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# Exit Strategies of Venture Capitalists in Hot Issue Markets: Evidence from the “Neuer Markt” in Germany

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In this study we analyze the IPO exit behavior of venture capitalists (VCs) in the *Neuer Markt*, the former market for young growth companies in Germany. We find empirical evidence that VCs were able to time their exit quite successfully in the primary market and to some extent also in the secondary market. The larger the number of shares being sold by the VCs at the IPO date, the lower is the IPO performance after expiration of the lock-up period. In addition, the firms that went public in the year 2000 planned their IPO too late in the stock market cycle so that - due to the mandatory lock-up period of six months - some VCs had no chance for a lucrative exit and still owned shares three years after the IPO. Thus, lock-up commitments can be quite costly for early investors particularly towards the end of a hot issue market.

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## Introduction

The markets for venture capital (VC) and initial public offerings (IPOs) are usually closely linked because the going public of a firm offers an important exit opportunity for early investors. This applies especially for hot issue markets, i.e., periods in which equity prices are extraordinary high and the number of IPOs increases dramatically (Lerner, 1994). Thus, the opening of a new stock market segment for high tech growth firms at the German Stock Exchange in 1997 - called *Neuer Markt* - offered venture capitalists the opportunity for more efficient and profitable exit strategies. This new market segment also set off a strong increase in venture capital financing for start-up firms in Germany. The year 1997 was also the beginning of a period of dramatically increasing stock prices world wide and particularly in the German *Neuer Markt* with index returns of up to 1,600% from March 1997 to March 2000 as measured by the Nemax (*Neuer Markt* Index). In fact, the *Neuer Markt* with its 329 listings became the most successful market for growth firms in Europe during that period. Unfortunately, due to an extremely poor performance of minus 96% of the Nemax from its peak in March 2000 and many scandals and bankruptcies, it was eventually closed as a market segment in March 2003. Of the 329 IPOs, 297 are now listed in the Prime Standard or General Standard segment of the German Stock Exchange, 18 were acquired, and 14 failed. Thus, an analysis of the *Neuer Markt* offers a great opportunity to analyze whether venture-backed IPOs are more successful than non venture-backed IPOs and whether venture capitalists are able to time their exit well. This latter aspect is especially interesting because the investors in the *Neuer Markt* were constrained by mandatory lock-up periods of six months.

The objective of venture capitalists usually consists of investing in promising private companies at attractive prices and selling them at much higher prices. One sensible exit route for successful ventures is going public and selling shares either in the primary or secondary market. Hot issue markets usually provide an ideal setting for such an exit. Gompers and Lerner (2003) find that realized VC returns are typically above average in hot issue markets and below average in cold issue markets. Because the underpricing of IPOs is particularly high in hot issue markets, it seems sensible for the VC not to exit at the time of the IPO but to sell the shares in the secondary market. However, if the lock-up period expires after the stock market has peaked, the venture capitalist may lose the opportunity for an optimal exit. In fact, the time window for exit at relatively high prices was very limited in the *Neuer Markt* and lasted only several months. Moreover, there was a time gap of six months between the going public and the exit. The objective of this study is to investigate the exit behavior of venture capitalists in Germany. In particular, we analyze whether VCs were able to exploit these ideal exit opportunities by selling shares either at the time of the IPO or in the secondary market at higher prices. In addition, we investigate for those IPOs that went public at the peak of the market whether the VC missed the optimal exit point and is still invested in the IPO. We find empirical evidence that VCs were able to time their exit quite successfully in the primary market and to some extent also in the secondary market. Obviously, those firms that went public in the year 2000 planned their IPO too late in the stock market cycle so that - due to the mandatory lock-up period of six months - some VCs had no chance for a lucrative exit. Some venture capitalists still owned shares even three years after the IPO. Thus, lock-up commitments can be quite costly for early investors in particular towards the end of a hot issue market.

The rest of this paper is organized as follows. In the next section the markets for venture capital and initial public offerings in Germany are described. The literature is reviewed in sec-

tion II and the optimal timing for an IPO and for a venture capital exit is discussed in section III. The data and methodology are described in section IV. The empirical findings are presented in section V in the following order. First we compare the performance of venture-backed and non venture-backed IPOs and then analyze the VC exit behavior in the primary market, the impact with respect to the lock-up commitment, and the exit behavior in the secondary market. Then we extend our empirical analysis by including some additional variables to check for the robustness of our previous results with cross sectional regressions. Finally we analyze the buy-and-hold returns for IPOs during the hot issue periods of 1999 and 2000. This study ends with a summary and conclusions.

## I. Venture Capital and Initial Public Offerings in Germany

In most economies venture capital and IPO markets are interdependent (Black and Gilson, 1998). This is also the case in Germany. In the following sections we analyze the German markets for venture capital and for initial public offerings.

### A. Venture Capital

The market for venture capital was not well established in Germany for a long period of time and is still not at a level that would be required to provide sufficient funds for start-up firms, given the size of the German economy. In the early 1980s, the total VC volume invested by members of the German Venture Capital Association (BVK), the German umbrella organization for venture capitalists, hardly exceeded an amount of one billion Euros. In the 1990s, however, the VC volume started to increase impressively. The amount of venture capital provided by members of the BVK for the period from 1983 to 2003 is documented in Figure I. Within this period VC volume increased from € 0.4 billion to € 39.9 billion. This amounts to an average annual growth rate of close to 30%. Obviously, this strong growth rate is the result of the global boom in technology stocks in the late 1990s and the opening of the *Neuer Markt* in 1997.

Despite the immense growth rate, the German VC market may still be considered underdeveloped by international standards. In 2002, the total volume of new venture capital investments in the United States was \$ 62.7 billion which amounts to 0.60% of U.S. GDP. In the United Kingdom, venture capitalists invested \$ 9.6 billion or about 0.62% of U.K. GDP. Even in France new venture investments exceeded \$ 5.5 billion or about 0.39% of GDP in 2002. In contrast, venture capital investments in Germany amounted only to about \$ 2.4 billion or 0.21% of GDP in 2002 (for detailed data see PWC/3i, 2003). Thus, these figures support the view of an underdeveloped VC market in Germany. The volume of invested funds will have to improve substantially in the future in order to provide sufficient risk capital so that start-up firms with promising prospects can be financed.

Additional insights into the current structure of the German VC market may be gained by analyzing the different sources of venture financing as well as the various exit routes used in recent years. Table Ia shows the sources of new VC funds for the period 1997 to 2000. Over that period the volume more than doubled from € 2,186 million to € 5,803 million. Nevertheless, due to the German universal banking system, financial institutions supplied a substantial fraction of VC investments. In fact, in 1997 banks provided 58% of the new venture capital. However, the relative involvement of banks has decreased continuously over recent years. In 2000, banks contributed about the same amount in absolute terms but only 29% of total new funds. This decrease reflects the shift to other sources of VC financing. While insurance com-

panies' proportion of VC volume increased from 10% to 17% from 1997-2000, the amount invested more than quadrupled. Interestingly, since the year 2000 pension funds also began increasing their supply of funds for venture capital financing in Germany. Such behaviour is usually the case in market based financial systems. In addition, the share of the public sector increased from 5% to 16%.

Obviously, the willingness to provide venture capital funds is related to the opportunity to exit from the venture at favorable terms later on. In principle, the VC has the following alternatives to exit: trade sale, management buy back, initial public offering or secondary purchase. The investment is written off if the venture fails. Table Ib shows the importance of various exit routes for German VCs for the period surrounding the *Neuer Markt* from 1997 to 2003. During this period the volume increased from € 728 million to € 2,132 million in 2002 but declined to € 820 million in 2003. Over this period VCs sold about 30% of their investments by trade sale. Buy backs by initial shareholders or management fluctuated between 3.7% in 2002 and 30% in 1998. Up to 14% of VC exits were realized by secondary purchases (2003). IPOs became popular during the time of very favorable exit conditions between 1998 and 2000. During this period, VCs sold up to 14% (1998) of their equity stake by bringing the company to the stock market. Beginning in 2001 and triggered by the decline in stock prices, IPOs were no longer a viable exit option resulting in not a single IPO in Germany in 2003 (Figure II). Instead, many ventures failed and write-offs became the most common exit route with about 40% annually between 2001 and 2003. Thus, the *Neuer Markt* apparently provided the venture capitalists with great exit opportunities at least for some time.

### **B. Initial Public Offerings in the Neuer Markt**

Historically, the German financial markets were relatively small and did not offer great opportunities for firms to go public. The number of IPOs for the period from 1977 to 2003 is shown in Figure II. In the late 1970s and the beginning of the 1980s, less than 10 firms went public each year. Over the period from 1983 to 1997 the annual number of new listings was between 9 and 33. Given the size of the German economy this is still a very small number. With the technology boom in the late 1990s, IPOs suddenly became tremendously popular even in Germany. In 1998, 71 firms went public and in the following two years this number increased to 166 (1999) and 160 (2000) IPOs. This period can clearly be labeled as a hot issue market. Due to the substantial decline in the stock price levels since March 2000 the IPO activity slowed dramatically and came to a standstill in 2003. In 2001 only 26 and in 2002 merely 7 firms went public in Germany. In 2003, there was not even one IPO. Some firms went public in 2004, but many announced IPOs were eventually withdrawn. Thus, the IPO market in Germany is currently in a very difficult position which may be due to the negative performance of the previous years, scandals, bankruptcies, and the closing of the *Neuer Markt* in 2003.

From an institutional perspective the increase in IPO activity in Germany was strongly supported by the opening of the *Neuer Markt* which was established as a special market segment for small and young growth firms in 1997. The previous attempt in 1989 to establish a similar market segment was less successful (Schmidt and Schrader, 1993). To signal the high standards of this new market segment, firms had to comply with several very special listing requirements of the *Neuer Markt*. In this form they were novel. First of all, IPOs were forced to raise substantial new equity capital as at least half of the issuing volume had to consist of primary shares. The reason for this requirement was that the exchange thought that growth firms always need additional equity capital. Furthermore, IPOs were forced to use the sometimes

substantial cash inflow from the IPO to finance growth. Debt repayment was not an option allowed for these firms. Moreover, additional equity capital could not be issued during the first six months. Thus, all required funds had to be raised at the time of the IPO, resulting in the usual agency and moral hazard problems (Bessler and Kurth, 2004). Most important - and of special interest for this study - initial shareholders had to commit to a mandatory lock-up period of at least six months. Such requirements were also used in other markets such as the U.S. and the U.K., but in those markets they were based on a voluntary contract between the underwriter and the firm. The basic idea of lock-up agreements is to signal the quality of the firm as well as the commitment of the founders, venture capitalists, and management not to exit the venture immediately after the IPO. This requirement was non-negotiable for all shares retained by initial shareholders. Thus, initial shareholders could either sell shares in the primary market or in the secondary market after six months of trading. Again, this created certain agency problems and opportunistic behavior by venture capitalists, banks, underwriters, and analysts (Bessler and Kurth, 2005). However, after the lock-up period, large equity stakes could be sold unnoticed by initial shareholders or management because there were no disclosure requirements. Bessler et al. (2003) even argue that this special legal environment of the German Stock Exchange, which was based on private law not public law, may have contributed significantly to the problems and failure of the *Neuer Markt*. Moreover, and very interestingly, there are special tax laws in Germany for the treatment of capital gains. Although this was not an important regulation for institutional investors, the private investor was locked-in by tax laws in that capital gains were not taxable after a holding period of 6 months until the end of 1998. This period was extended to 12 months at the beginning of 1999. Thus, a very special legal environment influenced the exit behavior of private and institutional investors in the German *Neuer Markt*. This behavior with respect to lock-up periods and tax laws resulted in significant stock price reactions.

The *Neuer Markt* is a perfect reflection of the rise and fall of the German IPO market. As presented in Figure III, the Nemax Allshare Index rose from about 500 in March 1997 to 8,583 in March 2000. Thus, within three years, the index increased by about 1,600%. Many firms exploited this “window of opportunity” in a hot issue market and listed either in 1999 or in 2000. More than 80% of all German initial public offerings in the *Neuer Markt* occurred within that period. Thus, on average more firms went public within a month during that period than within one year in the 1980s. However, the decline of the index from its peak of 8,583 in March 2000 to a level of 353 on October 8, 2002, a decline of 96%, was dramatic. Thus, the Deutsche Boerse AG finally closed the *Neuer Markt* segment in 2003 in response to this decline, but also due to several company scandals and legal problems (Bessler and Kurth, 2003). In sum, the attempt to overcome the traditional bank based financial system and to create a successful stock market segment in particular for innovative growth firms was clearly not a long term success. Nevertheless, the hot issue market of 1999 and 2000 was unique for the German stock market. Especially for growth firms it provided a great “window of opportunity” to issue new equity at relatively high prices. This was also a great opportunity for venture capitalist to sell their equity stakes either in the primary or secondary market at relatively high prices. However, for both the timing was essential.

## II. Literature Review

The importance of venture capital has been well documented in the academic literature in that an efficient venture capital market is important in providing risk capital for start-up

firms, thereby reducing the financing problems for risky ventures and stimulating economic growth (Gompers and Lerner, 1999a). Hence, supporting venture capital firms has become a pivotal element on the political agenda in some countries. Recently, France increased the percentage that insurance companies can invest as venture capital (Handelsblatt, September 8, 2004, p. 19). The main reason for such a support is that first of all venture capitalists perform important functions during the start-up phase of a company such as screening and consulting (Berlin, 1998). They further increase the success rate by closely monitoring and enforcing incentive compatible contracts (bonding) so that management is motivated to maximize the market value of the venture (Gompers and Lerner, 1999a).

If venture capitalists do have a significantly positive influence on the success and performance of start-up firms, this should be observable initially at the time of the initial public offering and then in a superior long-run performance of the IPO. Because some venture capitalists more often use initial public offerings as an exit route than trade sales or share buy backs, one would expect that the VC is sensitive to any negative reputation effects that may be caused by an underperforming IPO or by any inappropriate exit behavior. Consequently, reasonable offer prices and prudent exit behavior can be generally expected. If this is the case, venture capitalists should be in a position to signal the quality and value of an IPO, thereby reducing the adverse selection problems (certification hypothesis). Hence, venture-backed IPOs should have a lower underpricing and a superior long-run performance compared to non venture-backed IPOs. In contrast, it seems quite realistic to assume that venture capitalists possess private information and will seek an optimal exit either in the primary or secondary market in order to maximize their own return on investment. Thus, it may not be surprising that VCs possibly will exploit privileged information to the disadvantage of investors either in the primary or secondary market.

So far the empirical evidence on these issues is mixed. Megginson and Weiss (1991), for example, find for U.S. venture-backed IPOs on average a lower underpricing. In contrast, Barry et al. (1990) observe a lower underpricing only when experienced VCs are involved. In contrast, Francis and Hasan (2001), Smart and Zutter (2003) as well as Lee and Wahal (2004) find opposite results in that they document even higher initial returns for venture-backed IPOs. Brav and Gompers (1997), who investigate long-run performance, find superior returns for venture-backed IPOs. A special exit timing ability of VCs is also reported by Lerner (1994). This latter result is confirmed by Gompers and Lerner (1998) who observe that venture-backed IPOs significantly outperform before the exit of the venture capitalist and significantly underperform thereafter. In a more recent line of research, Field and Hanka (2001) provide evidence that VCs sell a substantial percentage of their shareholdings immediately after the lock-up period expires, thus making the end of the lock-up period an important valuation event. In addition, Brav and Gompers (2003) find extended lock-up periods for those IPOs that may have some severe agency problems. This suggests that lock-up commitments in general as well as the length of the lock-up period may be used as a positive signaling device.

Nevertheless, the primary objective of venture capital firms is to earn a superior risk adjusted return for their investors. This means an initial investment in a promising venture at a relatively low price and an exit at a relatively high price. Venture capitalists might be in a position to influence both. Depending on the venture, the expected returns of a successful investment is close to 60% annually (Berlin, 1998). Gompers und Lerner (2003) also document for the U.S. annual returns of more than 50% during boom markets. However, in a weak market environment such as that at the end of the technology bubble in 2001, this can change into

negative returns. This raises the question of an optimal point in time for exit. The two most prominent dates are either at the time of the IPO or after the expiration of the lock-up period. In the U.S. venture capitalists usually do not sell a large percentage of their stake at the time of the IPO, but often continue to play an active role in the company, for example, on the board of directors (Barry et al., 1990; Megginson and Weiss, 1991; Lin and Smith, 1998).

For Germany the long-run performance of IPOs was investigated by Bessler and Thies (2004) for the period from 1970 to 1995, which is a period before the opening of the *Neuer Markt*. They find the usual long-run underperformance (36 months) with the exception that IPOs with subsequent season equity offerings (SSEO) outperformed the market significantly. Bessler et al. (1998) also examine IPOs' operating as well as stock market performance in Germany for the same period. They find some evidence that corporate governance issues, i.e., the German universal banking system, may influence both the firms' decisions to go public and their performance in the secondary market. For the *Neuer Markt* in Germany, a number of studies investigated the impact of venture capitalists on the underpricing of IPOs, but do not find a significant difference between venture-backed and non venture-backed IPOs. Surprisingly, there seems to be a positive relationship between the reputation of the VC and underpricing, meaning that IPOs backed by reputable VCs are more underpriced (Franzke, 2001; Tykvova and Walz, 2004). Despite these findings, venture capitalists in Germany appear to sell more shares at the time of the IPO than their U.S. counterparts (Bessler and Kurth, 2004). Moreover, there is some empirical evidence that venture-backed IPOs are significantly more underpriced when the VC is either a member of the underwriting syndicate or a subsidiary of a bank (Bessler and Kurth, 2005). Obviously, there are severe conflicts of interest between VC financing, IPO underwriting and commercial banking. Empirical evidence for these problematic relationships is also provided in a study by Ber et al. (2001) for Israel.

There are only a few studies that investigate the long-run performance of venture-backed IPOs in the German *Neuer Markt*. The findings are generally an underperformance relative to other IPOs after 3 years. One frequently given explanation for these results is the inexperience of German venture capital firms (Rindermann, 2004; Tykvova and Walz, 2004). In contrast, Bessler and Kurth (2005) find strong indications that VCs and especially bank-affiliated VCs time their exit quite well in the primary as well as in the secondary market. When bank-affiliated VCs sell a major part of their shares at the time of the IPO, these firms underperform significantly in the secondary market. The opposite is generally true if bank-affiliated VCs keep their shares. It is very interesting to observe that there is a strong superior performance in the first six months of trading, but a tremendous decline in abnormal returns (BHAR) later on. Obviously, the end of the lock-up period is an important point in time in that we often observe a dramatic change in stock price performance. Nowak and Gropp (2002) also find empirical evidence for this notion by observing negative abnormal returns when the lock-up period expires. However, Bessler and Kurth (2005) find that the negative returns are more related to capital gains taxation (tax lock-up period) than to the regulatory lock up-period. Thus, it is important to take a closer look over the stock market cycle at the optimal timing of an initial public offering and the exit from the venture.

### III. Optimal IPO Timing and Venture Capital Exit Timing

The *Neuer Markt* offers an ideal opportunity to analyze the behavior of management and venture capitalist with respect to exit strategies and market timing during the hot issue market of 1999 and 2000. A very important aspect from both the firm's perspective as well as



that of the VC is that usually both have similar objectives, i.e., maximizing their own benefits with respect to the timing of an IPO and the timing of an exit, respectively. However, the point in time for an optimal revenue maximizing IPO on the one hand, and for an optimal return maximizing exit of the VC on the other hand, most likely differs. This is especially the case in a very volatile stock market, or more precisely, in a market with an extremely large increase and a sharp decline over a short period of time. On the *Neuer Markt*, the Nemax index increased from 2,979 on January 4, 1999, to 8,559 on March 10, 2000, and then declined again to 2,743 on December 29, 2000. This all happened within a period of 24 months. Finally the Nemax declined as low as 353 in October 2002 (Figure III).

Such an extremely volatile market is particularly risky for VCs in the regulatory environment of the German Stock Exchange where shareholders on the *Neuer Markt* were faced with a mandatory non-negotiable lock-up period of at least six months. Thus, the best possible time for an IPO and the optimal time for a VC exit may be six months apart. Because another special regulation of the German Stock Exchange forced the firms to issue new equity at the time of the IPO (Bessler et al., 2003; Bessler and Kurth, 2004), the offer price really mattered in that firms clearly tried to issue new securities at the highest possible stock market level. Obviously, the general VC objective is also to exit the venture around the highest stock market level. Thus, the first window of opportunity for the VC to exit the IPO was usually six months after the initial public offering. Consequently, this regulatory requirement may add to the potential conflicts of interest between management and the VC due to the fact that stock market levels do not stay constant for very long. As a matter of fact, the difference in stock prices after 6 months can be quite severe as is easily observed in Figure III.

#### IV. Data and Methodology

In the following sections we first describe our sample data and then the methodology employed in our empirical analysis.

##### A. Data

The sample for our empirical analysis includes 251 firms that went public at the *Neuer Markt* during the hot-issue market between January 1999 and December 2000. From this group of 251 IPOs, 86 firms received venture capital financing before the IPO. All this information is taken from the IPO prospectus. The main characteristics of all 251 IPOs (of the 86 venture-backed as well as the 165 non venture-backed) are presented in Table II. A comparison reveals that the venture-backed IPOs are on average significantly smaller than the non venture-backed IPOs.

Moreover, there are significant differences between venture-backed and non venture-backed IPOs with respect to various ownership structure characteristics. With regard to the issuing size and valuation of primary and secondary shares the owners in venture-backed IPOs sell more shares (22.01%) at the time of the initial public offering than the owners in non venture-backed IPOs (16.12%). The participation ratio, which is the number of secondary shares sold at the IPO date relative to the number of pre IPO shares, is 10.98% and 6.89%, respectively. In addition, venture-backed IPOs issue more primary shares than non venture-backed IPOs. Thus, the dilution factor (primary shares / number of shares pre IPO) is 37.15% relative to 33.47%. At a first glance, these differences do not appear to be that substantial, but they are all statistically significant, indicating some important differences between these two groups of IPOs. In the empirical part venture-backed IPOs are defined by a venture capital stake of at

least 4% before the IPO. As documented in Table III, the VC equity stake is on average 29.34% with a minimum of 4.38% and a maximum of 89.80%. The percentage of shares sold at the time of the IPO is between -49.74% and 100%, meaning that some VCs increased their holding and some sold all shares immediately. Due to the initial public offerings, the average VC stake decreases to 16.77% in the secondary market. Thus, about 25% of the shares are sold at the time of the IPO.

## B. Methodology

Initial returns (underpricing) of the IPO are calculated by relating the first price in the secondary market to the issuing price. The long-run performance is measured by holding period returns (BHR) which are calculated for a single stock  $i$  for time period  $T$  as follows:

$$BHR_{i,T} = \left[ \prod_{t=1}^T (1 + R_{i,t}) \right] - 1 \quad (1)$$

where  $R_{i,t}$  is the return of stock  $i$  at time  $t$ , and  $T$  is the time period for which the BHR is determined. For an equally-weighted portfolio of stocks the return is calculated as:

$$dBHR_{P,T} = \frac{1}{N} \sum_{i=1}^N BHR_{i,T} \quad (2)$$

where  $dBHR_{P,T}$  is the average BHR of the portfolio,  $N$  is the number of stocks in the portfolio, and  $T$  is the time period for which the BHR is calculated. To calculate “Buy-and-Hold-Abnormal>Returns” (“BHAR”) the return of the benchmark is subtracted from the IPO return.

$$BHAR = \frac{1}{N} \sum_{i=1}^N \left[ \left( \prod_{t=1}^T (1 + R_{i,t}) \right) - \left( \prod_{t=1}^T (1 + R_{M,t}) \right) \right] \quad (3)$$

The advantage of this method is that the terminal values of the two strategies, i.e., investing in an IPO or investing in the benchmark, are directly comparable. The “NEMAX All-share” index is used as the benchmark. This market weighted performance index includes all companies that are listed at the *Neuer Markt*.

We test for the statistical significance of our empirical findings with various methodologies. Because abnormal returns are highly skewed both parametric and non-parametric tests are employed. To analyze whether the mean BHAR is significantly different from zero we employ a skewness-adjusted t-test as documented in Lyon et al. (1999). Furthermore, we compare the BHAR of the two sub-samples. To test whether the abnormal returns of the two groups differ significantly, a parametric t-test for the differences in means is employed.

We also investigate the impact of venture capital on IPO underpricing and on long-run performance (BHAR) for 6 months and 36 months by employing cross-sectional OLS regressions with White’s heteroskedasticity-consistent standard errors. The independent variables include the control variables firm size and market-to-book ratio. Firm size corresponds with the market value of equity. These two variables adjust the IPO performance for the well known impact of size and growth potential (Lyon et al., 1999; Gompers and Lerner, 1999b). The firm size and market-to-book ratio are based on the first market price of the IPO.

## V. Empirical Results

The empirical results for underpricing and long-run performance of IPOs in the *Neuer Markt* are presented in this section. First we examine whether there are significant differences between venture-backed and non venture-backed IPOs (A). We then analyze whether there are differences with respect to other characteristics such as the exit behavior at the time of the IPO (B) as well as the impact of the lock-up commitment (C). In addition, we test for the robustness of our results with some cross sectional regressions (D). Finally, we investigate the exit decision of venture capitalists as well as the long-run performance of IPOs by employing raw returns instead of abnormal returns (E). By analyzing raw returns we follow the approach by Lowry (2003) who investigated the return behavior of initial public offerings in the U.S. in hot and cold issue markets. She does not find any differences in return behavior between hot and cold issue markets, but documents inferior raw returns for IPOs which initially listed in a hot issue market.

### A. Results for Venture-Backed and Non Venture-Backed IPOs

As discussed in the literature review there is the testable hypothesis that venture capitalists, due to their special screening, monitoring, and consulting abilities, should have a positive impact on firm quality and IPO performance. Thus, we first analyze the returns of the 86 venture-backed and the 165 non venture-backed IPOs with respect to initial returns (underpricing) and long-run performance. The results are presented in Figure IV and Table IV. Both sub-samples reveal a significant underpricing of 54.48% for venture-backed and 42.68% for non venture-backed IPOs. Moreover, the abnormal returns (BHAR) after 6 months of trading are positive with significant returns of 31.92% and 22.46%, respectively. Interestingly, after 36 months of trading (750 trading days) the performance of the IPOs in both sub-samples is nearly identical with 0.54% and 2.87%, respectively. These results suggest that, on average, the initial shareholders (owners) have much better exit opportunities after 6 months than either at the time of the IPO or later on. It is important to note that the difference in initial returns (underpricing) and returns after 6 and 36 months for the venture-backed and non venture-backed IPOs is not statistically significant, meaning that our conclusions in general apply to both groups of IPOs. It is also evident from Figure IV that there is hardly any difference between these two groups of IPOs. We therefore have to conclude from our empirical analysis that VC involvement does not appear to have a significant impact on IPO underpricing (initial returns) and on IPO long-run performance.

Our findings are to some extent in contrast to the empirical literature. One possible explanation for this is that German venture capitalists, given the dramatic increase in VC funds during the 1990s, did not have the experience, the ability or the time period needed to have a significant impact in order to outperform non venture-backed IPOs. It has to be added that especially IPOs in the year 2000 did not have the operating and financial performance yet for a successful listing. The great opportunity that an extremely high stock price level offered convinced many CEOs to go public sooner than later even when this was up to several years before the firm were realistically ready for an exchange listing. Thus, this very special market environment may not be the most adequate setting to make a verdict on the quality and contribution of venture capitalists.

### B. Venture Capital and Exit in the Primary Market

The venture capitalist usually has the choice to sell the shares either in the primary or secondary market. Given the assumed private information advantage of the VC, an immediate exit at the time of the IPO could be interpreted by the market as a signal of expected inferior performance for the foreseeable future. In contrast, a commitment by the venture capitalist to keep the equity stake for some time after going public should usually be interpreted as a positive signal about expected long-run returns. In fact, it has to be assumed that the venture capitalist who stays invested in the stock is hoping for a superior exit opportunity later on. In order to analyze the exit behavior in more detail we separate the 86 venture-backed IPOs into two sub-samples. The first group includes 43 IPOs in which the VCs sold a relatively higher percentage of their shares at the time of the IPO (High VC Exit). The other group includes the remaining 43 IPOs in which the VCs sold a relatively low percentage of the equity stake in the primary market (Low VC Exit). The empirical results are presented in Figure V and Table V. They reveal that the group with the higher exit behavior at the time of the IPO has, as expected, a higher underpricing of 65.16% compared to 43.80%. Thus, the market seems to be aware of potential agency problems. After the first 6 months of trading this group has not only a relatively low and insignificant performance of only 11.18% but also a significantly inferior performance relative to the other group (52.66%). Thus, for the second group with the higher commitment at the time of the IPO we first find a lower and significant initial return (underpricing) of 43.80% and then a higher and significant overperformance over the first six months of trading of 52.66%. Interestingly, immediately after the end of the lock-up period we observe a sharp decline in relative performance so that the two groups started to be hardly distinguishable after 12 months of trading. After 36 months the returns are not significantly different from zero (-3.02% and 4.10%) and there is no significant difference in BHAR between these two groups. The difference in the relative performance of the two groups becomes very obvious in Figure V. It appears that the IPOs in which venture capitalists had sold their shares at the time of the IPO do not have a price increase at all. In contrast, the VC group that does not exit at the time of the IPO has an excellent relative performance for the first six months of trading. The highest abnormal returns (BHAR) are reached around the end of the lock-up period. Subsequently the returns start to decline sharply. A look at the performance chart clearly indicates that an exit immediately after the end of the lock-up period was an exceptional time to sell the shares. Thus, the VCs had either a great ability to forecast return patterns very precisely or they or someone else had the opportunity to positively influence stock prices in the secondary market. Bessler and Kurth (2005) find for a larger sample of IPOs empirical evidence that buy recommendations by analysts that provided venture capital financing to the IPO have a positive impact on the performance over the first 6 months of trading. Thus, the German universal banking system may have some inherent agency problems that are exploited to the disadvantage of the small investor. In any case, such a price behavior offers the venture capitalist an ideal exit environment at the end of the lock-up period. Whether the lock-up period in general has some impact on underpricing and performance is investigated in the next section.

### C. Venture Capital and Lock-up Commitment

The rules and regulation with respect to the lock-up period on the *Neuer Markt* in Germany are unique in that a minimum period of six months is mandatory and non-negotiable, whereas in other countries it is usually based on a contract between the firm and the underwriter that can take various forms (Bessler et al., 2003). In our sample in 22 out of 84 venture-

backed IPOs the VCs made a commitment to extend the required lock-up period for a maximum of 12 months. Two IPOs had to be dropped because all shares were already sold in the primary market. Because of the extended lock-up periods we also analyze BHAR after 12 months in this section and omit the 36 months in the table. An extension that is voluntary should signal the confidence of the venture capitalist in the future performance of the IPO. Thus, we would expect a lower underpricing and a superior long-run performance for these firms due to the VCs involvement. Nevertheless, an extended lock-up period could also be demanded by the underwriter in order to place the shares successfully in the market and therefore may signal adverse selection problems (Goergen et al., 2004).

The empirical findings are presented in Figure VI and Table VI. A comparison of the results for both groups reveals that the initial return of 52.58% of the 22 IPOs with extended lock-up periods is almost the same as the significant initial returns of 51.24% of the IPOs with the standard 6 months lock-up period. However, after 6 months of trading the stocks with the 6 months lock-up period have significant BHAR of 37.02% compared to 22.08% for the other group. After 12 months of trading the return pattern has reversed in that the group with the 12 months lock-up period now has BHAR of 34.46% compared to 17.43%. After 36 months the returns for both groups are quite similar with insignificant BHAR of 0.65% and 2.43%.

The return pattern in Figure VI seems to indicate that the group with the 6 months lock-up period was fortunate to have the performance peak close to the end of this period, whereas the abnormal returns of the other group started to increase later on and reaching a peak some time later. There seems to be a parallel shift into the future of about three months. Interestingly, the BHAR at the end of each lock-up period are very similar with 37.02% (6 months) for the first group and 34.46% (12 months) for the other group. However, the 6 months result is significant whereas the 12 months result is insignificant. Overall, the results suggest that the extended lock-up periods of the venture capitalist are not a credible signal for superior long-run performance. Thus, we have to conclude that the empirical evidence does not suggest that an extended lock-up period indicates higher firm quality and therefore superior IPO performance.

#### **D. Cross Sectional Regressions**

In this section we extend our analysis by including additional variables and testing for the robustness of our empirical findings in the previous sections with several cross sectional regressions. The results are presented in Table VII. The dependent variables are IPO underpricing or initial returns (Model 1) and BHAR after 6 months and 12 months of trading (Models 2 and 3, respectively). All models now include the control variables market value of equity (ln Market Capital) and market-to-book ratio (ln Market/Book). The variables "Dummy VC", "Dummy VC is Underwriter", and "Dummy 2000" are dummy variables equal to 1 if the IPO is venture-backed, if the VC is underwriter, or if the IPO listed in the year 2000, respectively. The variable " $\Delta$  VC" denotes the change in the number of stocks at the IPO date and "VC Lock-up" the length of the lock-up period in months. In addition we analyze the impact of the dilution factor and the participation ratio.

In accordance with our findings based on abnormal returns (BHAR) in section A, the regression results indicate that the coefficient for the VC dummy variable is not significant in any model (Models 1a, 2a, and 3a). Obviously, our previous observation that VC ownership does not have any significant impact on IPOs underpricing and performance is confirmed. However, within the group of venture-backed IPOs the magnitude of the ownership has a significantly positive impact on IPO performance (Models 1b, 2b, and 3b). The higher the per-

centage of VC ownership, the lower is the IPO underpricing and the higher is the long-run performance. Furthermore, we observe higher initial returns if the VC is a member of the underwriter syndicate, indicating conflicts of interests when providing both services. This result is confirmed in a study by Bessler and Kurth (2005) who employ a larger sample and test for these issues in greater detail. The dummy variable "VC is underwriter" is a measure for the fact that the venture capitalist belongs to the underwriter institution. It has a significantly positive effect on underpricing for venture-backed IPOs (Model 1b). The empirical evidence supports the notion that investors are aware of these conflicts of interest and demand higher initial returns when the venture capitalist is part of the underwriter consortium. In addition, the dilution factor has a significant impact on underpricing in that a larger number of shares that are issued at the time of the IPO results in a higher underpricing. Habib and Ljungqvist (2001) argue that a high dilution factor in conjunction with high initial returns represents high opportunity costs for the IPO in the form of "money left on the table". In contrast, the participation ratio is significant only after 6 months of trading, indicating that shareholders that do exit in the primary market are not successful in reducing IPO underpricing as argued by Habib and Ljungqvist (2001). However, they are faced with quite promising exit conditions after the expiration of the lock-up period. Overall, we do not find empirical evidence that the performance of venture-backed IPOs differs significantly from that of non venture-backed IPOs.

The results of the cross sectional regressions clearly reveal that the BHAR after 6 months of trading are higher when the venture capitalist keeps the shares, i.e., sells less shares at the time of the IPO (Model 2b). Interestingly, the variable " $\Delta$  VC ownership" that measures the change in VC ownership is still significant after 36 months of trading (Model 3b). Thus, there is some evidence for a medium term and long term effect. Moreover, the results suggest that the VC is able to time the exit in the secondary market quite well. In contrast, we do not find any significant impact of the lock-up factor in the cross sectional regressions. Thus, as documented in section B, VCs are not able to signal the quality of the IPO by committing to an extended lock-up period. In sum, the empirical findings based on abnormal returns (BHAR) are basically confirmed by our cross sectional regression analysis. An analysis of raw returns or buy-and-hold-returns (BHR) should add further insights into the performance of venture backed IPOs especially with respect to exit strategies. We analyze BHR in the next section.

#### **E. Venture Capital and Exit Behavior in the Secondary Market: An Analysis of Raw Returns**

Our results in the previous sections reveal that VC exit behavior is to some extent related to the abnormal performance of the venture-backed IPOs. Therefore, we complement our study in this section with an additional analysis of raw returns. The basic idea is that VCs can achieve extraordinarily high returns by exiting in hot issue markets, but realize low (or negative) returns if the stock market declines. Thus, market valuation and IPO raw returns are critical factors that determine the VC's optimal exit decision. In declining stock markets, it may be sensible to sell the equity stake as soon as possible, i.e., in the primary market. In contrast, in a period of increasing stock prices, VCs should be more patient because they have the choice to exit in the secondary market any time after the lock-up period expires. In addition, if VCs are successful in timing the IPO in order to raise additional capital at relatively high prices, the listing date has to be scheduled at least six months before the reversion in stock prices. However, this applies only to markets with mandatory lock-up periods such as the *Neuer Markt*. In

the rest of this section we examine whether VCs succeeded in timing the IPO exit before stock prices crashed in the first quarter of 2000.

In Figure VII we present the buy-and-hold returns (BHR) of venture-backed and non venture-backed IPOs. Our empirical analysis so far does not provide any evidence of major differences in the stock market performance between each group. The BHR are quite independent of whether the IPO is venture-backed or not. This is also the case when we separate the sample by the years 1999 and 2000 (results are not reported here). Thus, there is no evidence that venture capitalists had superior abilities in the market over that period. It appears, however, that much of the performance is determined by the year of the IPO. We therefore distinguish between IPOs issued in the years 1999 and 2000. As is documented in Figure VIII there were profitable exit opportunities for VCs and other initial investors for those firms that went public in 1999. Obviously, these investors should have avoided the cost of underpricing of about 45% on average and should have sold their shares later on in the secondary market. In 2000, exit conditions changed dramatically. The BHR of IPOs is negative. They start to decline immediately from the very beginning of trading. Despite an underpricing of about 49% in 2000, some investors were much better off by selling their shares in the primary market instead of committing to a lock-up period of six months. Thus, VCs had excellent exit conditions in the stock market if the IPO initially listed before the third quarter in 1999 but had a difficult environment for the IPOs of 2000. This clearly indicates that VCs can profit nicely from IPOs in hot issue markets as long as the lock-up period expires before the stock market reverts. For IPOs initially listed in 2000 the VCs hardly had any opportunity to exit profitably in the secondary market due to lock-up periods. Staying invested may still be the only sensible option.

Until 2002 there was no data available about individual VC exit behavior in the secondary market. Due to some institutional changes in disclosure requirements in Germany, we now do have reliable information available about venture-backed IPO ownership structure after about three years of trading. We employ this data for an analysis of VC exit behavior in the secondary market. As reported in Table III, VC's mean (median) IPO ownership amounts to 4.22% (0.0%). This is strongly reflected in VCs exit behavior in the stock market. In 26 of 84 cases (31%), the VC still owned shares of the IPO even after about three years of trading. Thus, in 58 cases (69%) we do not observe any VC ownership and conclude that the VC must have exited sometime between lock-up expiration and the observation date of about 36 months after the IPO. Interestingly, these 26 IPOs are firms that went public in the year 2000 (17 IPOs, 65%). Only 9 IPOs initially were listed in 1999 (35%). Thus, considering only the IPOs of the year 1999, VCs exited within three years in about 80% of IPOs. For the venture-backed IPOs of 2000 this is only true for about 60% of our observations. Thus, the probability of a VC investment of venture-backed IPOs is about 20% for IPOs of 1999 and 40% for IPOs of 2000. In a logit regression not documented here we find strong evidence that the probability of VC investment after three years is indeed strongly influenced by the year of going public.

These observations are not surprising. For the venture-backed IPOs of 2000, the IPO happened too late in the stock market cycle so that the lock-up period had expired after the stock market crash in March 2000. Thus, VCs did not have the opportunity to exit successfully. In retrospect, many VCs should have sold all of their shares immediately after the lock-up expiration despite the declining stock prices. This is due to the fact that stock prices declined much further and did not recover until now. Thus, in 2000 those VCs that are still invested in the IPO after three years presumably expected just a temporary decline in stock prices and not a sustained decline in technology stocks. This behavior is not that surprising given the optimistic

environment at that time. Even the decrease of the Nemax index from 8,500 to 5,500 from March to June 2000 kept some market participants extremely optimistic. For example, DG Bank, one of the most active underwriters in *Neuer Markt* IPOs, forecasted in August 2000 that an increase of the Nemax back to 8,500 would occur by the end of that year. They also expected an even further advance to 12,000 by the end of 2001 (DG Bank, 2000). Unfortunately, the index was down to 1,100 at that time. Thus, it appears that not all venture capitalists were successful in perfectly timing their IPO exit.

## VI. Summary and Conclusions

Hot issue markets, i.e., periods with very favorable stock market valuations, usually provide an ideal setting for firms to go public and for a venture capitalist to exit profitably from the venture. In general, the VC can either exit in the primary market at the time of the IPO or later in the secondary market. In addition, a combination of both strategies is possible. Regulation of the German Stock Exchange for the *Neuer Markt* required that initial shareholders had to commit to a mandatory lock-up period of at least six months. If stock prices fluctuated substantially within the first six months of trading these shareholders were constrained to respond to significant price decreases and sell their shares immediately in the market. Thus, in the case of a mandatory lock-up period with high uncertainty about future stock price movements it may be sensible to even forego the usually large initial returns and to exit without delay in the primary market. However, if VCs have access to private information about firm performance, then they may be able to forecast future stock prices and time their exit successfully either in the primary or secondary markets. Whether VCs usually have certain abilities in predicting future stock prices, however, is doubtful indeed. Thus, a decision to exit or not at the time of the IPO involves quite some speculation about the IPO and stock market performance over the next six months.

In this study we examined underpricing (initial returns) and long-run performance of firms that went public in the *Neuer Markt* in 1999 and 2000. In this market segment, the time window of opportunity for a very lucrative going public and a profitable exit lasted only for several months. Although we apply different methodologies in our empirical analysis we do not find significant differences in the performance between venture-backed and non venture-backed IPOs. However, we do have some indications of excellent exit timing within the group of venture-backed IPOs. We first examine VC's exit decision at the IPO date and find strong evidence that VCs indeed timed their exit successfully. Thus, VC's exit behavior is a strong predictor of IPO abnormal performance in particular in the first six months of trading. The larger the number of shares that the VCs sell at the time of the IPO, the lower is the IPO performance after the expiration of the lock-up period. Second, the length of the lock-up period to which the VCs commit has no significant impact on the IPO performance. Thus, it is not clear at all whether voluntary extended lock-up periods signal higher IPO quality.

Finally, we investigate whether VC ownership after three years of trading is determined by general stock market conditions. From the initial shareholder and especially the venture capitalist perspective, it appears that those IPOs that were listed in 1999 had good opportunities to exit. In contrast, IPOs of the year 2000 did not have any opportunity for a profitable exit. For firms that went public in 1999, the VCs usually sold their shares within the first three years, most likely within the first year in the secondary market. For venture-backed IPOs that listed in 2000, it appears that many VCs did not exit at the time of the IPO and were surprised by the stock market crash in March 2000. There is some empirical evidence that they were prevented



from an optimal exit due to the mandatory lock-up period and are still invested in the IPO three years after the initial public offering. Obviously, from the perspective of the venture capitalist, the IPOs of the year 2000 decided to go public too late in the stock market cycle, although this was an optimal time for selling shares and raising additional equity. Consequently, lock-up commitments are costly agreements or signaling devices towards the end of a hot new issue market.

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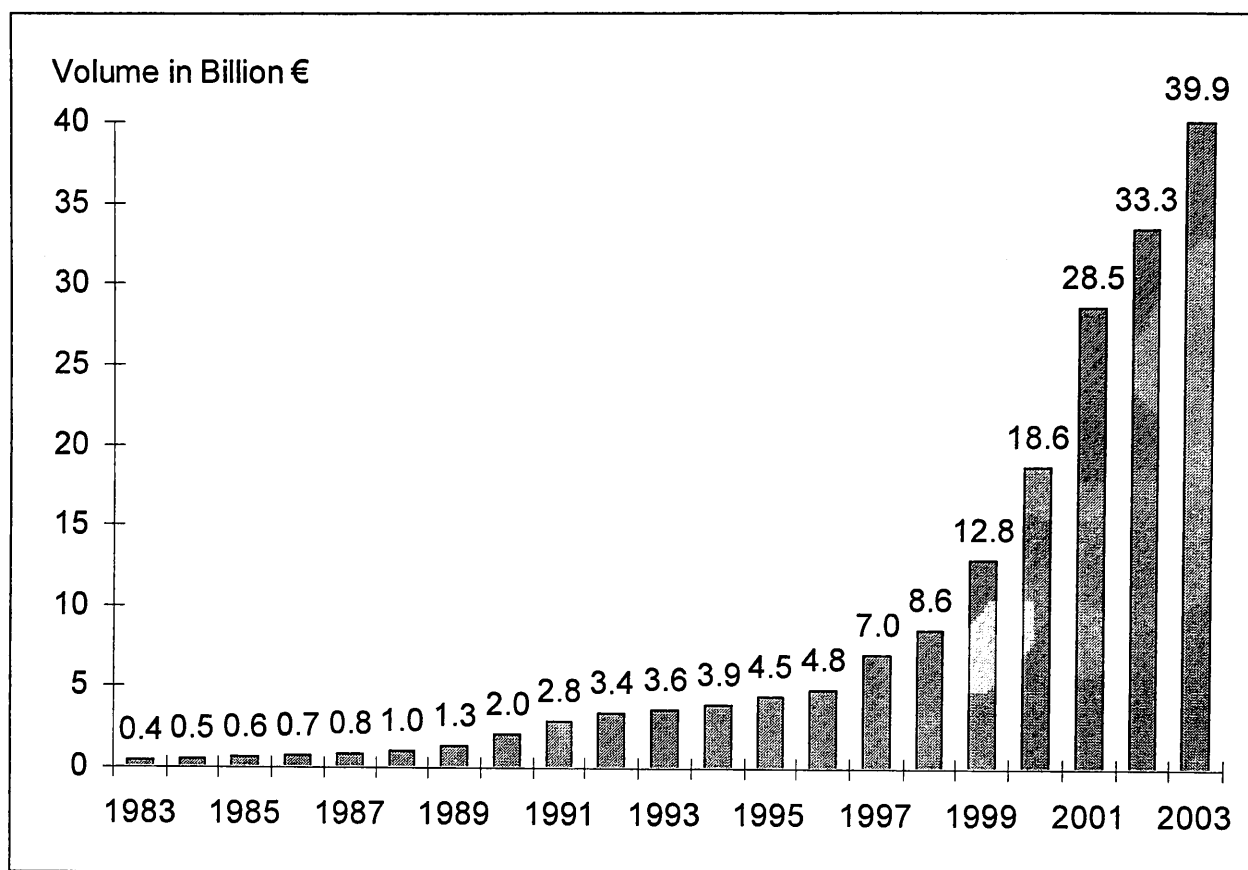
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**Figure I****Total Portfolio Volume Held by Members of the BVK (in € Billion)**

For the years 2001, 2002, and 2003 VC volume includes investments by pan-European funds of € 6.6, € 2.0 and € 5.1 billion, respectively.



Source: BVK (2004).

**Table Ia****New Funds Raised of VC in Germany (in Million €)**

Year	Volume	Banks	Insurance	Pension Funds	Public Sector
1997	2186	58.0%	10.0%	12.0%	5.0%
1998	1594	50.0%	14.0%	14.0%	4.0%
1999	4310	29.0%	10.0%	30.0%	12.0%
2000	5803	29.0%	17.0%	12.0%	16.0%

Source: BVK (2004).

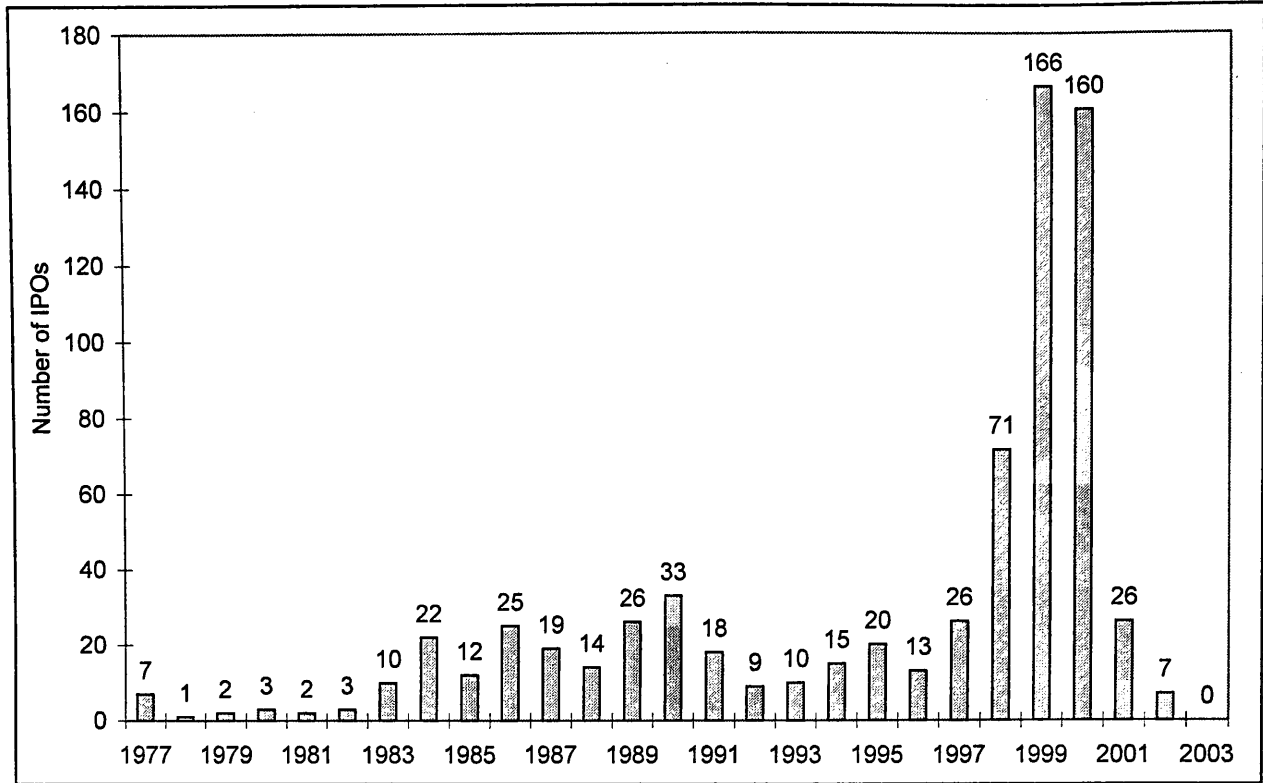
**Table Ib****VC Exit-Routes in Germany**

Year	Volume	Trade Sale	Buy Back	IPO	Secondary Purchase	Write-off
1997	728	34.1%	21.6%	2.7%	4.4%	15.0%
1998	537	22.5%	30.0%	14.0%	0.0%	17.0%
1999	769	25.1%	20.7%	12.6%	4.0%	21%
2000	1262	39.0%	17.1%	9.2%	7.4%	18.4%
2001	1855	20.4%	18.0%	0.4%	7.9%	36.3%
2002	2132	30.6%	3.7%	0.0%	11.7%	44.1%
2003	820	17.8%	9.9%	1.1%	14.0%	40.2%

Source: BVK (2004).

Figure II

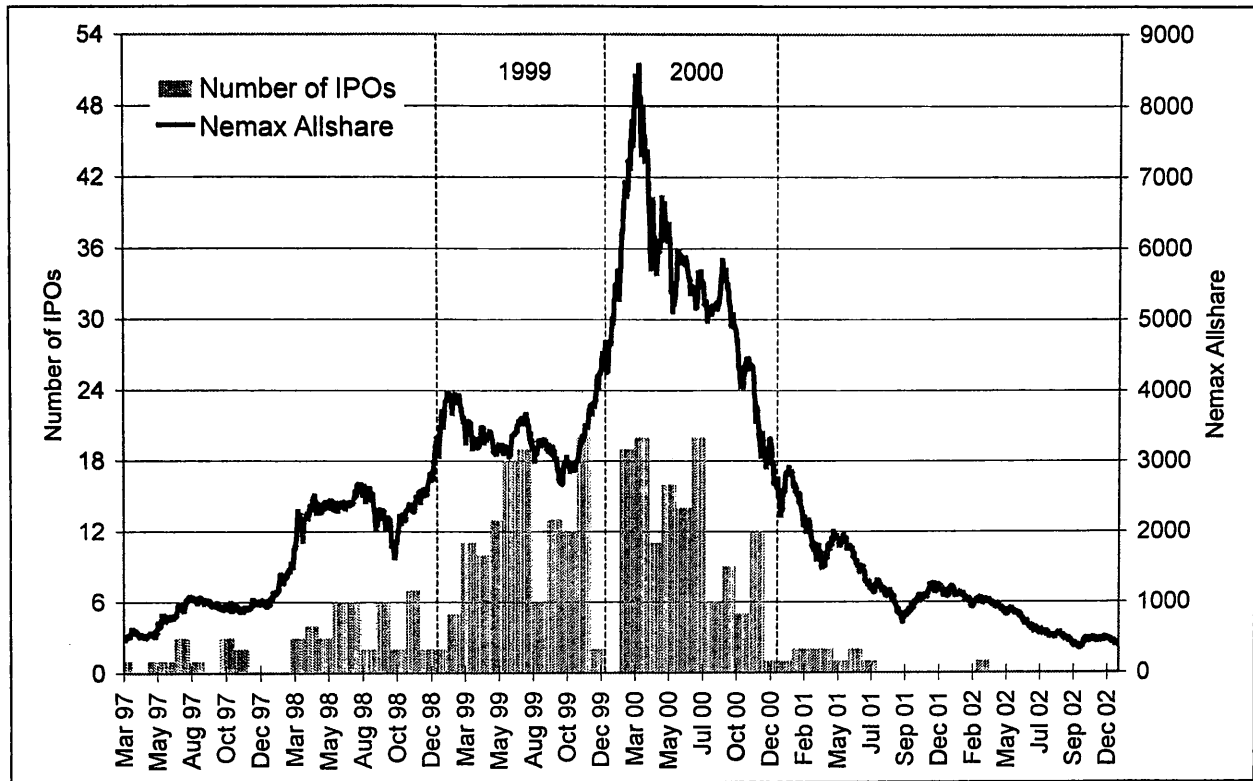
## Number of IPOs in Germany



Source: DAI, own calculations.

Figure III

## Number of IPOs per Month and Neuer Markt Index (Nemax)



Source: own calculations.



Table II

## IPO Characteristics

VB IPOs and NVB IPOs are venture-backed and non venture-backed IPOs, respectively. Median values are shown in squared brackets. Issues size contains the greenshoe option if exercised. This option allows the underwriter to buy additional shares from the

	All IPOs (251) Mean [Median]	VB IPOs (86) Mean [Median]	NVB IPOs (165) Mean [Median]	t-Test (Difference in Means)
<b>A. Size and Valuation</b>				
Issue Size [Mio. €]	81.42 [43.55]	52.04 [40.28]	96.74 [44.00]	-2.27**
Market Value Primary Market [Mio. €]	369.36 [133.30]	158.72 [112.46]	479.15 [154.65]	-1.88*
Market Value Sec- ondary Market [Mio. €]	487.78 [200.03]	248.26 [155.13]	612.62 [209.06]	-1.98**
<b>B. Primary and Secondary Shares</b>				
Secondary Shares/ Is- sued Shares [%]	18.14 [14.82]	22.01 [21.20]	16.12 [13.04]	2.98***
Participation Ratio [%]	8.29 [6.23]	10.98 [9.00]	6.89 [4.98]	3.47***
Dilution Factor [%]	34.73 [33.33]	37.15 [33.95]	33.47 [33.11]	2.07**

issuing firm at the issue price. The market values in the primary and secondary market are based on IPO issue prices and first stock market prices, respectively. The participation ratio is the ratio of secondary shares sold to the number of shares pre IPO. The dilution factor is the ratio of primary shares newly issued to the number of shares pre IPO. \*\*\*, \*\*, and \* denote 1%, 5%, and 10% significance levels, respectively.

Table III

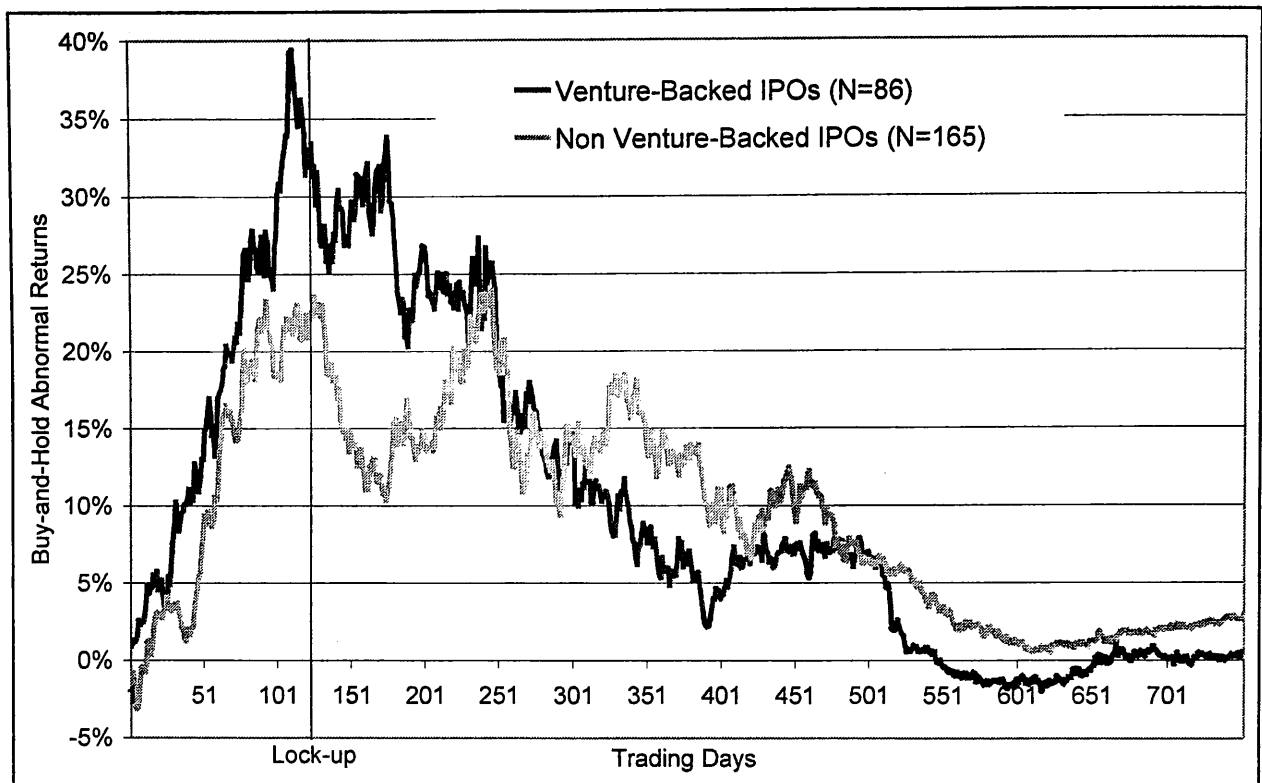
## VC Ownership

VC ownership post IPO represents the information just after the IPO.

	N	Mean	Median	STD	Min.	Max.
Pre IPO (%)	86	29.34	24.40	20.25	4.38	89.80
Post IPO (%)	86	16.46	13.34	12.92	0.00	71.30
% Shares Sold	86	26.12	22.36	25.11	-49.74	100.00
Lock-up (Month)	84	7.50	6.00	2.57	6.00	12.00
Ownership after 3 years (%)	84	4.22	0.00	9.78	0.00	76.49

**Figure IV****BHAR for Venture-Backed and Non Venture-Backed IPOs for the First 3 Years**

The returns are mean BHAR with the Nemax index as benchmark for the first 750 trad-



ing days. The vertical line represents the end of the lock-up period of six months.

Table IV

**Underpricing and BHARs for Venture-Backed and Non Venture-Backed IPOs**

VB IPOs and NVB IPOs are venture-backed and non venture-backed IPOs, respectively. N denotes the sample size, STD the standard deviation, T (adj.) and T (Means) the t-values from a skewness-adjusted t-test and a t-test for differences of means, respectively. \*\*\*, \*\*, and \* denote 1%, 5%, and 10% significance levels, respectively.

	N	Mean	Median	STD	T (adj.)	T (Means)
<b>Underpricing</b>						
VB-IPO	86	54.48	21.48	77.19	9.56***	1.19
NVB-IPO	165	42.68	14.29	70.03	11.70***	
<b>BHAR 123</b>						
VB-IPO	86	31.92	-10.16	112.80	3.27***	0.64
NVB-IPO	165	22.46	-6.20	108.94	3.15***	
<b>BHAR 750</b>						
VB-IPO	86	0.54	-4.46	26.52	0.19	-0.60
NVB-IPO	165	2.87	-4.33	33.92	1.22	

Figure V

## VC Exit at Time of IPO (Primary Market)

The returns are mean BHAR with the Nemax index as benchmark for the first 750 trading days. The vertical line represents the end of the lock-up period of six months.

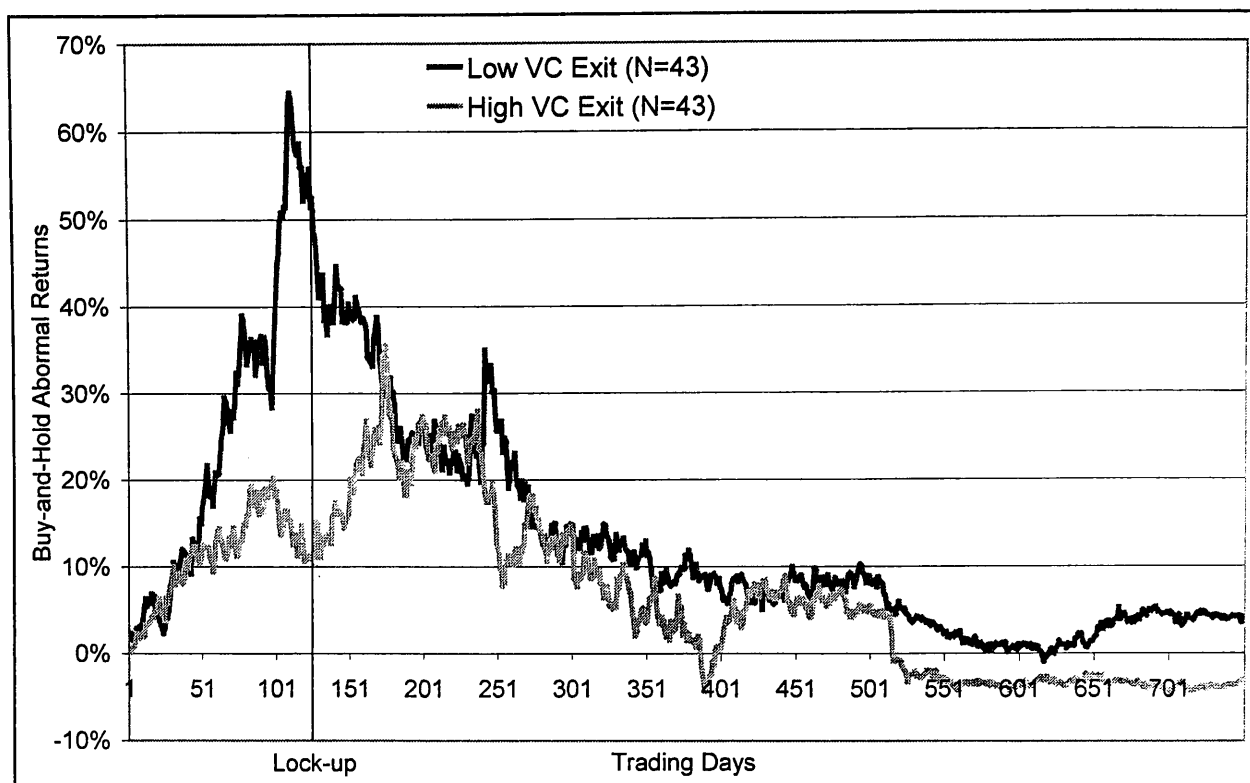


Table V

## VC Exit at Time of IPO (Primary Market)

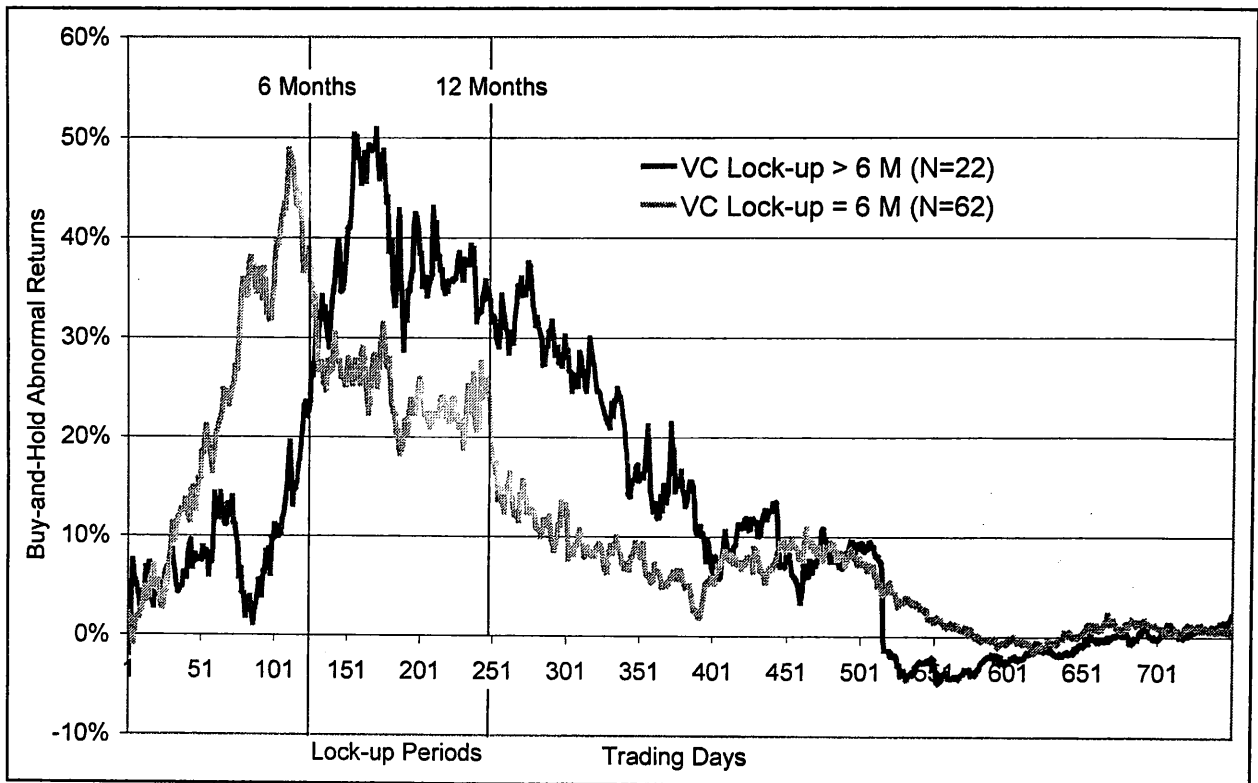
The venture-backed IPOs are separated in two sub-samples by the median value of shares sold at the IPO date. N denotes the sample size, STD the standard deviation, T (adj.) and T (Means) the t values from a skewness-adjusted t-test and a t-test for differences in means, respectively. \*\*\*, \*\*, and \* are 1%, 5%, and 10% significance levels, respectively.

	N	Mean	Median	STD	T (adj.)	T (Means)
<b>Underpricing</b>						
High VC Exit	43	65.16	29.41	82.94	7.54***	1.29
Low VC Exit	43	43.80	9.80	70.34	6.08***	
<b>BHAR 123</b>						
High VC Exit	43	11.18	-14.60	75.66	1.05	-1.72*
Low VC Exit	43	52.66	6.83	138.36	3.39***	
<b>BHAR 750</b>						
High VC Exit	43	-3.02	-4.47	22.97	0.99	-1.25
Low VC Exit	43	4.10	-4.03	29.50	1.01	

Figure VI

## VC Lock-up Commitment

The returns are mean BHAR with the Nemax index as benchmark for the first 750 trad-



ing days. The vertical lines represent the end of the lock-up periods.

Table VI

## VC Lock-up Commitment

The venture-backed IPOs are separated in two sub-samples by the length of lock-up commitment. N denotes the sample size, STD the standard deviation, T (adj.) and T (Means) the t values generated by a skewness-adjusted t-test and a t-test for differences in means, respectively. \*\*\*, \*\*, and \* are 1%, 5%, and 10% significance levels, respectively.

	N	Mean	Median	STD	T (adj.)	T (Means)
<b>Underpricing</b>						
Lock-up = 6 M	62	52.58	21.48	77.67	7.96***	0.08
Lock-up > 6 M	22	51.24	10.63	68.15	4.80***	
<b>BHAR 123</b>						
Lock-up = 6 M	62	37.02	-11.80	126.30	2,86***	0.69
Lock-up > 6 M	22	22.08	3.78	68.76	1.79*	
<b>BHAR 250</b>						
Lock-up = 6 M	62	17.43	-6.20	131.81	1.14	-0.54
Lock-up = 12 M	20	34.46	-5.18	120.45	1.67	



**Table VII****Cross Sectional Regressions**

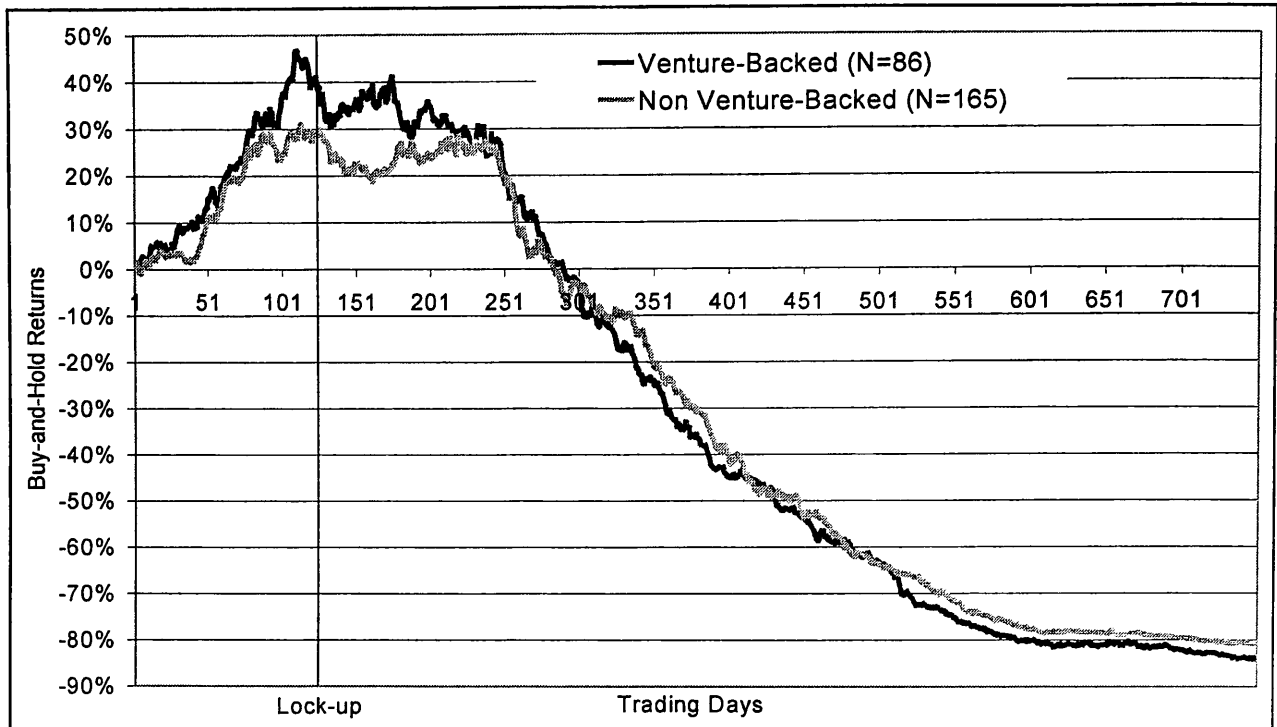
The table on the following page reports OLS regression results with White's heteroskedasticity-consistent standard errors. The dependent variables are IPO initial returns (model 1) and BHAR after 6 months and 12 months of trading (models 2 and 3). All models include the control variables market value of equity (ln Market Cap.) and market-to-book ratio (ln Market/Book). The variables Dummy VC, Dummy VC is Underwriter, and Dummy 2000 are dummy variables equal to 1 if the IPO is venture-backed, if the VC is underwriter, and if the IPO listed in 2000, respectively.  $\Delta$  VC denotes the change in the number of stocks at the IPO date and VC Lock-up the length of lock-up period in months. The dilution factor is the ratio of primary shares newly issued and the number of shares pre IPO. The participation ratio is the ratio of secondary shares sold and the number of shares pre IPO. a, b, and c are 1%, 5%, and 10% significance levels, respectively.

	Underpricing		BHAR 6 Months		BHAR 36 Months	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b
Intercept	-3.26 [-5.39 <sup>a</sup> ]	-2.45 [-2.38 <sup>b</sup> ]	-1.53 [-1.09]	-5.76 [-1.49]	-0.27 [-0.50]	1.34 [1.67]
ln Market Cap.	0.06 [1.70 <sup>c</sup> ]	0.01 [0.22]	0.15 [2.04 <sup>b</sup> ]	0.44 [1.98 <sup>b</sup> ]	0.04 [1.31]	-0.06 [-1.45]
ln Market/Book	1.22 [9.49 <sup>a</sup> ]	1.24 [6.20 <sup>a</sup> ]	-0.48 [-2.29 <sup>b</sup> ]	-0.94 [-3.41 <sup>a</sup> ]	-0.22 [-4.91 <sup>a</sup> ]	-0.13 [-2.25 <sup>b</sup> ]
Dummy VC	0.01 [0.18]		0.22 [1.42]		-0.00 [-0.4]	
VC Ownership pre IPO		-3.73*10 <sup>-3</sup> [-1.80 <sup>c</sup> ]		-0.01 [-0.95]		3.78*10 <sup>-3</sup> [1.93 <sup>c</sup> ]
Δ VC Owner- ship		0.34 [1.51]		1.67 [2.19 <sup>b</sup> ]		0.16 [1.90 <sup>c</sup> ]
VC Lock-up		0.00 [0.18]		0.04 [1.17]		-0.01 [-0.54]
Dummy VC is Underwriter		0.19 [2.08 <sup>b</sup> ]		0.27 [0.97]		0.04 [0.58]
Dummy 2000	-0.03 [-0.53]	-0.11 [-1.10]	-0.42 [-2.81 <sup>a</sup> ]	-0.84 [-3.08 <sup>a</sup> ]	0.02 [0.36]	0.08 [1.54]
Dilution	2.09 [7.54 <sup>a</sup> ]	2.30 [4.83 <sup>a</sup> ]	-0.22 [-0.34]	-0.50 [-0.45]	-0.11 [-0.54]	-0.00 [-0.00]
Participation	-0.11 [-0.36]		-1.32 [-1.87 <sup>c</sup> ]		-0.05 [-0.20]	
Adjusted R <sup>2</sup>	0.59	0.68	0.04	0.23	0.06	0.19
# Observations	251	84	251	84	251	84

Figure VII

## Raw Returns (BHR) of Venture-Backed and Non Venture-Backed IPOs

The returns are mean BHR for the first 750 trading days. The vertical line represents the

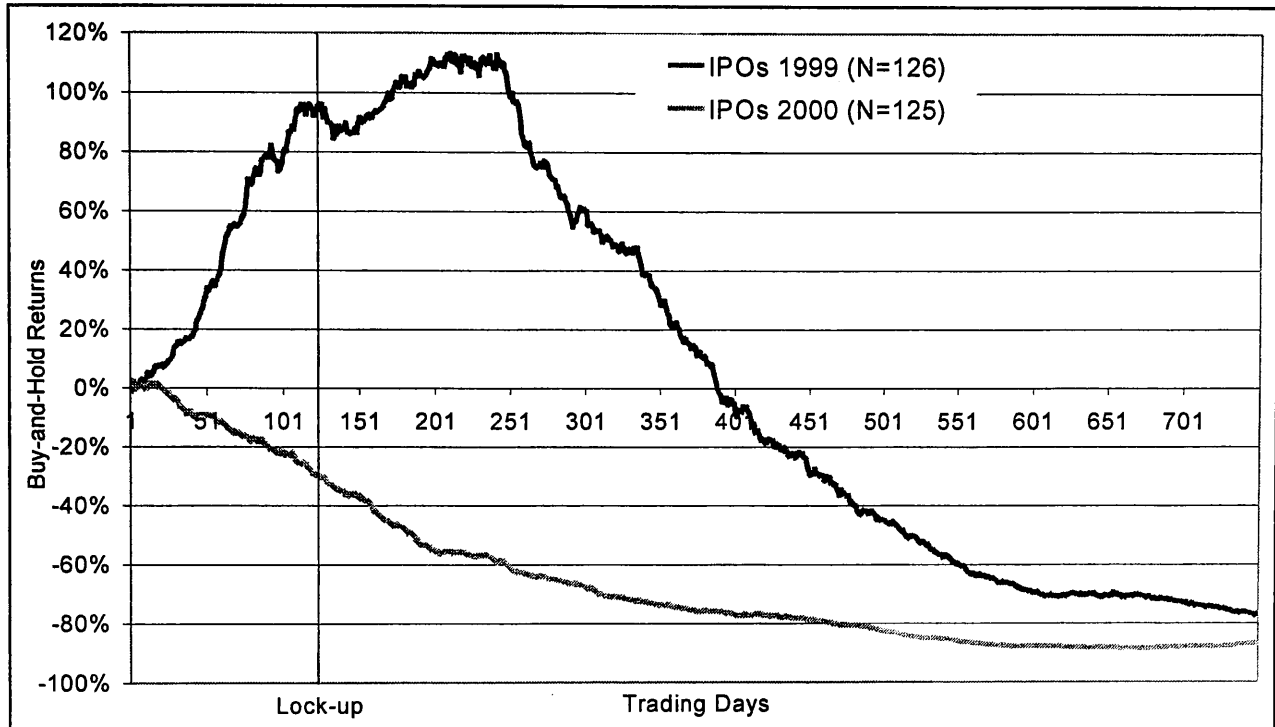


end of the lock-up period of six months.

Figure VIII

## Raw Returns (BHR) and the Year of Issuance

The returns are mean BHR for the first 750 trading days. The vertical line represents the



end of the lock-up period.