

Post-IPO operating performance, venture capitalists and market timing

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Abstract

We analyse the post-issue operating performance of 304 venture-backed and 264 non-venture UK IPOs 1985-2000. The full sample exhibits a significant operational decline five years post issue. While this is mainly driven by non-venture IPOs, the difference between these and venture-backed IPOs is statistically insignificant. Cross-section regression results indicate a significantly positive relationship between venture capitalist certification and operating performance 1985-1997 but not during the 1998-2000 bubble. Operating declines cluster in the latter period which features a significantly negative relationship between initial returns and post-IPO operating results. These findings point to market timing in the bubble years.

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1. Introduction

Researchers have documented a long-run decline in companies' post-IPO operating performance in various advanced economies. Jain and Kini (1994) and (1995), Mikkelsen, Partch and Shah (1997) and Teoh, Welch, and Wong (1998) provide evidence for the USA, Pagano, Panetta and Zingales (1998) for Italy, Khurshed, Paleari and Vismara (2003) for the UK, and Cai and Wei (1997) and Kutsuna, Okamura, and Cowling (2002) for Japan.¹ All of these studies find that IPO firms exhibit a decrease in operating return on assets and operating cash flows deflated by assets relative to their pre-IPO levels. However, only Jain and Kini (1995) specifically examine the role of venture capitalists (VC) in this context. To our knowledge, ours is the first study of the post-issue operating performance of a unique sample of some 568 venture-backed and non-venture IPOs in the UK.²

The long-run decline in companies' post-IPO operating performance should not come as a great surprise since long run IPO investment or stock market performance also displays a similar trajectory. Simplifying somewhat, two broad explanations for operating underperformance can be discerned. On one hand, the classical approach stresses the presence of information asymmetries based on reduced management ownership post IPO. This leads to increased agency costs in the spirit of Jensen and Meckling (1976) and a subsequent focus on non-value maximising projects. On the other hand, behavioral approaches posit that underperformance can be explained by market timing by entrepreneurs or venture capitalists. Examples of this include the windows of opportunity theory of capital structure of Loughran and Ritter (1995) and the market timing theory of capital structure of Baker and Wurgler (2002) even if the latter is not specifically developed for IPO markets. Related to these is the notion that window-dressing of accounting numbers leads to an overstatement of pre-IPO operating levels and understatement of post-IPO operating levels. For instance, Teoh, Welch and Wong (1998) find evidence of such behaviour in relation to the accounting treatment of accruals.

Conflicts of interest between various interest groups are inherent in both approaches. Classical approaches such as that of Jain and Kini (1995) argue that the certification role of venture capitalists is crucial in alleviating such conflicts of

¹ See also Wang, Wang, and Lu (2003) for a study of IPOs in Singapore.

² While Khurshed et al. (2003) is the first study of the operating performance of UK IPOs, their sample does not distinguish between venture- and non-venture IPOs.

interest. They report that venture-backed IPOs generate superior post-IPO performance relative to non-venture IPOs. Furthermore, they find that proxies for the quality of venture capitalist involvement impact positively on post-issue operating performance. By contrast, behavioural finance researchers argue that such conflicts come to the fore during particular periods such as the recent bubble period years. Issuers then use market timing to take advantage of the prevailing market sentiment.

This paper contributes to the above debate by analysing operating performance using a relatively large non-US dataset.³ We employ a sample of some 568 IPOs in the UK, the most developed international capital market after the US. More specifically, our sample comprises some 304 venture-backed and 264 non-venture IPOs issued on the London Stock Exchange (LSE) over the course of the 1985-2000 period. This differs substantially from that used by Khurshed, Paleari and Vismara (2003) in their study of the operating performance of a sample of UK IPOs both from the LSE and the Alternative Investment Market for the sample period 1994-1999.⁴ Furthermore, we undertake detailed tests of behavioural as well as classical hypotheses across cohort years, industry sectors and various capital market sorts in seeking to understand the underlying causes for the long-term operating decline post-IPO.

The results show significant operating declines five years post-IPO relative to the pre-issue year for the overall sample. This finding confirms the UK operating underperformance puzzle found by Khurshed, Paleari and Vismara (2003) for the 1995-1999 sample period. Industry analysis reveals that significant underperformance is present only in the high-technology sector for the overall sample and both venture-backed and non-venture samples. These findings are consistent with the view that poor-quality IPOs were taken public in this sector which subsequently suffered a sharp fall in operating cash flow over assets. Cross-section regression results support this view.

The second contribution of this paper is that our sample enables us to focus on any potential performance differential between venture-backed and non-venture IPOs and to shed light on the specific role of venture capitalists in relation to post-issue operating returns. In this manner the paper seeks to build on the existing US findings

³ Here we follow Ritter (2003) in using 500 as the minimum standard for a large sample in the IPO context.

⁴ This IPO market with no minimum market capitalization and more flexible regulations than the LSE was established in 1995.

of Jain and Kini (1995). Significant operational declines are found for the non-venture IPO sample but not for the venture-backed IPOs. However, contrary to the Jain and Kini (1995) findings, the operating performance differential between venture-backed and non-venture IPOs is virtually never significant for our UK sample.

Cross-section regression results confirm the positive impact of VC involvement overall on post-IPO operating performance. VC variables, such as their pre-IPO stake and their funds under management pre-IPO show a significantly positive impact on post-IPO operating returns. However, the results indicate that VC reputation actually has a negative impact on post-IPO operating performance which is consistent with Lerner's (1994b) VC market-timing hypothesis. He shows that experienced venture capitalists are more proficient in bringing companies to market at times they perceive to be optimal compared to their less reputable colleagues. The Lerner hypothesis is borne out by the finding that VC certification is found to be significant during the normal (1985-1997) period but not during the bubble (1998-2000) years. This is consistent with the model by Benninga, Helmantel and Sarig (2004) which predicts that entrepreneurs are willing to take companies public when their cash flows are at a relative peak.

The final contribution of this paper is to add to the recent literature on the bubble period and behavioural attempts to explain the events through the role of investor sentiment. We establish that significant underperformance is concentrated in the bubble period of 1998-2000.⁵ The results indicate a significantly negative relationship between initial returns and post-IPO operating results. Indeed, cross-section regressions indicate that the negative impact of initial returns is significant only in the 1998-2000 period but not in the 1985-1997 period. This is consistent with Krigman, Shah and Womack (1999) who view high underpricing as a signal of investor exuberance.

Pre-IPO earnings deflated by assets have a significantly positive impact on post-issue operating performance only during the 1998-2000 period. Thus lower quality companies with weak operating performance before the float are likely to continue such weak performance post-IPO in the bubble years. This may explain the significant underperformance in this period. These results conform to the conjecture

⁵ We have less than the usual five years of operating data for IPOs between 1998 and 2000 since our sample is truncated in December 2002.

of Ljungqvist, Nanda and Singh (2004) about a fall in operating quality of companies aiming to go public in hot markets such as the bubble period.

The remainder of this paper is organised as follows: In section 2 the literature on post-IPO operating performance, venture capitalists monitoring and IPO timing is reviewed. Section 3 describes the data and methodology used. Section 4 discusses the hypotheses to be tested and Section 5 presents the empirical results related to operating performance. The cross regression results are reported and analysed in section 6. Conclusions appear in section 7.

2. Operating performance, venture capital and timing of IPOs

The puzzling decline in operating performance post-IPO has been extensively documented in the literature. For example, Jain and Kini (1994) use a sample of 2,125 US IPOs from 1976 to 1988 and report that firms going public exhibit a substantial decline in post-issue operating performance. Specifically, the performance of IPO firms declines significantly relative to its pre-IPO levels over the period extending from the year prior to the IPO until five years after the offering. This result holds irrespective of whether performance is based on their operating return on assets or on operating cash flows where both are deflated by assets.

These empirical findings have subsequently been replicated. For instance, they are confirmed by Mikkelsen, Partch and Shah (1997) and Teoh, Welch and Wong (1998) in the US and by Khurshed, Paleari and Vismara (2003) in the UK. The latter use a sample of 415 IPOs issued between 1995 and 1999 both on the Official List (219 IPOs) and the Alternative Investment Market (196 IPOs) of the London Stock Exchange. Overall, these results suggest that investors appear to value firms going public based on the expectation that earnings growth would continue while in actuality the pre-IPO profit margin, on which the expectations are based, is not even sustained.

Jain and Kini (1995) examine the operating performance of US IPOs segregated into venture-backed and non-venture companies. Their data selection approach matches 136 venture-backed IPOs as closely as possible by offering amount to 136 non-venture IPOs in the same industry for the period 1976-1988. They report that venture-backed firms have significantly lower operating returns on assets and operating cash flows over assets compared to non-venture IPOs in the year prior to

the offering. The venture-backed firms have, however, higher capital expenditures deflated by assets compared to the non venture-backed firms.

These results show that monitoring by venture capitalists deters management from cutbacks in capital expenditures or other attempts to window-dress the accounting numbers prior to going public in the hope of securing higher than justified valuations. This is confirmed in recent research by Morsfield and Tan (2003) who find that discretionary accruals are significantly lower for venture-backed IPOs than for non-venture firms. This suggests that venture capitalists behave more like principals than agents in this context. The above evidence is thus supportive of the positive impact of venture capitalist monitoring as reported by Barry, Muscarella, Peavy and Vetsuypens (1990).

Jain and Kini (1995) find dramatic declines in operating performance for both venture and non-venture IPOs relative to their pre-IPO levels, with the decline being significantly deeper for the latter group. Similarly, the venture-backed group demonstrates relatively superior performance in terms of the operating return on assets in each post-issue year relative to the pre-IPO year. Cross-section regression analysis confirms that venture capital participation and higher quality venture capital monitoring leads to improved performance. In addition, Jain and Kini show that the capital market recognises the value of venture capitalist monitoring which is reflected in the higher levels of market-to-book and P/E ratios at the time of the offering. The results are interpreted as supporting the contention that venture capitalists are able to take issuers public at higher P/E ratios. These findings can, however, also be interpreted in line with Lerner's (1994b) argument that venture capitalists are highly proficient at timing the IPO market and of taking advantage of windows of opportunities as proposed by Loughran and Ritter (1995).⁶

Brav and Gompers (1997) extend the debate and confirm the findings on IPO timing in general which was first highlighted by Ritter (1991) and Loughran and Ritter (1995). They compute yearly cohort results and find that years of greatest IPO activity are associated with the most severe underperformance. Benninga et al. (2004) similarly show that IPOs appear to cluster during periods in which investors place relatively high values on the cash flows of the firms that go public. Draho (2001) argues that the recent frenzy over internet-related IPOs was a direct consequence of

⁶ Lerner (1994b) uses a sample of 750 privately held biotechnology firms financed by venture capitalists between 1978 and 1992, including 136 IPOs and 614 private financings.

the sharp increase in the valuation of the companies prior to and during the frenzy. Conversely, the Benninga et al. model indicates that firms are taken private when the market valuation of the expected cash flows is low. They show that the option to reprivatise recently issued firms is not trivial. Almost half the firms that go public are delisted, one way or another, within five years after the IPO.⁷ Their model complements the adverse selection argument of Leland and Pyle (1977) which states that insiders have private information on their firms' prospects and only propose to float them on the public markets when their profitability is about to decline permanently.

3. Data and methodology

3.1 Data selection and sources

A sample of 568 IPOs from January 1985 to December 2000 was collected from the issues of the Quality of Markets Quarterly Review and Primary Market Fact Sheets published by the LSE. IPOs of investment trusts, financial companies, building societies, privatisation issues, foreign-incorporated companies, unit offerings and spin-offs are excluded. The filtering process also excludes share issues at the time of a relisting after a firm was temporarily suspended or transfers from lower tier markets such as the now defunct Unlisted Securities Market or Alternative Investment Market.⁸ The final sample thus consists of IPOs of ordinary shares by domestic operating companies on the Official List of the London Stock Exchange with listing methods comprising placements or offers for sale at a fixed price.⁹

Venture-backed IPOs are defined as those IPOs where a venture capitalist is included as a minimum 3% (or 5%) shareholder in the listing prospectus.¹⁰ Venture capitalists are investment firms included in the directories of the British Venture Capital Association (BVCA), European Venture Capitalist Association (EVCA) or National Venture Capitalist Association (NVCA – the US venture capitalist

⁷ CMBOR (2001) reports 42 going private deals in 2000 in the UK alone, representing 40% of the total UK buy-out market value.

⁸ The filtering process is consistent with the methodologies used in recent IPO research papers. See for example Espenlaub, Gregory and Tonks (2000), Espenlaub, Goergen and Khurshed (2001) for the UK and Bradley, Jordan, Roten and Yi (2001) for the US.

⁹ The sample of 568 IPOs used in this paper is the result of the filter described above applied to a total of 2,285 IPOs that listed in the period on the Official List of the London Stock Exchange.

¹⁰ There are two different threshold requirements to define venture-backed IPOs because in some IPO prospectuses shareholders with holdings larger than 3% are listed separately while in others only those with holdings larger than 5% are listed separately.

association) as well as those listed in the database of Venture Economics Inc., a consulting firm that tracks investments and fundraising by venture capital firms.

To avoid a survivorship bias, any changes in venture capitalist names or funds managed are recorded using BVCA, EVCA and NVCA directories since 1985 where available. The venture-backed IPOs identified through the above process were compared to those compiled by the UK Venture Capital Journal for 1985 – 1989 and the BVCA between July 1992 and December 2000. However the ownership information in the prospectus is always deemed accurate in cases of discrepancies.¹¹ The 568 IPOs in the sample include 304 venture-backed and 264 non-venture IPOs.

Information on the issue date of the company, type of issue, market value, proceeds raised, name of lead underwriter as well as business sector are taken from the LSE Quality of Markets Quarterly Reviews, Primary Market Fact Sheets and Yearbooks. Underwriters are classified according to the annual ranking in Hambro Companies Guides. Throughout the paper, all pound sterling values have been converted to pounds of 2002 purchasing power using the Retail Price Index.

IPO prospectuses were inspected in Companies House, Extel Financial microfiches and Thomson Financial Global Access Database to obtain information on pre-IPO operating performance, ownership, board membership and identities of investors. Specifically, the ‘Substantial Shareholders’ and ‘Placing/Offer Agreement’ sections of the prospectus were used to collect venture capitalists’ pre- and post-IPO equity holdings and sale of ordinary shares. The data on venture capitalists’ board participation and period of board tenure were collected from the ‘Board of Directors’ section that identifies the top executives and directors of the issuing company. Board members who represent venture capitalists are usually designated as such. The venture capitalist shareholdings one year post-IPO has been collected from the issuer accounts and LSE Yearbooks.

The venture capitalists’ year of incorporation, dates and sizes of funds raised are from the BVCA, EVCA and NVCA directories as well as venture capitalists’ websites and Venture Economics Inc. When venture capitalists syndicate their investments with other venture capitalists, one investor usually takes the role of lead venture capitalist. The lead venture capitalist is defined as the one with the highest

¹¹ The discrepancies occurred where IPOs are listed as venture-backed in the UK Venture Capital Journal or by the BVCA but no venture capitalist is listed as a shareholder in the IPO prospectus. This may be because the venture capitalists’ stake is too small to be listed in the IPO prospectus, venture capitalists have sold their stake before IPO or hold non-equity claims.

equity stake prior to IPO, indicating higher effective control over the decisions of the firm, similar to the definition used by Barry et al. (1990). If two or more venture capitalists hold equivalent positions, the one with board representation is classified as lead. VC reputation is measured by an index based on the venture capitalist's age before the IPO and number of deals involved in as lead over the 16 years of the study. Those venture capitalists with a reputation index value greater than the average are classified as having an established reputation (see Lin and Smith (1998)).¹²

Post-issue operating data was sourced from the Hambro Companies Guide and issuer accounts. Delisting data are from the London Stock Exchange Yearbooks. The offering and closing prices on the first day of trading, market value at IPO and post-issue were taken from *Datastream* which was also used to cross-reference post-issue operating data and delisting information.

3.2 Methodology

The operating performance of IPOs is measured from the fiscal year before the IPO until five years post-IPO using the median as the standard measure in line with the existing literature.¹³ The median change is computed for less than five years post-IPO for some companies due to lack of data as a consequence of delistings and the fact that accounting data were only collected until December 31, 2002.¹⁴ Throughout the paper, operating performance is calculated using the ratio of operating cash flow deflated by total assets.¹⁵

Clementi (2002) states that the operating cash flow deflated by total assets ratio is less vulnerable to accounting manipulation than for example operating return on assets. Operating return on assets is potentially subject to artificial earnings inflations in the years prior to the IPO when using discretionary accruals adjustments as shown by Teoh, Welch and Wong (1998). Clementi argues however that the dramatic decline in operating performance post-IPO reported in the literature is not consistent with the

¹² The index value is calculated as follows:

Index of lead venture capitalist reputation = $0.5 * (\text{Age of lead venture capitalist} - \text{Mean age}) / \text{age} + 0.5 * (\text{Number of deals as lead by lead venture capitalist} - \text{Mean number of deals as lead}) / \text{deals}$

¹³ See for example Jain and Kini (1994), Mikkelsen et al. (1997) and Loughran and Ritter (1997).

¹⁴ For the overall sample, about 30% of companies delist within five years of their IPO. See Jain and Kini (1999, 2000) for survival rates of IPO firms in the US.

¹⁵ The operating cash flow is defined as the operating income less capital expenditure, where operating income equals net sales less cost of goods sold and selling, general and administrative expenses before depreciation, depletion and amortisation. See Jain and Kini (1994, 1995), Kaplan (1989) and Smith (1990) for a similar approach.

above creative accounting explanation which should lead to smooth declines post IPO in order to avoid legal action against the management. He thus concludes that the decline in measures of operating performance is a genuine reflection of decreasing profitability.

The change in operating performance is measured as its median change. For example, the variable [Operating cash flows on assets, (t) – Operating cash flows on assets, (-1)] represents the increase in operating cash flows on assets for a firm measured over a time-window starting one year prior to IPO to t fiscal years after the IPO. All reported significance tests are based on the Wilcoxon signed rank test of the null that the changes are zero. Furthermore, Z-statistics are computed to conduct Wilcoxon matched-pairs signed rank tests of the null hypothesis that the distribution of operating performance is identical for venture-backed and non-venture IPOs.

4. Hypotheses

(i) Decline in operating performance post-IPO

According to classical theory, there is no reason why IPOs should exhibit declines in post-issue operating performance relative to the pre-IPO year. If anything, post-issue operating performance should improve due to increased access to capital and to stock market monitoring. Behavioral approaches suggest that post-issue operating performance should mirror post-issue financial performance and thus exhibit a long run decline. For instance, Benninga et al. (2004) argue that owners decide on a flotation before the firm's profitability declines. They develop a theoretical model consistent with the above view, showing that companies are taken public only when outside investors are ready to pay a higher price for a firm's cash flows than the entrepreneur's valuation of these flows.

Hypothesis 1

H₀: IPOs do not exhibit declines in post-issue operating performance relative to the pre-IPO year.

H₁: IPOs do exhibit declines in post-issue operating performance relative to the pre-IPO year.

(ii) Market timing

A division into bubble and normal periods would allow one to test behavioural theories of market timing. These posit that IPOs floated in a bubble market period underperform more severely compared to those floated in normal markets due to the more pronounced influence of market sentiment in the former period. For instance, Ljungqvist et al. (2004) stipulate in a formal model that IPOs underperform in bubble markets due to the existence of sentiment investors driving prices beyond their fair value. In this paper the bubble period is defined as the 1998-2000 period consistent with the definition used by Ofek and Richardson (2002).¹⁶

Hypothesis 2

H₀: There post-issue operating performance of IPOs floated is similar over different time periods.

H₁: IPOs floated during bubble market suffer greater declines in operating performance when compared with IPOs floated during normal market periods.

(iii) Venture-backed versus non-venture IPOs

Hellmann and Puri (2002) find that venture capitalists play a crucial role in making their portfolio companies more professional organisations. Likewise, Jain and Kini (1995) argue that venture capitalists provide post-issue value-additive monitoring services. They find that venture-backed IPOs exhibit relatively superior post-issue operating performance compared to a control sample of non-venture IPOs.

Hypothesis 3

H₀: Venture-backed IPOs generate superior post-IPO operating performance compared to non-venture IPOs.

H₁: There is no difference in post-IPO operating performance between venture and non-venture IPO performance.

(iv) High technology sector

A large proportion of the high-technology IPOs in our sample went public during the 1998-2000 period. This is a period when investor enthusiasm for the internet in particular was at its height, as documented inter alia by Ofek and Richardson (2002) for the US.¹⁷ They show that a significantly larger proportion of investors in internet

¹⁶ The US and UK stock markets are closely linked.

¹⁷ Indeed, 65% of our venture-backed sample in that period are high-tech firms while only 26% are high-tech in the 1985-1997 period.

stocks consisted of individuals rather than institutions, making the market increasingly prone to behavioural biases that lead to overly optimistic beliefs. Ofek and Richardson develop a framework in the spirit of Miller (1977) arguing that irrationally exuberant investors overwhelmed the market with their unrealistically high valuations, in particular in the high-technology sector. Thus high-technology IPOs should exhibit significant post-issue operating performance declines.

Hypothesis 4

H₀: Post-issue operating performance is the same across industry sectors.

H₁: Post-issue operating performance is poorer in the high technology sector.

(v) Venture capital variables

Meggison and Weiss (1991) first formulated the classical VC certification hypothesis that, due to asymmetric information, venture capitalists function as certifying agents to the issuing firms. This has been supported in various guises by many researchers. Barry et al. (1990) show that venture capitalists exercise strong controls over their portfolio companies, mainly due to large block shareholdings and active participation in the board of directors. Lerner (1994a) demonstrates that syndication among venture capitalists may lead to a superior selection of investments, by bringing together more expertise, support and access to capital. Gompers (1996) cites industry wisdom that established venture capitalists with long track records can quickly and easily raise large funds. Brav and Gompers (1997) argue that reputable venture capitalists provide access to top-tier investment and commercial bankers, participate on the board of directors and implement superior management structures.

Hypothesis 5

H₁: There is a positive relationship between the reputation and involvement of the venture capitalists pre-IPO in the issuing firm and its long run post-IPO operating performance.

H₁: There is no significant relationship in this case.

(vi) Impact of underpricing

Based on the signalling theories of Allen and Faulhaber (1989), Grinblatt and Hwang (1989) and Welch (1989), Jain and Kini (1994) conjecture that low-value firms are unlikely to incur the cost of underpricing in order to look like high-value firms. This is because the true firm value is likely to be revealed at the time of assumed

secondary offerings shortly after the IPO. In the resulting separating equilibrium, only high-value firms underprice at the offering. Assuming that post-IPO operating performance proxies for unobservable firm quality at the time of the offering, the signalling models of underpricing predict that IPO firms that underprice should exhibit superior operating performance compared to those that do not.

Alternatively, behavioural finance theories view the role of underpricing in a rather different light. For instance, high underpricing is taken as a signal of investor exuberance in behavioural contributions such as that of Krigman, Shah and Womack (1999). In the context of models such as theirs, higher initial returns foreshadow declines in operating performance.

Hypothesis 6

H₀: There is a positive relationship between underpricing of the IPO and its post-IPO operating performance.

H₁: There is a negative relationship between underpricing of the IPO and its post-IPO operating performance.

(vii) Pre-IPO earnings quality

Ljungqvist et al. (2004) conjecture in their Prediction No 6 that lower-quality companies go public for opportunistic reasons in hot IPO markets. This results in a decline in the quality of the average issuer and particularly in its earnings deflated by total assets. Ljungqvist and Wilhelm (2003) show that some 62% of firms listing in the US in 1997 had 12-month track records of earnings while this had fallen to just 23.6% in 1999. It thus follows that the poor pre-IPO performance of low quality companies going public in bubble periods or hot markets will be reflected in inferior long-term post-IPO operating performance.

Hypothesis 7

H₀: There is no relationship between pre-IPO earnings (turnover) growth deflated by assets and post-issue operating performance.

H₁: There is a positive relationship between pre-IPO earnings (turnover) growth deflated by assets and post-issue operating performance.

5. Empirical results

5.1 Descriptive statistics of pre-IPO operating performance levels

Table 1 presents summary operating results and performance ratios for our sample.

[Table 1 around here]

Panel A provides descriptive statistics for the full sample of 568 IPOs as well as separately for the 304 venture-backed and 264 non-venture IPOs at the fiscal year prior to the offering. The pre-IPO data for the overall sample indicate that the firms coming to market are relatively small. They have a median market capitalisation of £54m, median sales of £27m and median operating income of £3.1m.

Venture-backed companies are significantly larger businesses in terms of market capitalisation and book value of assets and liabilities compared to non-venture floatations. The median market capitalisation of venture-backed IPOs is £65.8m, more than 50% higher than for non-venture IPOs at £40.5m and significantly different at the 1% level. Similarly, venture-backed IPOs' prior year total assets and liabilities are significantly larger at the 1% level compared to non-venture companies, at £21.5m and £14.8m versus £17.1m and £10m, respectively. These results are in line with Lin and Smith (1998) and Megginson and Weiss (1991) who also find significant differences in assets and liabilities between their venture and non-venture IPO sample.¹⁸

Panel A shows that venture-backed companies have higher operating income and cash flows in the pre-IPO year at £3.6m and £1.9m versus £2.6m and £1.2m for non-venture firms, respectively. The difference is significant at the 5% level. The findings are consistent with the sample venture-backed firms including many buyouts. The latter usually are large, highly cash generative businesses that involve relatively high levels of debt in order to increase the equity returns of the venture capitalists.

Table 1, Panel B compares the median operating ratios for the full sample and for venture-backed and non-venture IPOs. Venture-backed IPOs have significantly larger liabilities/assets and smaller sales/assets ratios at the 1% level compared to non-venture IPOs, at 72.4% and 142.4% versus 67.7% and 164.6%, respectively. The capital expenditure/assets ratio for venture-backed IPOs is smaller compared to non-venture IPOs only at the 10% level of significance.¹⁹ However, the pre-IPO operating

¹⁸ Jain and Kini (1995), however, find no significant differences in prior year total assets between venture-backed and non-venture IPOs.

¹⁹ Jain and Kini (1995), however, find that venture-backed IPOs have significantly lower operating return on assets and operating cash flows over assets compared to non-venture IPOs in the year prior to the IPO. Furthermore, they find that venture-backed IPOs have significantly larger median capital expenditures over book value of total assets compared to non-venture floats.

performance levels are not significantly different between venture-backed and non-venture IPOs.

5.2. Operating performance change by cohort year

Table 2 reports the results on the median change in operating cash flow deflated by total assets from the fiscal year prior to the IPO to five years post-IPO by cohort year.

[Table 2 around here]

The first three columns show the number of IPOs between 1985 and 2000 both for the full sample and then separately for venture-backed and non-venture IPOs. The next three columns report the median change in operating cash flow deflated by total assets for these three categories of IPOs and the last column reports the significance tests for difference in medians between venture and non-venture IPOs.

The number of IPOs has been highly variable over the sample period. Particularly noticeable is the relatively large number of IPOs during the mid-1990s and 2000 and the relative scarcity of offerings pre 1993. The null in Hypothesis 1 is that IPOs do not exhibit significant operating declines relative to the pre-IPO year. Table 1 however shows that UK IPOs have experienced significant overall declines in their operating performance. The median operating cash flow deflated by total assets decreased by -1.65% in the six years from the pre-IPO data to five years post-IPO and this is significantly different from zero at the 5% level. Thus we can reject Hypothesis 1. This novel result for the UK spanning the 1985-2000 period supports that of Khurshed et al. (2003). They find similar results for a sample of UK IPOs issued during the 1995-1999 period both on the Official List and the Alternative Investment Market of the LSE.²⁰ Our findings are also in line the US findings of Mikkelsen et al. (1997) and Jain and Kini (1994) who both report significant declines in post-IPO operating performance.

Hypothesis 2 stipulates that post-issue operating performance is similar over time. IPOs in thirteen of the sixteen years of the sample period show no significant operating performance change five years post-IPO. There is significant improvement of 8.34% in cash flows deflated by assets for IPOs issued in 1985. However, IPOs issued in 1999 and 2000 suffered significant operating declines at the 5% and 1%

²⁰ Note that they examine operating performance three years post-IPO relative to the pre-issue year versus the five year post-IPO horizon used in this paper.

levels, respectively.²¹ This confirms the decline in operating quality of IPOs during bubble markets as stipulated by Ljungqvist, Nanda and Singh (2004). Ljungqvist and Wilhelm (2003) also show a dramatic decline in earnings quality of US IPOs between 1997 and 1999. We can thus reject Hypothesis 2 given that there is significant evidence for time-variation in post-issue operating performance between different time periods, with significant declines concentrated in the 1999 and 2000 calendar years.

For the venture-backed sample, the overall underperformance of -0.11% after five years is not significantly different from zero. By contrast, the underperformance of -2.95% for non-venture IPOs is significant at the 1% level. This suggests that IPO operating decline is mainly a non-venture phenomenon in the UK. Contrary to Hypothesis 3 and Jain and Kini (1995), the performance differential between venture-backed and non-venture IPOs is almost never significant. Indeed, there is a significant difference in operating performance between venture and non-venture IPOs only in three years: 1987, 1989 and 1996.²² Hypothesis 3 thus can be rejected for the overall sample excluding these exceptions.

Venture-backed IPOs show significant increases in post-IPO operating performance only in 3 years, 1985, 1989 and 1992. However, they experience sharp declines in operating performance of -9.65% and -26.38% in 1998 and 2000 that are significant at the 10% and 1% levels, respectively. Non-venture IPO operating performance is significant only in 1999 and 2000 with figures of -6.97% and -9.56% which are significant at the 10% and 1% levels, respectively. We conclude that both types of IPOs issued during the bubble period of 1998-2000 exhibit sharp decreases in operating cash flows over assets, contrary to Hypothesis 2.

5.3 *Operating performance by industry*

Table 3 reports the number of IPOs and median change in operating cash flow for twelve industry sub-sectors and three aggregate sectors classified according to the LSE 2000 Yearbook

[Table 3 around here]

²¹ These results may be affected by the truncation of our sample in December 2002.

²² Venture-backed IPOs outperform non-venture IPOs in 1987 and 1989 at the 5% level of significance and in 1996 at the 1% level of significance.

The first three columns show a fairly even split across sectors with 206 IPOs in the services sector, followed by 183 in high-technology and 179 in industry. The split between venture-backed and non-venture IPO is fairly similar .

This industry split contrasts with US IPO studies that usually report a strong bias towards the high-technology sector as stated by Jain and Kini (1995) for example. The difference in industry specialisation by venture capitalists is likely due to the fact that UK venture capitalists operate mainly in buyouts and expansion capital across many different sectors. Early stage technology investment, the true venture capital as known in the US, represents only a fraction of capital deployed in the UK venture-capital market. The European Venture Capital Association (EVCA) reports for example that 88% of the total investment amount in the UK was in buyouts and expansion capital deals in 2000. Buyouts are usually carried out with high levels of debt so that stable business sectors with high quality cash flows are needed to support the leverage in these transactions.²³ The present sample thus provides a more balanced representation by industry and sector of the IPO market than do US studies.

Hypothesis 4 states that post-issue operating performance is similar across industry sectors. For the full sample, a sharp decline of -4.78% in operating performance is discernible only for high-technology IPOs. Hypothesis 4 can thus be rejected since this is statistically significant at the 1% level. It is consistent with the results in Table 2 since most high-technology IPOs were floated during the 1998-2000 bubble period.

The Table reveals significant declines at the 5% level for both venture-backed and non-venture IPOs of some -4.85% and -4.49%, respectively, in the high-technology sector. Non-venture IPOs also exhibit significant decreases in operating cash flows over assets in the industry sector, with a fall of -4.01% five years post-IPO relative to the pre-IPO year. This is the only sector in which non-venture IPOs perform significantly worse than venture-backed companies at the 10% level of significance.

IPOs in the telecom/IT sector experienced the sharpest decline of some -39% in median operating performance for the full sample. This is statistically significant at the 1% level. Other high-technology sub-sectors that declined significantly include health/pharmaceuticals with -8.12% (significant at 10% level) and

²³ Seed and start-up investments in 2000 represented only about 12% by capital invested in the UK and that was a large increase relative to the previous years.

media/photography with a fall of -1.82% (significant at the 5% level). By contrast, IPOs in the electronic/electrical equipment sector showed a significant operating performance improvement of 7.00% for the full sample at the 1% level.

These results are mirrored when looking separately at venture-backed and non-venture companies. Venture-backed IPOs experienced steep operating declines of some -34.74% and -26.03% in the telecom/IT and health/ pharmaceuticals sub-sectors that are significant at the 1% and 5% levels, respectively. Non-venture IPOs in the telecom/IT sub-sector also declined dramatically by -46.24% which is significant at the 1% level.²⁴ The evidence so far conforms to the Ljungqvist et al. (2004) view that poor-quality IPOs, both venture-backed and non-venture, were taken public during the 1998-2000 bubble period in the telecom and IT sector which subsequently suffered considerable decreases in operating cash flow over assets.

5.4 Operating performance by capital market and operational variables

The results of univariate analysis of operating performance using capital market and operational sorts are presented in Table 4.

[Table 4 around here]

The simple sorts include prestigious versus non-prestigious underwriter, high versus low initial return, old versus young issuing firm, high versus low market capitalisation or gross proceeds, high versus low revenues, profitability or net assets three years pre-IPO. The median cut-off points were recalculated separately for the whole sample, and for venture-backed and non-venture IPOs to take into account sample variation.

The full sample column presents a number of interesting trends with only one of the sorts in each category showing significant declines in operating performance.²⁵ For example, IPOs sponsored by low-prestige underwriters, as defined by annual Hambro underwriter rankings, and young IPOs generate significant declines in operating performance at the 5% and 1% levels with figures of -2.98% and -2.92% , respectively.

Interestingly, companies with lower revenues and profitability (using operating profit deflated by total assets as the profitability measure) in the three years pre-IPO

²⁴ The health/pharmaceuticals sub-sector was the only one with significantly different performance between venture-backed and non-venture IPOs. In that case, venture-backed IPOs performed significantly worse compared to non-venture IPOs at the 10% level.

²⁵ The raw initial return and net assets/liabilities sorts are the only ones for the full sample of IPOs where both IPOs with high and low sorts failed to generate significant declines in operating performance.

experience significantly worse operating performance of -6.06% and -3.49% , respectively, both significant at 1%. This can be interpreted as lower quality companies performing worse post-IPO and the split into venture-backed and non-venture IPOs sheds further light on this. Only venture-backed companies with below-median revenues and net assets/liabilities pre-IPO generated significant decline post-issue. These posted falls of -4.98% and -4.90% that are significant at the 5% and 10% levels, respectively.

All categories of non-venture IPOs show significant declines in operating performance for one of the two sorts. Similar to the overall sample, IPOs sponsored by low-prestige underwriters and those that are younger indicate post-issue operating declines of -4.01% and -4.29% , respectively, that are both significant at 1% level. Likewise, companies with weaker pre-IPO performance show significant declines whether using revenues, profitability or net assets/liabilities. Contrary to results found for the overall sample, non-venture IPOs exhibit significantly worse operating returns when they are smaller and issue less proceeds, at the 5% and 1% levels, respectively. Finally, non-venture IPOs with high raw initial returns show decreases in operating cash flows over assets of -3.49% post-IPO, that is statistically significant at the 1% level. Venture-backed IPOs with high initial returns and low net assets/liabilities outperform non-venture IPOs at the 1% levels while those with low market cap and proceeds outperform non-venture IPOs at the 10% level.

6. Regression results

6.1 Regression variables

The results of tests of hypotheses 4-7 in a cross-section regression framework are presented in Tables 5 and 6. The estimation method is ordinary least squares and t -statistics calculated using White's (1980) heteroskedasticity-consistent method. The dependent variable in all specifications is the change in operating cash flows deflated by total assets from the fiscal year preceding the IPO up to five year after the IPO.

Hypothesis 5 is examined using a number of proxies for venture capital involvement and reputation. The VC variable is a dummy for venture-capital involvement that equals 1 if the IPO was venture-backed and zero otherwise. The VCREP dummy variable equals 1 if the IPO's lead venture capitalist has an established reputation as defined previously and zero otherwise. The relationship

between venture capitalists' funds under management and IPO operating performance is proxied by the variable VCFUND which is the natural logarithm of the (average) funds managed by the venture capitalists before the IPO. Further venture capitalist-related variables used derive from Lerner (1994a), Megginson and Weiss (1991) and Barry et al. (1990) and include the number of venture capitalists holding equity stakes at the IPO (NOVC), the aggregate venture capitalist equity stake before the IPO (VCSTAKE0) and a dummy variable coded 1 if there is a venture capitalist on the board at the time of IPO (DIR). As stated above, a positive relationship is expected between these variables and IPO operating performance according to Hypothesis 5.

The FIRST DAY RETURN variable is the raw return on the first day of trading. This variable is used in tests of the signalling theories behind Jain and Kini's (1994) hypothesis that predicts that companies with higher underpricing signal better post-IPO operating performance in line with Hypothesis 6. The alternative views high underpricing as a signal of investor exuberance and thus predicts that higher initial returns foreshadow substantial declines in operating performance.

Two operating variables are incorporated to represent the impact of pre-IPO operating ratios on post-IPO operating performance in line with Hypothesis 7. The variables are TURNOVER/ASSETS and EBIT/ASSETS (with operating income divided by total assets as the profitability measure). They represent the growth in the level of turnover and EBIT, respectively, between up to three years pre-IPO and the fiscal year of the IPO divided by the average total assets in those four years.²⁶ A positive relationship is predicted between both EBIT/ASSETS and TURNOVER/ASSETS and long run performance in hot markets under the alternative of Hypothesis 7.

Two variables are included in the regressions to represent firm age and size: the natural logarithm of the age of the issuer at IPO (AGE) and the natural logarithm of the issuer's market capitalisation at IPO (MARKETCAP). The UNDERWRITER dummy variable is used to control for underwriter reputation and equals 1 if the IPO's lead underwriter is listed in the top-ten in the annual Hambro underwriter rankings. Industry dummies are also included in the regression analysis as research by Levis (1993) has shown that there are marked differences in the long-run performance of

²⁶ Khurshed (1999) uses a similar approach.

individual industries. The SERVICES dummy captures distributors and retailers, leisure, restaurants and transport as well as support services. The HIGH-TECH dummy includes electronic and electrical equipment, health and pharmaceuticals, media and photography as well as telecom, IT hardware and software.

6.2 Cross-section regression results

Table 5 reports the results of the operating performance regressions for the full sample. The first specification uses the VC dummy for testing Hypothesis 5 while the second specification uses separate proxies for VC involvement. Table 6 reports the results of the same approach applied separately to the 1985-1997 and 1998-2000 samples, to analyse better the effect of the internet bubble period on post-IPO operating cash flows deflated by total assets.²⁷

[Table 5 around here]

In the first specification using the full sample of 568 IPOs, the coefficient on the VC dummy is significantly positive at the 5% level. Thus Hypothesis 5 cannot be rejected.

The coefficient on the initial return variable is significantly negative at the 5% level and so we reject Hypothesis 6. This is a novel finding as neither Jain and Kini (1994) nor, more recently, Khurshed et al. (2003) manage to find any significant relationship between underpricing and post-issue operating performance. However, our results are consistent with findings by Krigman et al. (1999) that show that IPOs with high initial returns are likely to be affected by investor sentiment and thus can foreshadow operating underperformance post-issue. Interestingly, these findings link with the fact that the coefficient on the high-technology variable is also significantly negative at the 5% level and so we can reject Hypothesis 4.

The coefficients on all the previous variables continue to be significant in the second specification. Those of the pre-IPO stake held by venture capitalists and their funds under management pre-IPO show a significantly positive impact on post-IPO operating returns at the 10% and 5% levels, respectively, in line with Hypothesis 5. However, the VCREP variable coefficient is significantly negative at the 10% level, suggesting a negative impact of venture capital reputation on post-IPO operating performance. While this rejects Hypothesis 5, we note that it is consistent with

²⁷ A number of other regression specifications were tested, but none of those were significant or produced significant results.

Lerner's (1994b) venture capitalist market-timing hypothesis that more reputable venture capitalists are successful at timing IPOs.

Table 6 reports the separate results for the 1985-1997 and 1998-2000 periods.

[Table 6 around here]

We initially summarise the results from the first specification for the 1985-1997 period.²⁸ The venture capital dummy coefficient is significantly positive at the 5% level supporting Hypothesis 5. However, none of the coefficients of the other pre-IPO operating or industry-related variables is statistically significant apart from that on the AGE variable. The second specification for the same period shows that the coefficients of the pre-IPO venture capitalist stake and funds under management both are significantly positive at the 5% level supporting Hypothesis 5.

The coefficient of determination increases sharply to 26.4% and 27.6% in specifications three and four, respectively, for the 1998-2000 sample period. Interestingly, the positive VC impact during the 1985-1997 period is not in evidence now. Indeed, none of coefficients of the venture-capital related variables is now significant in these two specifications. This rejects Hypothesis 5 and VC certification for the 1998-2000 period.

The EBIT/ASSETS variable coefficient is significantly positive in both specifications at the 1% level and this rejects Hypothesis 7. This is consistent with pre-IPO, poorly performing companies continuing to perform poorly afterwards. The initial return variable coefficient is significantly negative at the 10% and 5% levels, for specifications 3 and 4, respectively, while the coefficient of the high-technology variable is significantly negative at the 10% level in specification 4. These results reject Hypotheses 6 and 4. They point towards investor sentiment impacting on IPOs with high initial returns and in the high-tech sectors whose post-issue operating performance crashed.

7. Conclusions

This paper analyses the post-issue operating performance of a unique sample of 304 venture-backed and 264 non-venture UK IPOs over the course of the 1985-2000 period. Our sample focuses exclusively on IPOs on the Official List of the London Stock Exchange. Similar to previous US samples, ours exhibits a significant decline

²⁸ Note that our dependent variable is now truncated at December 2002 and so represents operating performance over an average of 3.5 years only.

in operating performance five years after the offering compared to the pre-IPO year. These results confirm the operating underperformance puzzle for the UK market and the earlier findings of Khurshed et al. (2003) over the shorter 1994-1999 period.

We find that operating underperformance is significant for non-venture IPOs overall but not for venture-backed IPOs. However the difference between them is not statistically significant. Cross-section regressions indicate that venture-capitalist certification has a significantly positive impact on operating performance during the normal years but this certification ceases to be significant during the 1998-2000 bubble years. Venture capitalist reputation actually has a negative impact on post-IPO operating performance which is consistent with Lerner's (1994b) venture capitalist market-timing hypothesis.

Finally, our findings show that significant operating declines are concentrated in the 1998-2000 bubble period. These findings are consistent with the view that poor-quality IPOs taken public during this period subsequently witnessed a sharp fall in operating cash flow over assets. Cross-section regression results support these claims. Similarly, they indicate a significantly negative relationship between initial returns and post-IPO operating returns in the 1998-2000 bubble years but not in the 1985-1997 period. These findings are in line with the behavioural finance theories of researchers such as Loughran and Ritter (1995), Krigman et al (1999) and Ljungqvist et al. (2004). More generally our results are in line with the Baker and Wurgler (2002) market timing theory of capital structure and the Benninga et al. (2004) model prediction that entrepreneurs undertake IPOs only when operating performance is about to deteriorate. We conclude that the bubble years point to the influence of both market timing and investor sentiment on long run operating performance.

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Table 1: Descriptive statistics of pre-offering operating results, 1985-2000

Panel A: Prior year operating figures and market value at IPO

	Medians (2002 prices)			<i>Wilcoxon signed-rank test for medians venture backed versus non-venture backed IPOs</i>
	All IPOs	Venture backed IPOs	Non-venture backed IPOs	
Prior year sales, in £m	26.98	29.42	24.74	1.51
Prior year operating income, in £m	3.06	3.58	2.56	2.08**
Prior year earnings per share (EPS), in pence	10.25	10.38	10.11	0.34
Prior year book value of total assets, in £m	19.28	21.50	17.09	3.28***
Prior year book value of equity, in £m	4.94	5.10	4.71	0.71
Prior year book value of total liabilities, in £m	12.15	14.78	9.98	3.62***
Prior year capital expenditure, in £m	1.09	1.18	0.98	1.44
Prior year operating cash flows, in £m	1.39	1.90	1.17	2.24**
Market value, in £m	54.13	65.75	40.53	5.33***

Panel B: Prior year operating ratios

	Medians (%)			<i>Wilcoxon signed-rank test for medians venture backed versus non-venture backed IPOs</i>
	All IPOs	Venture backed IPOs	Non-venture backed IPOs	
Total liabilities/book value of total assets (%)	69.80	72.39	67.67	2.57***
Sales/book value of total assets (%)	152.03	142.43	164.55	2.65***
Operating income/book value of total assets (%)	14.56	14.28	15.33	1.49
Capital expenditure/book value of total assets (%)	6.02	5.84	6.51	1.79*
Operating cash flow/book value of total assets (%)	7.07	7.74	6.31	0.53

Descriptive sample statistics for 304 venture backed IPOs and 264 non-venture backed IPOs listed on the Official List of the London Stock Exchange between January 1985 to December 2000. The venture backed IPOs are all new issues within the sample with venture capital participation recorded in the IPO prospectus. Operating income is before interest and tax. The book value of total assets is defined as the book value of equity plus debt. Market value is defined as market price at IPO times number of shares outstanding plus book value of debt. Operating cash flows are defined as operating income less capital expenditures. Prior year is the fiscal year preceding the year during which the firm goes public. Accounting data is from the prospectus, Hambro Company Guide and issuer accounts. The significance tests for the difference in medians are based on the Wilcoxon signed rank test. One, two and three asterisks indicate significance, at the 10%, 5% and 1% level or better, respectively.

Table 2: Operating cash flow over assets five years post-IPO relative to pre-IPO

Year	Number of all IPOs	Number of venture backed IPOs	Number of non-venture IPOs	Median change in operating cash flow over assets -1 to +5 All IPOs	Median change in operating cash flow over assets -1 to +5 Venture-backed IPOs	Median change in operating cash flow over assets -1 to +5 Non-venture IPOs	Wilcoxon signed-rank test for medians venture backed versus non-venture backed IPOs
1985	22	7	15	8.34**	11.34**	8.23	1.051
1986	34	10	24	3.17	2.39	3.17	0.303
1987	35	19	16	-0.35	2.90	-3.58	2.351**
1988	32	13	19	-0.02	5.07	-9.45	1.189
1989	18	8	10	3.29	7.21**	-7.41	2.266**
1990	7	5	2	-4.57	-4.57	11.58	0.581
1991	5	2	3	-3.45	3.19	-23.19	0.289
1992	23	16	7	5.61	9.44**	-2.26	0.568
1993	54	35	19	-2.35	-0.91	-7.91	0.996
1994	86	44	42	-6.25	-8.14	-3.27	1.084
1995	44	26	18	0.87	-1.31	7.85	0.752
1996	56	32	24	-0.30	2.93	-6.67	2.815***
1997	52	30	22	2.30	-0.37	5.72	0.519
1998	29	18	11	-4.01	-9.65*	-2.47	0.472
1999	18	9	9	-10.40**	-22.90	-6.97*	0.088
2000	53	30	23	-21.60***	-26.38***	-9.56***	0.242
1985-1997	468	247	221	-0.12	1.24	-2.26	1.257
1998-2000	100	57	43	-13.57***	-21.60***	-6.84***	0.411
Total	568	304	264	-1.65**	-0.11	-2.95***	0.797

The sample consists of 304 venture backed IPOs and 264 non-venture backed IPOs listed on the Official List of the London Stock Exchange between January 1985 to December 2000. The venture backed IPOs are all new issues within the sample with venture capital participation recorded in the IPO prospectus. Median change in operating cash flow deflated by total assets is from the fiscal year preceding the IPO up to five years after the IPO, expressed as a percentage. Operating cash flows are defined as operating income less capital expenditures. The median change is measured for less than five years for some companies due to lack of data as a consequence of delistings and the fact that accounting data was only collected until 31 December 2002. Accounting data is from the prospectus, Hambro Company Guide and issuer accounts. The significance tests for the change rates are based on the Wilcoxon signed rank test and test that change rates are different from zero. One, two and three asterisks indicate significance, at the 10%, 5% and 1% level or better, respectively.

Table 3: Operating cash flow over assets five years post-IPO relative to pre-IPO year

		Number of IPOs			Median change in operating cash flow over assets -1 to +5			
Industry codes	Industry classification	All sample	Venture-backed IPOs	Non-venture IPOs	Median change in operating cash flow over assets All IPOs	Median change in operating cash flow over assets Venture-backed IPOs	Median change in operating cash flow over assets Non-venture IPOs	<i>Wilcoxon signed-rank test for medians venture backed versus non-venture backed IPOs</i>
00, 70	Resources and utilities	13	2	11	6.85	6.92	6.85	0.296
10	Basic industries	56	30	26	-1.24	0.24	-4.12	0.846
20	General industrials	37	24	13	0.97	2.72	-3.79	1.049
30	Cyclical consumer goods	40	24	16	-0.65	1.43	-11.18	1.142
41, 43, 46	Beverages, food producers and packaging	33	18	15	-4.38**	-2.34	-6.73**	1.012
51, 52, 63	Distributors and retailers	61	31	30	1.42	3.28	0.45	0.317
53, 56, 59	Leisure, restaurants and transport	68	30	38	0.15	3.12	-2.36	1.457
58	Support services	77	46	31	-1.82	-1.97	-1.82	0.415
25	Electronic and electrical equipment	47	27	20	7.00***	5.99	7.53	0.419
44, 48	Media and photography	48	20	28	-1.82**	0.51	-5.23	0.084
54	Health and pharmaceuticals	42	27	15	-8.12*	-26.03**	-0.12	1.679*
67, 93, 97	Telecom, IT hardware and software	46	25	21	-38.99***	-34.74***	-46.24***	0.738
00, 10, 20, 30, 41, 43, 46, 70	Industry	179	98	81	-1.30	1.00	-4.01**	1.721*
51, 52, 53, 56, 58, 59, 63	Services	206	107	99	-0.04	1.00	-1.81	0.421
25, 44, 48, 54, 67, 93, 97	High-technology	183	99	84	-4.78***	-4.85**	-4.49**	0.261

Median change in operating cash flow deflated by total assets is from the fiscal year preceding the IPO up to five years after the IPO, expressed as a percentage. Operating cash flows are defined as operating income less capital expenditures. The median change is measured for less than five years for some companies due to lack of data as a consequence of delistings and the fact that accounting data was only collected until 31 December 2002. Industry codes are from the London Stock Exchange 2000 Yearbook. The significance tests for the change rates are based on the Wilcoxon signed rank test and test that change rates are different from zero. One, two and three asterisks indicate significance, at the 10%, 5% and 1% level or better, respectively.

Table 4: Operating cash flow over assets five years post-IPO relative to pre-IPO year categorized by various capital markets and operational variables

Variable	Condition	Median change in operating cash flow over assets -1 to +5 All IPOs	Median change in operating cash flow over assets -1 to +5 Venture-backed IPOs	Median change in operating cash flow over assets -1 to +5 Non-venture IPOs	Wilcoxon signed-rank test for medians venture backed versus non-venture backed IPOs
Underwriter prestige	High-prestige	-0.19	0.43	-1.82	0.295
	Low-prestige	-2.98**	-1.30	-4.01***	0.517
Raw initial return	High	-1.39	0.96	-3.49***	2.103**
	Low	-1.75	-1.22	-2.50	1.015
Age	Old	1.00	1.24	-1.47	0.212
	Young	-2.92***	-1.46	-4.29***	0.885
Market cap	High	-1.65*	-1.20	-2.24	0.609
	Low	-1.69	0.79	-3.90**	1.729*
Gross proceeds	High	-1.87**	-1.66	-2.49	0.661
	Low	-1.22	0.79	-3.41*	1.693*
Revenues	High	0.37	1.49	-1.76	0.659
	Low	-6.06***	-4.98**	-6.92**	0.926
Profitability	High	0.67	1.58	-1.70	1.309
	Low	-3.49***	-4.90*	-3.41***	0.221
Net assets/liabilities	High	-1.27	-1.27	-1.81	1.528
	Low	-2.13	0.94	-4.48***	2.478***

The sample consists of 304 venture backed IPOs and 264 non-venture backed IPOs listed on the Official List of the London Stock Exchange between January 1985 to December 2000. The venture backed IPOs are all new issues within the sample with venture capital participation recorded in the IPO prospectus, expressed as a percentage. Median change in operating cash flow deflated by total assets is from the fiscal year preceding the IPO up to five years after the IPO. Operating cash flows are defined as operating income less capital expenditures. The median change is measured for less than five years for some companies due to lack of data as a consequence prior to the IPO. The profitability measure is operating income divided by total assets. Issuer incorporation data are from London Stock Exchange Yearbook. Accounting data is from the prospectus, Hambro Company Guide and issuer accounts. The significance tests for the change rates are based on the Wilcoxon signed rank test and test that change rates are different from zero. One, two and three asterisks indicate significance, at the 10%, 5% and 1% level or better, respectively. All pound values are in 2002 prices. The median change is measured for less than five years for some companies due to lack of delistings and the fact that accounting data was only collected until 31 December 2002. High-prestige underwriters are those listed in the top-ten in annual Hambro underwriter rankings. The raw initial return is the initial IPO return. Age is in months from incorporation to IPO date. Market capitalisation is defined as market price at IPO times number of shares outstanding. Nominal gross proceeds are defined as offer price times shares sold to the public, excluding overallotments. The revenues, profitability and net assets are measured for up to 36-month period

Table 5: Determinants of operating cash flow over assets five years post-IPO relative to pre-IPO year, for the whole sample period

	1	2
Intercept	-0.298** (-2.437)	-0.284** (-2.321)
VC	0.09** (2.255)	
AGE	0.063*** (3.158)	0.061*** (3.023)
MARKETCAP	0.001 (0.02)	0.004 (0.252)
UNDERWRITER	0.075** (2.114)	0.082** (2.284)
VCREP		-0.113* (-1.835)
NOVC		-0.023 (-1.297)
VCSTAKE0		0.001* (1.864)
DIR		-0.02 (-0.459)
VCFUND		0.022** (1.974)
FIRST DAY RETURN	-0.002** (-2.07)	-0.002** (-2.25)
TURNOVER/ASSETS	0.03 (1.104)	0.029 (1.08)
EBIT/ASSETS	0.41 (1.291)	0.411 (1.295)
SERVICES	-0.011 (-0.299)	-0.02 (-0.52)
HIGH-TECH	-0.114** (-2.458)	-0.123*** (-2.625)
Adj. R²	0.166	0.149
F-Stat	12.271***	8.601***
N	568	568

The dependent variable is the change in operating cash flow deflated by total assets from the fiscal year preceding the IPO up to five years after the IPO, expressed as a percentage. VC is a dummy variable, which equals 1 if the IPO was venture-backed and zero otherwise. AGE is the natural logarithm of the age of the issuer at IPO. The natural logarithm of market capitalisation (MARKETCAP) controls for size. The UNDERWRITER dummy variable equals 1 if the IPO's lead underwriter is listed in the top-ten in annual Hambro underwriter rankings. The VCREP dummy variable equals 1 if the IPO's lead venture capitalist has an established reputation as defined previously. NOVC is the number of venture capitalists holding equity stakes at the IPO. VCSTAKE0 is the aggregate venture capitalist equity stake before the IPO. DIR is a dummy variable coded 1 if there was a venture capitalist on the board at the time of IPO. VCFUND is the natural logarithm of the (average) funds managed by the venture capitalists before the IPO. FIRST DAY RETURN is the raw return on the first day of trading. TURNOVER/ASSETS equals the growth in turnover between up to three years pre-IPO and the fiscal year of the IPO divided by the average total assets in those four years. EBIT/ASSETS equals the growth in EBIT between up to three years pre-IPO and the fiscal year of the IPO divided by the average total assets in those four years. All values are in constant price. One, two and three asterisks indicate significance, at the 10%, 5% and 1% level or better, respectively. The t-statistics (in italics) are calculated using White's (1980) heteroskedasticity-consistent method.

Table 6: Determinants of operating cash flow over assets five years post-IPO relative to pre-IPO year, for hot and normal markets

	1985-1997		1998-2000	
	1	2	3	4
Intercept	-0.415*** (-2.966)	-0.409*** (-2.922)	0.015 (0.09)	-0.053 (-0.278)
VC	0.100** (2.409)		0.11 (1.059)	
AGE	0.068*** (3.273)	0.065*** (3.095)	-0.011 (-0.201)	-0.01 (-0.163)
MARKETCAP	0.029 (1.346)	0.037* (1.7)	-0.029 (-1.085)	-0.011 (-0.398)
UNDERWRITER	0.042 (1.089)	0.042 (1.13)	0.131 (1.201)	0.128 (1.158)
VCREP		-0.108 (-1.57)		-0.228 (-1.185)
NOVC		-0.033 (-1.604)		-0.017 (-0.405)
VCSTAKE0		0.001** (1.979)		0.002 (1.258)
DIR		0.01 (0.217)		-0.231* (-1.833)
VCFUND		0.025** (2.198)		0.042 (1.245)
FIRST DAY RETURN	-0.001 (-0.862)	-0.001 (-1.147)	-0.003* (-1.919)	-0.003** (-2.171)
TURNOVER/ASSETS	0.031 (1.179)	0.03 (1.118)	-0.024 (-0.408)	-0.015 (-0.248)
EBIT/ASSETS	0.308 (0.95)	0.307 (0.946)	1.308*** (3.412)	1.285*** (3.355)
SERVICES	0.01 (0.263)	0 (-0.019)	-0.159 (-1.437)	-0.145 (-1.239)
HIGH-TECH	-0.065 (-1.339)	-0.067 (-1.37)	-0.167 (-1.539)	-0.196* (-1.676)
Adj. R²	0.109	0.106	0.276	0.264
F-Stat	7.331***	5.261***	5.177***	3.737***
N	468	468	100	100

See footnote to table 5 for details.