Hot IPOs Can Damage your Long-Run Wealth!

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Abstract

This paper investigates the links between hot markets, long run underperformance and venture capital in the UK using a unique sample of 593 IPOs for the 1985-2003 period. It finds no evidence for long run underperformance for the full sample but does find robust support for significant underperformance during hot markets. The significant hot market return differential relative to the first day trading is consistent with investor sentiment and market timing. The differential relative to the offer price is also statistically significant thereby confirming Ljungqvist et al.'s (2006) first prediction and providing further support for long run underperformance by hot market IPOs.

The evidence does not support certification hypotheses. Hot-market, venture-backed IPOs underperform very significantly while their non-venture counterparts suffer substantial negative returns for only three years post-IPO. Similarly, the significantly negative relationship between underpricing and long-term returns for venture-backed IPOs during hot markets furnishes evidence of market timing.

Industry analysis reveals that the return differential is significant for the high-technology sector both for the full sample and separately for venture-backed and non-venture IPOs. Indeed a majority of high-technology firms in the sample went public during hot markets. Cross-sectional regressions provide additional support for significant underperformance by high-technology firms in hot markets for the whole sample and non-venture IPOs.

Finally, IPOs in general and venture-backed IPOs in particular with strong pre-IPO earnings growth generated significantly superior performance in all periods. The impact was most marked during hot markets, suggesting a role for robust pre-IPO operating results in determining the likelihood of long-term performance.

1. Introduction

Loughran and Ritter (1995) find for a sample of almost 5000 US IPOs 1970-1990 that investors receive annual returns of just 7% on average in the five post-issue years. To place this underperformance in context, investors would have had to invest a staggering 44% more in issuers than in similar-sized non-issuers to achieve the same terminal wealth.[1] Their graphic conclusion is that "Investing in firms issuing stock is hazardous for your wealth" (Ibid. p.46).[2] Long run underperformance has puzzled researchers in financial economics ever since and is identified by Ritter and Welch (2002) as possibly the most controversial area of IPO research.

This paper has three objectives. The first is empirically to test hypotheses related to hot markets and especially some of those proposed by Ljungqvist, Nanda and Singh (2006). To our knowledge the latter has not been done to date. Ljungqvist et al. argue that investor sentiment is the underlying cause of the IPO underperformance anomaly. They propose that a test of underperformance in hot markets relative to the offer price rather than the first day trading price provides a tougher hurdle. We adduce empirical support for significant underperformance in hot markets relative to both the first day trading price and to the offer price. These are in line with those of Ritter (1991), Cook, Jarrell and Kieschnick (2003) and Helwege and Liang (2004) and Derrien (2005) who link investor sentiment to hot markets.[3]

Our results are in agreement with recent findings for IPO markets in other countries. Helwege and Liang (2004) compare US firms going public in hot and cold markets during 1975-2000 and examine their performance over the following five years. Both hot and cold market IPOs are found in the same narrow set of industries and hot markets occur at the same time for many industries. Their results suggest that hot markets reflect greater investor optimism rather

[1] See Aggarwal and Rivoli (1990) and Ritter (1991) for early studies of the long-run underperformance of IPOs.
[2] The title of our paper was inspired by this quote.
[3] Many other researchers have underlined the role of investor sentiment including Loughran, Ritter, and Rydqvist (1994), Loughran and Ritter (1995), Rajan and Servaes (1997, 2003), Pagano, Panetta, and Zingales (1998), Teoh, Welch and Wong (1998), Baker and Wurgler (2000) and Lowry (2003).

than other factors. Cook et al. (2003) also find that US IPOs during hot markets have lower long-term returns than IPOs during cold markets due to sentiment investors driving prices beyond their fair value. Derrien (2005) is one of the few hot market studies to focus on a non-US market. His findings support the view that IPOs occurring during bullish market conditions in France are overpriced.

The second objective is to explore the links between long run underperformance and hot markets for a sample of UK IPOs. In this context it is the first attempt to investigate such links in the UK which boasts one of the largest and most developed capital markets outside the United States. Ibbotson and Jaffe (1975) and Ritter (1984) pioneered the hot markets concept. They documented the existence of hot periods of high IPO volume (underpricing) where subsequent underperformance tends to be more dramatic. The implication is that market timing is uppermost in issuers' minds when taking advantage of market sentiment in such periods.

Our UK sample comprises of a set of 593 venture-backed and non-venture IPOs on the Official List of the London Stock Exchange over the period from 1985 up to 2003. The advantages of this sample are twofold. On one hand, it is a relatively large sample according to the definition of Ritter (2003) who points out that Japan and the UK are the only countries other than the US that can muster IPO samples in excess of 500. On the other hand and more importantly, our UK IPO sample differs in one fundamental aspect from US samples. The latter contain a large proportion of high-technology firms while our UK sample is more evenly distributed by industry.[4] Thus our data should provide a basis for robust hypothesis testing of aspects of long run underperformance.

The third objective of the paper is to explore the conjecture first postulated by Brav and Gompers (1997) that venture capitalists play an important role in explaining the

[4] The sample of 593 IPOs used in this sample is evenly split by number of IPOs across the three aggregate industries (32% in high-technology, 33% in industry and 35% in services). The split is replicated across venture-backed and non-venture IPOs. In contrast to the above industry distribution, Gompers and Lerner (1999b) show that venture-backed IPOs in the high-technology sector represent 79% of the total during 1985-1996.

underperformance puzzle.[5] They show that US venture-backed IPOs outperform non-venture IPOs five years after the offer date and conclude that underperformance primarily resides in small non-venture IPOs which are the most likely to be influenced by investor sentiment. However, our sample shows no significant difference in returns between venture-backed and non-venture IPOs in contrast to the Brav and Gompers (1997) findings. The return differential between hot and normal markets is highly significant for venture-backed IPOs although it is only marginally significant for non-venture firms. Industry analysis reveals that this return differential is significant for the high-technology sector for both the full sample and separately for venture-backed and non-venture IPOs.

We find some evidence of venture capitalists exploiting investor sentiment during hot markets which is confirmed by a significantly negative relationship between underpricing and long-term returns for venture-backed IPOs during hot markets. This latter finding contrasts with that of Helwege and Liang (2004) who find no significant role for venture capital presence during either hot or cold markets in the US.

The remainder of this paper is organised as follows. In section 2 the literature on long run IPO performance, venture capital involvement and investor sentiment is reviewed. Section 3 describes the data and methodology related to performance measurement. Section 4 discusses the empirical results of univariate sorts and cross-sectional regressions. A final section concludes.

2. Hot Markets and Long-run IPO Underperformance

2.1 The underperformance anomaly

While long run underperformance is well documented for the USA, results for other countries such as the UK are rather limited. Levis (1993) used a sample of 712 UK IPOs 1980-1988 to

[5] The hypotheses in the recent rational literature on IPO market cycles typified by Lowry and Schwert (2002) and Pastor and Veronesi (2003) are beyond the scope of this paper.

document significant long-term IPO underperformance 36 months after the first trading day. Espenlaub, Gregory and Tonks (2000) re-examine the evidence on the long-term returns of IPOs for a sample of 588 UK IPOs 1985-1992. Using an event-time framework, they find substantial negative abnormal returns after the first three years irrespective of the benchmark used.

Although some researchers underline the role of hot IPO markets, only a few empirical studies have so far compared long-run performance in hot and cold (normal) markets. Helwege and Liang (2004) study a US sample of 3,698 IPOs between 1975 and 2000. Distinguishing between hot, cold and neutral markets they find both hot and neutral market IPOs tend to underperform while cold market IPOs tend to outperform a variety of benchmarks. After adjusting for economic conditions, they find little evidence for cross-sectional differences between the characteristics of hot and cold market IPOs and no significant difference between their post-issue operating performances. These findings lead the authors to conclude that hot markets are primarily driven by investor optimism.

Similarly, Cook et al. (2003), using 6,080 US IPOs between 1980 and 2002, show that IPOs during hot markets tend to perform more poorly than IPOs during cold markets. They find that IPOs trade at higher valuations and their offer sizes are larger during hot markets and that these firms are less likely to survive. They conclude that investor sentiment is a more important feature of IPO markets then hitherto recognised. Non-US studies are rare but Derrien (2005) is a notable exception. He develops a model in which bullish noise trader sentiment during hot markets leads to overpriced IPO shares relative to their long-run intrinsic value. Using a sample of 62 IPOs on the French stock exchange for the hot period of 1999 till 2001, he empirically shows that the long-run stock price performance of IPO shares is negatively impacted by investor sentiment.

Ljungqvist, Nanda and Singh (2006) build a theoretical model in which the presence of irrational investors leads to hot markets and the associated long-run underperformance. In their

model, sentiment investors purchase stock from institutional investors at inflated prices. Underwriters allocate new issues to their institutional client base if there is insufficient sentiment demand, perhaps due to a hot IPO market and many issuers trying to tap the capital markets. These institutional investors then sell off their holdings at increased prices to exuberant investors post-IPO who are driven by market fads. The sentiment driven prices, on the other hand, deflate over time, leading to negative returns. Below we extend the existing hot market studies by empirically testing some of the hypotheses proposed by Ljungqvist et al. (2006).

2.2 Venture capitalists and investor sentiment

While much of this literature stresses asymmetric information and the certification role of venture capitalists, a part of it also ascribes a role to investor sentiment. Brav and Gompers (1997) were the first to test the long-run performance of a sample of new issues disaggregated into venture-backed and non-venture IPOs.[6] They use a sample of 934 venture capital backed IPOs and 3,407 non-venture IPOs in the United States from 1972 through 1992 and show that venture-backed IPOs outperform non-venture IPOs over a five-year period. They conduct an asset pricing analysis and find that venture-backed IPOs do not underperform while non-venture IPOs indicate severe underperformance. Partitioning the non-venture IPOs on the basis of size shows that underperformance resides primarily in small non-venture IPOs.

Brav and Gompers (1997) argue that bouts of investor sentiment are a possible explanation for the severe underperformance of small non-venture IPOs because the latter are more likely to be held by individuals.[7] Along similar lines, Megginson and Weiss (1991) show

[6] A related literature deals with the conflicts of interest for underwriter-affiliated venture capital firms. See for example Gompers and Lerner (1999a) for the US, Hamao, Packer and Ritter (2000) for Japan and Espenlaub, Garrett and Mun (2000) for the UK.

[7] Brav and Gompers (1997) rerun the Fama-French three-factor regressions including an index that measures the change in the average discount on closed-end funds constructed as in Lee, Shleifer and Thaler (1991) who argue that this discount is a useful benchmark for investor sentiment. As expected, the change in discount is indeed negatively related to returns of the smallest group of non-venture IPOs.

that institutional ownership of IPOs is substantially higher for venture-backed than for non-venture IPOs. They report that institutions hold, on average, 42.3% of the offer in venture-backed firms as compared to 22.2% of the amount offered in non-venture backed firms. We employ the hot market concept to shed new light on the role and performance of venture versus non-venture backed firms

3. Data and Methodology

3.1 Data

A unique sample was selected from the IPOs listed on the London Stock Exchange for the period from January 1985 to December 2003. 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 is temporarily suspended or transfers from lower tier markets such as the now defunct Unlisted Securities Market and the Alternative Investment Market.[8] We exclude the latter IPO market established in 1995 since it has no minimum market capitalization and would likely lead to a small company bias.

The final sample consists of 593 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. This is the result of the filters applied to a total of 2,489 IPOs that listed on the Official List of the London Stock Exchange for the period 1985-2003. The sample include some 317 venture-backed and 276 non-venture IPOs. The data sources include Datastream, the London Stock Exchange Quality of Markets Quarterly Reviews, Primary

[8] The filtering process is consistent with methodological approaches used in recent IPO research. 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.

Market Fact Sheets and Yearbooks, IPO prospectuses, Extel Financial microfiches and Thomson Financial Global Access Database.[9]

3.2 Definition of hot and normal IPO markets

Hot IPO markets could potentially be defined on the basis of any of several criteria. These include an above-average number of IPO issues, non-negative autocorrelation[10] in IPO issue numbers and above-average or abnormal initial returns. Each points to different hot market years with some degree of overlap. We consider the latter to be important for robust definition and so identify hot IPO market periods as only those years that simultaneously satisfy all three criteria.

The most commonly used criteria are periods of either high IPO volume or high level of initial returns.[11] These two criteria are related as Lowry and Schwert (2002) show. They investigate the relationship between volume and underpricing or high initial returns over hot and cold markets and find that periods of high underpricing are typically followed by high IPO volume. We believe that another criterion also matters to capture the momentum generated by investor sentiment in hot markets. This can be represented by non-negative autocorrelation in the number of yearly IPOs. This requires that the number of IPOs in a hot market year to be no lower than that in the previous calendar year.

The basis of our classification into hot and normal markets thus implies that a hot market year simultaneously satisfies the two commonly used criteria of abnormal IPO volume and initial returns as well as non-negative autocorrelation in volume. Those years that fail to satisfy any or all of these criteria are classified as normal market years. Figure 1 shows the number of sample IPOs and raw IPO returns for each year from 1985 to 2003.

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[9] See Appendix I for more details.

[10] Close inspection of Table II in Lowry and Schwert (2002) reveals that volume is strongly autocorrelated. Indeed two coefficients in the volume regression on lagged volume are statistically significant as opposed to just one on lagged initial returns across all three data series.

[11] See Ibbotson and Jaffe (1975), Ritter (1984), Loughran and Ritter (1995), Helwege and Liang (2004) and Derrien (2005).

[Figure 1 around here]

The average number of issues per year over the full sample was some 31.2. Years rather than quarters or months are used as the basic time interval in classification to avoid the noise problems inherent in the use of shorter intervals.[12] There is an above average frequency of IPOs in the years 1986-1988, 1993-1997 and 2000. However, not all of these years exhibit non-negative autocorrelation in the number of IPOs issued. On this basis, only 1986-1987, 1993-1994, 1996 and 2000 indicate non-negative autocorrelation or investor sentiment in the spirit of Ljungqvist et al. (2006).[13] The average initial IPO return over the full sample was some 10.2%. On this basis, the years 1987, 1993, 1995 and 1998-2000 enjoy above average returns.

The only years simultaneously satisfying all of our three criteria are 1987, 1993 and 2000.[14] While three years may seem like a small fraction of our sample, the IPOs in these years account for some 142 IPOs or 24% of the total in our sample. The other 16 years of our sample are defined as normal market years.[15] There are two reasons for this. On one hand we do not wish to discard useful sample information since our total sample comprises only 593 IPOs. On the other, a test of the difference between hot markets and the remaining normal markets imposes a higher hurdle than one involving a test of the difference between hot markets and cold markets where the latter are defined as a lower percentile of the remaining sample.

3.3 Methodology

Several methodological issues related to long-run event studies have attracted attention in the financial economics literature. Barber and Lyon (1997), Kothari and Warner (1997) and Lyon,

[12] Helwege and Liang (2004) tackle the latter by using three-month centered moving averages of the number of IPOs for each month in their sample.
[13] The cycles of IPO issuance are highly correlated between the sample used in this paper and the total number of IPOs of 2,489 issued on the London Stock Exchange between 1985 and 2003.
[14] A number of other hot market definitions were used. These include the number of IPOs or initial IPO returns separately, as well as different IPO issuance and initial return cut-off points. The results were qualitatively similar to those reported in this paper.
[15] Although other researchers such as Helwege and Liang (2004) differentiate between hot, cold and in-between IPO markets, like Ritter (1984) we combine the latter and cold markets.

Barber, and Tsai (1999) provide discussions of the inference problems in tests of long-run returns using buy-and-hold abnormal returns (BHAR) and cumulative abnormal returns (CARs). BHAR is the difference between a sample firm's long run (say three-year) return and the corresponding return on a benchmark portfolio. CAR is calculated by subtracting benchmark returns from the IPO firm's return and summing abnormal returns over three years.

Barber and Lyon and Kothari and Warner provide simulation evidence that estimation procedures can produce biased BHAR estimates. Fama (1998) and Mitchel and Stafford (2000) argue that cumulative abnormal returns (CARs) are a more robust methodology for measuring long run returns since BHAR can magnify underperformance due to the compounding of single-period returns. This is important as the holding period length is arbitrarily fixed and the BHAR is increasing in holding period, given abnormal performance during any portion of the return series. They argue that CARs are a better, less biased method for calculating long-horizon returns as they avoid the compounding of a single time period's poor or strong performance (although still suffering from cross-sectional correlation).

In addition, Mitchel and Stafford (2000) argue that the distributional properties and test statistics for CARs are better understood while there are serious statistical problems with BHARs which exhibit strong positive skewness as shown by Barber and Lyon (1997). Statistical inference for the mean BHAR is thus often based on a bootstrapping approach that however cannot solve all dependence problems, leading to potentially biased test statistics. For these reasons, this paper employs CARs to compute long-horizon abnormal returns.

Equally-weighted average returns are used throughout this paper since we are interested in measuring the abnormal returns of the average firm undergoing an IPO. Equally-weighted average returns represent a portfolio investment strategy of investing an equal nominal amount in every IPO. This is a reasonable assumption given that rationing is not a limiting factor after the first day post-IPO. Consistent with Fama (1998), the weighting scheme has been chosen based

on the economic hypothesis of interest. Loughran and Ritter (2000) confirm that the equally-weighted methodology produces point estimates that are relevant from the point of view of a researcher attempting to predict the abnormal returns associated with a random event.

Loughran and Ritter (2000) show that tests using equally-weighted returns yield greater abnormal returns than tests that use value weighting. Weighting portfolios by firms' market capitalisation can lead to individual firms disproportionately dominating the portfolio, resulting in high return variance, as unsystematic risk is not diversified away. Consequently, the value-weighted tests will have low power and generate large standard errors and low *t*-statistics.[17]

3.4 Performance measurement

The long-run performance measurement includes both raw and market-adjusted returns over 36 months and 60 months after the IPO. The first two trading days are excluded to allow for underpricing in the initial trading days.[18] The returns incorporate dividend payments and are adjusted for rights and scrip issues. If the IPO is delisted before the 36^{th} (60^{th}) month, the return is added for CAR_i until the delisting date.

Following Gompers and Lerner (2003), the Cumulative Abnormal Returns (CAR) for a portfolio of IPOs (CAR_p) are obtained by taking the average across the CAR of all IPOs in the portfolio:

$$CAR_p = \frac{1}{n}\sum_{i=1}^{n} [\ CAR_i] \qquad (1)$$

The Cumulative Average Abnormal Returns (CAARs) are calculated following Lyon, Barber and Tsai (1999) and Espenlaub, Garrett and Mun (2000) to take account of a monthly rebalancing strategy. First, an average benchmark-adjusted return on a portfolio of *n* IPOs is

[16] Loughran and Ritter (2000) argue that value weighting is more appropriate when trying to measure the abnormal returns on a value-weighted portfolio with an equal amount of money invested in each time period.
[17] The power of a test is the probability of rejecting the null hypothesis when the hypothesis is false.
[18] See Doukas and Gonenc (2000) for a similar approach.

calculated for each calendar month as the equally weighted arithmetic average of the benchmark-adjusted returns:

$$AR_t = \frac{1}{n}\sum_{i=1}^{n} ar_{it} \qquad (2)$$

The three- (five-) year CAAR starting on the third trading day extending to *T* months after the IPO is the summation of the average benchmark-adjusted returns:

$$CAAR_{3\ to\ T} = \sum_{t=3}^{T} AR_t \qquad (3)$$

The Financial Times All Share index was chosen as the main benchmark index as it comprises the largest cross-section of listed shares. This index is a capitalisation-weighted index which represents 98%-99% of the market capitalisation of listed companies in the UK. It is comparable to the S&P 500 index in the USA and has typically been used in past studies on UK IPO performance.[19]

4. Empirical Results

4.1 Long run IPO underperformance

Long-run IPO returns by cohort year are reported in Table 1.

[Table 1 around here]

The number of IPOs and three-year benchmark-adjusted returns are shown in Panel A while five-year benchmark-adjusted returns are presented in Panel B. The classical position – which we call the underperformance hypothesis - is that IPOs do not underperform in the long run while behavioural approaches predict long run underperformance. Table 1 indicates that the three-year CARs for all IPOs of -1.53% are not significantly different from zero at conventional levels even

[19] See for example Levis (1993), Khurshed (1999), Espenlaub, Gregory and Tonks (2000) and Jelic, Saadouni and Wright (2004). The use of the Financial Times All Share index avoids the benchmark contamination issue raised in Loughran and Ritter (2000), as the components of the sample only represent a tiny fraction of the index throughout the period. Indeed, the 100 largest constituents (which are largely absent from the sample) represent about 80-90% of the index's value.

if those in 1989 and 2000 exhibit severe underperformance that is significant at the 1% level. Thus we cannot reject the underperformance hypothesis for the three-year CAR in line with the classical position. Similarly, the five-year CARs for all IPOs of -4.55% are not significantly different from zero.

Venture and non-venture IPOs

The classical certification null hypothesis states that venture-backed outperform non-venture IPOs in the long run. This is due either to the monitoring role of the venture capitalists or to investor sentiment-prone individuals holding a larger share of non-venture IPO stock as argued by Megginson and Weiss (1991). Table 1 indicates that neither the three-year CARs nor five-year CARs for venture-backed IPOs or non-venture IPOs are significantly different from zero. The overall difference between both sets of IPOs is also not significant even though non-venture IPOs underperformed by a significant margin in 1988-1989. Furthermore, a particularly strong performance by non-venture IPOs is noticeable during 2001 and 2002, which is statistically significant at the 1% level. This strong performance follows closely after the bursting of the internet bubble in 2000, indicating a flight to quality among investors in this period.

Thus the certification hypothesis is unequivocally rejected for the full sample using both three- and five-year CARs. These UK findings contrast with the US evidence of Brav and Gompers (1997) that shows a significant performance differential between venture-backed and non-venture issuers using five-year wealth relatives.

Hot and normal market IPOs

A division into hot and normal/cold periods permits tests of recent behavioural theories that IPOs floated in hot market periods underperform more severely compared to those in normal markets due to the influence of market sentiment in hot periods. For instance, the Ljungqvist et al. (2006) model predicts that IPOs underperform in hot markets due to sentiment investors

driving prices beyond their fair value. By contrast the classical position suggests that there is no difference in underperformance between hot and normal markets.

Table 2 reports the three- (Panel A) and five-year (Panel B) CARs for hot and normal periods.

[Table 2 around here]

The hot market IPOs generate three-year CARs of –27.96% that are significantly negative at the 1% level while the corresponding normal market CARs are insignificant at 6.80%. Thus the hot market prediction is supported at the 1% level for three-year CARs. The magnitude of underperformance during hot markets measured by five-year CARs is even more dramatic. The returns are now some –35.72% for all hot market IPOs and significant at the 1% level while those for normal IPOs are positive and insignificant. These results strongly support the prediction of Ljungqvist et al. (2006) that severe underperformance is associated with hot periods but not during normal markets.

The 142 IPOs during the hot periods divide into 84 venture-backed and 58 non-venture IPOs. Of the remaining 451 IPOs in normal periods, some 233 are venture-backed and 218 non-venture IPOs. This split produces results for venture-backed IPOs very similar to those for the overall sample. All hot and normal market CARs are significantly different at the 1% level and so the hot market prediction is supported in all cases. For non-venture IPOs, by contrast, only the three-year CARs exhibit marginally significant differences between hot and cold markets, while for five-year CARs the differences in returns are not significant. Indeed, hot market five-year CARs for non-venture IPOs are not significantly different from zero. Furthermore, the difference between venture- and non-venture IPOs CARs is significant only in one out of four cases (three-year CARs for normal markets) and then only marginally so at the 10% level.

These results thus confirm the prediction of a significant hot market performance differential by Ljungqvist et al. (2006), both for the overall sample and venture-backed IPOs.

They conform to their view of investor sentiment predominating during hot markets as also established by Helwege and Liang (2004). They also support the findings of Cook et al. (2003) who report that long-term returns of firms going public during hot markets are lower than those for firms going public during cold markets.

Figures 2a-2c depict five-year CAARs for all IPOs and for venture-backed and non-venture IPOs over for the whole sample and for hot and normal market periods.

[Figures 2a-2c around here]

Figure 2a shows that the CAARs for IPOs in hot and normal markets start to diverge after about nine months post-IPO, that the differential narrows temporarily between month 27 and month 44, but then continuously widens until five years post-IPO. The CAARs for normal market IPOs remain relatively constant over the five-years post-IPO in the –5% to 5% range, while hot market CAARs remain continuously negative after seven months in line with behavioural predictions.

These trends are broadly repeated when one divides the sample into venture-backed and non-venture IPOs in Figures 2b and 2c. While normal market venture-backed IPOs generate continuously positive returns, non-venture IPOs underperform continuously after 14 months post-IPO. The differential in returns between hot and normal markets widens to some 56% for venture-backed IPOs but reaches only 21% for non-venture IPOs five years post-issue. This points towards a more prominent investor sentiment influence in venture-backed as compared to non-venture IPOs. It is particularly noticeable that hot market CAARs exhibit the underreaction-overreaction profile predicted for stock returns in the behavioral finance theories of Barberis, Shleifer and Vishny (1998), Daniel, Hirshleifer and Subrahmanyam (1998) and Hong and Stein (1999). This pattern is especially prominent for non-venture IPOs.

Underperformance relative to the offer price

Figures 3a-3c depicts the CAARs using the offer price as the starting point.

[Figures 3a-3c around here]

The aim is to shed light on Ljungqvist et al.'s (2006) prediction No. 1 on IPO underperformance relative to the offer price. They argue that that latter presents a higher hurdle and thus offers a more exacting test of the underperformance hypothesis. The intuition is that the offer price will exceed the firm's fundamental value due to a surplus extracted from sentiment investors.

For the full sample, the results are similar to those previously reported with a return differential of about 40% between hot and normal periods. Similar to Figure 2a, the returns start out at fairly similar levels but then diverge considerably after the first year. However, the long-run performance is now much better both overall and in the normal markets but underperformance reaches -8% in hot markets. These findings support the Ljungqvist et al. (2006) prediction that hot market IPOs underperform even relative to the offer price.

The return differential between hot and normal markets for venture-backed IPOs in Figure 3b is much less dramatic than in Figure 2b. It is interesting that the returns are initially much larger for IPOs in hot markets relative to those in normal markets. Hot market IPO CAARs quickly decline and end up underperforming relative to normal market CAARs with an absolute decline of –16%. This result points towards the initial presence of sentiment investors that buy into overhyped issues, only to be disappointed in the long-term, as suggested by Ljungqvist et al. (2006). Finally, non-venture IPOs raised during normal periods outperform those in the hot periods by about 33% from the start, extending to about 54% after five years, as can be seen in Figure 3c. Hot market IPOs exhibit a slightly positive absolute 5-year underperformance of some +3%. Comparing Figures 3b and 3c, venture-backed IPOs appear sharply to underperform non-venture IPOs overall and in both hot and normal markets relative to the offer price.

Industry analysis

A large proportion of our sample of high-technology IPOs went public during hot markets.

Ofek and Richardson (2002) show for the US that a significantly larger proportion of investors in internet stocks consisted of individuals rather than institutions, making the market prone to behavioural biases based on overly optimistic beliefs.[20] They 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. Rational investors did not bet against them due to short sale constraints and the risk of prices increasing even further due to the limits to arbitrage hypothesised by Shleifer and Vishny (1997). Thus they predict that high-technology, hot market IPOs should underperform compared to those floated during normal markets.

The analysis of long-run performance is presented for twelve industry sub-sectors and three aggregate sectors classified according to the London Stock Exchange 2000 Yearbook in Table 3.[21] Panel A gives the three-year and five-year CARs for the full sample while Panels B and C report the results for venture and non-venture IPOs, respectively.

[Table 3 around here]

Panel A reveals that the three- and five-year CARs for the full sample are significantly negative for the high-technology sector during the hot periods at the 1% level. The CARs are also significantly different between hot and normal periods at the 1% level. We thus support the Ofek and Richardson (2002) prediction for the high-technology sector. These results are consistent with the basic premise of their model that some investors may occasionally be irrationally exuberant about the prospects of IPOs in a particular industry. None of the other aggregate sectors exhibits significant return differentials between the hot and normal periods.

[20] 65% of our venture-backed sample in that period are high-tech firms while only 26% are high-tech 1985-1997.

[21] The high-technology sector includes the pure technology sectors electronic/electrical equipment and telecom/IT hardware and software as well as media/photography and healthcare/pharmaceuticals as these sectors are the usual focus of classical venture capital both in the US and Europe and were sectors that were particularly prone to investor sentiment during the TMT bubble of the late 1990s (see for example Ofek and Richardson (2002), Loughran and Ritter (2004) and Lerner (1994) for similar definitions).

Panel B confirms the significant return differential between hot and normal markets for high-technology, venture-backed IPOs over both three- and five years at the 1% level. Again, the return differentials between hot and normal markets are not significantly different from the other aggregate sectors. However, the non-venture IPO results in Panel C reveal that only the three-year CARs for the high-technology sector are significantly different between the hot and normal periods at the 1% level while the services sector only shows significance at the 10% level. None of the aggregate industry sector return differentials is significant for five-year CARs.

The overall results from Table 3 point towards sustained underperformance in the high-technology sector during the hot market periods. This performance differential holds mainly for venture-backed IPOs, across both three-year and five-year periods. This is a refinement of the arguments of Lerner (1994) who shows that venture capitalists are able to bring companies to the public markets at times that they perceive to be optimal.

4.2 Cross-section regression results

The results from cross-section regression are presented in Table 4.

[Table 4 around here]

Results for all years, normal markets, and for hot periods only are reported for the full sample of all IPOs and for sub-samples consisting of either VC backed IPOs or non-VC backed IPOs. The estimation method used is ordinary least squares. The three-year CAR is the dependent variable and *t*-statistics are calculated using White's (1980) heteroskedasticity-consistent method.

Two variables are included in the regressions to control for firm size: the natural logarithm of the book value of assets in the year preceding the IPO divided by the market capitalisation at IPO (BTOM) as well as the natural logarithm of the issuer's market capitalisation at IPO (MARKETCAP). The latter is based on the firm's first closing price after the issue. An UNDERWRITER dummy variable is used to control for underwriter reputation.

This equals 1 if the IPO's lead underwriter is listed in the top-ten in the annual Hambro underwriter rankings. Finally, an industry dummy for the high-technology industry is included in the regression analysis as research by Levis (1993) has shown that there are marked differences in the long-run performance of individual industries and considerable return differences between hot and normal periods were found in particular for the high-technology sector in the univariate tests of Table 3. The HIGH-TECH dummy includes electronic and electrical equipment, health and pharmaceuticals, media and photography as well as telecom, IT hardware and software.

Ljungqvist et al. (2006) conjecture in their Prediction No 6 that lower-quality companies may go public in hot IPO markets for opportunistic reasons. This results in a decline in the quality of the average issuer, in particular in relation to earnings deflated by total assets. Ljungqvist and Wilhelm (2003) show that over 60% of firms listing in the US in 1997 had 12-month track records of earnings while this had fallen to just 24% in 1999. The behavioral assumption is that firms going public in hot markets will generally enjoy pre-IPO turnover growth to attract capital market investors. Under the classical assumptions, pre-IPO earnings quality should have no bearing on post-IPO performance, as share prices fully reflect intrinsic corporate values.

The variables TURNOVER/ASSETS and EBIT/ASSETS represent the growth in the level of turnover and earnings, 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. IPOs with strong earnings growth prior to the offering generated significantly superior performance at the 1% level in all periods and during both hot and normal markets. The coefficient on EBIT/ASSETS is particularly high for VC-backed IPOs during hot markets, while high TURNOVER/ASSETS are associated with stronger long term performance for non-VC backed IPOs during hot markets. This suggests that evidence relating to fundamentals such as pre-issue earnings growth and

turnover are particularly useful during hot markets to identify issues that are less likely to underperform in the long-term.

Ritter (1991) reports a negative impact of underpricing on long-run performance and Ofek and Richardson (2002) find a strong negative relation between underpricing and future excess returns to the end of 2000. However Ljungqvist et al. (2006) argue that the relationship is not necessarily monotonic. They argue in their Prediction No. 4 that the relationship is negative when the probability of the hot market ending is small.[22] This is tested using the coefficient on the FIRST DAY RETURN variable measured by the raw return on the first day of trading. For venture-backed IPOs, the coefficient on the initial return variable is very large and negative during hot markets, albeit only significant at the 10% level. For the full sample of IPOs and for non-VCs the coefficient is insignificant for both normal and hot markets. This suggests that VCs exploit sentiment traders and underlines the role of investor sentiment during hot markets. Indeed, the hot market dummy variable is significant at the 1% level for the whole VC sample. However, the high-technology dummy is significant at the 1% level only for the whole sample and non-VCs during the hot market.

The classical venture capital certification hypothesis was first formulated by Megginson and Weiss (1991). Brav and Gompers (1997) update this by arguing that reputable venture capitalists provide access to top-tier investment and commercial bankers, participate on the board of directors and implement superior management structures. Although we obtain positive coefficients for the VCREP dummy variable, it is always insignificantly different from zero.[23] In addition we find that prestigious underwriters do not provide a certifying role.

[22] Krigman, Shaw and Womack (1999), on the other hand, find a positive relation between underpricing and short-run, one-year returns, except for "extra-hot" IPOs", which generated the worst one-year performance in their sample.

[23] In other specifications we included a general VC dummy for all VC backed IPOs in place of VCREP, but this was also not significant.

5. Conclusions

We examine the relationship between hot markets, long run underperformance and venture capitalists for a sample of 593 UK IPOs 1985-2003. Hot market IPOs significantly underperform those issued during normal markets both relative to the first day trading price and to the offer price. The latter confirms Ljungqvist et al.'s (2006) first prediction and provides robust support for long run underperformance by hot market IPOs. These results underline the role of investor sentiment in hot markets consistent with the recent findings of Derrien (2005), Helwege and Liang (2004) and Cook et al. (2003). The significantly negative relationship between underpricing and long-term returns for venture-backed IPOs during hot markets furbishes evidence of market timing.

Industry analysis reveals that only the high-technology sector exhibits a significant return differential between hot and normal markets for the full sample and separately for venture-backed and non-venture IPOs. This result stems from the large proportion of high-technology firms issued during hot markets with the pervasive presence of exuberant noise traders. Cross-sectional regressions support the claim of significant underperformance by high-technology firms in hot markets for the full sample and non-venture IPOs. Venture-backed IPOs issued during hot markets underperform very significantly while their non-venture counterparts suffer substantial negative returns only three-years post-IPO.

References

Aggarwal, R., Rivoli, P., 1990. Fads in the initial public offering market? Financial Management 19, 45-57.

Baker, M., Wurgler, J., 2000, The equity share in new issues and aggregate stock returns. Journal of Finance 55, 2219-2257.

Barber, B., Lyon, J., 1997. Detecting long-run abnormal stock returns: The empirical power and specification of test statistics. Journal of Financial Economics 43, 341-372.

Barberis, N., Shleifer, A., Vishny, R., 1998. A model of investor sentiment. Journal of Financial Economics 49, 307-343.

Barry, C., Muscarella, C., Peavy, J., Vetsuypens, M., 1990. The role of venture capital in the creation of public companies. Evidence from the going public process. Journal of Financial Economics 27, 447-471.

Bradley, D., Jordan, B., Roten, I.,Yi, H., 2001. Venture capital and IPO lockup expiration: An empirical analysis. Journal of Financial Research 24, 465-494.

Brav, A., Gompers, P., 1997. Myth or Reality? The long-run underperformance of initial public offerings: evidence from venture capital and non-venture-backed companies. Journal of Finance 52, 1791-1822.

Carter, R., Dark, F., Singh, A., 1998. Underwriter reputation, initial returns, and the long-run performance of IPO stocks. Journal of Finance 53, 285-311.

Cook, D., Jarrell, S., Kieschnick, R., 2003. Investor sentiment and IPO cycles. Unpublished Working Paper, University of Mississippi.

Daniel, K. , Hirshleifer, D., Subrahmanyam, A., 1998. Investor psychology and security market under- and overreactions. Journal of Finance 53, 1839-85.

Derrien, F., 2005. Pricing in "hot" market conditions: who leaves money on the table? Journal of Finance 60, Forthcoming.

Doukas, J., Gonenc, H., 2000. Long run performance of initial public offerings: venture capitalists and reputations of investment bankers. EFMA 2000 Athens.

Espenlaub, S., Garrett, I., Mun, W., 2000. Conflicts of interest and the performance of venture-capital backed IPOs: A preliminary look at the UK. Venture Capital 1, 325-349.

Espenlaub, S., Goergen, M., Khurshed, A., 2001. Lock-in agreements in the UK: Is there a fourth IPO anomaly? Journal of Business, Finance and Accounting 28, 1235-1278.

Espenlaub, S., Gregory, A., Tonks, I., 2000. Re-assessing the long-term underperformance of UK initial public offerings. European Financial Management 6, 319-342.

Fama, E., 1998. Market efficiency, long-term returns, and behavioral finance. Journal of Financial Economics 49, 283-306.

Gompers, P., Lerner, J., 2003. The really long-run performance of initial public offering. Journal of Finance 58, 1355-1392.

Gompers, P., Lerner, J., 1999a. Conflict of interest and reputation in the issuance of public securities: Evidence from venture capital. Journal of Law and Economics 42, 53-80.

Gompers, P., Lerner, J., 1999b. The Venture Capital Cycle. The MIT Press, Cambridge, Massachusetts.

Hamao, Y., Packer, F., Ritter, J. 2000. Institutional affiliation and the role of venture capital: Evidence from initial public offerings in Japan, Pacific Basin Finance Journal 8, 529-558.

Helwege, J., Liang, N., 2004. Initial public offerings in hot and cold markets, Journal of Financial and Quantitative Analysis 39, 541-569.

Hong, H., Stein, J., 1999. A unified theory of underreaction, momentum trading and overreaction in asset markets. Journal of Finance 54, 2143-2184.

Ibbotson, R.G., Jaffe, J.F., 1975. Hot issue markets. Journal of Finance 30, 1027 – 1042.

Jelic, R., Saadouni, B., Wright, M., 2004. The performance of private to public MBOs - The role of venture capital. Journal of Business Finance and Accounting, Forthcoming.

Khurshed, A., 1999. Initial public offerings. An analysis of the post-IPO performance of UK firms. Unpublished PhD thesis, University of Reading.

Kothari, S., Warner, J., 1997. Measuring long-horizon security price performance. Journal of Financial Economics 43, 301-339.

Krigman, L., Shaw, W., Womack, K., 1999. The persistence of IPO mispricing and the predictive power of flipping. Journal of Finance 54, 1015-1044.

Lee, C., Shleifer, A., Thaler, R., 1991. Investor sentiment and the closed-end fund puzzle. Journal of Finance 46, 75-110.

Lerner, J., 1994. The syndication of venture capital investments. Financial Management 23, 16-27.

Levis, M., 1993. The long-run performance of initial public offerings: the UK evidence. Financial Management 22, 28-41.

Lin, T., Smith, R., 1998. Insider reputation and selling decisions: The unwinding of venture capital investments during equity IPOs. Journal of Corporate Finance 4, 241-263.

Ljungqvist, A., Nanda, V., Singh, R., 2006. Hot markets, investor sentiment and IPO pricing. Journal of Business, 79(4), forthcoming.

Ljungqvist, A.,Wilhelm, W., 2003. IPO pricing in the dot-com bubble. Journal of Finance 23, 723-752.

Loughran, T., Ritter, J. R., 2004. Why has IPO underpricing changed over time? Financial Management 33, 5-37.

Loughran, T., Ritter, J. R., 2000. Uniformly least powerful tests of market efficiency. Journal of Financial Economics 55, 361-389.

Loughran, T., Ritter, J. R., 1995. The new issues puzzle. Journal of Finance 50, 23-51.

Loughran, T.,. Ritter, J.R., Rydqvist, K., 1994. Initial public offerings: International insights, Pacific-Basin Finance Journal 2, 165-199.

Lowry, M., 2003. Why does IPO volume fluctuate so much? Journal of Financial Economics 67, 3-40.

Lowry, M., Schwert, G., 2002. IPO market cycles: Bubbles or sequential learning? Journal of Finance 57, 1171-1200.

Lyon, J., Barber, B., Tsai, C., 1999. Improved methods for tests for long run abnormal stock returns. Journal of Finance 54, 165-202.

Megginson, W., Weiss, K., 1991. Venture capital certification in initial public offerings. Journal of Finance 46, 879-893.

Mitchel, M., Stafford, R., 2000. Managerial decision making and long term stock price performance. Journal of Business 73, 287-329.

Miller, E., 1977. Risk, uncertainty and divergence of opinion. Journal of Finance 32, 1151-1168.

Ofek, E., Richardson, M., 2002. The valuation and market rationality of internet stock prices. Oxford Review of Economic Policy 18, 265-287.

Pagano, M., Panetta, F., Zingales, L., 1998. Why do companies go public? An empirical analysis. Journal of Finance 53, 27–64.

Pastor, L., Veronesi, P., 2003. Stock price and IPO waves. NBER Working Paper No. W9858.

Rajan, R., Servaes, H., 1997. Analyst following of initial public offerings. Journal of Finance 52, 507–530.

Rajan, R., Servaes, H., 2003. The effect of market conditions on initial public offerings. In: McCahery, J., Renneboog, L. (Eds.), Venture Capital Contracting and the Valuation of High-tech Firms. Oxford University Press.

Ritter, J. R., 2003. Differences between European and American IPO markets. European Financial Management 9, 421-434.

Ritter, J. R., 1991. The long-run performance of initial public offerings. Journal of Finance 42, 365-394.

Ritter, J. R., 1984. The 'hot issue' market of 1980. Journal of Business 57, 215-241.

Ritter, J. R., Welch, I., 2002. A review of IPO activity, pricing and allocations. ournal of Finance 57, 1795-1828.

Shleifer, A., Vishny, R., 1997. The limits of arbitrage. Journal of Finance 52, 35-55.

Teoh, S., Welch, I., Wong, T., 1998. Earnings management and the long-run performance of initial public offerings. Journal of Finance 53, 1935-1974.

White, H., 1980. A heteroskedastic-consistent covariance matrix and a direct test of heteroskedasticity. Econometrica 48, 817-838.

Table 1: CARs for venture-backed and non-venture IPOs

Panel A: Three-year cumulative abnormal returns against the FTSE All Share index

Year	Number of all IPOs	Number of venture backed IPOs	Number of non-venture IPOs	All IPOs	Venture backed IPOs	Non-venture backed IPOs	*t-statistic venture versus non-venture backed IPOs*
1985	22	7	15	23.07%	26.67%	21.38%	*0.152*
1986	34	10	24	16.08%	25.46%	12.16%	*0.685*
1987	35	19	16	-5.96%	-12.73%	2.07%	*0.562*
1988	33	14	19	-19.65%*	7.46%	-39.63%**	*2.201***
1989	19	8	11	-49.91%***	-4.88%	-82.66%***	*2.119***
1990	7	5	2	-6.85%	-25.38%	39.48%	*0.931*
1991	5	2	3	1.00%	-15.24%	11.82%	*0.344*
1992	23	16	7	14.25%	23.24%	-6.32%	*1.013*
1993	54	35	19	-4.22%	-4.50%	-3.69%	*0.043*
1994	86	44	42	-1.27%	1.49%	-4.16%	*0.309*
1995	44	26	18	-2.68%	4.54%	-13.11%	*0.592*
1996	56	32	24	-13.48%	-17.18%	-8.55%	*0.381*
1997	52	30	22	40.92%*	51.81%***	26.08%	*0.743*
1998	30	18	12	40.25%	46.38%	31.06%	*0.349*
1999	18	9	9	-18.20%	-32.12%	-4.29%	*0.511*
2000	53	30	23	-66.68%***	-70.28%***	-61.97%***	*0.765*
2001	5	1	4	75.50%**	11.19%	91.57%***	*0.103*
2002	10	8	2	56.37%**	49.03%*	75.95%***	*0.544*
2003	7	3	4	49.98%	56.44%	43.52%*	*0.227*
Total	593	317	276	-1.53%	1.64%	-5.16%	*0.914*

Panel B: Five-year cumulative abnormal returns against the FTSE All Share index

Year	Number of all IPOs	Number of venture backed IPOs	Number of non-venture IPOs	All IPOs	Venture backed IPOs	Non-venture backed IPOs	*t-statistic for difference in means venture backed versus non-venture backed IPOs*
1985	22	7	15	-16.55%	-4.25%	-22.29%	*0.376*
1986	34	10	24	-19.36%	-1.91%	-26.63%	*0.819*
1987	35	19	16	-10.58%	-26.09%	7.82%	*0.967*
1988	33	14	19	-25.71%	4.94%	-48.30**	*1.615*
1989	19	8	11	-28.69%	3.19%	-51.88**	*1.265*
1990	7	5	2	6.51%	-9.72%	47.07%	*1.089*
1991	5	2	3	-15.78%	-68.01%	19.04%	*0.718*
1992	23	16	7	8.07%	14.10%	-5.71%	*0.488*
1993	54	35	19	-46.24%***	-44.69%***	-49.10%*	*0.156*
1994	86	44	42	-19.78%*	-26.83%*	-12.39%	*0.630*
1995	44	26	18	9.10%	22.67%	-10.50%	*0.785*
1996	56	32	24	24.18%	21.14%	28.23%	*0.262*
1997	52	30	22	30.24%	28.41%	32.73%	*0.107*
1998	30	18	12	34.67%*	46.97%	16.23%	*0.793*
1999	18	9	9	28.43%	20.27%	36.59%	*0.384*
2000	53	30	23	-41.59%***	-58.99%***	-18.89%	*0.256*
2001	5	1	4	97.4%*	-13.06%	125.02%**	*2.407**
2002	10	8	2	61.23%***	54.44%*	79.32%***	*0.571*
2003	7	3	4	49.98%*	56.44%	43.52%*	*0.227*
Total	593	317	276	-4.55%	-3.74%	-5.48%	*0.871*

The sample consists of 317 venture backed IPOs and 276 non-venture backed IPOs listed on the Official List of the London Stock Exchange between January 1985 to December 2003. The venture backed IPOs are all new issues within the sample with venture capital participation recorded in the IPO prospectus. Three-year (five-year) equal-weighted cumulative returns on IPOs are calculated by adding returns from the third day of trading to the end of the month of the IPO and from then on adding monthly returns for thirty-five (fifty-nine) months. Abnormal returns are the simple difference between the IPO return in a given month and the FTSE All Share index. If the IPO is delisted before the thirty-fifth (fifty-ninth) month the return is added until the delisting date. Since monthly returns are available only until 30 June 2005, the returns are truncated for IPOs after 1 July 2000. All IPO and benchmark returns are taken from Datastream. One, two and three asterisks indicate significance, at the 10%, 5%and 1% level or better, respectively.

Table 2: CARs for Venture-backed and non-venture IPOs in hot and normal markets
Panel A: Three-year CARs (FTSE All Share)

Panel A: Three-year cumulative abnormal returns against the FTSE All Share index

Period	Total	Venture backed	Non-venture	All IPOs	Venture backed IPOs	Non-venture backed IPOs	*t-statistic for difference in means*
Hot	142	84	58	-27.96%***	-29.86***	-25.21**	*0.312*
Normal	451	233	218	6.80%	13.00%**	0.17%	*1.645**
t-statistic for Hot versus Normal				4.046***	3.859***	1.878*	

Panel B: Five-year cumulative abnormal returns against the FTSE All Share index

Period	Total	Venture backed	Non-venture	All IPOs	Venture backed IPOs	Non-venture backed IPOs	*t-statistic for difference in means*
Hot	142	84	58	-35.72***	-45.59***	-21.42%	*1.332*
Normal	451	233	218	5.26%	11.35%*	-1.24%	*1.228*
t-statistic for Hot versus Normal				3.934***	4.241***	1.229	

The sample consists of 317 venture backed IPOs and 276 non-venture backed IPOs listed on the Official List of the London Stock Exchange between January 1985 to December 2003. The venture backed IPOs are all new issues within the sample with venture capital participation recorded in the IPO prospectus. The Hot period includes 1987, 1993 and 2000. The Normal period includes the other years. Three-year (five-year) equal-weighted cumulative returns on IPOs are calculated by adding returns from the third day of trading to the end of the month of the IPO and from then on adding monthly returns for thirty-five (fifty-nine) months. Abnormal returns are the simple difference between the IPO return in a given month and the FTSE All Share index. If the IPO is delisted before the thirty-fifth (fifty-ninth) month the return is added until the delisting date. Since monthly returns are available only until 30 June 2005, the returns are truncated for IPOs after 1 July 2000. All IPO and benchmark returns are taken from Datastream. One, two and three asterisks indicate significance, at the 10%, 5%and 1% level or better, respectively.

Table 3: CARs by Industry

Panel A: Three-year and five-year cumulative abnormal returns against the FTSE All Share index for the whole sample

		3 year CAR			5 year CAR		
Industry codes	**Industry classification**	**Hot**	**Normal**	***t-statistic***	**Hot**	**Normal**	***t-statistic***
00, 10, 20, 30, 41, 43, 46, 70	Industry	-18.82%*	-11.34%	*0.582*	-46.45%***	-21.35%**	*1.328*
51, 52, 53, 56, 58, 59, 63	Services	31.07%**	17.32%	*0.721*	15.56%	21.14%***	*0.253*
25, 44, 48, 54, 67, 93, 97	High-technology	-57.55%***	1.13%	*4.054****	-47.77%***	-0.81%	*2.918****

Panel B: Three-year and five-year cumulative abnormal returns against the FTSE All Share index for venture-backed IPOs

		3 year CAR			5 year CAR		
Industry codes	**Industry classification**	**Hot**	**Normal**	***t-statistic***	**Hot**	**Normal**	***t-statistic***
00, 10, 20, 30, 41, 43, 46, 70	Industry	-23.62%*	2.28%	*1.624*	-47.08%**	-10.05%	*1.557*
51, 52, 53, 56, 58, 59, 63	Services	13.65%	27.23%***	*0.565*	-10.75%	34.06%***	*1.621*
25, 44, 48, 54, 67, 93, 97	High-technology	-54.08%***	-2.95%	*2.638****	-60.04%***	-5.80%	*2.542****

Panel C: Three-year and five-year cumulative abnormal returns against the FTSE All Share index for non-venture IPOs

		3 year CAR			5 year CAR		
Industry codes	**Industry classification**	**Hot**	**Normal**	***t-statistic***	**Hot**	**Normal**	***t-statistic***
00, 10, 20, 30, 41, 43, 46, 70	Industry	-11.87%	-26.26%	*0.693*	-45.53%*	-33.73%**	*0.385*
51, 52, 53, 56, 58, 59, 63	Services	63.97%**	7.29%	*1.804**	31.68%*	8.07%	*1.587*
25, 44, 48, 54, 67, 93, 97	High-technology	-94.67%***	5.65%	*3.078****	-31.68%*	4.72%	*1.483*

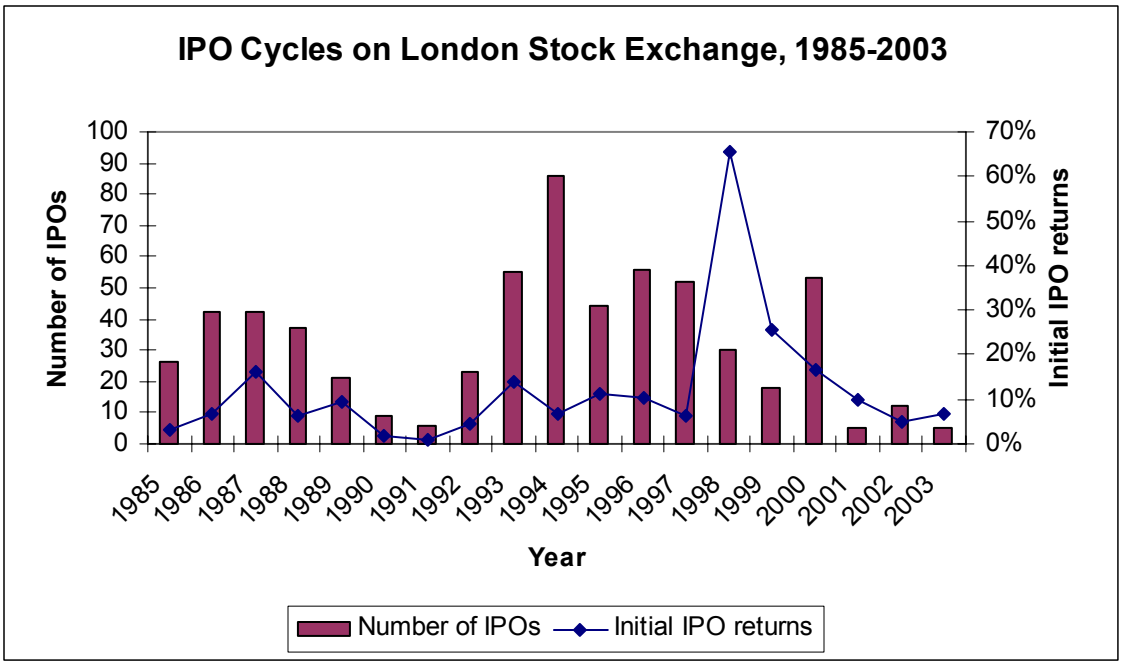
See notes for Table 2. Industry codes are from the London Stock Exchange 2000 Yearbook

Table 4: Determinants of three-year cumulative abnormal performance

	All IPOs			Non-VC			VC-backed		
	1	2	3	4	5	6	7	8	9
	1985-2003	Normal markets	Hot period	1985-2003	Normal markets	Hot markets	1985-2003	Normal markets	Hot markets
Intercept	-0.0562	-0.2628*	0.0629	-0.1976	-0.4124**	-0.0409	0.1938	0.0565	-0.1077
	(0.46)	(1.88)	(0.28)	(1.23)	(2.34)	(0.13)	(0.92)	(0.23)	(.27)
BTOM	-0.0327	-0.0160	-0.1952	-0.0914	-0.0102	-0.3923***	0.0127	-0.0279	0.1744
	(0.42)	(0.18)	(1.59)	(0.83)	(0.08)	(3.32)	(0.13)	(0.22)	(1.00)
MARKETCAP	0.0079	0.0587*	-0.0951*	0.0247	0.0967**	-0.1303*	-0.0176	0.0021	0.0207
	(0.25)	(1.66)	(1.66)	(0.55)	(2.07)	(1.99)	(0.39)	(0.04)	(0.20)
UNDERWRITER	0.0385	0.0285	0.0281	-0.0133	-0.0700	0.1527	0.0655	0.0894	0.0641
	(0.51)	(0.32)	(0.20)	(0.11)	(0.52)	(0.66)	(0.66)	(0.74)	(0.37)
FIRST DAY RETURN	-0.0469	0.1900	-0.3707	-0.0180	0.0892	-0.0800	-0.1012	0.2389	-0.7126*
	(0.24)	(0.53)	(1.58)	(0.06)	(0.17)	(0.36)	(0.39)	(0.49)	(1.78)
TURNOVER/ASSETS	0.0380	0.0245	0.1071	0.0634*	0.0461	0.2443***	-0.0297	-0.0368	-0.0599
	(1.25)	(0.82)	(1.42)	(1.68)	(1.17)	(4.47)	(0.50)	(0.58)	(0.37)
EBIT/ASSETS	0.2825***	0.2304***	0.5689***	0.2048	0.1363	0.4310*	0.3654***	0.3055***	1.1420***
	(2.82)	(2.65)	(2.92)	(1.57)	(1.47)	(1.77)	(3.05)	(2.86)	(3.65)
HIGH-TECH	-0.1770**	-0.0589	-0.4458***	-0.1535	0.0689	-0.8055***	-0.2075**	-0.1808	-0.1226
	(2.16)	(0.60)	(2.96)	(1.20)	(0.45)	(3.99)	(1.97)	(1.39)	(0.53)
VCREP	0.1159	0.1158	0.0662				0.0787	0.0703	0.1021
	(1.53)	(1.29)	(0.46)				(0.75)	(0.53)	(0.56)
HOT MARKET	-0.2871***			-0.2272*			-0.3580***		
	(3.44)			(1.68)			(3.26)		
R^2	0.071	0.034	0.229	0.045	0.030	0.385	0.112	0.052	0.255
F-Stat	4.900***	1.908*	4.931***	1.571	0.930	4.463***	4.280***	1.528	3.202***
N	589	447	142	274	216	58	315	231	84

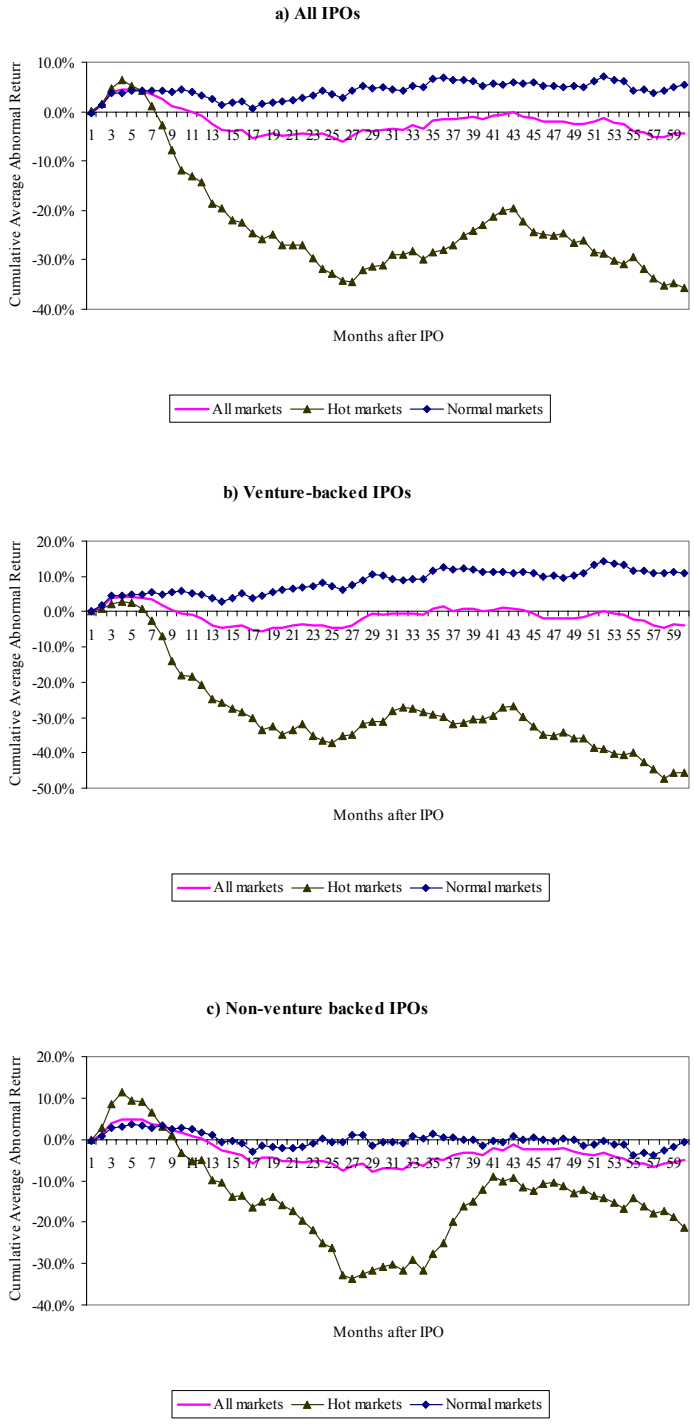
The sample consists of 315 venture backed IPOs and 274 non-venture backed IPOs listed on the London Stock Exchange between 1985 and 2003. This sample is slightly smaller than that used in the rest of the paper due to the unavailability of earnings data for two IPOs. The Hot period includes 1987, 1993 and 2000. The dependent variable is the three-year CAR against the FTSE All Share index. BTOM is the natural logarithm of the book-to-market ratio 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. 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. The VCREP dummy variable equals 1 if the IPO's lead venture capitalist has an established reputation as defined previously. All regressions are OLS and include a HIGH-TECH industry dummy variable. 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.

Figure 1



The full population of IPOs contain 2,489 issues listed on the London Stock Exchange between 1985 and 2000. The sample consists of 593 IPOs listed on the London Stock Exchange between 1985 and 2003. The data are from the London Stock Exchange Quarterly Markets Reviews.

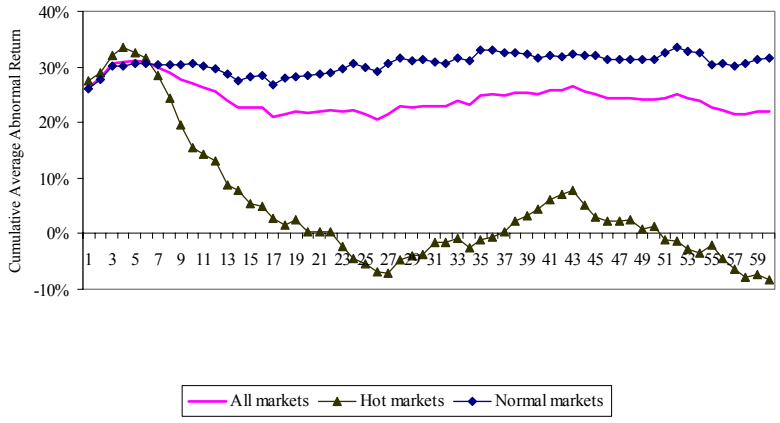
Figure 2: Long-run CAARs, 1985-2003



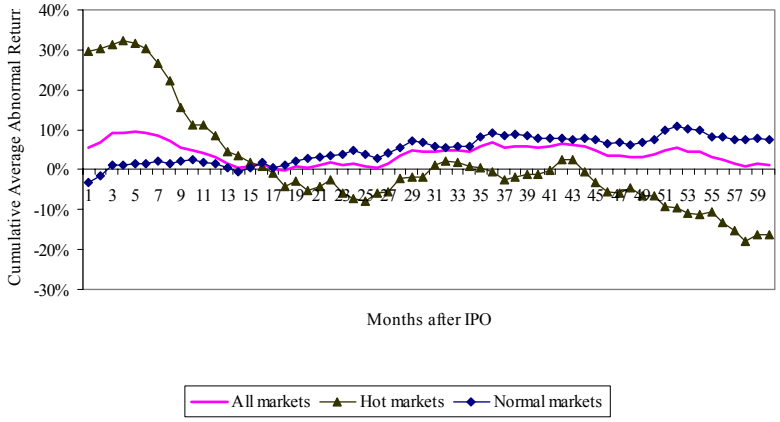
The sample consists of 317 venture backed and 276 non-venture IPOs listed on the London Stock Exchange between January 1985 to December 2003. The venture backed IPOs are all new issues with venture capital participation recorded in the IPO prospectus. The monthly abnormal returns are difference between the IPO return in a given month and the FTSE All Share. The Hot period includes 1987, 1993 and 2000. The Normal period includes the other years. Abnormal returns are then averaged across IPOs to yield the monthly average abnormal returns. The cumulative average abnormal returns (CAAR) are calculated by cumulating the AARs from the third day of trading to the end of the month and then cumulating AARs for fifty-nine months. Since monthly returns are available only until 30 June 2005, the returns are truncated for IPOs after July 2000.

Figure 3a: Long-run CAARs relative to the offer price

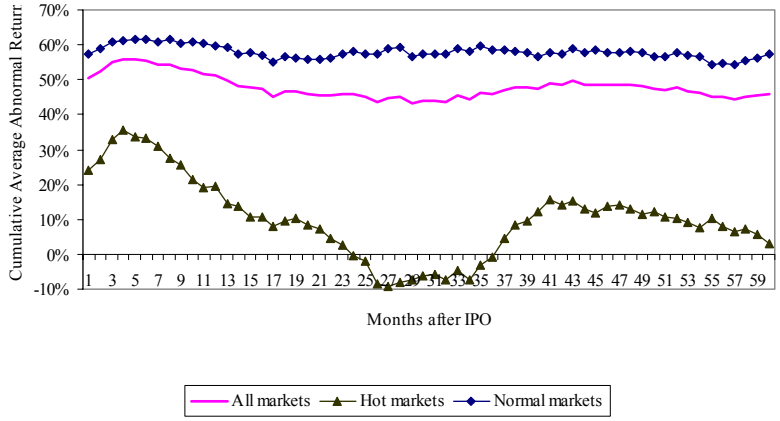
a) All IPOs



b) Venture-backed IPOs



c) Non-venture IPOs



Appendix I. Data Sources

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.[24] 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 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. In cases of discrepancies, the ownership information in the prospectus is deemed to be accurate.[25] Information on the incorporation date of the company, issue date and price, type of issue, market value, proceeds raised, name of lead underwriter and auditor as well as business sector are taken from the London Stock Exchange Quality of Markets Quarterly Reviews, Primary Market Fact Sheets and Yearbooks. Underwriters and auditors are classified according to the annual ranking in Hambro Companies Guides.

Daily and monthly returns for the IPOs and stock indexes (Financial Times All Share, Financial Times All Share ex-financials, Financial Times Small Cap and Financial Times Small Cap ex-investment trusts) are taken from Datastream. IPO prospectuses were inspected in

[24] 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.

[25] 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.

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 capitalist board participation and board tenure period were collected from the 'Board of Directors' section. The latter identifies the top executives and directors of the issuing company. Board members who represent venture capitalists are usually designated as such.

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 latter is defined as the venture capitalist with the highest 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. Venture capitalist 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 19 years of the study. Those venture capitalists with a reputation index value greater than the average are classified as having an established reputation (Lin and Smith, 1998).[26]

[26] The index value is calculated as follows:
Index of lead venture capitalist reputation = 0.5*(Age of lead venture capitalist – Mean age)/$_{age}$ + 0.5*(Number of deals as lead by lead venture capitalist – Mean number of deals as lead)/$_{deals}$