investigate the determinants of full and partial exits by VCs from their investee companies across the US and Canada. CM argue that a VC will exit from an investment at the time when the expected present discounted value of marginal return to effort of the VC in the business is less than the corresponding cost of effort. This may imply for some VCs and companies the relinquishing of only part of their holdings because future benefits may be larger if some foothold in the company is maintained (VC holdings as a real option).

[v] These results were most marked for American rather than Canadian VCs, where significant effects were less in evidence.

[vi] The typical fund life is 10-12 years and therefore as investments tend to be made by year three many investments will be liquidated before year 10. See Cumming and Macintosh (2003).

[vii] A referee has pointed out that Cumming(2006) controlled for the number of managers working at the VC fund in order to address the problem of 'limited attention' which may affect VC performance. However, whilst this variable would be desirable, we do not have such information in the present database.

[viii] The reader will recognise that we are identifying an interaction effect here.

[ix] GEM firms whose market values are highly correlated with the market index will also find that a higher HS will raise their chances of promotion. In the regressions that follow, due to this co-linearity, we do not use market cap as a regressor in addition to HS.

[x] The actual number of companies used in the hazard rate analysis is somewhat smaller than this due to (a) missing observations (e.g. missing accounts data); (b) some companies only offering 1 year of data (such companies cannot form part of a hazard rate analysis which requires at least two years of data on a company.)

[xi]Of the 28 delistings that occurred 3 of these had only one year of data and so could not be used for our hazard rate analysis that follows.

[xii] In the analysis that follows we use net profit (*Np*) as our profitability measure. This is partly because the quality requirements of the Main Board (MB) of the HK stock exchange mean that more profitable firms in that sense are more likely to be promoted to the MB in the following year.

[xiii] The figure of 2.25 for the mean leverage implies that book values of equity were negative on average.

[xiv] To see this note that if all firms are of equal size H=1/N, where N is the number of firms. If we set this equal to .25 we get N=4.

[xv] This may not be ideal as it does not measure the duration of VC involvement with the company, which as we have seen, was found to be significant in recent studies in predicting exits. (Cumming and Johan, 2010). However, we do not have any measure of Vc investment duration in our dataset.

[xvi] It is easy to show that the predictor $x_{jt}\beta$ does not include an intercept and that is why none is reported in the semiparametric analysis to follow.

[xvii] Analysis time is measured in years from the origin runs from 1 to only 11, rather than 1 to 13 because, due to missing data and to the fact that a hazard rate requires *two* years of data to calculate, *there are no observations with t=12 or 13.*

[xviii] 'Net lost' plus transfers in each period reduce the set of firms at risk in the next period, the so-called 'risk set'. Thus, for example, in year 3, 1 firm transferred and 3 were censored so that the risk set in the next period is 118, having fallen by 1+3=4 over the previous year's total of 122.

[xix] But not significantly so.

[xx] The mean comparison for sales growth is not significant at the 10% level.

[xxi] Again, not significantly so.

[xxii] Many other models were in fact estimated including the Gamma, Lognormal, AFT and cloglog models. However, several of the models failed to converge and the four models presented represent the most plausible results.

[xxiii] There are no outcomes where delistwhy = 6.

[xxiv] The RElogit program in STATA used in this analysis does not produce Chi2 values or Pseudo R2.

[xxv] Due to issues of non-convergence and/or co-linearity in the estimation we were unable to include time dummies along with industry controls in any of the regressions. However, the concentration index (H) and market index (HS) control to some degree for industry and calendar effects.

[xxvi] This may of course also be explained by the very small sample size for bankrupt companies.

[xxvii] This method uses the proportion of 1's in the population as a parameter. Since we do not have the proportions for the whole period we used the proportions for the period 2007-2011 from Table 1 for this purpose. We note that this is not, however, ideal. The analysis underlying this program is in King and Zeng(1999a,b). The STATA software is to be found in Tomz,King and Zeng(1999) and can be downloaded from http://gking.harvard.edu.

[xxviii] We thank a perceptive referee for pointing out the importance of examining the economic impact of the variables on the promotion hazard.

[xxix] See Appendix 2 for details of the calculations of the marginal impacts on the hazard ratios of variations in the independent variables.

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