Initial public offerings in the UK: an examination of the role of venture capital

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Initial public offerings in the UK: An examination of the role of Venture Capital

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على قدر أهل العزم تأتي العزائم وتأتي على قدر الكرام المكارم

وتعظم في عين الصغير صغارها وتصغر في عين العظيم العظائم.

المتنبي (٩١٥-٩٦٥).

Men are at the dimension of their acts; it is by knowing their acts that we know them. In the eye of the small, small things are huge, but for the great souls, huge things appear small.

AL-Mutanabbi (915-965).

Abstract

Following the seminal work of Ibboston and Jaffe (1975) and then Ritter (1991) several studies, using different sample sets and different periods of time, have documented that initial public offerings (IPOs) are both underpriced and are underperforming market index reference portfolios. A growing body of literature has been trying to develop an explanation for the IPO anomalies. The involvement of venture capitalists in the public offerings has been regarded as empirical evidence to test the underpricing and the long-term underperformance. As such, it is argued that venture capitalists can affect both the pricing of the offering and the performance of the shares following the IPO. The common claim of these explanations is that companies backed at the IPO by venture capitalists are regarded by potential investors as lower risk, and hence issuers do not need to underprice to attract investors. Similarly, companies backed by venture capitalists are expected to exhibit a positive abnormal return in the long-term.

To assess whether the above claim holds on the U.K. initial public offering market, a sample of venture capital backed IPOs that went public in the period 1992-1996 was matched with a sample of non venture capital backed IPOs. Consistent with the prevailing belief that venture capitalists reduce the uncertainty at the offering, venture capital backed IPOs are found to be less underpriced than the non venture capital backed IPOs. The comparison of the long-term performance of VC-backed and non-VC-backed IPOs yielded mixed results depending on the method used to compute the abnormal returns. The cumulative average returns show that venture capital IPOs are underperforming market portfolios whereas non-venture backed IPOs have relatively outperformed the market portfolios at the end of the 36^{th} month after floatation. On the other hand, a rather contrasting result was found using the buy and hold method as a measure of the abnormal returns. Both venture capital and non venture capital IPOs appear to outperform the market portfolios. Similar results were also documented by Shah (1995) and Allen, Morkel-Kingsbury et al. (1999) where IPOs on average outperformed the market indices. Based on these results it is hard to state that VC-backed IPOs have outperformed non-VC-backed IPOs, or vice versa, at the end of the 3 year period after floatation. However, the results of the

long-term returns provide further evidence that the abnormal returns are highly sensitive to the methodology employed. Segmentation of the returns according to the market floatation showed that IPOs floated on the AIM market are more underpriced and more underperforming than IPOs floated on the LSE market. Finally, contrary to the expectation, the survival analyses showed that VC-backed IPOs have a lower probability of survival than comparable non-VC-backed IPOs.

Declaration

The work in this thesis is based on research carried out in the School of Economics, Finance and Business, University of Durham, United Kingdom. No part of this thesis has been submitted elsewhere for any other degree or qualification and it is all my own work unless referenced to the contrary in the text.

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AKNOWLEDGEMENTS

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I more than grateful to my parents, Mourad & Malika, my sisters and brothers. They were very instrumental in encouraging me to strive towards my goals with a sense of responsibility and integrity.

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CHAPTER ONE INTRODUCTION

Venture capital is often regarded as one of the main sources of share capital for unquoted companies at many stages of their life. As such it can be defined as investment by professional investors of long-term, risk equity finance in new firms where the primary reward is an eventual capital gain, supplemented by dividend yield (Wright and Robbie (1998)). The growing success of venture capital backed companies in the last decade has led to a mounting recognition of the importance of venture capital financing to the economic development. Given this, it is not surprising that venture capital has emerged as a topic of increased interest and research effort.

A review of venture capital literature indicates that venture capitalists provide much more than money to their portfolios. As pointed out by Sahlman (1994) venture capitalists, through their experience and active involvement, help unquoted companies to grow and perform better. It is argued that their role is to provide financial and business advice, to monitor, to assist venture managers in developing strategy, to act as a sounding board for the firm, and to provide social networks, customers and suppliers (MacMillan, Kulow et al. (1989); Fried and Hisrich (1995) and Sapienza, Manigrat et al. (1996)). This is similar to saying that venture capitalists take a long-term view of returns in the form of capital gains and allow managers to focus on long-run issues more than is the case with other investors who might constantly call for short-term assessments of performance (Lam (1991); Bygrave and Timmins (1992) and Fried and Hisrich (1995)). Consistent with this, is the image associated with venture capitalists which lends credibility to the portfolio firm and sends positive signals to employees, customers and suppliers regarding the ongoing viability of the firm (Cornell and Shapiro (1988)).

Early attempts to quantify the value that venture capitalists provide beyond capital to their respective investments have tended to be descriptive. As such, researchers often seek to determine the value added by surveying entrepreneurs and venture capitalists for their perceptions and then extrapolating as to the possible effects on performance

(see among others, Sapienza, Manigrat et al. (1996); Rosenstein, Bruno. et al. (1990) and MacMillan, Kulow et al. (1989)). The results emanating from this approach are ambiguous and contrasting. For instance, Sapienza (1992) attempted to measure the value added by venture capitalists by surveying venture capitalists and the CEOs about the intensity of their interaction as well as the performance of the venture over a one-year period. The results showed that the level of innovation pursued by the venture company and the style of interaction have a significant impact on the value of venture capitalists involvement. This has led the author to conclude that the provision of money is a necessary but far from sufficient condition to promote economic growth. In an other study, Rosenstein, Bruno et al. (1989) surveyed 198 venture capital-backed firms and the results showed that CEOs of these firms did not perceive that venture capitalists on their boards added more value than did other board members. Similarly, MacMillan, Kulow et al. (1989) examined the relation between venture capitalist involvement and venture performance. The results showed that some activities with a high degree of involvement, such as negotiating employment terms or serving as a sounding board, are associated with high performance; whilst other activities such as recruiting top management are associated with poor performance.

These studies rely on the perceptions of the CEOs and venture capitalists, where bias and inaccuracy are potential threats whenever perceptual measures are used. Moreover, these studies looked only at firms that received backing from venture capitalists. What about the relative performance of firms that did not receive venture capitalist financing? In other words, little is known about the performance of firms that were not backed by venture capitalists in the literature. According to Gompers (1998) many firms take an active policy of avoiding venture capital because they feel that the terms imposed by venture capitalists are too costly for the company. Amit, Glosten et al. (1990) take an even more critical stance, questioning whether the venture capital industry fosters the most promising firms. Based on the fact that venture capitalists face adverse selection problems when taking an investment decision, they argued that venture capitalists cannot accurately assess the skill level of entrepreneurs. As a result, most able entrepreneurs/managers will not find the price offered by venture capitalists to be sufficiently attractive and will choose to develop their projects without venture capital participation. Is this the case? Do firms

with better opportunities really avoid venture capital? In other words, do companies backed by venture capitalists perform better than ones that were not?

The purpose of this study is to assess and compare the post-performance of firms that received and did not receive financing from venture capitalists at the initial public offerings market. The initial public offering (IPO) is chosen as the context for this study for a number of reasons. Prior research efforts to assess the value added by venture capitalist involvement have been constrained because measures of performance outcomes for private firms are difficult to gather across firms. Evaluating the effects of venture capitalists involvement in firms at the initial public offering provides a unique opportunity to gather consistent economic performance measures across firms. In addition to that, existing knowledge on the performance of venture capitalists is largely derived from studies on the U.S. venture capital market. Thus, there is the danger of projecting the U.S. findings to other regions of the world. As pointed out by Bygrave and Timmins (1992) the venture capital industry takes different forms around the world, reflecting differences in economic and social structures, legal and fiscal environments. For instance, venture capitalists in the U.K. tend to invest in late stage companies whereas U.S. venture capitalists invest in early stages and seed companies. That is also to say that U.K. venture capitalists invest in less risky companies than do their counterparts in the U.S..

This study does not stop at only comparing the post-performance, it also goes on to analyse the survival and the risk profile of venture capitalist backed and non-venture capitalist backed companies. In so doing, this is the first study to the author's knowledge in the U.K. to attempt to conduct such analyses and hence traverses uncharted territory in the prospects of making a contribution to knowledge.

By investigating performance of the initial public offerings this study also aims at contributing to the IPO literature. Following the seminal work of Ibboston and Jaffe (1975) and then Ritter (1991) several studies, using different sample sets and different periods of time, have documented that initial public offerings (IPOs) are both underpriced and underperforming market index reference portfolios. The involvement of venture capitalists in the public offerings has been regarded as empirical evidence to both irregularities, underpricing and long-term

underperformance (see for example Barry, Musceralla et al. (1990); Megginson and Weiss (1991); and Brav and Gompers (1997)). Venture capitalists are seen as a factor that can affect both the pricing of the offering and the performance of the shares in the post IPO. It is argued that IPOs backed by venture capitalists are considered less risky than the ones that are not backed by market traders, and hence issuers do not need to underprice to attract investors. In addition to that, venture capitalists bring firms in their portfolio to the initial public offering market on an ongoing basis. Therefore, they have a strong incentive to establish a trustworthy reputation that will allow, in the future, access to the IPO market on favourable terms. Moreover, a reputation for trustworthiness will help the venture capitalist to establish a strong relationship with all participants in the offering (auditors, underwriters, pension fund managers and institutional investors). This suggests that companies backed by venture capitalists should exhibit a positive abnormal return in the long-term. This assertion stems from the fact that venture capitalists usually provide much more than financing to their portfolio.

To assess the above claims, an event study methodology was adopted whereby venture capital IPOs are treated as the event group and non-VC-backed IPOs as the non event group. In other words, this study compares the stock performance of two distinct groups; the first set consists of companies that have received financing from venture capital whilst the second set consists of firms that did not receive financing from a venture capital prior to the IPO. Stock performances of the two groups were compared over two periods (windows). The first window refers to the initial return and it is defined from the offering day to the first closing day of trading, whilst the second refers to the long-term returns and it is defined as the period between the end of the first month and the 36^{th} anniversary after the floatation.

To compare the survival and the risk profile of VC-backed IPOs and non-VC-backed IPOs, techniques for examining survival were adopted. First, the survival and the hazard functions of both samples were estimated. Second, the impact of venture capitalists on the survival of IPOs was tested using the Cox hazard regression model.

The initial sample consisted of 574 IPOs listed on the London stock exchange and the Alternative Investment market between 1992 and 1996. According to the British

Venture Capital Association 231 firms from the initial sample were backed by venture capitalists. After excluding companies for which data was not available, the final sample consisted of 191 VC-backed companies.

Several empirical studies have documented that returns are affected by the size of the issue (see, for example Drake and Vestsuypens (1993); Megginson and Weiss (1991) and Mikkelson, Partch et al. (1997)). In these studies the size of the issue is measured as the proceed of the capital raised at the floatation. Conversely, many empirical studies conducted in different countries and at different periods of time have documented that IPOs are underpriced at floatation and that the price of the issue tends to adjust in order to reflect the market value within the first few weeks of trading. Following this, it is argued that the size of the company would be better measured as the market capital of the ordinary share at the end of the first month of floatation. Similarly, the sector to which the IPO belongs has also been seen as an empirical factor that could affect the abnormal returns. For instance Ritter (1991) argued that the level of returns tends to be clustered by industry; and Brav and Gompers (1997) claimed that matching firms to industry portfolios avoids the noise of selecting individual firms and can control unexpected events that affect the returns of the entire sector.

Thus, in order to conduct a comparative study, all IPOs that were floated on the London stock exchange between 1992 and 1996 and were not named on the list provided by the British Venture Capitalists Association[1] were classified as non venture capital backed IPOs. From this sub-sample a sample of non venture capital backed IPOs was matched according to the size and industry classifications of the VC-backed IPOs. Following this procedure 141 non-VC-backed IPOs were matched to 191 VC-backed IPOs.

This research provides an empirical test that examines the relationship between the involvement of venture capitalists at the initial public offerings and the firm performance. In so doing, it relies on venture capital literature (e.g. Gorman and Sahlman (1989), Bygrave and Timmins (1992) and Sapienza, Manigrat et al. (1996))

[1] British Venture Capitalist Association compiles a yearly list of all firms backed by a venture capitalists and floated on the market.

on the one hand and finance literature on the other hand (e.g., Ritter (1991), Barry, Musceralla et al. (1990), Megginson and Weiss (1991) and Brav and Gompers (1997)) to develop hypotheses regarding the effects of venture capitalist involvement on firm performance.

The remainder of this dissertation consists of six chapters. The next chapter provides an overview of venture capital activities. The first section examines the various stages of the venture capital life cycle with special reference to the risk associated with each stage of financing, whilst the second section reviews the activities of venture capital investment and the process by which venture capitalists select their ventures. This process appears to be long and complex and consists of two main parts. The first part of the process consists of the following stages, screening, evaluating and structuring where it is argued that venture capitalists receive a large number of investment proposals and only a few of them make it to the final stage. The second part of the process is related to post-investment activities that consist of increasing the probability of success of the investment. The third section discusses the possible exit routes for venture capitalists and focuses mainly on the two principal types of exit routes, namely trade sale and initial public offering, where advantages and disadvantages of both exit strategies are summarised. The last section of chapter two discusses the current trends and characteristics of the U.K. venture capital industry. The discussion suggests that, in the U.K., venture capitalists prefer to invest in capital expansions, management buy-outs (MBOs) and buy-ins (MBIs) rather than to invest in seed capital, start-ups and other early stage companies. This is due largely to the additional risk that is associated with early stage ventures and the time and costs involved in financing smaller deals compared with the benefits.

As stated earlier, the initial public offering is the context chosen in this study to evaluate the effect of the involvement of venture capitalists on the performance of their respective investment portfolios, thus the purpose of chapter three is to review and discuss the different existing theories and evidence in this area. The review focuses mainly on studies that have been subject to considerable academic research, namely underpricing and long-term IPO performance. Underpricing refers to the high initial first day return where it is argued that the offering prices of new issues

are significantly lower than the market prices on the first day of trading. In other words, the shares of new issues are offered to investors at prices considerably below the price that they subsequently trade at on the stock market. Subsequently, many studies have documented that these IPOs are underperforming other quoted companies in the stock market in the long-run. The findings documented in these studies suggest that investors would lose money by buying and holding shares of companies that recently went public. Consequently, many researchers have attempted to develop an explanation for these irregularities. The second section of the chapter discusses the main theoretical explanations regarding IPO underpricing. These explanations are categorised in the following broad areas:
1) theories focusing on informational asymmetries; 2) explanations based on the reputation of the firm as well as the underwriter of the issue; 3) explanations based on signalling and share allocation theories. The empirical evidence regarding long-term IPO underperformance is reviewed in the second section. Similarly, with regard to the long-run IPO underperformance, researchers have also come up with varieties of explanations, ranging from the effect of investors' behaviour and the effect of factors such a ownership structure and the reputation of the issuer, to problems with the models used to compute and test the significance of the average abnormal returns. These are discussed in the last section of chapter three.

Chapter four reviews the literature surrounding the impact of the involvement of venture capitalists on the firm performance. The first part reviews the early attempts undertaken by researchers to gauge the role of venture capitalists in the venture they fund. As mentioned earlier, theses studies tend to be descriptive and as such they survey both entrepreneurs/managers and venture capitalists on their perceptions of value added. The second part discusses the empirical studies that assess the effects of venture capitalist involvement on the initial public offerings of firms. More specifically, it looks at the relationship between the underpricing phenomenon and the venture capitalist as well as the effects of venture capitalists on firm performance following the initial public offerings. The last part discusses the few studies that have attempted to assess the impact of venture capitalist on post IPO survival.

Chapter five presents the research methodology and provides a justification for the approach adopted throughout this thesis. It also describes the data sources and

highlights the main difficulties that this study faced regarding data collection. The second part of this chapter describes the event study method used to test the hypotheses presented in chapter four and discusses the main arguments regarding the measurements of the long-term abnormal returns by contrasting the common methods used to measure the long-term returns, namely cumulative average returns (CARs) and the buy and hold returns (BHRs). Moreover, it presents the statistical tests used to test for the significance of both the underpricing and the long-term abnormal returns. The survival analysis techniques used to compare the survival and the risk profile of VC-backed and non-VC-backed IPOs are described in the last part of the chapter.

The description of the sample and the empirical findings of the analysis are presented in chapter six. The dissertation concludes with chapter seven and a discussion of the study's findings, their implications, limitations of the research and implications of the research for further studies.

CHAPTER TWO VENTURE CAPITAL INVESTMENT IN THE U.K.

As mentioned in the previous chapter the aim of this research is to assess the impact of the involvement of a venture capitalist on the firm's performance at the initial public offering. In doing so it is important from the outset to define venture capital and give an overview of venture capital activities. In the last decade venture capital has became one of the main sources of share capital for unquoted companies at many stages of their life, partly due to the growing success of venture capital backed companies both in the U.S. and U.K.. This has led to a mounting recognition of the role of venture capital in innovation, job creation, economic growth and industrial renewal and has increased its importance as an area for academic research (Mason and Harrison (1999)). Thus, it is necessary to have a sound knowledge of what venture capitalists do in order to gain grater insights into the context in which venture capitalists operate and what impact they have on the performance of their respective portfolio investments. Consequently, the purpose of this chapter is to describe and discuss the size and the structure of the U.K. venture capital industry and the ways in which venture capitalists work. In undertaking such a task it is important to identify what is distinctive about venture capital.

Venture capital can be defined as an investment by professional investors of long-term, unquoted, risk equity finance in new firms where the primary reward is an eventual capital gain, supplemented by dividend yield (Wright and Robbie (1998)). In other words, venture capital is a method of financing the start-up, development, expansion or purchase of a company. In following this process the venture capitalist acquires an equity stake of the company in return for providing the funds. As active shareholders in the business, venture capitalists receive their return through participation in increasing levels of profit and on the eventual sale of the investment.

A comparison between finance raised from venture capital and finance raised from a lender indicates that the two methods of investments have different characteristics. The major difference between borrowed money and venture capital share capital relates to asset security. Lenders are rewarded by interest and capital repayment and

the amounts borrowed are usually secured either on the business assets or the individual shareholder directors' personal assets. As a last resort, a lender can bankrupt a business if the business defaults. Albeit, venture capitalists may provide debt finance, in some cases, equity finance is by far the most type of finance that they provide. As such venture capitalists share the risk of failure with other shareholders. To compensate for the risk undertaken venture capitalists require an appropriately high rate of return. In other words, venture capitalists must offset the risk by confining their investments to ventures exhibiting potential above average return on equity.

The overall consensus from U.K. studies is that, on average, (see Dixon (1991), Murray and Lott (1995) and Wright and Robbie (1996)) the internal target return of venture capitalists is around 30 percent and this return may vary according to the stage of the investment, the size of the firm and the degree of technology involved in the project. A study by the British Venture Capital Association (1995) analysed the returns of venture capital funds launched in the U.K. between 1980 and 1990 and reported that the average annual return to end-December 1994 was 12.1 percent with large MBOs generating the highest returns at 23.1 percent on average, and early-stage deals the lowest, at only 4.0 percent on average. One should note, however, that these figures are heavily influenced by the recession of the late 1980s. More recent statistics are more encouraging, perhaps not surprisingly given that they cover a period of uninterrupted real economic growth. Net returns for private equity funds raised between 1980 and 1999, measured to the end of December 1999, were 33.6 percent, 31.1 percent, 27.2 percent and 20 percent over periods of one year, three years, five years and ten years, respectively (British Venture Capital Association (2000)).

The present chapter is structured as follows. The next section examines the various stages of the venture capital life cycle with special reference to the risk associated to each stage of financing. The third section reviews the activities of venture capital investment and the process by which venture capitalists select their ventures. This process is somewhat lengthy and complex. The first part of the process consists of the three subsequent stages, screening, evaluating and structuring where venture capitalist receive a large number of investment proposals and only a few of them

make it to the final stage. The second part of the process is related to post-investment activities that consist of increasing the likelihood of success and improving the return of the investment. The possible exit routes for venture capitalists are discussed in section four. This section focuses on the two principal types of exit routes namely trade sale and initial public offering; advantages and disadvantages of both exit strategies are summarised. Based on statistics from the British Venture Capital Association (BVCA), section five gives an overview of the U.K. venture capital industry. This section provides a brief history of the growth and development of the industry. It discusses also the current trends and characteristics of the industry. The discussion about the U.K. venture capital industry suggests that the providers of venture capital funds are more eager to invest in capital expansions, management buy-outs and buy-ins than to invest in seed capital, start-ups and other early stage companies. This is due largely to the additional risk that is associated with early stage ventures and the time and costs involved in financing smaller deals compared with the benefits. In essence, it may be that venture capitalists are more willing to provide development capital than early stages financing.

2.1 Investment Stages

There are different stages in corporate development, each of which has distinct characteristics. The venture capital industry recognises these different stages to the extent that most funds specialize in one or more. Stages range from an investment that may take up to eight years or longer for realization (seed capital) to one which is considered as bridge finance (mezzanine). The following section summarises the different stages of venture capital investment.

2.1.1 Seed capital

Seed capital is investment into the research and development of a business idea before it is actually launched into the market. For instance it may involve producing a prototype product or the design of a package for a service industry. It may also include initial research in order to assess the size and scope of potential markets.

Unlike well-established companies, seed enterprises do not have a developed product and share of the market. Moreover this stage is characterised by extreme uncertainty concerning the emergence of a viable enterprise. That is to say, if the entrepreneurs or managers do not have the right kind of experience and a proven track record in business development, the risk for the potential funding partner rises still further. Consequently, many venture capitalists avoid such early stage financing.

2.1.2 Start-up

Start-up capital is the second stage in the life cycle of an enterprise. It is the stage where the idea or product prototype has been fully developed together with a business plan. In other words, the enterprise is in the process of being set up, staff are recruited, company premises are to be equipped and a distribution network is to be established.

Similar to seed capital investment, it is unlikely that either the product or the enterprise can be assumed to have proven themselves commercially. Hence, the risk for the investor is a high one and many venture capital providers prefer to avoid start-up projects.

2.1.3 Early-stage finance

According to the British Venture Capital Association, early stage finance is investment to initiate commercial manufacturing and sales for companies that have completed the product development stage, but are not yet generating profits. Like the abovementioned stages, this stage is not popular with the mainstream venture capital providers in the U.K. since it still involves an essentially unproven product or company. It is regarded as a high-risk area for investment.

2.1.4 Later-stage financing

At this stage the company is already established with one or more products in the market and requires further financing to expand its activities. That is to say, to expand its production capacity, recruit extra staff, extend its marketing or product development program or acquire additional working capital. The management team is supposed to have some level of experience. This kind of investment is therefore considered to be significantly less risky than the earlier stages and, as such, it attracts venture capital much more easily.

2.1.5 Development capital

Development capital is widely regarded as forming a separate category in terms of entry levels. At this stage, financing is required to develop an alternative product or to expand by acquiring one or more already established companies. If a company in this position has a good performance record, a project of this kind will be regarded by venture capitalists as being on a par with expansion funding as far as risk is concerned.

2.1.6 Management buy-outs (MBOs)

Management buy-outs create an independent business by separating it from its existing owners (e.g., a family-controlled business). This separation is often the result of the acquisition of the business by the existing management team or employees. In other words, management buy-out funding is sought to enable the existing operating management, and possibly also new investors, to acquire a business (or the shares of a business) that is already established and working. As it deals with established business, such a project is regarded as a relatively low risk in venture capital terms and MBOs have in fact been growing in popularity among venture capitalists in the last decade, mainly in the U.K. and continental Europe. This rise to prominence has, at least in part, been driven by business refocusing and subsequent disinvestment by large organisations.

2.1.7 Management buy-ins (MBIs)

Unlike management buy-outs, a management buy-in involves bringing a new management team, to acquire the existing company with the support of venture capital. At this stage the business is assumed to be well established and the new management team to have an appropriate level of operating experience. MBIs are also generally regarded as a relatively low risk propositions by venture capitalists. However, given that the management team wishing to acquire the company is less familiar with it than managers bidding for a MBO, in this respect the MBI is more likely to be regarded by venture capitalists as a less attractive proposition than a MBO.

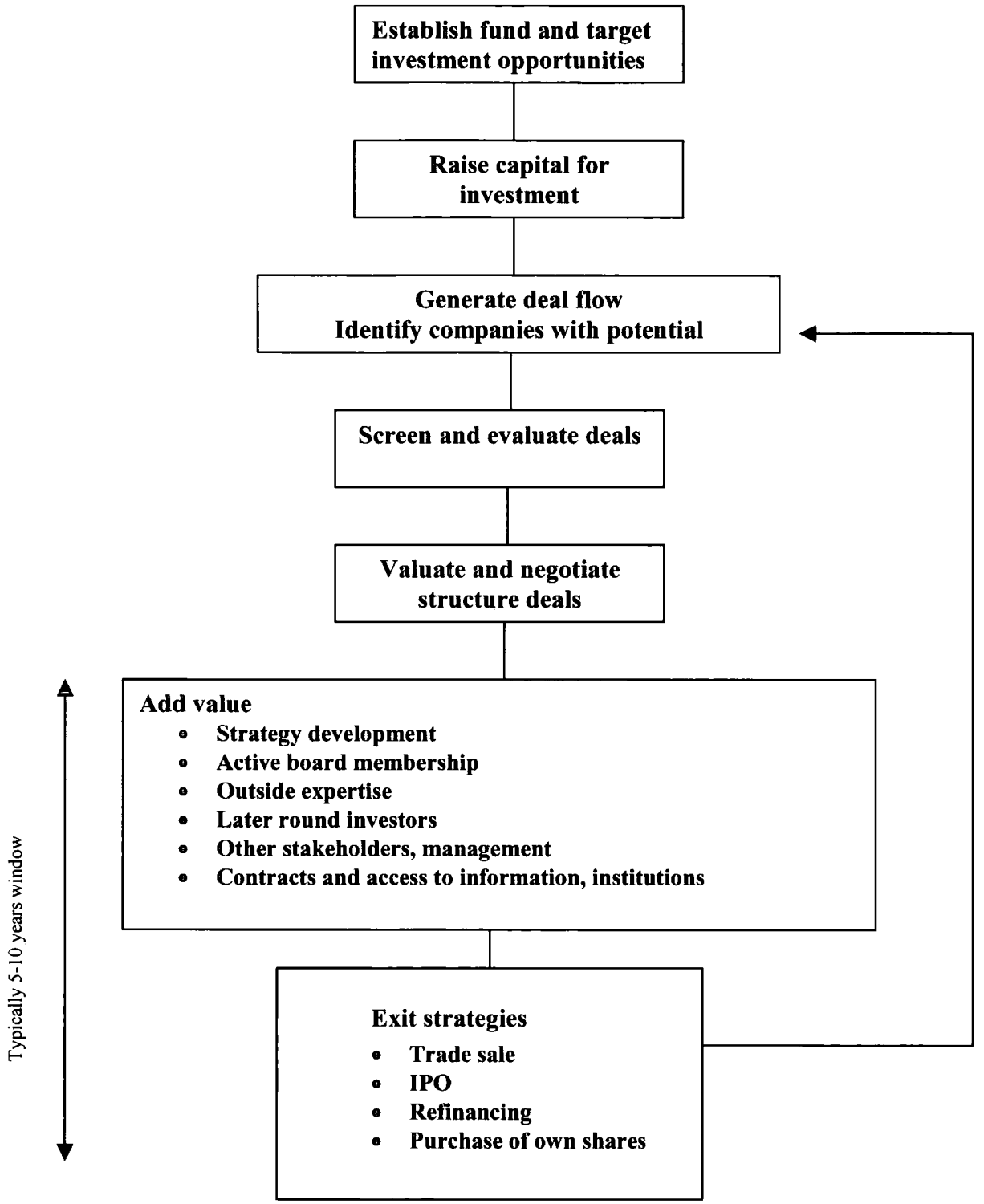
2.2 Venture capital investment process

As mentioned earlier venture capital differs from other methods of funding a new venture in many ways. This section explains the fundamentals of venture capital investment and the process by which venture capitalists select their ventures. Figure 2.1 shows the classic venture capital investing cycle (Bygrave and Timmins (1992)). It describes the process from the establishment of a fund to the exit of the investment.

Besides providing capital, venture capital provides also contacts, managerial and general business knowledge. As pointed out by Bygrave and Timmins (1992) venture capitalists add most value by actively involving themselves in the prosperity of the enterprises in which they invest.

What distinguishes venture capitalists is that they usually invest in companies where there is a substantial element of risk relating to the future creation of profits and generation of cash flows. Thus the success or failure of any given venture depends on the efforts and skills of the people involved as well as on certain factors outside their control (macroeconomic variables, for example). This makes the evaluation of the venture difficult and venture capitalists cannot rely simply on traditional evaluation methods (for instance, discounted cash-flow analysis, IRR, etc). They also

Figure 2-1 Investment process

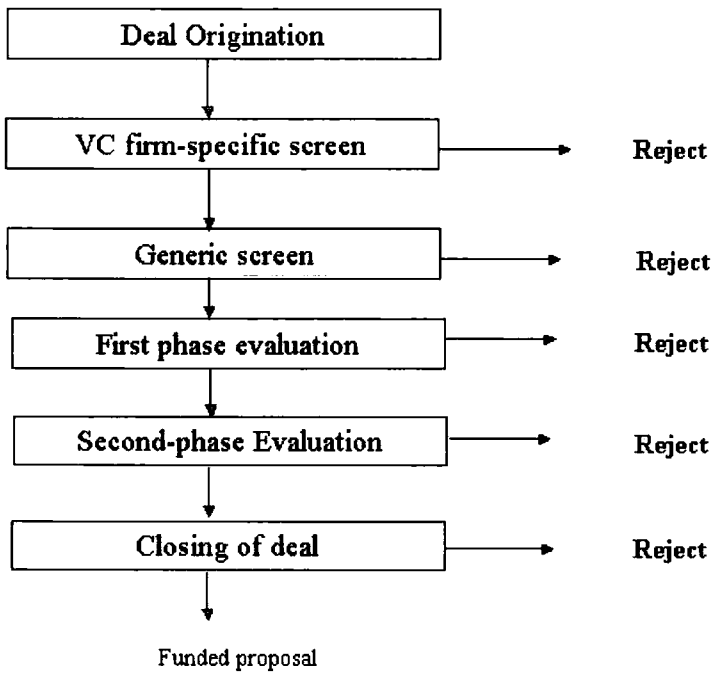


Source :*Bygrave and Timmons (1992, p14)*

have to rely on a subjective, as pointed out by Tyebjee and Bruno (1984), assessment procedure based on the business plan presented to them.

As mentioned at the outset of this chapter, the primary reward of venture capital investment is capital gain rather than interest income or dividend yields. This is to say that venture capital investment is risky. To offset this risk venture capitalists select only investments that exhibit above-normal returns. According to Fried and Hisrich (1994) venture capitalists follow the subsequent procedure (see figure 2.2) before making a decision on whether to invest or not.

Figure 2-2 Venture capitalist process



Source: Fried and Hisrich (1994), somewhat modified, p51

2.2.1 Screening

It is argued that venture capitalists receive a large number of business plans, far more than they can invest in. Therefore a screening procedure is required to reduce the number of proposals to a manageable number to be evaluated in-depth. As pointed out by Dixon (1991) only 10 percent of the business plans received pass the

screening process. Several studies have attempted to look at venture capitalist investment criteria or, more precisely, at the factors that venture capitalists think are important when screening proposals. These studies can be categorised in two groups, those that surveyed venture capitalists specialising in financing early stages (seed and start up investments) and studies that focus on late stages. The former studies argue (see for instance MacMillan, Zemann et al. (1987)) that the most important criteria used by venture capitalists in screening business plans are entrepreneurial personality and experience. Fried and Hisrich (1994) analysed the process, adopted by venture capitalists financing late stages, in screening investment proposals. The results of the investigation suggest that venture capitalists take into account the following criteria before proceeding to the evaluation stage: the viability, integrity and novelty of the project, the record and leadership skills of the management team and the possibility of high return at the exit. In one other study, Wright and Robbie (1996) argue, using a U.K. sample of venture capitalists, that the latter place most emphasis on a very detailed scrutiny of all aspects of the business, including sensitivity analysis of financial information, discussions with personnel and access to considerably more information of an unpublished and subjective kind.

2.2.2 Evaluation

The second step consists of evaluating business plans that have passed the initial screening. This evaluation process is crucial as a means to avoid making bad investments. Evaluating a new venture is somehow difficult and several researchers have studied the criteria that venture capitalists use for this purpose (see for example Tyebjee and Bruno (1984); MacMillan, Siegel et al. (1985) and Fried and Hisrich (1994)). Murray (1991) argued that internal rate of return (IRR) is the most common measure of evaluation and that the process of evaluating involves numerous iterations, based on assumptions about the future trend in performance, to assess the robustness of the proposed investment projects that meet an acceptable IRR. However by examining a sample of 30 U.K. venture capitalists Dixon (1991) reported that little scrutiny of information is considered when assessing risk and adjusting for an IRR target. According to Wright and Robbie (1996) venture capitalists apply more than one valuation technique in evaluating their investment

projects, yet in the U.K. and particularly among later stage investments they usually place most emphasis on valuations based on price-earnings. This suggests that each venture capitalist firm can develop its own set of evaluation techniques and methods, and these can be either objective, subjective or both. The valuation adopted will depend, of course, on factors such as the experience of the venture capitalist, the stage of financing and the type of the project or company.

2.2.3 Structuring

This is the final stage where the deal has to be structured in order to make sure that entrepreneur/management team and the venture capitalist are in agreement. A closer look at the deal structuring approval between the venture capitalists and the investee company highlights the agency relationship where the venture capitalist is the principal and the management team is the agent. Sahlman (1990) showed that the process of financial contracting in the venture capital deal is focused primarily on allocating cash, allocating risk and providing appropriate incentives for both parties. The contract that governs the interaction between venture capitalist and firm portfolio includes features such as the amount and timing of the investment[2], composition systems directly linked to firm value creation and mechanisms for the venture capitalist to monitor the firm.

The purpose of the deal is to provide strong controls and appropriate incentives for the new venture managers to behave in the best interests of the firm. Through its many protective covenants, the agreement is specifically designed to ensure that the portfolio bears a disproportionate share of the risk of poor performance. For example, the use of convertible preferred stock ensures that the venture capitalists hold liquidation preference should the firm fail. Perhaps, most importantly, as pointed out by Sahlman (1990) the agreement stipulates that the management team receive lower cash compensation and greater long-term compensation in the form of incentive stock options or, as they are known in the U.K. 'equity ratchets' that vest

[2] Venture capitalists typically invest more than once during the life of a company and the amount invested often increases with each round. They expect the capital invested at each point to be sufficient to take the company to the next stage of development, when it will require additional capital to make further progress.

over time. Hoskisson, Hitt et al. (1989) argued that such market based compensation plans are more effective than bonus plans based on accounting measures (i.e, profit sharing, gain sharing, etc) at tying executive wealth to shareholder wealth. It is often argued that ownership creates strong individual incentives.

2.2.4 Post-investment agreement

After the investment decision is made and the deal consumed, it is in the interest of the venture capitalists to make sure that the venture succeeds by generating capital gain. Therefore, venture capitalists now become actively involved in managing the companies they fund. Involvement may include all activities of the company, from strategic planning to operational matters such as helping recruit managers, working with suppliers and customers, and raising additional capital. It is argued (see for example Megginson and Weiss (1991)) that venture capitalists enjoy a close relation with investment banks who can assist companies going public or merging with other companies. Several studies (see for instance, MacMillan, Kulow et al. (1989); Fried and Hisrich (1995) and Sapienza, Manigrat et al. (1996)) have shown that venture capitalists can be influential board members and take an active part in shaping operating business strategies. Yet, the degree of involvement after the investment varies depending on the venture capitalist and the situation in the company. All the above activities are designed to increase the likelihood of success and improve return on investment.

2.3 Exit routes of venture capitalists

Usually before the deal is struck venture capitalists and the company will agree on the exit method. The method ultimately chosen will impact on the venture capitalist, the investee company and its management. There are four methods by which venture capitalists can exit their funding portfolio.

2.3.1 Trade sale

A trade sale consists of selling the shares of the venture capitalists to another company already operating - or proposing to enter - the relevant business sector in return for cash, shares of buyer or other assets. According to the British Venture Capital Association (1992) trade sale is the most common exit used by U.K. venture capitalists.

The deal is usually conducted through a financial adviser who has knowledge of the unquoted market and has both credibility and experience in selling companies. Depending on the size of the business the financial adviser may be an investment bank or a firm of accountants. The financial adviser is supposed to have contacts within the specific market sector in which the business operates. He is also supposed to assist in the preparation of an information memorandum to be submitted to potential purchasers. In order to maximise the exit value the financial adviser invites the potential buyers to make a bid on the offer. This auction process is likely to last three to four months. Once this period is over the final negotiations are conducted, with the highest bidder, to strike a deal. Table 2-1 surmises briefly the advantages and disadvantages of this strategy.

2.3.2 Initial public offerings (IPOs)

An initial public offering is an offering of shares to the public, normally followed by the listing of the shares on the stock exchange. Usually the body regulating the stock exchange considers the venture capitalists as insiders. Therefore, the latter will be typically restricted in selling or liquidating their holdings into the public market at the date of the public offering. Rather, securities will be sold into the market over a period of months or even years following the public offering. Alternatively, after the offering the venture capitalist firm may dispose of its investment by making a dividend of investee firm shares to the venture capitalist's owner (subscribers to the fund).

Table 2–1 Advantages and disadvantages of the trade sale

Advantages	Disadvantages
Management and investors may sell their entire shares.	Management opposition because it may lose control to the acquiring firm.
Trade sale can be carried out for any size of company.	Confidentiality. In most cases the best candidate-buyers are often close competitors. The memorandum contains some confidential information which, notwithstanding good confidentiality agreements, is transferred to the competition.
Timing is flexible.	Business may face restructuring at the hands of the trade buyer.
A buyer can rectify commercial management problems.	
Contractual arrangements can cover specific difficulties.	
Trade sales can command higher values if a specific buyer places a high value on the business.	

Source Strang (1998) (modified, p20)

The British Venture Capitalists Association reported that 45 percent of the 93 initial public offerings floated on the London main market in 1995 were venture backed (see table 2.2). In 1995, 29 venture-backed firms went public raising 56 percent of the total fund raised.

Table 2–2 Summary of U.K. venture backed floatation on LSE from July 1992

	Total no. of issues	No of venture backed issues	% of total issues	Total funds raised £m	Funds raised by VC-backed issues £m	% of total funds raised
1992	26*	16	62 %	1,189.522	1,130.930	95 %
1993	118	45	38 %	2,531.198	1,391.608	55 %
1994	175	73	41 %	5,752.235	1,716.603	30 %
1995	64	29	45 %	1,770.524	991.495	56 %
1996	87	39	45 %	8,748.518	1,223.773	14 %
1997	106	33	31 %	6,383.130	976.310	15 %
1998	81	24	30 %	5,301.020	1,163.120	22 %
1999	50	10	20 %	4693.87	587.81	12 %
Total	707	269	38 %	358257.33	9,0880.94	25 %

(Figures from the British Venture Capital Association)

* It includes only companies that were floated on the third and fourth quarter of the year 1992.

Figures exclude companies that were transferred from USM. Investment trusts, reverse takeovers and overseas companies are also excluded.

Table 2–3 Summary of U.K. venture backed AIM fund raising floatation from June 1995

	Total no. of issues	No of venture backed issues	% of total issues	Total funds raised £m	Funds raised by VC-backed issues £m	% of total funds raised
1995	11	3	27 %	69.49	7.16	10 %
1996	93	26	28 %	471.73	122.92	26 %
1997	78	18	23 %	321.43	67.62	21 %
1998	53	10	19 %	264.45	34.02	13 %
1999	57	2	5 %	280.846	17.518	15.5 %
total	302	59	19.5 %	1407.946	249.238	17.7 %

(Figures from the British Venture Capital Association)

Figures exclude companies that were transferred from USM. Investment trusts, reverse takeovers and overseas companies are also excluded

To enable small and medium size companies to raise funds the London stock exchange has established the Alternative Investment Market (AIM) with less restrictive conditions than the main exchange, which replaced the Unlisted Securities Market in many ways. In 1996, 28 percent of 93 IPOs on AIM were venture backed. Yet, the number of venture-backed companies floated on the AIM is still relatively small if compared to the number of venture-backed floatation on LSE. For instance in 1996, 45 percent (see table 2.2) of the companies that went public in the LSE were backed by venture capitalists. The fact that 45 percent of the IPOs in 1996 were venture backed is hard evidence that venture capitalists in the U.K. prefer to invest in established companies rather than investing in early stage finance deals. Table 2–4 summarises advantages and disadvantages of initial public offerings.

Table 2–4 Advantages and disadvantages of IPOs

Advantages	Disadvantages
Popular with the managements, as it allows them to remain in place and in control.	Less than full exit. VCs are only allowed to sell a portion of their holdings.
Finance available for expansion.	Market risk. Illiquidity of the markets or unexpected downturns may result in IPO being aborted.
Liquid market for market shares.	Floatation may be available only to larger companies.
Enhanced status and public awareness.	Increased scrutiny from shareholders and media.
Increased employee motivation via share incentive schemes.	Significant regulatory requirements and commitments.
Public recognition for the company.	

Source Strang (1998) (modified, p 23)

2.3.3 Refinancing

Venture capitalists may also exit by means of a sale of their shares to a third party. The latter can be either an other venture capitalist or an institutional investor such as an insurance company or a pension fund. This type of exit differs from a trade sale in that only the shares of the venture capitalist are sold to the third party.

Refinancing or, as sometime it is referred to, secondary buy-out is becoming more common, although it still accounts for a relatively small percentage of exits. Reasons for selling the holdings to a third party may include the need to increase or maintain liquidity; it may otherwise be that the investee has passed from one stage of growth to another where the venture capitalist no longer feels it can add value to the venture or maintain the stream of earnings realised early on.

2.3.4 Purchase of own shares or buy-back

Another exit route is the buyback, through which the entrepreneur/manager repurchases the shares held by the venture capitalist. Usually the price of the share is negotiated between the venture capitalist and owner-manger of the firm. This kind of exit is likely to be encountered in circumstances where the business has not performed well and the exit is not being made voluntarily.

2.4 U.K. venture capital industry

In the above sections we firstly identified the different stages of the venture capital life cycle. Secondly, we explained the venture capital investment process in selecting potential investee firms and thirdly we described the exit routes available to venture capitalists. In what follows attention is turned to providing a brief history of the growth and development of the U.K. venture capital industry. A review and discussion is provided of the industry characteristics, trends during the last decade, the provider of funds and investment by industry sector.

Venture capital in the U.K. originated in the late 18th century, when struggling entrepreneurs began to obtain patronage from wealthy individuals to back their projects. This informal method of funding became known as venture capital financing in the beginning of the 1930s when Charterhouse was launched as the first modern professionally managed specialist fund, providing risk equity capital for growing small and less established companies (Lorenz (1985) p41). However the real development of the venture capital industry in the sense in which it is understood today did not begin until the late 1970s and early 1980s. According to the BVCA there are now over 100 active venture capital firms in the U.K., which provide several billion pounds each year to unquoted companies mostly located in the U.K..

The growth of the U.K. venture capitalist firms during the past two decades has been the results of a combination of structural, political, social, fiscal, economic and investment factors. As a result of this combination, the U.K. venture capital industry is considered as the largest and most developed in Europe. According to a recent report by the Bank of England (2001), in 1999, U.K. venture capital investment accounted for 46 percent of the total amount invested in the whole of Europe by the European venture capital industry. In terms of size, the U.K. industry is second only to the U.S., and per capita it is actually the largest in the world. In the period spanning 1984 and 1999, BVCA members have invested, in total, around £35.5bn across over 19,000 companies. Figure 2.3, shows a low level of investment in the early 1990s and this may be due to the worldwide recession that occurred during this period. On the other hand, in the late 1990s the funds invested have increased dramatically. For instance, in 1999 the total fund invested by the BVCA amounted to £7.8bn (see table 2.5) and this represents a 60 percent increase from the previous year. These funds were provided to more than 1473 new and developing business and management buy-in and buy-out companies.

Figure 2-3 Fund invested by BVCA members (1987-1999)

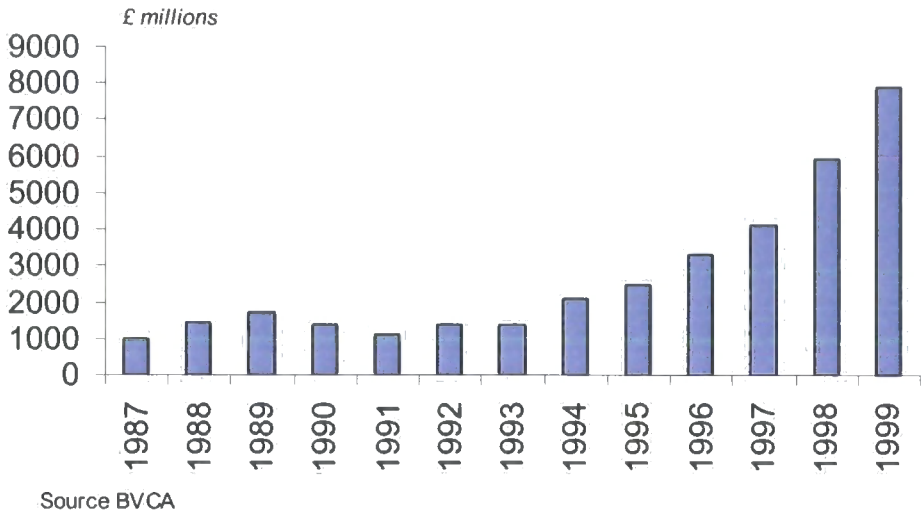


Table 2–5 British venture capital investment

	1995	1996	1997	1998	1999
Number of BVCA members	107	103	105	117	155
Total amount invested (£ bn)	2.535	3.239	4.184	4.919	7.8
Number of companies financed	1,163	1,200	1,272	1,332	1473

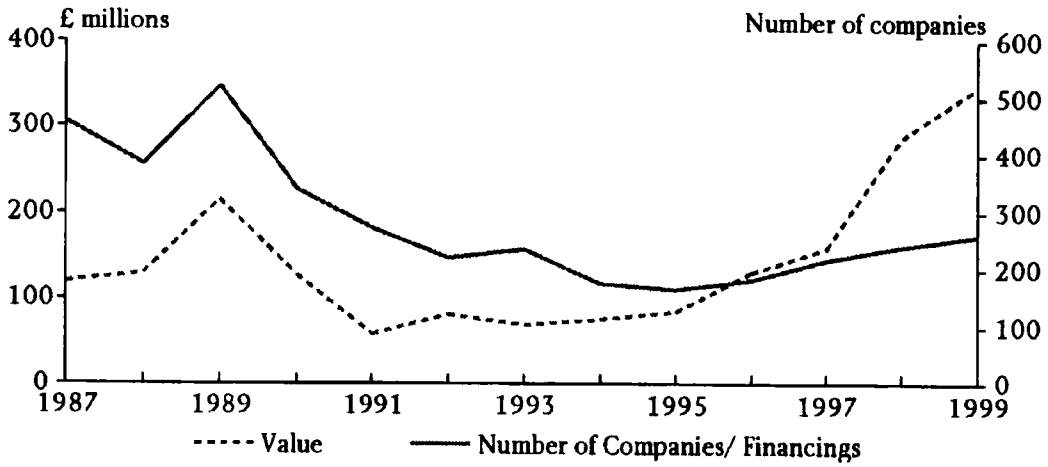
Source BVCA

2.4.1 BVCA investment by financing stage[3]

Investments have been categorised by three main financing stages, namely early stage, expansion and MBO/MBI. From the total fund raised only a small amount is allocated to early stages finance. Although in 1999 the total of early stage investments in U.K. companies increased by 20 percent from 1998 and by 60 percent from 1989 (see figure 2.4), the total amount allocated was only 0.35bn. The number of companies backed by venture capitalists was well down on a decade earlier (260 compared with a peak of 521 in 1989).

[3] Figures in this section (2.4.1) are taken from the report published by the Bank of England, 2001 and titled "Financing of Technology-based Small Firms".

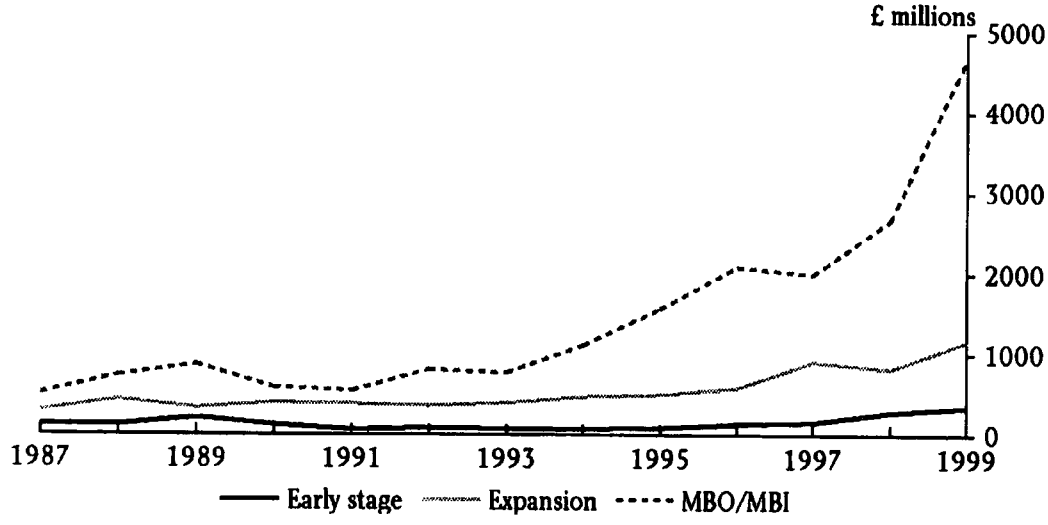
Figure 2-4 Early stage finance in the U.K.



Source BVCA, cited in Bank of England (2001), p10.

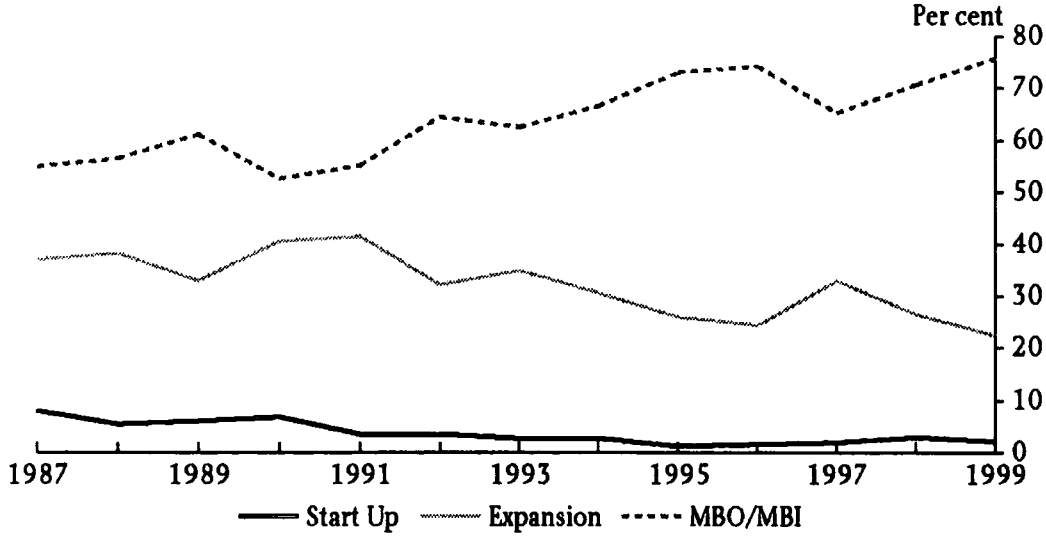
In contrast to the early stages, figures 2.5 and 2.6 respectively show clearly the increase in the U.K. venture capital industry involvement in MBO/MBI investment. In 1999, 75 percent of the total amount invested went to MBO/MBI activities. This further shows the preference of venture capitalists to later stages investment. However, a closer glance at figure 2.5 shows that there has been an increase in investment size within each financing stage. For instance, the average value of early stage financing deals went up by 71 percent over a decade to 1998 (from £0.34mn to £1.2mn).

Figure 2-5 U.K. investment by stage



Source BVCA, cited in Bank of England (2001), p11

Figure 2-6 U.K. investment allocated to stages of finance

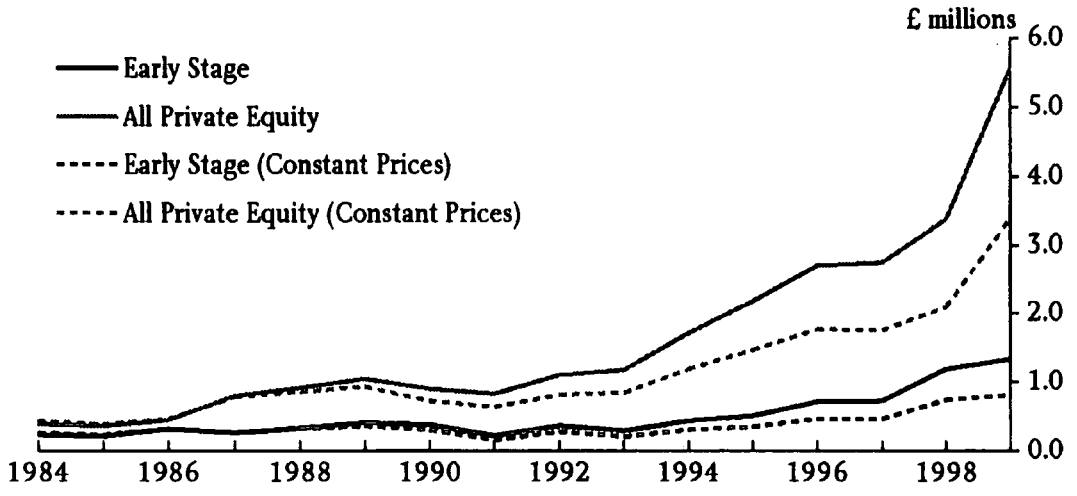


Source BVCA, cited in Bank of England (2001), p11

Deal sizes can be used to explain why late stage investments have become such an important activity in the U.K. venture capital market. The recent increase in the value of funds together with the deal size reflect the fact that the typical venture capital fund does not always possess the time to evaluate and monitor a relatively large number of small investments. This suggests that the economies of scale are

becoming ever more important in the venture capital industry and that smaller funds are less likely to generate genuine return due to relatively high operating costs. As pointed out by Murray (1999) U.K. venture capital success has been made at the expense of excluding early stage investments from the market place because of their small size.

Figure 2-7 Average deal of BVCA members[a]



(a) 1984 constant prices

Source BVCA, cited in Bank of England (2001), p12

More crucially perhaps, in the U.K. venture capitalist prefer lower risk investments, largely because late stage companies are already established businesses and have a performance record.

2.4.2 Type and sources of funds

Venture capital funds can be divided into 5 categories, according to their ownership and sources of funding.

2.4.2.1 Clearing bank captive fund

These funds are generally established by commercial banks to invest in businesses that do not meet their loan criteria and are managed by the Bank's venture

investment management teams. Funds are open ended, i.e., the amount of capital available to them for investment is not fixed. The provider of this kind of fund often prefers investments that generate part of their return in the form of dividends. With comparison to independent funds, captive funds have a larger debt element in their investment.

2.4.2.2 Institutional captive funds

These venture funds are part of banks or insurance companies and are usually close ended. Investments are financed mainly through equity, although they may make some debt investment. Recent funding development shows that former captives now raise funds from external sources as well, in this case they are known as semi-captives. In the U.K. institutional captive and semi-captive funds are often viewed as investing primarily in later stage projects such as development capital and management buy-outs and buy-ins.

2.4.2.3 Independent funds

Independent funds raise their capital from different sources. This is to say that single investors do not dominate the funds. These funds usually make equity investments in projects and they are typically funded through limited life closed ended funds, with funding coming from pension funds, foreign investors, etc., and are more committed than captives in generating returns for investors by realising a capital gain Wright and Robbie (1998). Independent funds usually invest in particular industries, such as computer and high-tech business, medical and pharmaceutical industries.

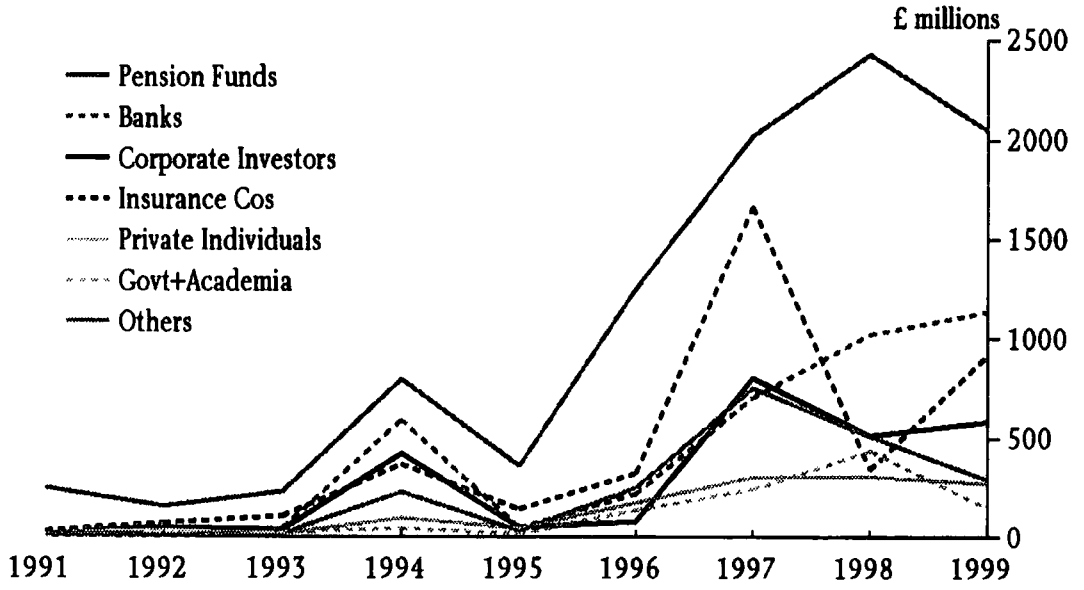
2.4.2.4 Enterprise Investment Scheme (EIS)

They were set up by the government to replace the Business Expansion Scheme (BES) and to encourage investors (business angels) to invest in certain types of smaller unquoted U.K. companies. A company has to meet the EIS criteria in order to attract investors.

2.4.2.5 State-owned agencies

Agencies like the Welsh development agency, the Scottish development agency and English estates are state run investment schemes, set up to regenerate and revitalise some particular regions or industries by encouraging, advising and helping local businesses. These schemes are sponsored through central government grants.

Figure 2-8 Source of BVCA private equity



Source BVCA, cited in Bank of England (2001), p14

The graph 2.8 shows that BVCA members raise their funds from different sources. According to the British Venture Capital Association (2000) pension funds have long been the main source, accounting for 39 percent of investment of BVCA members between 1987 and 1998 and have become increasingly important since 1995. Gompers (1994) argued that the increasing dependence of the venture capital industry on institutional and especially pension fund capital has had adverse effects on the willingness of venture capitalists to provide early-stage finance. This may be due to the allegedly short horizons of pension fund managers resulting from the short-term performance pressures associated with a quarterly evaluation of funds. In other words, pension funds regard the investment in early stages as not profitable business since it absorbs a huge amount of management time and effort without the

likelihood of providing returns commensurate with the risks involved. Early stage funds tend to incur greater unit costs while having smaller total funds over which to defray costs than later stage development capital or MBO/MBI funds. As venture capital fund sizes increase, the attractiveness of investing small amounts in early stage companies falls. This could also explain why venture capitalists in the U.K. prefer to invest in MBOs/MBIs and development/expansion capital in which the investor's returns are realised much earlier. However a glance at table 2.6 shows that the contribution from U.K. institutions has declined. For instance, in 1986, U.K. pension funds were the largest single source of investment in U.K. venture capital firms, contributing nearly 41 percent of all funds (see Bovaird (1990), p8). In the years, 1996 and 1997 the absolute level of U.K. pension funds contributions fell by 15 percent and 11 percent respectively. According to the National Association of Pension Funds[4] U.K. pension funds allocate only 0.53 percent of their assets to venture and development capital funds. In contrast U.S. pension funds are estimated to allocate some 5.4 percent of assets to private equity, of which 1.4 percent goes to early-stage and expansion finance and 4 percent to leveraged buy-outs.

On the other hand a closer look at the statistics concerning the value of funds invested by overseas investors in the U.K. venture capital industry indicates that the proportion of funds is increasing, particularly from the U.S.. For instance, in 1998 the value of funds raised from the U.S. for investment in U.K. private equity funds exceeded those raised in the U.K.. Capital provided from the U.S. accounted for 51 percent of the total investment in U.K. private equity funds in 1998, whereas U.K. investment fell in absolute terms and accounted for just 27 percent. It is argued that the reason of the increase in U.S. inflows is related to the high returns realised in the buy-out market in the U.K., which have outperformed those in the U.S. and Europe over the past five years. In a survey conducted by the British Venture Capital Association (1998), 76 percent of respondents claimed that good returns were a major attraction of the U.K. market. They also regarded U.K. funds as a gateway into the growing European venture capital market.

[4] Reported in British Venture Capital Association (1998). Why should you invest in venture capital. London, BVCA.

Table 2–6 Investment by investor type

Type of source		Amount raised (£m)			% of amount raised		
		1998	1997	1996	1998	1997	1996
Pension funds	U.K.	553	622	734	10	10	30
	Overseas	1,875	1,397	519	34	21	21
Total pension funds		**2,428**	**2,019**	**1,253**	**44**	**31**	**51**
Insurance companies	U.K.	152	1,160	221	3	17	9
	Overseas	193	505	104	3	8	4
Total insurance companies		**345**	**1,665**	**325**	**6**	**25**	**13**
Corporate investors	U.K.	83	376	29	1	6	1
	Overseas	432	428	51	8	6	2
Total corporate investors		**515**	**804**	**80**	**9**	**12**	**3**
Banks	U.K.	383	238	68	7	4	3
	Overseas	640	467	153	11	7	6
Total banks		**1,023**	**705**	**221**	**18**	**11**	**9**
Government agencies and academic institutions	U.K.	5	10	56	7	0	2
	Overseas	434	234	82	8	4	4
Total government agencies and academic institutions		**439**	**244**	**138**	**8**	**4**	**6**
Private individuals	U.K.	157	164	68	3	3	3
	Overseas	152	142	108	3	2	4
Total private individuals		**309**	**306**	**176**	**6**	**5**	**7**
Other sources	U.K.	182	228	207	3	4	8
	Overseas	329	525	45	6	8	2
Total other sources		**511**	**753**	**252**	**9**	**12**	**10**
Total from U.K. sources		1,515	2,798	1,383	27	43	57
Total from overseas sources		4,055	3,698	1,062	73	57	43
Grand Total		**5,570**	**6,496**	**2,445**	**100**	**100**	**100**

Source BVCA

2.4.3 Venture capital investment by industry

Table 2–7 Investment by industry sector

Economic groups & sectors	Number of companies			% of companies			Amount invested (£m)			% of amount invested		
	1998	1997	1996	1998	1997	1996	1998	1997	1996	1998	1997	1996
Resources	18	19	24	1	2	2	100	47	95	3	2	4
Mining	4	6	4	—	1	—	12	17	22	—	1	1
Oil & Gas	14	13	20	1	1	2	88	30	73	2	1	3
Basic industries	81	72	84	7	6	8	227	234	148	6	7	5
Chemicals	23	25	31	2	2	3	65	32	64	2	1	2
Construction & building materials	48	47	44	4	4	4	117	193	73	3	6	3
Forestry & paper	6		9	1	—	1	17	9	11	—	—	—
Steel & other metals	4	0	0	—	0	0	28	0	0	1	0	0
General industrials	233	220	244	21	20	23	505	576	619	13	19	23
Aerospace & defence	5	0	0	1	0	0	13	0	0	—	0	0
Diversified industrials	0	2	11	0	—	1	0	20	47	0	1	2
Electronic & electrical equipment	60	67	81	5	6	8	111	183	107	3	6	4
Engineering & machinery	168	151	152	15	14	14	381	373	465	10	12	17
Cyclical consumer goods	65	73	82	6	6	8	163	172	188	4	6	6
Automobiles	14	14	21	1	1	2	65	18	37	2	1	1
Household goods & textiles	51	59	61	5	5	6	98	154	151	2	5	5
Non-cyclical consumer goods	173	150	135	15	14	12	469	432	308	13	14	11
Beverages	3	2	2	0	—	—	4	1	—	—	—	0
Food producers & processors	48	39	55	4	4	5	186	127	100	5	4	4
Health	51	52	45	5	5	4	127	77	142	3	3	5
Packaging	11	13	13	1	1	1	60	41	38	2	1	1
Personal care & household products	3	2	0	—	—	0	1	24	0	—	1	0
Pharmaceuticals	57	42	20	5	4	2	91	162	28	3	5	1
Tobacco	0	0	0	0	0	0	0	0	0	0	0	0
Cyclical services	321	393	364	28	35	35	1,799	1,197	1,140	48	40	40
Distributors	68	78	85	6	7	8	223	139	147	6	5	5
General retailers	27	42	35	2	4	3	163	171	180	4	6	6
Leisure, entertainment & hotels	32	41	42	3	4	4	367	332	150	10	11	5
Media & photography	63	83	61	6	7	6	620	198	211	17	6	8
Restaurants, pubs & breweries	24	24	18	2	2	2	83	50	123	2	2	4
Support services	84	87	95	7	8	9	232	170	156	6	6	6
Transport	23	38	28	2	3	3	111	137	173	3	4	6
Non-cyclical services	13	23	17	2	3	1	14	114	23	—	3	1
Food & drug retailers	5	16	13	1	2	1	2	42	19	—	1	1
Telecommunications services	8	7	4	1	1	—	12	72	4	—	2	—
Utilities	5	3	1	—	—	—	44	2	—	1	0	—
Electricity	5	3	1	—	—	—	36	1	—	1	—	—

Gas distribution							8	1		—	—	—
Water	0	0	0	0	0	0	0	0	0	0	0	0
Financials	28	59	35	3	5	4	108	86	188	3	3	6
Banks	0	4	0	0	—	0	0	—	0	0	—	0
Insurance	7	23	5	1	2	1	41	50	95	1	2	3
Life assurance	0	3	0	0	—	0	0	—	0	0	0	0
Investment companies	4	0	0	—	0	0	2	0	0	—	0	0
Real estate	5	13	11	1	1	1	33	8	35	1	—	1
Speciality & other finance	12	16	19	1	2	2	32	28	58	1	1	2
Information technology	185	104	74	17	9	7	346	206	97	9	6	4
Information technology hardware	28	15	22	3	1	2	70	44	24	2	1	1
Software & computer services	157	89	52	14	8	5	276	162	73	7	5	3
Total	1,122	1,116	1,060	100	100	100	3,775	3,066	2,806	100	100	100

Notes: The sector definitions have been based on the FTSE Actuaries Industry Classification System,
Source BVCA

A glance at the actual number of companies backed shows that venture capitalist investments have shifted from manufacturing and industrials to technology companies (mainly computer, pharmaceuticals and communications related). Venture capitalists backed more companies from this group of industries than any other industry grouping. In 1998, they received £707 million (representing 19 percent of the total—up 19 percent on 1997) was invested in 351 companies. In 1998, the greatest increase in the number of companies backed was information technology sector, where 185 companies were backed, up by 87 percent on the 74 companies backed in 1996. 57 pharmaceutical companies were backed in 1998 and this represents an increase of about 65 percent of companies backed in 1996. However, when the amount invested is considered, cyclical services have attracted the most investment in 1998 (48 percent of the total amount invested), up by 8 percent from 1996. The next most important industry in terms of amount invested is media and photography-£620 million was invested representing 17 percent of the total invested in 1988, up by 11 percent from 1996. Support business was the next most active sector with 84 companies receiving £232 million in 1998. One other sector benefiting from high investment levels is engineering and machinery where 168 companies (accounting for 15 per cent of the total) received £381 million (representing 10 per cent of the total).

In short, the above table shows clearly that many companies operating in computer related industries have been backed by venture capital, yet the amount of money received is still negligible if compared with the amount received by manufacturing and consumer related companies. This represents further evidence that the U.K. venture capital industry tends to prefer financing late stage companies where risk is low.

CHAPTER THREE INITIAL PUBLIC OFFERINGS LITERATURE

All firms need to raise capital at some point during their life cycle to finance new projects or expand their operations. One way of raising capital for less established companies is to make new stock offerings in the capital market. The aim of this chapter is to present and discuss the literature in the field surrounding initial public offerings (IPOs)[5]. Rising capital through an IPO has always been regarded as a critical decision to make for any company. As such, the efficiency of the IPO process and the performance of companies subsequent to their floatation in the market has been the subject of considerable academic research. Since initial public offerings are the context chosen in this study to evaluate the effect of the involvement of venture capitalists on the performance of their respective investment portfolios, the author's intention is to provide an overview of different existing theories and evidence in this area. Within this chapter is the methodical backbone of the present dissertation. This chapter does not claim to cover the whole literature regarding IPOs, yet the major contributions are highlighted. The focus is, of course, on the two anomalies that have generated much research, namely *initial underpricing* (setting the offering lower than it is worth) and *long-term underperformance*

Underpricing refers to the high initial first day return anomaly[6]. It is argued that the offering prices of new issues are significantly lower than the market prices on the first day of trading. In other words, the shares of new issues are offered to investors at prices considerably below the price that they subsequently trade at on the stock market. Following the seminal work of Ibboston and Jaffe (1975) and then Ritter (1984) several researchers have documented, in different countries and at different periods in time that, on average, new issues (companies that recently went public) are underpriced.

Several studies have also documented that the shares of new issues, are underperforming other quoted companies in the stock market in the long-run.

[5] The first sale of stock by a company to the public.
[6] Usually defined as the difference between the offer price (as published in the company prospectus) and the first day trading closing price.

Researchers usually compare the returns of the new issues following their entrance to the market, for a period of 3 years or 5 years, with the returns of a reference portfolio or a market index. Though with different magnitude, these studies report that new issues are underperforming the market (or benchmark portfolio) in the long-run. The findings suggest that investors would lose money by buying and holding shares of companies that recently went public.

The remainder of this chapter is structured in the following way: the next section highlights the main theoretical explanations, put forward by academics, of the underpricing phenomenon. These explanations can be categorised in the following broad areas:

1) Theories focusing on the informational asymmetries that occur between the different parties (issuing firm, underwriter and investors) involved in an IPO;

2) Explanations based on the reputation of the firm as well as the underwriter of the issue;

3) Explanations based on signalling theories;

4) As data on market-structure start to become available in a number of countries, some studies have investigated the way in which the shares are allocated to investors to give explanations to the IPO underpricing.

Section two, on the other hand, reviews the empirical evidence suggesting the existence of "hot issue " markets in which average initial returns are unusually high. Many studies argue that there are periods when underpricing appears to be systematically larger than in other periods and they are characterised by a large number of offerings. Section three of the chapter reviews and discusses the empirical studies regarding long-run performance. While the final part highlights the main explanations, put forward in the literature, of the long-run underperformance.

3.1 Underpricing

As mentioned earlier in this chapter, several studies have reported, in different countries and at different periods in time, that companies appear to underprice their shares as they go public. Table 3–1 compiles some of the international evidence on

IPO underpricing. Early evidence comes from the USA, while studies of other countries emerged in the 1980s. Many companies (small and medium size) went

Table 3–1 International evidence of IPO underpricing

Country	Authors	Sample period	Sample size	Initial return (percent)
Brazil	Aggarwal, Leal et al. (1993)	1979-90	62	78.5
Brazil	Leal (1998)	1979-92	66	74.1
Canada	Jog and Srivastava (1996)	1971-92	254	7.4
Chile	Aggarwal, Leal et al. (1993)	1982-90	19	16.3
Mexico	Aggarwal, Leal et al. (1993)	1987-90	37	33
USA	Ritter (1991)	1974-85	1,526	14.3
USA	Ibboston, Ritter et al. (1994)	1960-92	10,626	15.3
Austria	Aussenegg (1997)	1984-96	67	6.5
Belgium	Manigaret and Rogiers (1992)	1984-90	28	13.7
France	Jacquillat (1986)	1972-86	87	4.8
France	Vandemaele (1999)	1984-95	228(Second Marche)	20.9
France	Derrien and Womack (1999)	1983-98	448	9.5
Germany	Ljungqvist (1995)	1970-93	180	9,2
Greece	Kazantzis and Thomas (1996)	1987-94	129	51.7
Hungary	Jelic and Briston (1999)	1990-98	25	44
Italy	Cherubini and Ratti (1992)	1985-91	75	29.7
Netherlands	Buijis and Eijgenhuijsen (1993)	1982-91	72	7.4
Poland	Aussenegg (1999)	1991-98	149	35.6
Portugal	Alphao (1989)	1986-87	62	54.4
Spain	Fernandez, Abascal et al. (1992)	1985-90	71	35.4
Sweden	Rydqvist (1993)	1970-91	213	39
Switzerland	Kunz and Aggarwal (1994)	1983-89	42	35.8
U.K.	Jenkinson and Mayer (1988)	1983-86	143	10.7
U.K.	Levis (1993)	1980-88	712	14.3
China	Datar and Mao (1999)	1990-96	226(A-share)	38.8
China	Su and Fleisher (1997)	1987-95	57(B-share)	37.1
Hong Kong	McGuinness (1992)	1980-90	80	17.6
Japan	Jenkinson (1990)	1986-88	48	54.7
Japan	Kaneko and Pettway (1994)	1989-93	37	12
Korea	Dhatt, Kim et al. (1993)	1980-90	347	78.1
Taiwan	Chen (1992)	1971-90	168	45
Thailand	Wethyavivorn and Smith (1991)	1988-89	32	58.1
Thailand	Allen, Morkel-Kingsbury et al. (1999)	1985-92	150	63.49
Australia	Finn and Higham (1988)	1966-78	93	29.2
Australia	Lee, Taylor et al. (1996)	1976-89	226	11.9
Malaysia	Dawson (1987)	1978-83	21	166.6
New Zealand	Vos and Cheung (1992)	1979-91	149	28.8
Nigeria	Ikoku (1995)	1989-93	63	19.1
South Africa	Page and Reyneke (1997)	1980-90	118	32.7

Source updated from Jenkinson and Ljungovist (1996)
Initial returns may be measured between the (first) subscription day and the first trading day, or some day soon after trading starts. They may be initial returns (raw returns) or initial market adjusted returns . Generally, results are robust to market-return adjustments and choice of time.

public during the 1980s and the 1990s partly as consequence of the privatisation schemes that took place in many countries and the development of the Second Markets that are characterised by less rigid listing requirement. In most countries new issues are undepriced and therefore initial first day returns are positive. For example buying new issue stocks that were floated between 1978 and 1983 in the

Malaysian stock exchange at the offer price and selling at the first trading day would yield an average return of 166.6 percent. Investing on IPOs that were floated on the Austrian stock exchange between 1984 and 1996 would generate an abnormal return of 6.5 percent.

Several theories have been proposed to explain the underpricing anomaly of new issue markets. The following section summarises the most important theoretical models.

3.1.1 Adverse selection theory

The central hypothesis of the adverse selection theory is information asymmetry. Based on this Rock (1986) first assumed that both the issuing firm and the investments bank involved in the underwriting do not know the real value of shares offered. Then he posited that investors are differentially informed about the true value of the new issues. Rock divides investors into two categories, informed and uninformed. In his model, the informed investors know the true value of the IPO while uninformed investors do not. He argued that uninformed investors are confronted with a winner's curse as a consequence of the information asymmetry that occurs between informed and uninformed potential investors. Thus, uninformed investors are more vulnerable to subscribe to overpriced issues.

The situation that faces uninformed investors in making decisions about buying new issuing firms is similar to Akerlof (1970) well-known argument on the market for lemon cars. Uninformed investors are not able to distinguish between good quality issues and lemons. The latter are described as very risky and poor quality firms that investors should try to avoid buying at floatation. As a consequence of the information asymmetry that occurs between informed and uninformed investors, issuers rationally underprice new issues because uninformed buyers will withdraw from the market if they do not have a substantial premium to overcome their informational disadvantage. In other words, Rock's model claims that companies intentionally underprice their shares as a rational behaviour in order to induce uninformed investors to participate in the market and thereby raise the demand for the issue. This has led Rock to suggest that investors face an *ex-ante uncertainty*.

That is to say uninformed investors who subscribe to the offer cannot be certain about the value of the offering before it starts trading in the market.

To examine Rock's (1986) claim, Ritter (1984) used two variables as proxies to measure ex-ante uncertainty. The annual sales of the issuing firm prior to the official listing and the volatility of its stock returns after floatation. The author argued that firms with low annual sales volume are more risky than the ones with high annual volume sales. In doing so, he first, categorised 1028 firms that went public over the period 1977-1982 according to their annual sales and examined whether there is a relation between the expected initial return and the annual sales. As an alternative to the first measure of risk, Ritter also split 926 issues into six equal-sized risk groups according to their standard deviation of returns in the period after floatation. The results showed that there is a positive correlation between the degree of underpricing and the measures of ex-ante uncertainty. They also indicate a significant correlation between these variables and the amount underpriced. This has led Ritter to conclude that the more uncertain the market is about the true market value of the issuing firm, the higher the discount the company must offer to the uninformed investors to submit bids.

Later Beatty and Ritter (1986) (B & R) developed and tested Rock's (1982) winner's curse explanation for IPO underpricing by introducing underwriters into Rock's argument. They proposed the following two claims. First, there is an equilibrium relation between the ex-ante uncertainty and the degree of underpricing; that is to say that the magnitude of underpricing depends on how risky the IPO is. Second, the investment bank underwriting the issue imposes the equilibrium. To explain their propositions B & R argued that there is a conflict of interest between issuing firms and uninformed investors. As mentioned by Rock (1982) and Ritter (1984) uninformed investors will only submit purchase orders if, on average, the initial public offering is underpriced. On the other hand, issuing firms are not willing to leave "money on the table" (underprice) as they go public only once during their business cycle. According to B & R the only way to overcome this conflict is to have an intermediary between the abovementioned two parties with an incentive to appropriately price the shares. The intermediary is of course the investment bank that manages the offer. The authors argue that investment banks can fulfil the role of

setting an appropriate price because they are constantly in the business of underwriting. As result of this the investment banks build and develop a reputation and earn a return on this reputation. Thus, it is in the interest of the investment banks to impose an underpricing equilibrium while setting the offering price. In other words, investments banks have to enforce underpricing equilibrium; otherwise, they will lose underwriting commissions in the future. If they underprice too much, they will lose business from issuers[7], while if they underprice too little, they will lose business from investors[8]. Using Ritter's (1984) sample and conducting regression analysis B & R look at the relationship between uncertainty and underpricing. Consistent with Ritter's (1984) work, Beaty and Ritter found a significant positive relationship between the level of underpricing and the degree of ex-ante uncertainty. To test the proposition whether underwriters enforce the equilibrium, the authors assessed the relation between the mispricing (by investment bankers) and the subsequent change in market share. The market share is defined as the fraction of the number of initial public offerings that investment banks manage and co-manage. To determine whether there is a mispricing, they computed the absolute standardized average residual. The latter is defined as $\overline{R}_i \div (\sigma_i / \sqrt{N_i})$, where $\overline{R}_i$ is the average residual (is the difference between the initial return of the issue managed by the underwriter and the expected initial return before floatation[9]), and σ_i is the standard deviation of the residuals. The mispricing is measured by the absolute standardized average residual. The higher it is, the more the underwriter mispriced the issue. Consistent with their argument the results show that underwriters who misprice their offering saw their market fall subsequent to the period of mispricing.

3.1.2 The Principal-agent theory

Unlike Rock's model which relies on information asymmetry between informed and uninformed investors, Baron (1982) model relies on another information asymmetry, that between issuing firm and the underwriter managing the floatation. Baron's

[7] If an investment bank underprices its offering too much, potential issuers will turn to other underwriters and cease dealing with the investment bank.

[8] If an investment bank does not underprice its offering enough, uninformed investors, who are subject to winner's curse will cease buying shares underwritten by the bank.

[9] The expected initial return before floatation is obtained from the regression analysis conducted to test the relation between uncertainty and initial returns proposed by Ritter (1984).

model assumes that issuers do not know the real value and underwriters have superior information about potential demand for the issue. Therefore, issuers delegate the offer price decision to the underwriter and hence cannot perfectly monitor the underwriter. He argued that the underwriters have an incentive to underprice in order to minimise their risk in selling the entire amount committed to outside investors. Though Baron's model does clearly define an inverse relationship between the true value of the firm and the magnitude of underpricing, one may argue that it does not take into account competition in the underwriting business. Issuing firms could choose the underwriter that it is offering the best deal (i.e., the underwriter who is not willing to underprice significantly the shares of the firm). Moreover, Baron does not take into consideration the fact that the investment bank would be concerned about supporting its own reputation and therefore have additional incentive to produce truthful information.

Muscarella, Vetsuypens et al. (1989) tested Baron's model by examining 38 underwriters (investment banks) that went public between 1970 and 1987. The sample included only investment banks that marketed their own shares at floatation. According to the authors, as the underwriters market their own shares and there is no information asymmetry in this case, there should not be any underpricing. In other words as the issuers are themselves the underwriters, the argument put forward above by Baron (1986) that underwriters tend to underprice the issues in order to reduce the risk of not selling the entire amount committed to potential investors are expected not hold true. In contrast to the expectation of the authors, the results showed that that shares are underpriced even without information asymmetry. Thus their finding does not support Baron's theory of underpricing. This has led them to conclude that underpricing is a persistent phenomenon that could not be explained merely by information asymmetries that occur between issuing firms and underwriters. However, one may note that the conclusions of this study are drawn upon a small sample sized of 38 banks where caution has to be made.

3.1.3 Reputation hypotheses

This section discusses further explanations put forward in the literature to explain the widely reported (see table 3-1) phenomenon of underpricing. In contrast to the previous models that focused on information asymmetries that occur between the different parties involved in the initial public offerings, the hypotheses highlighted in the present section are based on reputation building. Three hypotheses are considered and presented. The first hypothesis refers to the legal insurance hypothesis that was developed in the U.S. The supporters of this hypothesis argue that in the U.S. issuing firms and underwriters deliberately underprice their offer in order to insure against future lawsuits from investors disappointed with the performance of shares. The second hypothesis asserts that the reputation of underwriter managing the offering could influence the price of the issue at floatation. That is to say, investors are not aware of the real value of the new issue, therefore they rely on the underwriters to communicate the value of the shares. In doing so, issuing firms prefer renowned underwriters to market their shares. This is to insure that the selling price of shares is not underpriced. The third and final hypothesis proposes that the presence of venture capitalists in an initial public offering could also affect the price of the issue. For example if the issue is backed by a venture capitalist this would assist the investors in ascertaining the real value of the shares. Hence the reputation of the venture capitalist is at stake as it is frequently involved in listing its investments in the stock market.

3.1.3.1 Legal liability

First, Louge (1973) and Ibboston and Jaffe (1975) suggested that underpricing is an efficient form of protecting agents (issuers and underwriters) involved in a public offering against lawsuits from investors. Tinic (1988) developed and tested the implications of this hypothesis looking at U.S. IPOs that were issued before and after the Securities Act of 1933 -The Act holds liable the parties involved in any kind of false or inadequate information presented in the registration statement. An investor in IPOs, thus, is entitled to sue every party who signed the registration statement, including the underwriter associated with the offering, to receive a compensation for the loss incurred. According to the author, underpricing may provide the issuer and

the underwriter with protection against legal liabilities. Tinic first suggested that underpricing may serve to reduce potential statutory legal liabilities and then hypothesises that, if true, the IPOs issued after the 1933 Act should exhibit substantial larger initial excess return than the ones issued prior to it. The results presented showed that the Act had a significant impact on the behaviour of underwriters and on the pricing of IPOs. Though the initial excess returns of the IPO sample issued prior to 1933 were significantly positive, the degree of underpricing was less than the excess returns generated by the IPOs sample issued after 1933.

In one other study, Drake and Vestsuypens (1993) tested the abovementioned hypothesis put forward by Lougue and Ibbodton over the period of 1969-1990. They analysed 93 IPOs which were sued for misstatements in the IPO prospectus or registration statement. Though the results have to be interpreted with caution[10], they showed that these 93 IPOs are not overpriced, on average, but are as underpriced as other IPOs of similar size. Drake and Vestsuypens claimed that underpricing an IPO is not a very efficient way of avoiding future lawsuits as, at least in this sample, it did not appear to protect them from being sued. The authors showed also that the purchasers of the underpriced issue are just as likely to sue, in the U.S., as purchasers of overpriced ones. Furthermore firms that are sued are not more or less underpriced than comparable companies that are not sued. According to Alexender (1993) the lawsuits avoidance explanation to underpricing as advanced by Louge (1973) and Ibboston and Jaffe (1975) is based on a misleading assumption about actual legal and financial liability for underwriters and issuers. She argued that underwriters do not in reality bear the full costs of litigation. In addition to that, underwriters have no incentive to insure themselves further by undepricing the issue because they are already insured. Therefore, if it happens that there is a settlement that has to be paid to the investors as consequence of their lawsuit (against the parties involved in the IPO), insurance companies will then take the responsibility of compensating investors. That is to say those underwriters do not need to insure further by underpricing because, in the majority of the cases, they hold insurance from insurance companies. It would have been more sensible to say in this situation that

[10] The study includes only firms which were published in legal databases (see (Drake and Vestsuypens 1993))

underwriters are concerned about their reputation rather than striving to avoid legal liabilities. Underwriters who provide misleading information about issuing firms to investors may damage their reputation. Underwriters could also lose the business of underwriting as consequence of their past behaviour. Further, Alexander contended that underpricing would offer only limited protection because it is irrelevant in suits brought under the 1933 Securities Act. Thus, she concluded that undepricing cannot be seen as efficient and effective means of gaining insurance against securities law violations.

3.1.3.2 Underwriter's reputation

As mentioned earlier the second hypothesis claims that the offer price of a new issue is affected by the prevailing reputation in the market of the investment bank underwriting the IPO. Louge (1973) suggested that the choice of a prestigious rather than a non-prestigious investment bank might influence the price which investors are willing to pay for the shares sold. This statement reflects the belief that when a firm sells shares for the first time its true value is imperfectly known by investors and that the reputation of the investment bankers chosen by the firm's owner provides information to the market about the firm's true value.

Titman and Trueman (1986) developed a model that can be applied to any high quality outsider who can provide information about the issuing firm. It is claimed that this model can explain how the quality of the investment bank chosen can rationally be used by investors in valuing new issues. Titman and Trueman argued that an issuing firm with more favourable private information about its own value will choose a higher quality investment bank than will an entrepreneur with less favourable private information. In other words, issuing firms have an incentive to choose the quality level of the investment bank that correctly reveals their private information to investors. Their model predicts that the higher the quality of the underwriter, the more favourable will investors infer the information to be and so the higher will be the price at which the new issue can be sold. The authors did not provide empirical evidence to support their claim, yet they suggested the use of some proxies that can be used in empirical studies to measure the quality of underwriters for future research.

Carter and Manaster (1990) examined the effect of the reputation of investment banks on the initial performance of IPOs. They argued that underpricing is costly to the issuing firm and low risk firms have an incentive to reveal this characteristic to the market. In order to fulfil this, issuing firms prefer to select underwriters who are well established and occupy a prestigious status in the market. Thus, issuers use the reputation of the investment bank to reveal to the investors that the issue is less risky and fairly priced. Carter and Manster developed a theoretical model in which prestigious underwriters are, on average, associated with IPOs of low dispersion firms, i.e., less risky firms. They also provided empirical evidence that low dispersion firms are seen to use prestigious underwriters to signal to the market that they are in fact low risk firms. In a follow up study Carter, Dark et al. (1998) assessed the significance of the 3 proxies used as measures in the past studies to assess the reputation of investment banks and their association with initial returns. The first measure of the underwriter's reputation is given by Carter and Manaster (1990) *(CM)* and it is derived from its position in "tombstone announcements"[11]. The ranking scale is established by comparing tombstone announcements listed on *The Wall Street Journal.* The second measure *(JM)* is just a slightly modified from the *(CM)* measure, since in the Johnson and Miller (1988) study the underwriters are further classified into four categories. The third measure is derived from Megginson and Weiss (1991) (MW). The *(MW)* measure uses the relative market share of the underwriters as a proxy to measure the reputation. In other words, the quality of each underwriter is measured as percentage of the total proceeds of the IPOs managed at the offering. The higher is the percentage the higher is the quality. To test the underwriters reputation the authors used a sample of 2292 U.S. IPOs that went public over the period 1979-1984. The results showed that the reputation proxies are significantly related to initial returns only when they are examined separately, i.e., using univariate regressions. However, the *(CM)* measure is significant when used in a multivariate regression along with the two others proxies. Thus, the latter result indicates that the *(CM)* underwriter reputation proxy has relatively greater explanatory power and explains more of the variation in the initial returns than the two other proxies. Finally, the authors claimed that the better the reputation of the underwriter, the less is the underpricing.

[11] A tombstone announcement is a listing of a pending public security offerings

3.1.3.3 Venture capital reputation

The investment of venture capitalists in firms going public was also seen, in the literature, as a factor that affects the price of an IPO. Like investment banks, it can be argued that investors regard the presence of venture capitalists in a public offering as a certification that reduces the risk of the issue. Venture capitalists certify the quality of the issue through their reputation and financial investment. As mentioned earlier the presence of venture capitalists in an initial public offering could affect the price of the issue. Established venture capitalists bring firms in their portfolio to the initial public offerings market on an ongoing basis. Therefore, venture capitalists have a strong incentive to establish a trustworthy reputation that, in the future, will allow access to the IPO market on favourable terms. Moreover, a reputation for trustworthiness will help the venture capitalist establish a strong relationship with all participants in the offering (e.g., auditors, underwriters, large pension fund managers and institutional investors).

Megginson and Weiss (1991) argued that venture capitalists can perform the certification function and reduce the uncertainty of a firm's true value. They compared a sample of venture capital backed IPOs with a control sample of non-venture capital backed IPOs matched by industry and offering size from 1983 to 1987. They found that firms certified by venture capitalists experience on average lower underpricing at public offerings. Gompers (1996) also developed a venture capitalists hypothesis. He suggested that venture capitalists (as they are repeatedly involved in IPOs) do not want to be associated with IPO failure since they want to maintain their prevailing reputation in the market, as consequence, they are less likely to overprice the issue.

In an attempt to explore whether capital markets recognise the monitoring role of venture capital in the initial public offering, Barry, Musceralla et al. (1990) examined a set of IPOs backed and non-backed by venture capitalists over the period from 1978 to 1987. They argued that venture capitalists can benefit the issuing firms. Investors do not have reliable information about the issuer's assets and investment opportunities. As a consequence investors rely on venture capitalists to provide information because the latter are repetitively involved in the capital market and their

reputation is at stake. The authors provided empirical evidence supporting the notion that venture capitalists' experience and capability in monitoring investments can send vital signal to investors at the time of an IPO. This has led to the suggestion that venture capitalists share at least some of the private information (with the issuing firm) about prospects of the firms they back. Therefore, the authors speculated, venture capitalists may have an even greater incentive to build a reputation for backing good firms.

3.1.4 Signalling theories

These theories stem from the assumption that the issuer of the stock has perfect information about its intrinsic value while investors are uninformed. IPOs are characterised by a great deal of uncertainty about their real value because of the scarcity of public information at the time of initial offering. To reduce this uncertainty and information asymmetry (between issuers and investors), high quality issuers set the offering lower than it is worth (underprice) to enable investors to distinguish them from low-quality issuers. In doing so, high-quality issuers are providing a signal of the quality of the IPO to the investors. While low-quality issuers cannot afford to underprice because, unlike high quality issuers, they would not be able in the post IPO, to recoup "the money left on the table" in future issuing activity. The latter is defined as the difference between the market value of the offering in the after market and the gross proceed raised at floatation (offering price times the number of shares issued). In other words, the underpricing is deliberately and voluntarily conducted by issuing firms to signal their true value. Thus, the offering price provides a signal to the investors of the quality of the IPO

Ibboston (1975) argued that new issuers underprice in order to "leave a good taste in investor's mouths so future underwritings from the same issuer could be sold at attractive prices"[12]. Several studies formalised this statement and modelled a signalling game in which underpricing is the key-element. As mentioned above these models have in common that the firm's owner-managers know the true value of the

[12] See Ibboston (1975, p 264)

firm whilst potential investors do not. The underpricing is deliberate and voluntary to signal the true value.

Following Ibboston's (1975) proposition, Welch (1989) developed a signalling model in which he assumed that low-quality firms must incur a cost when trying to imitate high-quality firm. He also argued that issuing firms are rational and have superior information about the future cash flows than are investors and underwriters. In his model, Welch showed that high quality firms can afford to underprice because they are able to recoup the money left on the table. According to Welch high quality firms follow two-stage sales. The first stage refers to the initial public offerings where high quality firms issue only a portion of the total amount of shares they intend to offer to the public. The price of this portion does not reflect the real value of the high-quality firm because it is underpriced. The remaining shares will be sold later in seasoned offerings. In doing so, high quality firms are able to recover the loss incurred in the initial public offering because the price of the seasoned offering is much higher than the offering price at the IPO. On the other hand, poor quality firms could not follow the above procedure because investors in the market may discover the real quality of the firm between the initial public offering and any seasoned offering. Therefore it is not worthwhile for poor quality firms to imitate high quality firms by underpricing their issue as they would not be able to recover this cost later. Thus, Welch suggested that underpricing is a credible signal of good firms because it is costly for bad firms to imitate.

Further, Welch tested the central hypotheses that IPO firms substantially reissue (i.e. conduct seasoned offerings), and that the proceed raised is higher than the proceed realised at initial public offering. In doing so, he used a sample of 1028 firms that went public over the period 1977-1982 and reported that within the first three years after the IPO, issuing firms do indeed reissue in seasoned equity. The mean of seasoned equity proceeds is three times higher than the IPO proceeds for the reissuing firms. This has led the author to conclude that the timing of the seasoned equity offerings is related to the initial public offering and that IPOs could have been used as means to advertise future issuing.

Similar to the above model Grinblatt and Hwang (1989) and Allen and Faulhaber (1989) presented a generalisation of Leland and Pyle (1977) model, in which they assumed that issuing firms are more informed about the firm's future value than investors are. To reduce the information asymmetry between the above two parties the authors argued that the managers-owners signal the true value by retaining a fraction of the shares of the new issue and by offering the shares at a discount. This is to say that, issuers are signalling both the expected return and variance of future earnings (risk of future investments) to the investors. Thus, according to Grinblatt and Hwang (1989), firms use the fraction retained by the owners and underpricing as signals to the quality of the shares. By retaining some of the shares, owners are effectively sending a signal to the investors that future cash flows will be higher and so it is worth investing in their stocks. The reason why the owners hold onto the shares would be to sell them later in seasoned offerings at a higher price. Conversely, the owners of low quality firms, in Grinblatt and Hwang's model, would prefer to sell as many shares as possible to acquire the maximum capital before the firm's real value is discovered by investors who translate this by valuing the shares at a lower share price in the market. As pointed out by Allen and Faulhaber (1989) bad quality firms are deterred from imitating good quality firms because they are less likely to experience high future cash flows and therefore are less likely to pay high future dividends. As result of this Allen and Faulhaber argued that investors can rationally interpret future dividends more favourably for firms that underprice at their IPO.

From what has been said above it is clear that signalling models have little practical importance if companies do not follow a multiple-stage sale policy of an initial offering followed by subsequent equity offerings or insider sales. Jegadeesh and Welch (1993) tested the signalling hypothesis empirically by assessing the likelihood of a seasoned equity offering (SEO) as a function of the IPO-underpricing. They found small explanatory power of IPO-underpricing for likelihood of SEOs, which cast doubt on the signalling hypothesis. In one other study, Garfinkel (1993) tested the signalling hypothesis by looking at whether the likelihood of insider selling increases as a function of underpricing. He found no correlation, casting further doubt on underpricing signalling.

Jenkinson and Ljungovist (1996) pointed out that the signalling models described above have been designed mainly for the U.S. primary market where the majority of the issuing firms are young start-ups. Conversely, in the U.K. and possibly in Europe, issuers are mostly large and well-established firms. In addition to that, initial public offerings are primarily sell-outs by existing managers and owners, rather than capital-raising by the firm (as it is the case in the U.S.). This is to say that in the U.K. and Europe owners of issuing firms regard the initial public offerings as a way to transfer the ownership from a private entity to a public company. Thus, the primary aim of the original owners is to realise a certain amount of cash at floatation not at subsequent equity offerings.

3.1.5 Share allocation theories

Recent research on IPOs underpricing, mainly in the U.S., has been oriented toward understanding the basis on which shares are allocated to investors; specifically, when the offer is oversubscribed. It is argued that in the situation where excess demand exists, underwriters tend to ration the quantity of the shares, rather than further adjusting the offering price or increasing the amount of shares to meet the demand.

The most common method to obtain a listing in the U.S. market is the bookbuilding procedure Cornelli and Goldreich (2001). This procedure can be described as follows: first, the investment bank and the issuing firm set a price range for the IPO; then, the investment bank goes on a "road show" to market the issue, investors are invited to evaluate the issue and make a bid for a quantity of shares. During this step the investment bank constructs a demand curve for the issue from the preliminary indication received from investors. Once this stage is over, the investment bank prices the issue at the level where demand exceeds supply[13] and allocates the shares to investors at its discretion. The main characteristic of this offering mechanism is that the investment bank does not have to disclose the procedure in which the offering price is set and how the shares are allocated to investors.

[13] See (Cornelli and Goldreich 2001)

Benveniste and Spindt (1989) argued that, during the "road show", investors reveal their belief about the value of the issue to the investment bank. In order to compensate investors who reveal information, the investment bank will favour them when allocating shares. In a later study, Benveniste and Busaba (1997) compared the commonly used methods for floatation in the U.S., namely, the fixed-price offering[14] and bookbuilding procedure. The result of the analysis showed that the bookbuilding method of offering generates higher proceeds and reduces average underpricing to issuers.

Most recently, as detailed data, on the U.S. market, become available some studies have attempted to assess whether underwriters prefer institutional to individual investors when allocating shares. Sheman and Titman (2001) attempted to assess why investment banks market IPOs only to a certain number of investors. They argued that investment banks face a trade off when deciding to increase the number of investors, and that the degree of underpricing depends on the cost of the information[15]. When information is costless the number of investors participating is large and underpricing tends toward zero. When information is costly, the desire for information determines the degree of underpricing. In one other study Aggarwal, Prabhal et al. (2002) examined whether underwriters favour institutional investors in allocating shares of IPOs by using a compiled dataset of U.S. offerings. In other words, the authors tried to find out whether institutions are allocated more underpriced issues than individuals. They argued that underwriters prefer institutional investors because they, by their scale, are more likely to be better informed, are more important clients, and usually commit to buying additional shares in the after market. Moreover, underwriters exchange large commissions in subsequent trading with institutional investors. In order to carry out the investigation Aggrawal, Prabhala et al. (2002) relied on information given from nine investment banks about IPOs in which they served as lead managers. The sample consisted of 174 IPOs that went public between May 1997 and June 1988. The results were consistent with the assumption, underwriters favour institutional clientele. The findings showed also that institutions are allocated about three quarters of the shares

[14] Unlike the book building procedure fixed price offerings are priced without soliciting investors interests.
[15] Private information concerning the issuing firm.

that shoot up (i.e. shares of IPOs that have a high first day return), about three times the allocation to individual investors. Furthermore, the authors showed that institutions have received the most underpriced issues and stayed away from the overpriced ones. Thus, underwriters appear, at least in this study, to favour institutional investors by allocating more shares in IPOs with strong pre-market (pre-IPO) demand, which typically have higher initial first day return. This is consistent with bookbuilding theories in which institutions receive more shares when an issue is oversubscribed as an exchange for indicating to the underwriters favourable pricing information.

Other studies (see for example Brennan and Franks (1997); Mello and Parsons (1998); and Stoughton and Zechner (1998)) argued that issuers prefer to allocate their share to a wide range of investors rather than allocating them to only a few institutional investors. It is also argued that, having a large number of small shareholders will create liquidity and hence it is a kind of defence from take-overs to the issuers. This is to say that owners of the issuing firms do not want to allocate their shares to few institutional investors because the latter are more likely to take over the control of the management of the firm. Issuing firms underprice deliberately in order to create excess demand (i.e., issues are oversubscribed). This excess of demand allows issuers to ration the allocation of shares and to discriminate between investors. In doing so, issuers are reducing the individual size of each holding. As pointed out by Brennan and Franks (1997) the dispersion of holdings reduces incentives for the new shareholders to monitor the incumbent management.

To test whether the argument that owners of issuing firms underprice in order to create excess demand and therefore retain the control of the company, Brennan and Franks (1997) examined a sample of 69 firms that went public in the London Stock Exchange over the period 1986-1989. In doing so, the authors posited that the owners of the IPO firm wish to maintain control of their company after the IPO, to avoid the possibility of being taken-over. Therefore, underpricing the issue could reduce the risks of a take-over since underpricing will lead to over-subscription and rationing. This will allow the issuing firms to discriminate between investors. Consistent with the argument the results showed that underpricing is related to over-

subscription, and over-subscription is frequently related to discrimination against large shareholders in the allocation process.

3.2 Hot issue markets

As mentioned at the outset of this document, the second section of the present chapter deals with studies related to hot issue markets. These studies argue that there are periods when underpricing appears to be systematically larger than in other periods. Empirical evidence suggests the existence of "hot issue markets" for IPOs. The hot issue markets are generally defined as periods in which large numbers of new issues are floated and the average abnormal returns are high. Shiller (1990) and Ritter (1991) argued that during these hot issue periods many poor quality IPOs are floated on the market, taking advantage of the market over-optimism. Ibboston and Jaffe (1975) found that the underpricing phenomenon occurs only during particular periods in the U.S. IPO market. At the beginning and end of the 1960s new issue markets were hot in the sense that there was significant underpricing. In the interim, however there was no evidence of underpricing. Ritter (1984) examined a sample of 1082 U.S. IPOs that went public over the period 1977-1982. Following Rock's explanation for underpricing (see section 3.1.1, adverse selection theory, p52) Ritter assumed that hot issue markets occur during the periods where there are higher proportions of high-risky firms in the IPO market. As advanced by Rock the more risky is the issuing firm, the more the offering is underpriced. Thus high-risk issues should exhibit higher average returns because there is more uncertainty about their initial return. Conducting a time-series analysis Ritter identified a hot issue market between January 1980 and March 1981 and reported that the average return from the offer price to the first day after market price is more than forty-eight percent for IPOs in 1980 and 1981, while the average initial return for the period 1977-1982 is about sixteen percent. Consistent with the assumption, the results showed that there is a significant relationship between the risk of the issue and the initial return. Higher risk companies have higher average initial return. A further investigation of higher risk issues indicates that underpricing is concentrated in particular industries, such as new issues by oil and gas firms (natural resource issues). The results showed an average initial return of 110.9 percent for natural resources during the hot issue

period and 18.3 percent during the cold period (not hot period), a difference of 92.6 percent. While for non-natural resource issues the average initial return is much smaller during hot issue period; it is 21 percent and otherwise is 15.8 percent, a difference of only 5.2 percent. Ritter argued that the last result regarding the natural resources is inherently unstable and can last forever, because natural resources issues had been subject to a *monopsony* exploitation during the hot issue period. This monopsony is defined as the fact that underwriters intentionally underprice the issues in order to earn profits. The latter are earned by allocating issues to favoured investors.

According to Allen and Faulhaber (1989) the hot issue market for natural resource firms around the period 1980 is due to the exogenous shock of the 1979-1980 oil crisis. During this period the price of oil doubled which resulted in substantially increased prices for petroleum products all over the world. This led to an increase in the demand of natural source shares in the stock market because of the prospect of high profit as result of the increase of the price of products derived from oil. Thus underwriters saw this period as a good opportunity to bring new natural resource firms to the market. Allen and Faulhaber (1989) argued that this prospect of highly profitable energy may have been the impetus for the 1980-1981 hot issue market in natural resource companies, characterised by both underpricing and over subscriptions as reported by Ritter.

3.3 Empirical studies on long-term underperformance

Researchers have been further puzzled by the long-run performance of IPOs. Several studies have documented with different magnitude that IPOs underperform the market. The setting of the offer price of an issue is an important informational event because it indicates the extent to which the assessment by the market deviates from it. The evidence of empirical studies shows that all price adjustments occur in the first trading days. This suggests that the IPOs market in the short-run is quite efficient. On the other hand, Aggarwal, Leal et al. (1993) explained that the abnormal returns occurring to IPO investors may only be interpreted as evidence of underpricing by underwriters if it is shown or assumed that the after market for IPOs

is efficient. Thus, they indicated the importance of the long-term price behaviour of IPOs.

Ritter (1991) investigated a sample of 1,526 IPOs that went public in the U.S. during the 1975-84 period. He showed that in the 3 years after going public these firms significantly underperformed a comparison group. The comparison group was constructed from stocks floated on the American Stock Exchange (Amex) and the New York Stock Exchange (NYSE) and matched by size and industry. The results showed that the average abnormal return for the sample of IPOs is 34.47 percent over a 3-year holding period, while the return of the control sample is of 61.86 percent over the same holding period. This is to say that investing 1$ in new issues and holding for 3-years would have yielded about 1.34$. On the other hand investing the same amount of money in the control sample would have generated 1.62$. In other words the IPOs underperformed the market by 27.39 percent. The U.S. long-run underperformance was also documented by Aggarawal and Rivoli (1990). They documented a negative abnormal return of -13.73 percent in the first year subsequent to the initial offering for 1435 IPOs over the period 1979-1984. Ritter argued that there is a tendency for firms with high initial returns to have the worst aftermarket performance. This tendency is stronger for smaller issues than larger ones. In addition to this, younger companies do even worse than average. The empirical evidence presented in his study also showed that there is a substantial variation in the underperformance year to year. For example, the average market returns after 3 years are positive for 1975-1980 IPOs and negative for 1981-1984 IPOs, across industries. He interpreted these results by claiming that (1) investors are periodically overoptimistic about the earning potential of young growth companies, and (2) firms take advantage of these "windows of opportunity".

Loughran (1993) compared a sample of 1,656 initial public offerings conducted during the period 1967-1987 to the NASDAQ equally-weighted index. He found that, on average, IPOs underperform the NASDAQ index during the six-calendar-years after going public. The results showed that the average six-calendar- year holding period return for IPOs is 17.29 percent, while the average six-calendar-year holding return for the NASDAQ index is 76.23 percent. Thus IPOs underperformed the index by 58.94 percent. In a later study, Loughran and Ritter (1995) assessed

long-term trends in stock returns of security issuance. The results indicated that companies issuing stocks from 1970 to 1990, whether an IPO or a seasoned equity offering (SEO), significantly underperformed the non-issuing firms for five years after the offering date. These findings also showed that the average annual return during the five years after issuing is only 5 percent for firms conducting IPOs, and only 7 percent for firms conducting SEOs. Investing an equal amount at the same time in a non-issuing firm with approximately the same market capitalisation, and holding it for an identical period, would have produced an average compound return of 12 percent per year for IPOs and 15 percent for SEOs.

Servaes & Rajan (1997) examined IPOs from 1975-1987 and documented a five years raw return of 24 percent. Then, by comparing the raw returns to three different benchmarks namely, the smallest deciles from the NYSE/AMEX index, the NYSE/AMEX and firms matched by size and industry, they found that IPOs are underperforming respectively 47 percent, 17 percent and 41 percent the benchmarks.

Levis (1993), using a method similar to Ritter and Chopra (1990), examined 712 IPOs listed on the London stock exchange over the period spanning from 1980 to 1988. He used three different benchmarks (Financial Times Actuaries All Share Index, Extended Hoare Govett Smaller Companies Index and a specially constructed All Share Equally Weighted Index) to compute the first day initial return and 36 months returns following the IPO. The results showed a positive 14.3 percent initial return and indicate the existence of long-run underperformance of the London Stock exchange. This underperformance varies from 8 to 23 percent depending on the benchmark used to compute the long-run adjust returns.

Espenlaub, Gregory et al. (2000) attempted to examine the robustness of U.K. long-term underperformance of initial public offerings documented in Levis's work by using a wide range of benchmarks and models to compute the long-term abnormal return. In doing so, they examined a sample of 588 IPOs during the period 1985-1995. They first compared returns using the following benchmarks: the CAPM, Size Control Portfolio, Value Weighted Multi-Index; Fama-French (1996) Value-Weighted Three Factors model using Hoare Govett index and RATS. After computing the cumulative returns, they reported, irrespective of the benchmark, a

substantial negative abnormal return to IPOs following 60 months after the floatation. However, the magnitude of the underperformance depended on the benchmark employed. For instance, the cumulative returns measured relative to Hoare Govett model over the 60 months is slightly negative and insignificant with comparison to the other benchmarks. As suggested by Fama and French (1995) the selection of the benchmark is very critical, when using the event study methodology, because it affects considerably the scale of the abnormal return. In other words, abnormal return is very sensitive to the benchmark used. Furthermore Loughran and Ritter (1995) argued that presence of cross-correlation in the contemporaneous returns, and the t-statistics tests used to assess the significance of the abnormal returns are likely to be overstated because the tests assume that the observations are independent. To control for the cross-correlation problem Espenlaub, Gregory and Tonks used the calendar-time approach developed by Jaffe (1974) and then Mandelker (1974). This approach consists of calculating the annual return by compounding monthly returns of IPOs that took place within the calendar-year. The results of the latter approach showed that the underperformance is less significant across all benchmarks. Consistent with Fama (1998) conclusion, they argued that long-term underperformance of IPOs is crucially depended on the choice of the benchmark and the methodology adopted to compute the abnormal return.

The underperformance is not limited to the U.S. and U.K. markets. Uhlir (1988) investigated the German market. He documented an underperformance of 7.4 percent after one year of going public over the period between 1977and 1987. Finn and Higham (1988) examined a sample of 93 Australian IPOs that went public between 1966 and 1978. They found that buying an issue at the end of the listing month and holding to the end of the first year will yield a return of 6.52 percent below the indices. Keloharrju (1993) showed that the average Finnish IPO lost 22.4 percent from the first market trading to three years later, versus 1.6 percent average decline for the market index. Kunz and Aggarwal (1994) examined a sample of 42 Swiss IPOs between 1983 and 1989 and document an underperformance of 6.1 percent respectively.

The underperformance phenomenon has also been documented in emerging markets. Dawson (1987) examined the one-year abnormal returns for IPOs in Hong Kong,

Singapore, and Malaysia during 1978-1984. Though the abnormal returns are statistically insignificant, they reported an underperformance of 9.3 percent in Hong Kong, 2.7 percent in Singapore and, in contrast, an overperformance in Malaysia of 18.2 percent. The author explained the Malaysian abnormal return by nothing that the benchmark used in his study was not a market wide one, but an industrial one. In an other study, Aggarwal, Leal et al. (1993) examined new issues in three Latin American markets, Brazil, Chilli and Mexico. They reported respectively an underperformance of IPOs following three years after floatation in the three markets of 47 percent, 23.7 percent and 19.6 percent.

Unlike the aforementioned studies, Shah (1995) found, by examining a sample of 2056 Indian IPOs from 1991 to 1995, that Indian IPOs on average outperform the market index for the first 200 trading days. He also reported that, then, the IPOs decline and after 400 days they are approximately at the level of the first trading day. The same controversy was reported by Allen, Morkel-Kingsbury et al. (1999) in analysing the long run performance of 150 Thai initial public offerings floated during 1985-1992. The IPOs outperform the market index by 10.2 percent at the end of the 3rd year anniversary.

3.3.1 Long-run underperformance explanations

Most of the IPO long-term studies, documented above, indicate that IPOs all over the world are underperforming the market index or reference portfolios in the long-run. This underperformance or irregularity as it is sometimes referred to in the literature, has been the concern of many researchers who attempt to give somehow rational explanations. These studies have come up with all sorts of explanations: from the effect of investors behaviour, the effect of factors such us ownership structure and the reputation of the investment bank underwriting the issue, to the problems with models used to compute and test the significance of the average abnormal returns. Thus the remaining of this section reviews briefly some explanations put forward for the long-run underperformance.

3.3.1.1 Behavioural explanations

Miller (1977) argued that underperformance might be due to heterogeneous expectations, concerning the valuation of the firm, by optimistic and pessimistic investors. As time passes the divergence of opinions decreases, as more information becomes available, and this causes prices to drop. According to Ritter and Welch (2002) this argument is consistent with the lockup period; the interval of time after the floatation during which original owners of an IPO can not sell their shares. This period of time is determined by the underwriter and usually last 180 days in the U.S.. They argued that at the end of this period the share prices fall because more public shares become available in the market. Shiller (1990) posited that investors in the market are irrational and are subject to fads because they value IPOs beyond fair value, so that prices will drop over time as information on the true value becomes available to the market. This implies that firms could time IPOs strategically and could predict when investors' over-optimism is likely to occur and a favourable offer price can be obtained. As suggested by Miller, prices fall as information on the true value becomes widely available, investors adjust their initial overvaluation, which leads long-run returns to fall.

Rajan and Servaes (1997) attempted to examine whether the long-run underperformance of initial public offerings is due to over-optimism on the part of investors. They made the assumption that brokerage house analysts drive the investor's expectation. In doing so, they gathered a sample of firms issued between 1975 and the second quarter of 1987 from databases compiled by Ritter (1991), Barry, Musceralla et al. (1990) and Loughran and Ritter (1995). The results showed, first, that highly-underpriced issues attract larger numbers of analysts. Analysts then systematically overestimate the earnings of these companies, with forecast errors averaging 5 percent of the firm's stock price. As the forecast window increases, so does the forecast error. Thus, analysts are more overoptimistic about a firm's long term prospects than its short term prospects. These forecast errors are low, but they still remain significant after size and market adjustment. This indicates that overoptimism of analysts for IPOs is only partly a reflection of their overoptimistic in general.

Second, the authors reported a positive relation between the number of IPOs coming to market in a given industry, in a given quarter, and several measures used by analysts to assess the long-term growth earnings projections for recent IPOs in these industries. Since these growth projections are overly optimistic, they interpreted this result as consistent with the window of opportunity argument and investor behaviour.

Third, the results regarding the relationship between analysts' long term growth projections and aftermarket stock price performance of IPOs indicate that the firms with the highest projected growth substantially underperform three benchmarks (the NYSE/AMEX value weighted index, the smallest decile of the NYSE/AMEX indices and size and industry matched firms). However the firms with the lowest growth projections outperform these benchmarks. This finding indicated that investors appear to believe the inflated long-term growth.

As mentioned earlier, some researchers have attempted to gauge whether the long-term IPOs performance could be affected by factors such as ownership structure, the presence of venture capitalists and the reputation of the underwriters. In what follows empirical studies regarding the ownership structure and underwriter reputation are summarised whereas the venture capital effect is reviewed in the chapter IV.

3.3.1.2 Ownership Structure

Jain and Kini (1994) attempted to assess the performance of firms as they make the transition from private to public ownership through initial public offerings. Unlike the abovementioned studies, which focus on post-issue stock price to assess the performance of IPOs, Jain and Kini (J&K) investigated the change in operating performance of IPOs. They measured the operating performance of 682 firms going public over the period 1976-1988. Though J&K showed that the firms have high growth in sales and capital expenditure relative to firms in the same industry, the results indicated a significant decline in post-issue performance, as measured by the operating returns on assets and operating cash flows deflated by assets for years 0, +1, +2 and +3 relative to their pre-IPO levels, year -1. Thus, they argued that the

declining operating performance of IPO firms cannot be attributed to lack of sales growth opportunities or cutbacks in post-IPO capital expenditure. Then in an attempt to give explanations to this decline, they examined the relation between operating performance and the fraction of the firm retained by the original entrepreneurs and reported a positive relationship. J&K interpreted this result as being consistent with Jensen and Meckling's agency hypothesis (1976) and Leland and Pyle's signalling hypothesis (1977). According to the agency hypothesis, higher ownership retention by mangers reduces their incentives to undertake non-value-maximising projects. Leland and Pyle argued that, by retaining a significant ownership stake in the firm, entrepreneurs can signal project quality since false representation can be costly. Both hypotheses predict superior performance of IPOs with higher entrepreneurial ownership.

According to signalling models, underpriced issues at IPOs should exhibit high operating performance and hence higher after market returns in comparison to those that do not. It is argued that firms underprice shares at IPOs to signal their quality, given that they will be able to recoup the cost of underpricing in subsequent offerings when the share prices are higher. In other words, as mentioned earlier (see section 3.1.4, signalling theories, p61) owners of new issues sell only a fraction of their shares at floatation and the other fractions are sold later in seasoned offerings at a higher price. To test this argument the authors looked at the correlation between the initial return at IPO and post-issue changes in operating performance. J&K found no relation between the average initial returns at floatation and change in operating performance at IPO. The absence of a positive relation between the change in operating performance and underpricing has been interpreted by the authors as being inconsistent with the signalling explanation for underpricing.

Mikkelson, Partch et al. (1997) examined the relation between ownership characteristics and operating performance over a period up to ten years for a sample of 283 firms which went public in the period 1980-1983. The results showed that operating income scaled by assets or by sales exceeds the performance of matched publicly traded firms before going public and after two years declines to a level that is below the performance of the matched firms. Investigation of whether the operating performance of IPO firms is explained by changes in stock ownership

characteristics showed that neither the level nor the change in performance is related systematically to various measures of ownership by officers, directors and blockholders. They concluded that the change in equity ownership that results from going public does not lead to changes in incentives that affect operating performance.

3.3.1.3 Investment bank

Carter, Dark et al. (1998) assessed the relationship of both the initial and three-year returns following IPOs with investment banker's reputation. They used the three existing proxies as measures of underwriter reputation namely, *(CM)*, *(JM)* and *(MW)* measures (for more details, see section 3.1.3.2, p58), and provided comparative evaluation of those measures. First, in terms of underpricing, they found that each of the reputation proxies is significantly related to the IPO initial returns as it is widely documented in previous IPO literature; the better the reputation of the underwriter, the less is the short-run underpricing. They showed that among the three alternative reputation proxies, the *(CM)* measure explains more of the variation in the initial returns compared to *(JM)* or the *(MW)*.

Second, in terms of long-term performance, they argued that high reputable underwriters attempt to market IPOs that will experience the least negative long-term market adjusted returns. As a consequence investors use the investment banker's past performance, as measured by the quality of firms in which they have previously sold equity, to assess their credibility. By selecting IPOs that have relatively better long-term performance, investment bankers protect their reputation. Therefore, in conducting a regression analysis, the coefficients for underwriter prestige measures are expected to be positive when long-term abnormal return is used as an independent variable. The results suggested that IPO underwritten by more prestigious investment bankers, on average showed a less negative performance over three-year periods. The results also indicated that when the reputation proxies are evaluated simultaneously, only the *(CM)* measure is statistically significant and related to the IPO stocks' three-year returns.

3.3.2 Measurement problems

Although the measurement problems will be discussed later in chapter V it is worth to highlight here the main difficulties faced when using event study methodologies in computing the abnormal long-term performance. Some researchers argued (see for instance Barber and Lyon (1997) and Khotari and Warner (1997)) that the commonly used methods to measure the long-term performance influence the magnitude of abnormal returns and generate miss-specified test statistics. There is a great debate among academics about whether it is better to use the cumulative abnormal returns (CARs) or the buy-hold-returns (BHR). The latter is the return obtained by investors as a consequence of a strategy consisting in buying stocks at the end of the first trading day and holding them for a period of time. Barber and Lyon argued that the use of BHR is most appropriate because it measures the investors' experience. Furthermore, the returns obtained by investors in the long-run are better approximated by compounding returns. On the other hand Fama (1998) argued that the use of CARs is better suited because it yields less spurious rejections of market efficiency than does BHR. That is to say the abnormal long-run IPO performances are sensitive to the methodology employed and hence there is no general consensus on how to measure the long-term abnormal returns.

The statistical inferences conducted to test the significance of the abnormal returns, such as t-test is mis-specified because of potential violations of the underlying statistical inferences. Lyon, Barber et al. (1999) argued that the use of the traditional t-test to gauge the significance of the long-run abnormal returns yields mis-specified test statistics that over-reject the null hypothesis of no positive abnormal performance. One cause of the mis-specification is due to the distribution of the abnormal long-run abnormal return. It is widely documented that the long-run returns are positively skewed.

Some empirical research on IPOs, use the market return as benchmark (as measured by official indexes) in measuring the long-run performance. This benchmark is compared to a portfolio of IPOs, equally weighting *(EW)* or value weighting *(VW)* indices. It is argued that adopting the market index as a benchmark causes the t-test to be biased towards no abnormal returns because the IPO firms are included in the

benchmark. Finally, as pointed out by Fama (1998) all methods used for the estimation of abnormal returns are subject to problems arising from poor specification of the models and no method is able to minimise these problems for all classes of events. Even close models, such as Fama-French three-factor model and benchmarks matched by size and book-to-market ratio, which appear to control for variations in the returns motivated by these two variables, give rise to different estimations of abnormal returns.

3.4 Summary

As mentioned at the outset, the objective of this chapter is to survey the literature regarding initial public offerings. It is evident from this literature that the underpricing anomaly has been a topic of theoretical investigation for decades. The persistence of underpricing in IPO markets, especially during the recent internet bubble in the U.S., has raised further questions about the theoretical models previously presented. Ritter and Welch (2002) argued that theories based on asymmetry information are overemphasised and are unlikely to explain underpricing. In their view, there is no single dominant explanation for underpricing. As pointed out by Ritter and Welch reasons for underpricing differ from one company to another. Since none of the above-mentioned models appear to give an exhaustive description of the phenomenon of underpricing, the importance of studying the relative strength of the different models cannot be underestimated. Finally, as noted earlier with regard to long-run returns, the latter are not only sensitive to the benchmark and period of analysis but also to the methodology adopted. As posited by Khotari and Warner (1997), Fama (1998) and Loughran and Ritter (2000) the method of performance measurement influences both the magnitude of the abnormal returns as well as the size and power of the statistical return. So, one must be caution when interpreting long-run abnormal returns. This issue will be discussed later in greater detail in the chapter V.

CHAPTER FOUR VENTURE CAPITAL INVOLVEMENT & INFLUENCE

A review of research on venture capital indicates that venture capitalists provide much more than financing for their portfolio. Venture capital is centred around equity based financial instruments which provides long-run investment to unquoted companies. The aim is to achieve primary reward as a capital gain rather than income interest or dividend yield. Unlike other passive sources of capital (for example banks), venture capitalists are personally and actively involved in their portfolio companies. As pointed out by Sahlman (1994) venture capitalists (VCs), through their experience and active involvement, help unquoted companies to grow and perform better. Their major roles are, to provide financial and business advice, to monitor activities, to assist venture managers in developing strategy, to act as a sounding board for the firm, and to provide social networks, customers and suppliers (see for example MacMillan, Kulow et al. (1989); Fried and Hisrich (1995); and Sapienza, Manigrat et al. (1996)).

Venture capitalists have been also characterised as "patient" investors who take a long-term returns view in the form of capital gains and thereby allow managers to focus on long-run issues more than is the case with alternative investors who might constantly call for short-term assessments of performance, Lam (1991); Bygrave and Timmins (1992); and Fried and Hisrich (1995). Consistent with this long-term perspective, the image associated with venture capitalists lends credibility to the portfolio firm and sends positive signals to respective employees, customers and suppliers regarding the ongoing viability of the firm, Cornell and Shapiro (1988). At the time of the initial public offering, VCs are considered as an insider and will be restricted in selling or liquidating their holding for some time after the floatation.

In short, venture capitalists are active investors who provide valuable services to their portfolio firms through ongoing long-term commitment. Jensen and Meckling (1976) argued that active investors play a crucial role in monitoring and organising firms in which they participate. As argued in the previous chapter the presence of venture capitalists, as investors in a firm going public, has been regarded as a factor

that can affect both the price of the offer and the subsequent performance of the issue in the stock market. Thus the purpose of this chapter is, first, to discuss the studies that looked at the effect of the involvement of venture capitalists on a firms' performance, and second, to develop the main hypotheses, of the present study, which will be tested later. The remainder of this chapter is organised as follows. The next section discusses the early attempts undertaken by researchers to gauge the role of venture capitalist in the venture they fund. The common element of these studies is to survey both entrepreneurs and venture capitalists on their perceptions of value added. While, the third section discusses the empirical studies that assess the effects of venture capitalists involvement on the initial public offerings of firms. More specifically, it looks at the relationship between the underpricing phenomenon (discussed in the chapter III) and venture capitalists. It also discusses studies that have investigated the effects of venture capitalists on firm performance subsequent to initial public offerings. The final section discusses the few studies that attempted to assess the survival rates of companies that received financing from venture capitalists.

4.1 Venture capital and value added

Early attempts to assess the effect of venture capitalists on firm performance have tended to be descriptive. As such, researchers often seek to determine "value added" by surveying entrepreneurs and venture capitalists for their perceptions and then extrapolating as to the possible effects on performance. MacMillan, Kulow et al. (1989) investigated the correlation between venture capitalists involvement and venture performance. They examined 62 venture capitalist (from the Sol C Snider Entrepreneurial Centre of the Wharton School and Venture Economics, Inc) about their degree of involvement into strategic and operational activities relative to that of the top entrepreneurs in the firms they back. The results indicated that the level of involvement of venture capitalists differs from one activity to another. They also showed that some activities with relatively high degrees of involvement, such as negotiating employment terms or serving as a sounding board, are associated with high performance. Whilst other activities such as recruiting top management are associated with poor performance. Regression analyses showed no evidence of

systematic variation in involvement and thus they come to the conclusion that activity levels depends on the personal preferences of the venture capitalists.

In the same spirit Rosenstein, Bruno et al. (1989) surveyed 198 venture capital-backed firms in Northern California and Texas. The results of the survey showed that the CEOs of these firms did not perceive that venture capitalists on their boards added more value than did other board members. In a follow-up study, Rosenstein, Bruno. et al. (1990) carried out a telephone survey with 98 CEOs from 162 venture backed companies who participated in the prior study. The findings showed that CEOs rate venture capitalists as contributing about the same as other outside board members unless there is a venture capitalist on the board from the "top 20" VC firms (as defined in Stien and Bygrave (1990)). They concluded that venture capitalists add value only when they belong to the "top 20" set.

Sapienza and Timons (1989) also examined the individual role of venture capitalists in the venture they found by matching responses from CEOs of VC-backed ventures and lead investors. Consistent with Rosenstein, Bruno et al. (1989) the respondents identify three important roles: strategic, supportive, and networking. The authors also found that venture capitalists' roles are regarded as being important mainly: (1) in early stage ventures; (2) for entrepreneurs without start-up experience; and (3) when venture capitalists hold a larger equity position in the venture. This led them to conclude that venture capitalists do add more than money.

In a later study Sapienza (1992) attempted to measure the value added by venture capitalists. In doing so, they carried out a survey of 51 U.S. venture capitalists and CEOs about the intensity of their interaction as well as the performance of the venture over a one-year period. The results indicated that the level of innovation pursued by the venture company and the style of interaction have a significant impact on the value of venture capitalist involvement. The authors concluded that: (1) the provision of money is a necessary but far from sufficient condition to promote economic growth and resilience; (2) some elite VC firms may be better at this process than others; (3) VC provide assistance, which is particularly useful for highly innovative ventures; (4) the nature, style and interaction of VC and CEO of

the venture has a significant impact on the value of venture capitalists involvement, specifically, more involved, open relations appear superior.

In the U.K. Harrison and Mason (1992) investigated the role of business angels and venture capitalists in entrepreneurial companies by using a methodology similar to the MacMillan, Kulow et al. (1989) study. The results indicated that sounding board and strategic activities are very important to entrepreneurs. They also showed that entrepreneurs backed by venture capitalists are more dependent on their assistance than do those backed by business angels. A survey conducted by the British Venture Capital Association (1992) showed that entrepreneurs rate non-financial assistance as important as financial support in providing high value added. A follow-up survey carried out by the British Venture Capital Association (1999) based on 175 companies backed by venture capital, indicated that 87 percent view the presence venture capital as being crucial and very important to the growth of their business. The results of the survey also showed that 60 percent of respondents regarded highly the venture capitalist contribution as a sounding board for ideas.

Conducting a comparative study, Sapienza, Manigrat et al. (1996) examined the venture capitalist's governance and their effort to add value beyond money in the U.S. and the three largest markets for venture capital in Europe (United Kingdom, France and the Netherlands). They developed a theoretical model of value added on the expectation that venture capitalists add most value when the venture is struggling, when uncertainty is high, and when venture capitalists are relatively more experienced. This study has been affected by two major factors. The first one regards data collection: in the U.S. data was collected during the period 1987-1988 whilst in Europe it was collected in 1992. The second is that the survey conducted in the U.S. consists of interviewing venture capitalists and CEOs of their portfolio companies, whereas in Europe the study consisted of surveying only venture capitalists. In spite of these limitations the results are consistent with prior studies; they showed that venture capitalists see their strategic roles as their most important contribution, followed by their interpersonal roles and their networking roles. The results also showed, both in Europe and in the U.S., venture performance is positively related to the measures used to determine value added. However, contrary to expectations

(highlighted in the theoretical framework of this study) venture capitalists add more value to high performing than to poorly performing ventures.

In analysing venture capitalist industries in the U.S. and Europe, the study indicated that venture capitalists in the U.S. and in the U.K. expend greater effort in monitoring and assisting their portfolio companies than do those in France and the Netherlands. The comparison between the three European countries showed that VCs in the United Kingdom are more involved in their funded companies and add the most value.

The inconsistencies in the findings reported in the abovementioned studies can be attributed in part to differences in the measures used to determine the effect of venture capitalists on the firm portfolio performance. Moreover, measures of performance for private and unquoted companies are difficult to gather and standardise across companies. Caution must be exercised in the application and interpretation of findings based on perceptual measures. These studies rely on the perceptions of the CEOs and venture capitalists where bias and inaccuracy are potential threats.

An alternative approach is to examine the effects of venture capitalist involvement on performance subsequent to initial public offerings (IPOs). As pointed out by Sapienza (1992) a stock-based approach enjoys the advantage of being objective and being tied to an economic outcome. Thus, evaluating the effect of venture capital in IPO firms provides an opportunity to gather consistent economic performance measures across firms. Moreover, among other exit strategies from the venture available to venture capitalists (for example management buy-outs, mergers and acquisitions), an IPO is by far the most lucrative for the venture capitalist. According to Bygrave and Timmins (1992) the average realised return from an IPO in U.S. stock market is almost 5 times greater than acquisition.

4.2 Venture capital and underpricing

The involvement of venture capitalists in an initial public offering has been seen as empirical evidence of underpricing theories. Like investment banks, investors regard the presence of venture capitalists in a public offering as a form of certification that reduces the risk of the issue. It is argued that issuers and investors have different information sets concerning the value of the offering firm. Issuers are believed to have an incentive to hide or delay the revelation of adverse information, if any, in order to sell shares at a higher price. Rational investors understand this incentive and will only offer a low average price for the offer since they are likely to be convinced that accurate information disclosure has not occurred. On the other hand if there is a third party (venture capitalist) with reputational capital at stake backing the issue, investors would regard the issue as less risky.

As mentioned in the previous chapter venture capitalists bring companies in their portfolio to the market on an ongoing basis. Therefore, they have a strong incentive to establish a trustworthy reputation in order to retain access to the IPO market on favourable terms. Moreover, the greater a venture capital firms perceived access to the IPO market the more attractive it will be to entrepreneurs, thus assuring a continuing deal flow. As pointed out by Sahlman (1990) the venture capitalist fund manager market is a relatively small and efficient labour market where the individuals' performance is constantly monitored and valued. Therefore, the investments in reputational capital by venture capitalists allow them to remain in the venture capital industry as well as in the capital market.

Megginson and Weiss (1991) assessed whether the presence of venture capitalists can certify that the offering price of the issue reflects all the available and relevant inside information. In doing so they compared a sample of 320 U.S. venture capital backed IPOs with a control sample of 320 non-venture capital-backed IPOs matched by industry and offering size from 1983 to 1987. They found that firms certified by venture capitalists experience on average lower underpricing at public offerings, go public with higher quality underwriters and auditors, generate greater interest from institutional investors, and go public at younger ages. Moreover venture capitalists lower the cost of due diligence and reduce underwriter, legal, auditor and associated

floatation expenses. Therefore, as pointed out by Ritter (1987), venture capitalists are able to reduce two of the highest costs associates with going public namely underpricing and underwriter compensation.

Brophy and Verga (1988) examined initial stock prices and the variability of stock returns for 20 days after IPO of 210 VC-baked and 1053 U.S non-VC-backed ventures, from 1977 to 1983. They hypothesised that if venture capitalists add value, the companies they back will be less underpriced at the outset than otherwise, moreover their initial returns would vary less than those of other ventures. The results showed that VC–backed IPOs outperform non-VC-backed IPOs and that while non-VC-backed firms benefit substantially from adding a prestigious underwriter, VC-backed firms do not. Thus, they concluded that venture capitalists serve a critical function.

In an other study on the U.S stock market Barry, Musceralla et al. (1990) assessed the performance of venture capitalists by examining a set of 433 venture capital backed and 1123 non-backed IPOs over the period 1978 to 1987. The findings support the notion that venture capitalists' experience and capability in monitoring investments can send a vital signal to investors at the time of an IPO. This has lead to some suggestions that venture capitalists share at least some of the private information about the prospects of the firms they back; moreover they come to the IPO market repeatedly. Therefore, the authors speculated, venture capitalists may have an even greater incentive to build a reputation for backing good firms. The results showed also that IPOs backed by higher quality venture capitalists are less underpriced.

Lerner (1994) provided evidence of the ability of venture capitalists to take companies public at the time when equity valuations are high by examining 350 U.S. venture capital backed biotechnology IPOs spanning from 1978 through 1992. The results of this study showed that experienced venture capitalists are more effective at timing IPOs.

The above studies showed clearly that, at least in the U.S., companies backed by venture capital are less underpriced than non-VC-backed companies. As pointed out

in Sapienza, Manigrat et al. (1996) venture capitalist practices and behaviours in the U.K. appear to be most like those in the U.S. Therefore, one would expect U.K. venture capitalist backed IPOs to exhibit less uderpricing than other non-venture capitalist backed IPOs. This expectation can be stated formally as follows:

H1: VC-backed will be less underpriced than non-VC-backed

4.3 Venture capital and long-run performance

As mentioned in chapter III (see section 3.1.3.3, p60) the involvement of venture capitalists in an initial public offering has been seen as a factor that can enhance long-term performance. The first studies, to test this proposition, focused on the assessment of target industries, and yielded mixed results. Cherin and Hergert (1988) computed cumulative returns for a 24-month period after the IPO of 71 VC-backed ventures and 59 non-VC-backed ventures in the U.S. computer and software industry. A negative return is found in both sets during the period of the study, with no statistical difference between the two groups, and therefore they concluded that venture capitalists do not provide additional value. Similar to this prior study Stien and Bygrave (1990) compared the returns of high-tech companies backed by the top 20 VCs, with the returns of similar companies that are not backed by the top 20 VCs, in the U.S.. They defined 20 high tech venture capitalists as those firms that hold the most seats on the boards of the directors of the sample companies. Based on this split, the results showed that firms which had venture capitalists from the top 20 enjoy higher returns. This has led them to conclude that venture capitalists from the top 20 do indeed add value.

Jain and Kini (1995) compared the post-issue operating performance of 136 U.S. matched pairs of IPOs from the period 1978-1988. They found that venture backed companies significantly outperform non-venture backed companies in terms of change in operating performance during the 3 years following the IPO. Though both the VC-backed and non-VC-backed exhibit declines relative to pre-IPO levels, the VC-backed enjoyed superior performance compared to non-VC-backed on two cash flow related measures, operating returns on assets and operating cash flows deflated by total assets. They also investigated the claim that venture capitalists help firms go

public at higher price-to-earnings, (P/E) ratios. In doing so, they compared the median levels of the market-to-book and P/E ratios for the two sets of companies over several post-issue years. Consistent with the claim the results indicated that the P/E ratio for VC-backed IPOs is significantly higher than the ones of non-VC-baked IPOs. This has led them to conclude that the market recognises and rewards the value of VC monitoring even after the initial public offering.

Mikkelson, Partch et al. (1997) examined whether the presence of venture capitalists in an IPO influences investor's valuation of companies. They found that firms backed by VC experience a smaller decline in operating performance from the year pre-IPO to the first year after the floatation. In contrast to Jain and Kini's study (1995) the authors found no evidence of superior operating performance of VC-backed firms in the 3 years subsequent to the IPO. Regression analyses showed that the variation in operating performance after the floatation is explained mostly by the size and the age of the issue. Further, in an effort to investigate whether size matter for the post performance of the new issues, Mikkelson, Partch et al. (1997) split the sample in two size groups, measured by market capital. The results showed that the median of the performance of small size issues (measured by total asset value) is significantly below the performance of a portfolio sample matched by industry in the post-issue. While larger issues the median performance is not significantly different from the performance of industry-matched firms, in post-issue.

One should note that these kinds of studies based on accounting information are susceptible to varying accounting methods and consequently the possibility of accounting manipulation exists. Moreover, the authors do not mention in their work the gap of time that usually exists between the publication of the financial statements and the date the company is listed on the market. To illustrate this take the following example of a company that was listed on the 12th of December 2001 and assume that the fiscal year for this company ends on the 31 of March 2001. One year prior to the issue would mean November 2000. The financial statements are published at the end of the fiscal year, i.e, March 2001. So there is a time gap between March and November. It is difficult, not to say impossible, to get perfect matching because companies go public at different times during the year.

In a further attempt to shed light on the long-run undeprformance of U.S. IPOs, documented in prior studies,[16] Brav and Gompers (1997) compared two distinct samples of IPOs, a venture-backed and non-venture backed. According to the authors, venture capital backed issues should exhibit less long-run underperformance in comparison to non-venture backed IPOs. They argued that venture capitalists back only promising and high growth companies. Moreover, venture capitalists stay on the board of directors long after the IPO and may continue to provide access to capital that non-venture-backed companies lack. Venture capitalists have also contacts with top-tier investment and commercial bankers and may be able to attract high quality analysts to follow their companies and hence reduce the information asymmetry between investors and firms. This may lead institutional investors, who are the main source of capital for venture funds, to hold equity in firms that have been backed and taken public by venture capitalists.

Another explanation put forward for the superior long-run performance of venture backed IPOs, is venture capitalist concerns for their reputation. As pointed out by Gompers (1996) venture capitalists repeatedly bring firms public, if they become associated with failures in the market, they may damage their reputation and ability to take firms public in the future.

Several benchmarks are used in the study of Brav and Gompers (1997) to compute the 5-year buy-and-hold returns for a sample of 934 venture-backed and 3407 non-venture backed businesses that went public between 1972 and 1992. They compared returns to the following benchmarks S&P 500, NASDAQ value weighted composite index, NTSE/AMEX value weighted index, NYSE/AMEX equally weighted index, and Fama and French (1994), industry portfolios size and book-to-market matched. The results show a wide difference between the two sets in terms of equally weighted returns and wealth relative[17] to the various benchmarks. However, value weighted returns do not exhibit any difference and appear similar in the samples.

[16] See Ritter (1991) and Loughran and Ritter (1995).

[17] Wealth relative return is defined as $\sum(1+R_{i,T})/\sum(1+R_{bench,T})$, where $R_{i,T}$ and $R_{bench,T}$ are the buy and hold return respectively on IPO i for period t and on the benchmark portfolio over the same period.

In order to gauge whether the underperformance is captured by Fama and French (1993) 3 factors[18], they used the intercept from the time series regressions as an indicator of abnormal returns. The intercept from the regressions of equal and value weighted venture-backed IPOs are significant, indicating that the three factors model cannot be rejected. With regard to non-venture backed firms, when the returns are weighted equally, the intercept is significantly negative indicating severe underperformnce. When the returns are value weighted, a smaller negative intercept is produced. Partitioning the non-venture backed sample on the basis of size shows that underperformance occurs only with small issue sizes. Fama and French's model cannot explain the underperformance of these small size non-venture backed firms.

Various explanations are put forward by Brav and Gompers (1997) for the small size undeperformance. First, unexpected shocks may have hit small companies during the 1980s. They justified this by the fact that returns of IPO firms are highly correlated in calendar time even if the firms go public in different years. Underperformance for venture-backed firms is concentrated between 1983 and 1986 and is concentrated from 1981 through 1987 for the non-backed firms.

The second explanation for the underpeformance of small, low book-to-market ratio firms is related to investor's sentiments. They argued that small non-backed ventures are more likely to be held by individuals. Individuals are more vulnerable to the influence of fads or lack of complete information. As pointed out by Megginson and Weiss (1991) institutional holdings of equity after an IPO are substantially higher for venture-backed IPOs than non-venture-backed IPOs.

According to Brav and Gompers (1997) small firms are more affected by information asymmetry because individuals spend considerably less time tracking returns than institutional investors do. Barry, Musceralla et al. (1990) showed that small non-venture-backed companies are floated on the market with lower tier underwriters than similar venture backed ones. Individual investors are also seen as a way that may derive utility from buying small size issues stocks because they value

[18] RMRF: the value weighted market return on all NYSE/NASDAQ (RM) minus risk free rate (RF), SMB (small minus big): the difference each month between the return on small firms and big firms, HML (high minus low): the difference each month between the return on portfolio of high book-to-market stocks and the return on a portfolio of low -book-to market stocks.

them as a "lottery ticket". The skewness of returns is high for small non-venture-baked IPOs, if compared to either large or small venture-backed IPOs.

From the above review of U.S. empirical studies on long-term IPO performance, venture capitalists involvement appears to play a dominant role in enhancing the economic value of firms that make it to the IPO stage. In short, venture capitalists certifications not only reduce the information asymmetries associated with going public, they also have positive effects on the long-run performance. Having said that the VC-backed companies are expected to exhibit higher long term returns than non-VC-backed IPOs, the next hypothesis is:

H2: In the long-run VC-companies outperform non-VC-companies

4.4 Venture capital and firms survival

As showed in chapter III, the aftermarket returns of the initial public offerings have received considerable amount of attention from academics. However, few studies have attempted to investigate the IPOs survivability in the aftermarket. Brown (1970), in analysing U.S. IPOs that went public between 1950 and 1960, reported that the average failure rate after 10 years going public is about 20 percent. In another study Jain (1999) showed that approximately a third of IPO firms fail within the first five years after floatation (Khurshed (2000)).

Unlike the above studies (Brown (1970) and Jain and Kini (1999)) that were only confined to the failure rate, Hensler, Rutherford et al. (1997) took a different approach by investigating the relationship between IPO characteristics at floatation and time survival in the aftermarket. In so doing, they adopted survival analysis technique methodology on 741 firms that were floated on the NASDAQ between 1976 and 1984 and track each firm until the end of 1992. Failure to survive is defined as those companies that were delisted from the stock exchange for negative reasons[19]. Using the delisting codes reported in the 1992 Centre of Research in Security Prices (CRSP), they found that 408 firms were delisted from the stock exchange for negative reasons and 333 continued to trade through 1991. As for the

[19] Firms that conducted merger were excluded from the analysis.

IPO characteristics at the floatation that could affect the survival time in the aftermarket the authors posited the following hypotheses: larger size[20] companies have higher probability of survival than small size firms; similarly, older firms were also seen as having higher probability of survivability; initial returns should be positively related to survivability; unlike in Ritter's study (1991), IPO activity is seen as not having any effect on survivability; market level is expected to have a negative relation with the survival time; the percentage of insider ownership at floatation is expected to be positively related to the survival time; risky companies, measured as the number of risk factors reported in the prospectus at floatation are expected to have lower survivability. Using Cox hazard methodology and estimating the accelerated failure time model, the results of the regression were consistent with the authors' expectation. The survival time for NASDAQ IPOs increases with size, age, initial return, IPO activity and the percentage of insider ownership and decreases with increasing number of risk factors and market level at floatation.

Jain and Kini (2000) built on Hensler, Rutherford et al. (1997) and introduced to their model the impact of venture capitalists. As argued at the outset of this chapter, venture capitalists are active investors who provide valuable services to their portfolio firms through ongoing long-term commitment. Thus, the image associated with venture capitalists lends credibility to the portfolio firm and sends positive signals to respective employees, customers and suppliers regarding the ongoing viability of the firm, Cornell and Shapiro (1988). Following this line of reasoning, Jain and Kini posited that the presence of venture capitalists at the floatation should reduce the probability of not surviving. In the view of the authors, there are various aspects of going public that can a firm benefit from the venture capital involvement, and classify these aspects into internal and external. They argued that venture capital could play a leading role in internal aspects (such as resource allocation, planning etc.) as consequence of its equity stake in the firm. As for the external aspects - such as underwriters, analysts' coverage- which are not controlled directly by VC but by the intermediaries that arrange it, could be achieved by the reputation that VC enjoyed in the market. This is to say the reputation that venture capitalists enjoy in the market will help to establish a strong relationship with these intermediaries

[20] Measured as the size of the issue

To conduct survival analysis, the authors used a sample of 877 U.S. firms that went public during 1977-1990 and tracked each firm to the end of 1996 to establish whether it is still trading or not. Following Hensler, Rutherford et al. (1997) they define survival firms as those firms that continue to trade in stock exchange. Public firms that get delisted for negative reasons[21] or are acquired are classified as non-survivors. Their justification for excluding acquired firms is based on prior empirical findings which suggested that such kinds of firms are typically distressed. Welbourne and Andrews (1996) showed that, IPO firms that are acquired experience declining stock price performance prior to the acquisition. With regard to the sample selection between VC-backed IPOs and non-VC-backed IPOs, the authors seemed to be neglecting to provide the readers with information on what basis they considered an IPO as backed or non-backed by venture capitalists.

The comparison of the survival distribution of the two groups showed that VC-backed IPOs have a lower rate of failure in comparison to non-VC-backed IPOs. The cumulative percentage of firms failing within the five years after floatation is 25.5 percent and 30 percent for the VC-backed IPOs and non-VC-backed IPOs respectively.

In an attempt to assess whether there are differences between sectors rates of failures, the authors segmented their sample into six different sectors. The results appeared to only lend credibility to the belief that venture capitalists concentrate their financing in restricted number of selected sectors. However, as pointed out by Khurshed (2000), it is surprising to notice that VC-backed IPOs operating in the high tech industries such as computer equipment have higher rate of failure than their non-VC-backed IPO counterpart.

The results of the multivariate Cox Hazard regression indicated that the presence of venture capitalists at floatation is significant and hence improve the life time of the IPO. Similarly, factors such as research and development (R&D) intensity, analyst following, investment banker prestige and success in the road of the show have

[21] Negative reasons include insufficient capital, liquidation, bankruptcy, non-payment of fees or delinquent in filing, failure to meet financial guidelines to list, insufficient number of market makers, price falling below acceptable levels, and insufficient number of shareholders.

positive impact on survival in the aftermarket. In other words, the results showed that VC-backed IPOs significantly allocate higher resources to R&D expenditures, attract prestigious underwriters and quality analysts and do extremely well during the road show in comparison to non-VC-backed IPOs.

Most recently, Manigaret, Baeyens et al. (2002) compared the survival of the Belgian venture capital backed companies with a sample of companies that did not receive financing from venture capitalists. Unlike the above studies which rely only on VC-backed IPOs, Manigaret, Baeyens et al. (2002) examined all companies that received financing from the venture capitalists[22]. In so doing, they identified 565 companies that received financing from VCs between 1987 and 1997. Following prior studies, (see for example Megginson and Weiss (1991)), each VC-backed company was matched to a non-VC company according to its size and its life cycle stage in the year before the VC investment. They define survival as those companies that still exist as an independent entity up to nine years after the investment.

According to the authors not all termination events could be regarded as a negative outcome for a company. Merger or acquisition could be seen as a positive achievement for a firm. In line with this reasoning three types of termination events were analysed separately, namely M&A, bankruptcy and sum of all negative events[23]. Contrary to the findings of Jain and Kini (2000) study, the probability of survival for non-VC-backed companies is higher than non-VC-backed companies. The cumulative survival rates are 56.25 percent and 58.27 percent respectively for VC-backed companies and non-VC-backed companies. The cumulative M&A event rate for VC-backed companies appears to be slightly lower than the non-VC-backed companies and these are 5.30 percent and 6.69 percent respectively. In the view of the authors, this result is surprising as venture capitalists actively seek to exit through trade sales and acquisitions. The cumulative bankruptcy event rate for VC-backed companies is 19.49 percent whereas for non-VC-backed companies it is 14.84 percent.

[22] The authors do not mention whether their sample includes companies that are listed on the Belgian stock exchange

[23] This includes bankruptcies, closures and lost follow-up.

Further, the authors conducted a multivariate regression analysis by introducing a VC dummy variable along with other control variables that could affect the survival time of a firm. The results confirmed the univariate analysis where the presence of venture capital did not appear to influence the survival time of the company. Consistent with the expectation, companies with low cash ratios and high long term debt have a low survival term time.

The findings reported by Jain and Kini's study (2000) appear to be contradicting the results reported by Manigaret, Baeyens et al. (2002). One possible explanation to the discrepancy in the findings could be related to the samples used in the two studies. The first study assessed the survival of IPOs in the aftermarket whereas the second study examined the survival of companies that received financing from venture capitalists for the period up to nine years after the investment. As discussed in chapter II section 2.1 (p23) start-up and early stage companies are regarded as risky companies and hence one should expect that the probability of failure to be high in this life cycle stage. Table 1, in Manigaret, Baeyens et al. (2002, p110), shows that 55 percent of the sample are early stage financing[24] whereas 45 percent are late stage companies. Given this early stage proportion in the sample, one would expect high failure rate. It would have been helpful if the study have investigated the survival time between early and late stage companies. Then, a direct comparison could have been possible to be drawn between the two studies as Jain and Kini (2000) investigated only late stage companies (i.e., IPOs).

Although the results reported above are mixed, in the context of the broader literature the expectation within the thesis is that the presence of the venture capital at floatation would increase the survival time of IPOs. In addition the VC-backed IPOs are expected to have higher survival time probability than non-VC-backed IPOs. Thus, the following hypothesis is offered:

[24] This figure includes both start-ups and early stage companies.

H3: VC-backed IPOs have higher probability of survival than non-VC-backed IPOs.

The hypotheses developed in this chapter will be tested later on in chapter VI. However, it will be first necessary to discuss the data selection procedures and the method used throughout this thesis to test the hypotheses.

CHAPTER FIVE RESEARCH METHODOLOGY & DATA SELECTION

As stated at the outset of the thesis, the purpose of this study is to contribute to a better understanding of the involvement of venture capital in initial public offerings. To investigate this, a scientific approach was adopted throughout the research which consists in formulating and testing hypothesises. According to Hollis (1994) there are two rivaling traditions in the social sciences: *explanation* and *understanding*.

The tradition of *explanation* has its roots in the natural sciences and when applied to the social sciences it represents a view on social life and human affairs as belonging to a natural order that can be studied objectively. Researchers who subscribe to this reasoning are often called positivist. Positivist research belongs to the tradition of explaining and rejects every fundamental difference between the natural and the social sciences, Hollis (1994). According to May (1996) the scientific task and goal for this view consists in inquiring about the reasons for a phenomenon searching for the universally applicable over different times and conditions. In this philosophical thought it is often argued that it is possible to achieve true knowledge since the phenomenon's existence is not connected to who is carrying out the study A distinction is made between researcher and the object of research. Conforming to this approach all methods used are described as objective and analyses are made quantitatively, May (1996).

The other tradition in the philosophy of social science is *understanding*, Hollis (1994) The understanding view on society, human life and social action differs profoundly from that of *explanation*. It aims at an "interpretive" or "hermeneutic" social science. According to hermeneutics there is a crucial difference between explaining nature and understanding (interpreting) culture (May, 1996). The core issue in this tradition is that the social world must be understood from within, rather than explained from without", as pointed out by Hollis (1994). The hermeneutic researcher sees meaning in actions that come from the shared ideas and rules in society. They also believe that actors mean something by their actions.

The scientific goal and task for the hermeneutic approach is to understand a phenomenon's meaning. This meaning is affected by time, culture and the specific individuals involved. Nothing is universally applicable over time. This view marks a difference between the aims of social science and natural science. The hermeneutic view is holistic and reality is perceived as subjective, hence there is no true knowledge. In other words there is no understanding without someone who understands (May, 1996).

This study uses the *understanding* approach, aiming at clarifying the involvement of venture capitalists in the initial public offerings and at shedding further light on the uderpricing and long-term IPO underperformance described in chapter III. The objective of the present study is not to explain these in a way that is universally true, but to give a current account of a phenomenon within a specific sample and in a certain period.

The remainder of this chapter is structured as follows. The next section briefly describes the different methodological approaches, namely qualitative and quantitative approaches, and gives the justification of the approach adopted in this study. Section two describes the data sources and highlights the main difficulties faced when trying to obtain data. The hypothesises of the standard event methodology are discussed in the third section. Section four describes in detail the event method adopted in this thesis to compute and test both the initial and the long-term returns. The final section describes the survival analyses techniques used to assess the probability of IPOs survival of the sample.

5.1 Qualitative and quantitative approach

Bryman (1992) describes two different methodological approaches that are used in the study of social science: the *qualitative* and the *quantitative* approach. There are no absolute differences between the two approaches; in particular they are not mutually exclusive as often researchers combine the two within a research project. The choice between qualitative and quantitative methods should be guided by the formulation of the research problem.

A qualitative method focuses on the researcher's perception and interpretation of the situation and cannot be transformed into "numbers" Bryman (1992). Qualitative data and methods have strengths in that they give a general view of the situation. A holistic picture increases understanding of social processes and contexts.

According to Bryman (1992), a quantitative method turns information into digits and numbers, making it possible to analyse it statistically. The main advantage of a quantitative method is that it is possible to draw conclusions about a population based on the results of the sample.

As described below, the secondary data used in this study is quantitative and as the aim is to conduct a comparative study between venture capital backed IPOs and non-venture-capital-backed IPOs, a quantitative methodological approach has been adopted in the present study.

5.2 Data sources and selection

To test the hypotheses highlighted in the previous chapter secondary data is gathered from various sources. The first stage of the collection process consisted in contacting various institutions that are renowned for having the information needed to conduct the present study. The following organisations were contacted, KPMG, London Stock Exchange (LSE) and British Venture Capital Association (BVCA). The subsequent databases were also used, Datastream (containing economic and financial data), London Share Price Database (LSPD) which is provided by London Business School, and FAME (containing financial information about U.K companies). The aim behind seeking to use different sources is to enable us to cross check, in the case of any discrepancies in the data, as some information is available in more than one source. The abovementioned organisations and databases have been used in order to construct the sample. Before reaching the final sample the author has been confronted with various obstacles regarding the data collection. The problems faced in the present study are mainly related to data availability and financial resource constraints. These problems are highlighted below as the data sources are described.

5.2.1 LSPD

The LSPD was obtained from the London Business School. LSPD is a database of specific information on approximately 6,000 companies since January 1955. It contains 5 data ASCII files. To extract the data it was necessary to write a FORTRAN routine. The following section describes briefly the content of each file.

5.2.1.1 Source File

The file contains monthly share prices and share related data such as share capital, capital changes and dividend payments. The data is collected from a number of sources, including the Stock Exchange Daily Official List, the Financial Times and Extel's EXSHARE service. Each firm in the Source file is stored as a block. Within each block there are seven different sections of records:

- General Descriptive (**G records**)
- Capital Changes (**C records**)
- Dividends (**D records**)
- Units (**U records**)
- Prices (**P records**)
- Share Capital (**S records**)
- Names & Stock Exchange Daily Official Code (SEDOL)[25] Numbers (**N records**)

5.2.1.2 Master Index File

The Master Index is a comprehensive index of the names of all U.K. companies quoted on the London Stock Exchange since 1955. Information includes all past names and SEDOL numbers about companies if these have changed over the period. In other words it provides cross reference information which allows the user to trace companies which have changed their names or SEDOL numbers.

[25] This is a seven digit numbers used as an identifier for a security listed on the London Stock Exchange.

5.2.1.3 Returns File

Returns are generated from the above-described data files. It contains records for each company in the Source file as well as indices in the Indices file. Each record contains general descriptive data on the share or index to which it refers, followed by a time-series of monthly log returns and an annual series of market capitalisations.

The return is calculated as:

$$r_t = \ln((p_t + d_t) / p_{t-1}) \qquad (5.1)$$

where r_t is the log-return in month t, p_t is the last traded price in month t, d_t is the dividend, if any, during month t and p_{t-1} is the last traded price in month t-1.

5.2.1.4 Archive File

The Archive File provides, for each company, a monthly time series. Time series include those of turnover, market capital, Beta value, earnings per share, dividend per share, earnings per share and stock exchange industry code.

5.2.1.5 Indices File

The Indices File contains monthly time-series indices, which are stored as index values for each month together with some descriptive data such as dates, name and type. More precisely, it provides time series about the following types of indices: FTA FTSE Classified Index, FTA Classified Dividend Yield, FTA Classified Earnings Yield, International Stock Exchange Index, Exchange Rate, Interest Rate, Economic Index and Commodity percentage Return.

5.2.2 British Venture Capital Association

From the BVCA two lists of companies that received financing from venture capitalists were obtained. The first consisted of U.K. VC-backed companies floated on the main London Stock Exchange (LSE) between 1992 and 1999. Whilst the

second list contains U.K. VC-backed companies floated on the Alternative Investment Market (AIM). The information includes name of the company and the names of the venture capitalists that invested in the company and are still shareholders at floatation (see Appendix 5, table 8–1, p172). The most efficient way to cross check that the companies floated on the LSE and AIM are truly backed by VCs would be to obtain the prospectus at the issue of every company and hence ensure the validity of the data supplied from the BVCA. Due to the size of the sample targeted, the limitation of financial resources and the data filing of the LSE it was not possible to obtain the prospectus from the London Stock Exchange. As an alternative approach contact was made directly with the VC-backed companies, compiled on the list supplied by the BVCA via e-mail and telephone requesting the prospectus at floatation. After six-months only 20 prospectuses had been received from the 231 (see tables 2-2 and 2-3 p34) companies originally contacted[26]. Given the poor response a decision was taken to stop waiting and carry on with the data available as explained below.

5.2.3 New Issue Statistics

KPMG used to publish the New Issue statistics bulletin every three months until 1996 and thereafter every 6 months until 1998. The publication contained background information and overall statistics about IPOs during the quarter and is classified by industry. In other words it includes detailed information about every single IPO. The following details were included: date of issue, method of floatation, funds raised by shareholders, total proceeds[27], percentage of equity issued, market capital on floatation, cost of floatation, turnover in the year before floatation, pre-tax profits for 3 years before floatation, book value at floatation, number of shares issued and issue price. New Issue statistics also provided information about sponsor, broker, auditor, reporting accountant and solicitors to the issue.

[26] It should be noted that contact was made only with firms from the VC-backed sample (231 companies) because at this stage of the research the non-VC-backed sample had not yet been constructed as the aim was to obtain the final VC-backed sample before doing so. The construction of the non-VC-backed sample will be explained later in the next chapter.

[27] Total proceed is the offer price multiplied by the number of shares offered at floatation.

As mentioned earlier the aim was to extract the above information about U.K. IPOs from the New Issues Publications. To this end, KPMG was contacted directly via telephone and e-mail with the aim of obtaining the New Issues Statistics Publication. Regrettably the director of the publication, Mr Neil Austin, was unable to provide such information on the grounds that the New Issue is no longer being published. He also stated, in his letter, that back dated copies are no longer available and therefore KPMG was unable to help with the research. The Durham Business School librarian has also attempted to purchase the back dated New Issues statistics copies from KPMG for library use. Again, the librarian was told that back dated copies are not available and therefore can not be purchased. As a final attempt a visit was made to Newcastle KPMG branch and admission was kindly granted to use the local library. Only the New Issues statistics published between 1994 and 1998 were available. However, the following issues were missing and it was not possible to find them, 1994 January-March issue, 1994 July-September and 1995 April-June issues.

In an attempt to complete the missing issues contact was made directly with authors who mentioned KPMG New Issue Statistics as source to the data in their study. Two papers were identified from the U.K. literature on initial public offerings published respectively in the Financial Management and European Financial management journals.

An e-mail together with a headed letter was sent to Professor Mario Levis, the author of the paper dated 1991 and titled "The long-run performance of IPOs: the U.K. experience 1980-1988" requesting whether it would be possible for him to discuss with us his data sources. Unfortunately, after two further e-mails and letters, following the first contact, no correspondence from the author has been received. In the same way, contact was also made with Professor Alan Gregory, the co-author of the paper dated in 1999 and titled "Re-assessing the long-term underperformance of U.K. initial public offerings." He kindly responded to the e-mail stating that the data used in the paper was held with the other co-author Dr. Susanne Espenlaub and suggested to contact her directly. Once again, efforts were in vain, after several attempts to contact Dr. Susanne Espenlaub no response came. The fact of not being able to get hold of KPMG New Issues Statistics has seriously limited the research

endeavour, as some information contained in this publication is not available in any of the other sources cited earlier.

The aim of the present study was also to gather financial information about companies in the sample aiming to compare the financial operating performance of both VC-backed IPOs and non-VC-backed IPOs. It was also anticipated to conduct a cross-regression analysis to find possible explanations for underpricing and long-term performance. More precisely, this required financial statements from at least one-year pre-IPO to 3-year subsequent to the floatation. In attempting to obtain the data two difficulties were encountered while downloading the statements from DataStream. First, back records of financial statements of companies that are delisted, merged or acquired are omitted from the database after the event. The reason for the disappearance of companies that have conducted a merger or acquisition is due to the fact that these companies usually change their names and consequently are allocated new mnemonics within the database. To overcome this obstacle the Master Index file available on the LSPD database was used to trace these changes.

After tracing the companies that went missing due to merger or acquisition, a further problem arose when trying to download financial statements from Datastream. This difficulty is related to data availability. Datastream provides financial statements only for companies which are still trading in the market. Back records for companies that have changed their Mnemonic for reasons such as merger or acquisition are truncated from the database. As an alternative, attention and effort was turned to FAME in the hope of gathering the missing statements.

5.2.4 FAME

FAME is renowned for containing information on public and private companies in the U.K. and Ireland including those that have been recently formed and have yet to file their first set of accounts. The information includes: company profile, profit and loss account, balance sheet and cash flow statement.

Similar problems were also encountered, though with less severity, using the database FAME. Balance sheets and cash flows of all companies are available however, the period of coverage of these statements differs from one company to an other. As stated above, the target was to gather statements about each company starting one year before floatation and finishing 3-years after the IPO. Although in some cases the statements were available, it was noticed that some items from statements were missing. For instance, in order to compute the operating margin, that is to say, the operating income before depreciation divided by the total asset; some of the items needed to calculate the depreciation were missing. From the 231 VC-backed companies available (from the BVCA) it was possible to gather complete information on only 42 firms. The majority of these companies were floated between 1994 and 1996. As a consequence it was decided to abandon this route and conduct only stock-based performance analysis in the present study. Thus the data for this analysis is gathered both from the LSPD and the BVCA.

5.3 Event study methodology

Over the recent years event study methodology has become popular among researchers in the fields of management, accounting and finance. It consists of measuring the effect of an unanticipated event on stock prices. In other words, the event study method is used to determine whether there is a positive or a negative stock price effect associated with an event. These events can be either endogenous or exogenous to the firm, such as corporate illegalities, launch of a new product, corporate refocusing, diversification schemes, investment decisions plant closure, major layoffs, corporate control changes, appointment or resignation of a senior executive, merger or acquisition, etc. Researchers assess the effect of the event by analysing the price movement over a period. More precisely, they define a period of time over which the impact of the event will be assessed. This period is known as the event study or the window. To conduct such studies researchers are implicitly making the assumptions described below.

5.3.1 Market efficiency

The market efficiency assumption constitutes the theoretical basis for the implementation of the event study method. The assumption of market efficiency simply means that at any given time, security prices fully reflect all available information. Therefore market traders are assumed to incorporate quickly any new relevant information available in the valuation of stock prices. The idea behind this, is that, information is quickly incorporated into stock prices and hence old information cannot be used to foretell future price movements. This also implies that at any time buying and selling securities does not require any specific skill, it simply means engaging in a game of chance. If markets are efficient and current, it means that prices always reflect all information. As pointed out by Fama (1965) in an active market that includes many well-informed and intelligent investors, securities will be appropriately priced and reflect all available information. If a market is efficient, no information or analysis can be expected to result in outperformance of an appropriate benchmark. The subscribers to this reasoning consider any relevant information as an event.

5.3.2 Unanticipated events

The second assumption consists in the fact that the event is announced first on the media and that the market traders did not have any prior knowledge of the event. The resulting abnormal return is assumed to capture the reaction of the market traders to the event which is then translated into the subsequent change in the stock price.

5.3.3 Confounding effects

In this case it is assumed that there are no other confounding effects emanating from other events. This assumption is considered by many researchers (see for example McWilliams and Siegel (1997)) as the strongest assumption of the event study method. In other words researchers assume that the only event that can affect the stock prices is the one under study. This assumption may seem hard to reconcile with long window studies where other events could occur during the period under observation and could affect the stock prices. However, as pointed out by McWilliams and Siegel (1997) a researcher can to some extent overcome this

obstacle by eliminating for instance firms that have confounding events from the sample, partitioning a sample by grouping firms that have experienced the same confounding events or by selecting companies that share the same characteristics (e.g., industry, size).

The above description concerns firms that are already floated on the market. This is not the case of the present study where companies do not have historical stock prices. The event, if any, is the presence of venture capitalists at the initial public offering. As mentioned in the previous chapter venture capitalists are considered as active investors who take a long-term view of returns in the form of capital gains. They provide assistance and help unquoted companies to grow and perform better. This is achieved through the provision of financial and business advice to venture managers. By doing so, managers tend to focus on long-term issues and, hence, send positive signals to market traders regarding the ongoing viability of the firm. On the other hand, as argued in chapters III and IV, non-venture-capital backed IPOs do not enjoy the same advantages of VC-backed IPOs. Venture capitalists are involved in the capital market and hence their reputation is at stake. Therefore market traders are aware of this fact and ought to believe that venture capitalists back only good companies.

Thus, it becomes interesting to investigate whether investors would consider the involvement of venture capital in an initial public offering as an event. This is similar to saying that VC-backed IPOs would be regarded differently to non-VC-backed IPOs in the market for the reasons cited above. This difference should appear at the time of the offering as well as in the post-IPO trading periods. To ascertain this statement a comparative study is conducted whereby venture capital IPOs are treated as the event group and non-VC-backed IPOs as the non event group. These are precisely the groups that will be considered in the next section and for which a comparison is made of the stock performance over two different periods. The first window is defined from the offering day to the first closing day at trading. Whilst the second is defined as the period between the end of the first month and the 36^{th} anniversary after the floatation.

5.4 Method

5.4.1 Initial adjusted returns

To test the hypotheses highlighted in chapter IV the event study method, described below, is adopted. First the initial market adjust return *(ar_i)* is measured; this is defined as the difference between the initial return *(r_i)* and the benchmark return of the corresponding reference portfolio *(r_m)*. The initial return of the firm *i* is computed as the difference between the offering price and the closing price of the first trading day,

$$r_i = \frac{P_i}{OP_i} - 1 \qquad (5.2)$$

Where P_i is the closing price of the first day after trading for IPO *i* and OP_i is the offering price of the IPO *i*. Both P_i and OP_i were obtained from the LSPD source file. P_i is the equivalent of P_1 on the **P** records whereas OP_i corresponds at G29 in the **G** records.

The corresponding market return index of IPO *i* is computed as follows

$$r_{i,m} = \frac{I_C}{Io} - 1, \qquad (5.3)$$

where I_c is the market index value at the close of the first trading day and I_o is the market index value at the opening of the first day of trading for the corresponding IPO. The Financial Times value weighted All Actuaries All Share Index (FTA) was used as a benchmark to adjust for the initial return. This index was obtained directly from Datastream.

Thus the adjusted initial market return can be expressed as follows

$$ar_i = r_i - r_{i,m}. \qquad (5.4)$$

The argument advanced by the share allocation theories regarding the underpricing explanation indicates that equation *(5-4)* does not entirely measure the real return earned by an investor which consist of buying an IPO at the offering price and selling it at the first day closing price. It is argued that issuers underprice the IPOs in order to create excess demand. To achieve this, issuers will ration the quantity of shares offered among investors rather than adjusting the issue price upward. Accordingly, investors are not allocated the full subscription. In other words, subscribers are getting a partial allocation from their original subscription. As pointed out by Keloharrju (1993) and Menyah and Inyangete (1995) in this case investors are bearing an extra cost for the amount tied-up in the subscription. If information on the last day of subscription is available, this extra cost can be accounted for by subtracting the opportunity cost of the capital, relative to the part of the capital[28] that has not been allocated shares from the initial return.

5.4.2 Aftermarket returns

Secondly, the long-run returns of IPOs are examined for a period of 36 months after floatation, where the first month is defined as the month following floatation. For instance, if a company was floated on the market on 21st of February, the following month of the long-run returns starts in March. Consequently, all IPOs in our sample are followed over the period of the study, if any firm was delisted before the 36th anniversary the remaining after market period is truncated.

It is worthwhile, however, before describing the method used to compute the abnormal returns, to point out that there is a growing concern among academics about the method that one should adopt when measuring long-term returns. More specifically, the debate is concentrated upon whether to use the cumulative average returns (CARs) as a measure for the long-run abnormal returns or the buy-hold-returns (BHRs)[29] as it will appear from this study that the two measures yield

[28] For the period going from the last day of subscription to the date, usually this period coincides with the date of the first trading day.

[29] In this study, following (Barber and Lyon 1997), the BHRs is preferred as measure of the abnormal returns because the latter approximate the returns earned and experienced by an investor. As this method suffers from some drawbacks (biases) and for the sake of comparison the CARs was computed as well. CARs was selected because it is widely used in event studies as opposed to other methods of measurement such as the calendar–time portfolio approach (see for instance (Loughram

different results. The latter is the return obtained by investors as a consequence of a strategy consisting of buying stocks at the end of the first trading day and holding them for a period of time whereas CARs consist on summing returns over the period of the study. In one study Barber and Lyon (1997) argued that long-term returns suffer from three biases, namely new listing, rebalancing and skewness[30]. Moreover, they showed that the degree and the magnitude of the biases depend on the method used to compute the long-run abnormal returns. Although, as will be discussed below, Barber and Lyon (1997) provided evidence that CARs are less affected by the abovementioned biases than BHRs, they went on to argue that they preferred the latter because it measures the investors' experience. This to say that the returns obtained by investors in the long-run are better approximated by compounding returns. On the other hand Fama (1998) argued that the use of CAR is better suited because it yields less spurious rejections of market efficiency than does BHR. Moreover, Fama (1998) and Mitchell and Stafford (2000) argued that BHR may overstate the long-run abnormal performance since it can grow with the return horizon even when there is no abnormal return after the first period. This discussion suggests that the abnormal long-run IPO performances are sensitive to the methodology employed and hence there is no general consensus on how to measure the long-term abnormal returns. Finally, as both of the abovementioned methods present some inconveniences, in this research the long-term returns are measured using both the CAR and the BHR in order to compare the robustness of IPO performances.

5.4.2.1 Cumulative average returns

The CARs are calculated following the computation

$$ar_{it} = r_{it} - r_{mt} \ , \qquad (5.5)$$

where ar_{it} is the market adjusted return for the issue i at the period t; r_{it} is the raw return for IPO i at period t and r_{mt} is the market benchmark return at period t. In this

and Ritter 1995) and (Brav and Gompers 1997)) which consists of aggregating firm returns on a single portfolio or the wealth relative reported by Ritter (1991).

[30] The biases affect the significance test of the abnormal returns. The test statistic section, below, discusses the biases in more details.

study the value weighted of two market benchmarks are used namely[31], the Financial Times value weighted All Actuaries All Share Index (FTA) and the value weighted Extended Hoare Govett Smaller Companies Excluding Financial Companies (HGSC)[32]. The IPO returns r_{it} are obtained from LSPD (returns file). These returns are taken from the Source file and are measured as the logarithmic difference between the last traded day of the month *t* and the last traded price in month *t-1* (**P4**, **P** records). Returns include dividend payments and are adjusted for rights and script issues. Following Espenlaub, Gregory et al. (2000) instead of using the logarithmic returns (as described in section 5.2.1.3, p100) the exponential of the returns was taken. The file containing the data was inadequate for direct application of equation *(5-5)*. Hence, it was necessary to develop two algorithms, a first one to extract the relevant data and a second one that would organise such data in a format compatible with spreadsheet applications. For more details see respectively Appendix 6, p180, Appendix 7, p182.

The average market adjusted return for month *t* on a portfolio of *n* stocks is defined as the equally-weighted arithmetic mean and is given as

$$\overline{AR_t} = \frac{1}{n}\sum_{i=1}^{n} ar_{it} \qquad (5.6)$$

Cumulative average return (CAR_{it}) from month *1* to month *T* are computed using

$$CAR_{it} = \sum_{i=0}^{T} \overline{AR_t} \qquad (5.7)$$

[31] According to (Loughran and Ritter 2000) value-weighted index is better suited than the equally-weighted index if the interest of the study is to quantify the change in the average wealth of the investor as a consequence of a certain event.

[32] The index value of Extended Hoare Govett Smaller Companies Excluding Financial Companies was obtained from Datastream.

5.4.2.2 Buy and hold returns

Similarly, the buy-hold returns (BHR) from month *1* to month *T* is simply the buy and hold return of the sample firms less the return on a buy and hold of the market index and is given by

$$BHR_{it} = \left[\prod_{i=1}^{T}(1+R_{it})-1\right]-\left[\prod_{i=1}^{T}(1+R_{mt})-1\right] \quad (5.8)$$

where BHR_{it} is the buy and hold adjusted return market for the issue i at the period t, R_{it} is the initial return for IPO *i* at month *t* and R_{mt} is the corresponding market benchmark return at *t*. Since BHR_{it} is calculated for every IPO, the average $\overline{BHAR_t}$ for month *t* on a portfolio of *n* stocks is given as follows

$$\overline{BHAR_t} = \frac{1}{n_t} BHR_{it} \quad (5.9)$$

where n_t is the number of firms trading at month t.

5.4.3 Test statistics

5.4.3.1 Initial return test for significance[33]

To assess whether the initial adjusted market returns and the long-term abnormal returns are different from zero, the following standard parametric test statistics was computed

[33] This test is reported in Chapter VI, Table 6–6.

$$t_{ar} = \frac{\overline{ar_{it}} \times \sqrt{n}}{\sigma_{ar_{it}}} \qquad (5.10)$$

where $\overline{ar_{it}}$ is the sample average of the initial adjusted market return and $\sigma_{ar_{it}}$ is the cross-section of the sample standard deviation of the initial adjusted market return. Given the fact that the initial returns, in this study, are not normally distributed and appear to be skewed, it is also necessary to report the non-parametric Wilcoxon signed-rank test (z-test, see table 6-6 p141), which tests the null hypothesis that the median abnormal return is equal to zero.

5.4.3.2 Long-term returns test for significance

Some studies (see for instance Barber and Lyon (1997) and Khotari and Warner (1997)) argued that the commonly used methods to measure the long-term performance influence the magnitude of abnormal returns and generate miss-specified test statistics. As mentioned earlier, Barber and Lyon (1997) (B & L) argued that the statistics test suffers from the new listing, the rebalancing and the skewness biases. Moreover, they showed that the degree and the magnitude of the biases depend on the method used to compute the long-run abnormal returns. According to the authors the new listing bias affects mainly long-run event studies because companies constituting, for instance, the market index include firms that were listed on the post-event period whereas the sampled firms or the event sample does not. This is also to say that including new listings in the benchmark will lead to a downward bias. As a consequence, the tests are biased toward finding positive abnormal performance for sampled firms[34]. In this study, however, the new listings bias will be different from the one described above by Barber and Lyon. As it considers IPOs as a context to compare the performance of companies that received financing from venture capitalists and ones that did not, the bias consists in the fact that some of the IPOs in our sample may be included in the market indices.

In the same way, (B & L) argued that buy and hold returns are more prone to rebalancing bias since the compound returns of a market index are computed under

[34] As discussed in chapter III (see, section 3.3) many empirical studies have documented that IPOs have poor long-term performance relative to other stocks and as a consequence (Barber and Lyon 1997) argued that including IPOs in the benchmark portfolio will lead to downward bias since IPOs occur after the sampled firms (e.g., those experiencing an event) are chosen.

the assumption of monthly rebalancing whereas the returns from the event sample are compounded without rebalancing. As result of this, abnormal returns are biased downward. This is to say that rebalancing bias militates against the finding of positive abnormal performance when it is truly present. Further, (B & L) showed that the cumulative average returns are less affected by the rebalancing bias since the latter are summated rather than compounded.

The third bias consists of the positive skewness of the long-run abnormal returns reported in several event studies. Skewness exposes the t-test to a severe downward bias which will lead to the rejection of the null hypothesis that the abnormal returns equal zero.

The above discussion suggests that the buy and hold method suffers from new listing bias, rebalancing and skewness biases whereas the cumulative returns suffer mainly from the new listing bias while the effect of the skewness bias is less sever than for the BHR returns. To alleviate the biases and produce specified tests (B & L) suggest using the control firm approach portfolio as benchmark. It consists of matching the sample firms to the control firms of similar size and book-to-market ratios. To construct the matching sample they considered all stocks listed on the U.S. stock exchange and repeated the following procedure every year during the event window (the period of the study). First, they considered all stocks in the index that have market value between 70 percent and 130 percent of the market value of the event sample. Second, they matched all firms in the study sample to the firm with closest book-to-market ratio from the index group derived from the first step. Consequently, the authors argued that the new listing and rebalancing biases are eliminated since both the study sample and the control firm portfolio include only firms that were listed at the event month, and the returns are compounded. Correspondingly, the skewness is eliminated as the abnormal returns become reasonably symmetric when using a control firm approach.

However, this study is more concerned about comparing the relative behaviour of VC-backed firms to non-VC-backed companies, the working assumption is that whatever biases there might be in comparing the VC-backed IPOs with the market index, these same biases will affect also the comparison of non-VC-backed IPOs

with the market portfolio. Hence, the final outcome, that is, the comparative understanding of the long-term performance of the two samples will not be significantly affected.

Taking into consideration the fact that the cumulative average returns are less skewed and following Allen, Morkel-Kingsbury et al. (1999) the following test was used to test whether the cumulative average returns are different from zero,

$$t_{CAR_t} = CAR_{it} \times (n_t)^{1/2} / ((t+1) \times \overline{Var} + 2 \times t \times Cov)^{1/2} \quad (5.11)$$

where n_t is the number of IPOs trading in month t, $\overline{Var}$ is the average cross-sectional variance over 36 months and Cov is the first-order auto-covariance of the $\overline{AR_t}$ series. As mentioned above the BHRs are more severely skewed than the CARs and in order to correct the skewness one uses the bootstrapped-skewness-adjusted t-statistic proposed by Lyon, Barber et al. (1999) (p174)[35] and given by

$$t_{sa_t} = \sqrt{n_t}(S_t + \frac{1}{3}\hat{\gamma}_t S_t^2 + \frac{1}{6n_t}\hat{\gamma}_t), t = 1,2,..36$$

Where (5.12)

$$S_t = \frac{\overline{BHAR_t}}{\sigma_{BHAR_t}}, and \hat{\gamma}_t = \frac{\sum_{i=1}^{n_t}(BHR_{it} - \overline{BHAR_t})^3}{n_t \sigma_{BHAR_t}}$$

In order to compute the critical values for the (t_{sa_t}) statistic the following procedure is used. First, the distribution is simulated of the t_{sa_t} by drawing b samples with replacement of size nb_t from the monthly original sample. Second, the skewness-adjusted test statistics are calculated in each of these b bootstrapped resamples. More precisely, the bootstrap used in this study consisted of drawing 1000 bootstrapped resamples from the monthly original sample of $nb_t = n_t/4$[36]. In each resample the following statistic is computed,

[35] This modified t-test was first introduced by Jonshon (1978) and is based on Edgeworth Expansion.
[36] The choice of $n_t/4$ is based on empirical analysis rather than theoretical basis. For more details (see Lyon and Barber, et al. 1999).

$$t^{b}_{ba_t} = \sqrt{nb_t}(S^{b}_{t} + \frac{1}{3}\hat{\gamma}^{b}_{t}S^{b2}_{t} + \frac{1}{6nb_t}\hat{\gamma}^{b}_{t}), t = 1,2,..36$$

Where

$$S^{b}_{t} = \frac{\overline{BHAR_t}}{\sigma_{BHAR_t}}, and \hat{\gamma}^{b}_{t} = \frac{\sum_{i=1}^{n_t}(BHR_{it} - \overline{BHAR_t})^3}{n_t\sigma_{BHAR_t}} \quad (5.13)$$

σ_{BHAR_t} is the cross-sectional sample standard deviation.

$t^{b}_{ba_t}$, S^{b}_{t}, $\hat{\gamma}^{b}_{t}$ are the monthly bootstrapped resample analogues of t_{sa_t}, $\hat{\gamma}_t$ and S_t from the original sample for b = 1,2,....1000 resamples. Following, Lyon, Barber et al. (1999) the null hypothesis that the monthly mean buy and hold return is zero is rejected if

$$t_{sa_t} < x_{l_t} \text{ or } t_{sa_t} > x_{u_t}.$$

For every month, the critical values (x_{l_t}, x_{u_t}) were obtained by sorting the monthly 1000 simulated t-value and then searching for the cut-off points at which the null hypothesis is rejected at α significance level. For instance at α equal 5 percent the cut-off points are the 25th and the 975th t-values from the 1000 t-value generated. In other words the two critical values of the transformed test statistic (t_{sa_t}) were obtained by solving the following equation:

$$\Pr\left[t^{b}_{sa_t} \le x_{l_t}\right] = \Pr\left[t^{b}_{sa_t} \ge x_{u_t}\right] = \frac{\alpha}{2} \quad (5.14)$$

To simulate and compute the above bootstrapped statistics a batch program was produced. For more details about the program see Appendix 8 p183.

5.5 Survival analysis techniques

Survival analysis methodology is commonly used in the fields of engineering and medical sciences. Recently, this methodology has found application in economics and business to predict events such as bank and company failure and employee turnover (Jain and Kini (2000)). The advantage of the survival analysis is that it takes into account censored data to compute the probability that the event may occur in the future. In other words, survival analysis allows the examination of the conditional probability of failure provided that the firm has survived up to the end of the period of observation. In this thesis, IPOs in the sample are tracked until December 1999 from the LSPD database to determine whether it continues to trade or ceases to be quoted[37].

Survival analysis is conducted because it is able to deal with censored data that represents situations where the events have not yet occurred and with time series data with different time horizons. The IPO market is characterised by both these situations. In this thesis, censored data refers to those IPOs that are still trading under the same SEDOL number during the period of observation. Moreover, the time window is different for each IPO depending on when it was floated on the market. For example, an IPO that went public in 1992 is tracked for seven years whereas an IPO that went public in 1996 is tracked for three years.

The survival is defined as firms that continue to operate independently as public corporations and have not necessarily ceased to be quoted for negative reasons. As can be seen, in appendix 8.10 p188, LSPD provides a number of reasons (events) as to why a firm has ceased to be quoted. In the first instance, all negative events are classified as non survival. Secondly, as there is not a clear distinction in the literature whether to consider the event of a merger or acquisition, as failure. Companies that ceased to be quoted as the result of such events are included in the non survivor (i.e., they are considered as censored IPOs).

[37] LSPD, in the source file provides an indication of the reason why the security ceased to be quoted. The codes can be found in Appendix 8.10.

In so doing, the survival and the hazard functions are estimated. This is to say that the survival and risk profile of VC-backed IPOs and non-VC-backed IPOs are compared. The survival function indicates the probability that an IPO does not experience a negative event (liquidation, administrative receivership, quotation suspended, etc) before a certain point in time *T*. It describes the proportion of IPOs that survive in each successive time period. If venture capital involvement positively influences the survival profile of IPO issuers, the survival function curve of VC-backed IPOs is expected to be above that of non-VC-backed IPOs. The hazard function describes the risk profile of IPOs. Higher values indicate a higher risk of IPO failure. The hazard probability is the probability that an IPO will fail given that it has survived up to the current time. Hence, if the involvement of VC lowers the risk of failure, the hazard function for VC-backed firms is expected to remain below the hazard function of non-VC-backed IPOs.

To test whether the presence of venture capitalists and other IPO characteristics affect significantly the survival time of IPOs, a Cox hazard regression model is used. In what follows the derivation of the model is described.

The hazard probability is the conditional probability that the IPO, floated at time $t = 0$, has ceased to be listed at time t given that it has been listed before time t. Let T, be the number of months an IPO is listed on the London stock exchange, the hazard probability is

$$T(t;X) = f(t;X) \Big/ (1 - F(t;X)) \qquad (5.15)$$

where $F(t; X)$ is the probability that an IPO with characteristics X has been delisted before time t and $f(t;X)$ is the probability density function on T. There are several forms of hazard models that differ in their assumption regarding the relationship between the hazard rate and the covariates (independent variables). The general form of the hazard model is

$$T(t;X) = h_0(t)e^{X\beta} \qquad (5.16)$$

where T is the length of the trading periods measured in months;

$h_0(t)$ is the baseline hazard function which describes the expected trading durations for the IPOs;

B is a vector of model parameters;

X is a vector of independent variables (covariates), which contains a VC dummy variable and some control variables.

As pointed out by Kalbfleisch and Prentice (1980), hazard models differ from each other in terms of the assumption made regarding the shape of the hazard function. The accelerated failure time model (AFT) is used in the present study. The latter is a parametric model based on a priori expectation. The main advantage of this model is that the effect of changes in the vector X, independent variables, on the hazard probability at any time t can differ according to the length of the aftermarket trading period (Hensler, Rutherford et al. (1997)). For instance, the impact of venture capitalists involvement on the survival may be greater for IPOs that have recently gone public than those that have been floated for some time. The AFT model can be written as follows:

$$T(t;X) = h_0(t)^{\sigma} e^{X\beta} \qquad (5.17)$$

where σ is an ancillary scale parameter that shapes the function. Equation (5.17) could also be written as

$$LnT(t;X) = \sigma h_0(t) + XB, \qquad (5.18)$$

since the failure distribution of IPOs is likely to be non-monotonic, the following log-logistic baseline hazard function is selected

$$h_0(t) = \lambda\rho(\lambda t)^{\rho-1} \Big/ (1-(\lambda t)^{\rho}) \qquad (5.19)$$

where λ and ρ are density parameters and t is the individual failure time. If ρ <1, the log-logistic function is monotinically decreasing and vice-versa.

The IPO literature reviewed has provided some evidence that variables such as size of the offering, initial return at floatation, ownership retention, investment bank underwriting the issue and risk of the issue could explain the long-term returns.

Given the data available to this thesis the following covariates (X) are used to estimate the Cox hazard model

Size = measured as the market capital of IPO at floatation;
Risk = standard deviation of the initial return at floatation;
DVC = dummy variable indicating whether the IPO is backed by VC or not;
LSE= dummy variable, equal 1 if the IPO is floated on the LSE main market and zero otherwise.

Ritter (1991) argued that larger offers tend to be less underperforming in the long-run compared to that of smaller offers, and hence the size of the IPO is expected to have a positive impact on the survival of the firm. Empirical evidence suggests that riskier IPOs are more underpriced. IPOs with high standard deviation are expected to be riskier; risk is expected to have a negative impact on the survival profile of an IPO. It is a known fact that IPOs floated on the LSE main market are larger and tend to be older than those floated on the AIM market. Given this, it is expected that the LSE dummy to have a positive impact on the survival. Finally, for reasons mentioned throughout this thesis, the presence of VC (measured by *DVC*) at the initial public offerings is expected to affect the survival positively.

The model parameters are estimated using the maximum likelihood method. A positive coefficient indicates a positive impact on the survival of the IPO. In other words, positive coefficients indicate factors that increase the aftermarket-trading period and hence increase the probability of survival.

Having discussed the data sources, the methods adopted to test the hypotheses of the present thesis, in what follows, in chapter VI, the description of the data together with the findings regarding initial returns, long-term returns and the probability of IPOs survival are presented.

DATA INTEGRITY & RESULTS

6.1 Data description

As stated in the previous chapter the data which was provided by the BVCA commences in 1992, and LSPD data is available only until December 1999; as the long-term returns are computed for a period of 36 months after floatation, the sample then ends in 1996. The initial sample is comprised of 574 IPOs (see table 6.2, p125) listed on London Stock Exchange and Alternative Investment Market between 1992 and 1996. According to the British Venture Capital Association 231 firms[38] from the initial sample are backed by venture capitalists. This sample excludes all transfers from the Unlisted Securities Market (USM), investment trusts and overseas companies. Financial and insurance companies such as banks, closed-end funds and real estate investment trust were excluded because they are considered distinct from other IPOs (see, Lee, Shleider et al. (1991); and Wang, Chan et al. (1992)). In order to be included in the sample, the IPO must be floated to the market either by placement or by offer for sale at fixed price and the firm conducting the IPO must have a SEDOL number with the London Share Price Database (LSPD). Following this procedure the final sample consists of 191 VC-backed companies[39].

From the source file the following information concerning the characteristics of each offering were derived, the issue date (**G28**, in the **G** records), the method of floatation (**G8**, in the **G records**), the issue price (**G29**, in the **G** records) and the first day closing price (**P3**, in the **P** records), the reasons (events) of why a company ceased to be quoted in the LSPD database or "type of death" (**G10**, in the **G** records) and the date of death (**G11**, in the **G** records). For more details about the subroutine used to extract the above data see Appendix 1, p161.

To derive the market capital at the end of the first month of the floatation and the London Stock Exchange industrial classification the Archive file was used from the

[38] (See tables 2.2 and 2.3)
[39] For full list of VC-backed IPOs included in the sample see Appendix 5, Table 8–1)

LSPD database. These items are coded as **A4** and **A11** respectively in the abovementioned file (see Appendix 2, p164).

Several empirical studies presented in the previous two chapters have documented that returns are affected by the size of the issue (see, for example, Drake and Vestsuypens (1993), Megginson and Weiss (1991) and Mikkelson, Partch et al. (1997), etc). In these studies the size of the issue is measured by the amount of capital raised at the floatation (issue price times the number of shares issued) and it is sometimes referred to as the total proceed[40]. Conversely, as mentioned in chapter III[41] many empirical studies conducted in different countries and at different periods of time have documented that IPOs are underpriced at floatation and the price of the issue tends to adjust in order to reflect the market value within the first few weeks of trading. Following this, it is argued that the size of the company would be better measured as the market capital of the ordinary share at the end of the first month of floatation.

The industry to which the IPO belongs has also been seen as an empirical factor that could affect the abnormal returns. As mentioned by Ritter (1984) the level of returns tends to be clustered by industry. Later, Brav and Gompers (1997) argued that matching firms to industry portfolios avoids the noise of selecting individual firms and can control unexpected events that affect the returns of the entire sector.

Following this argument, industry classification together with size has been considered whilst constructing the matching sample of firms that are not backed by venture capitalists in order to conduct a comparative study. Before constructing this sample all companies which were not named in the list supplied by the BVCA were classified as non-VC-backed IPOs. In so doing, the following procedures have been used to construct the non-VC-backed firms.

In the first instance, a search was made for matching a non-VC-backed IPO to every VC-backed IPO in the sample. To consider a non-VC-backed IPO as matching to a

[40] The total proceed of the floatation is not available in the PSID and can be obtained only from KPMG New Issue Statistics.
[41] Table 3–1

VC-backed IPO, the former has to satisfy the following three conditions. First, the non-VC-backed IPO has to be floated on the stock exchange in the period between 1992 and 1996. Second, the non-VC-backed IPO has to have the same industrial classification number. Third, the market capital[42] of the matching IPO has to be between 70 percent and 130 percent of the VC-backed IPO. In other words, let VC-backed IPO = Y and non-VC-backed IPO = X, then the third condition can be expressed as follows

$$70\,\% \times Y \geq X \leq Y \times 130\,\%.$$

Following this procedure it was possible to match only 21 VC-backed IPOs from the 191. In other words about only 10 percent of the VC-backed sample is matched using the above conditions.

Hence, in order to increase the number of matched IPOs, it was necessary to relax the conditions. The VC-backed sample is split into 10 market capital size groups and then the stock exchange industrial classification numbers of all IPOs forming each decile is obtained.

The industrial classification numbers obtained from each size group are sorted and saved in data vectors called $INDUS_i$ (i=1,2,...,10) to be used later in the analysis. To carry out this procedure, an algorithm was developed taking into consideration the three subsequent conditions: size (measured as the market capital at the last trading day of the first month after floatation), industry (stock exchange industry numbers, $INDUS_i$) and the time period (1992-1996). This algorithm was designed on the basis of the format and the content of the Archive file as described in Appendix 3, p166. For instance to match IPOs in the first decile group the above conditions can be expressed as follows, let

X= non-VC-backed IPO

XM = the market capital of the non-VC-backed IPO

[42] Measured as the market capital at the end of the first month after the floatation.

XI = the industrial classification number

XD = the date of the issue of the non-VC-backed IPO

δ' is a vector which contains the industrial classification numbers of the first decile group.

Min = the minimum market capital in the first decile

Max = the maximum market capital in the first decile

$$01/06/92 \geq Date \leq 31/12/96$$

SELECT X IF (XD = Date AND Min $\geq$ XM $\leq$ Max AND XI = δ')

The above process was repeated 10 times and every time the Min and Max was replaced with the corresponding market capital interval in the group decile. Similarly, the vector δ' was also replaced with the corresponding stock exchange industry classification. In short, the above describes the procedure which was adopted in order to construct the non-VC-backed IPO sample.

Finally, the information concerning the characteristics of non-VC-backed IPOs was derived from the data available on the Source file, the issue date **(G28)**, the method of floatation **(G8)**, issue price **(G29)** and the first closing day price **(P3)**, and the reasons, if any, for deletion or "type of death" **(G10)**. To derive this data the subroutine described in Appendix 4, p169 was made.

Table 6–1 Size distribution of VC-backed and non-VC-backed IPOs

Market capital £m	VC-backed IPOs	Non-VC-backed IPOs
≤ 13	10.2 %	24.3 %
> 13 ≤ 19.4	9.7 %	11.1 %
> 19.4 ≤ 29	10.7 %	15.3 %
> 29 ≤ 34	10.3 %	6.2 %
> 34 ≤ 42.5	9.1 %	7 %
> 42.5 ≤ 51	10.8 %	6.9 %
> 51 ≤ 67.9	9.1 %	11.1 %
> 67.9 ≤ 98.2	8.6 %	4.9 %
> 98.2 ≤ 159.2	11.8 %	2.1 %
> 159.2 ≤ 472	9.7 %	11.1 %

Further, all the matched non-VC-backed IPOs that did not constitute true initial public offerings were excluded. In other words, only companies that were brought to the market through placement and offer for sale at fixed price procedures were considered. This has led the study to match only 144 IPOs[43]. Table 6–1 shows that venture capital IPOs are evenly distributed over all market capital groups. This is not the case for non-VC-backed IPOs where 24.3 percent fall in the smallest decile. Moreover, 70.8 percent of non-VC-backed IPOs have a market value of less than 51 million against 60.8 percent of VC-backed IPOs. As discussed in chapter II (see, for instance, section 2.4.1, p25), this is further evidence that venture capitalists in the U.K. prefer to invest in late stage and established companies through, for example, management buy-outs and buy-ins. This also shows that the venture capital sample in this study is representative of its venture capital industry. The final sample consists of 355 IPOs of which 191 are VC-backed IPOs and 144 are not VC-backed IPOs.

Table 6-2 shows the distribution of both VC-backed and non-VC-backed IPOs between 1992 and 1996. The overall percentage of IPOs included in the sample is about 58 percent. In 1996, about 62 percent of IPOs introduced in the market were

[43] For full list of non-VC-backed IPOs see Appendix 5, Table 8–2

included in the sample. No apparent differences were noticed, as shown in table 6-3, in the number of offerings each year between VC-backed and non-VC-backed IPOs

Table 6–2 Distribution of VC-backed and non-VC-backed IPOs during 1992-1996

Year	Total number of IPOs	Number of IPOs included in the sample			% included in the sample
		VC-backed IPOs	*Non-VC-backed IPOs*	*Total*	
1992	26*	12	12	24	92.31
1993	118	37	25	62	52.55
1994	175	53	39	92	52.58
1995	75**	27	18	45	60
1996	180**	62	50	112	62.23
Total	574	191	144	335	58.37

Figures from the British Venture Capital Association. These Figures exclude companies that were transferred from USM. Investment trusts, reverse takeovers and overseas companies are also excluded.

* This figure includes only companies that were floated in the third and fourth quarter of the year 1992.

**Figures include IPOs that were floated in the AIM market.

Table 6–3 Number of VC-backed and non-VC-backed companies per year

Year	VC-backed IPOs	Non-VC-backed IPOs
1992	12 (6.28 %)	12 (8.33 %)
1993	37 (19.37 %)	25 (17.36 %)
1994	53 (27.74 %)	39 (27.08 %)
1995	27 (14.13 %)	18 (12.50 %)
1996	62 (32.46 %)	50 (34.72 %)
Total	**191**	**144**

The industry classification of VC-backed and the matched non-VC-backed IPOs is shown in table 6-4. As can be seen, the sample is concentrated in 30 industries. A closer look at the table indicates that IPOs are largely concentrated on 6 industries, namely Computer Hardware & Services, Software, Business Support Services, Retailers, Pharmaceuticals and Publishing & printing. This is consistent with the figure provided by the British Venture Capital Association and reported in the second chapter (table 2-7, p46) where venture capitalist investments have shifted from manufacturing and industrials during the 1980s to technology companies in 1990s.

Table 6–4 Sector classification of VC-backed and Matched non-VC-backed IPOs

Classification	Number of IPOs	Percentage of IPOs
Broadcasting Contractors	5	1.49
Hotels	5	1.49
Household Appliances & House-wares	5	1.49
Electronic Equipment	6	1.79
Healthcare	6	1.79
House Building	6	1.79
Media Agencies	6	1.79
Property	6	1.79
Telecommunications Equipment	6	1.79
Building, Construction & Materials	7	2.09
Plantations	7	2.09
Distributors	8	2.39
Food Processors & Manufacturers	8	2.39
Medical Equipment	8	2.39
Vehicle Components, Assemblers & Disruption	8	2.39
Rail, Road & Freight	9	2.69
Real Estate Holding	9	2.69
Leisure	10	2.99
Engineering	11	3.28
Restaurants, Pubs & Breweries	11	3.28
Chemicals	12	3.58
Electrical Equipment	12	3.58
Paper and Packaging	13	3.88
Pharmaceuticals	14	4.18
Retailers	16	4.78
Software	16	4.78
Business Support Services	17	5.07
Computer Hardware & Services	18	5.37
Publishing & Printing	21	6.27
Others	49	14.63
Total	335	100

Table 6-5 reports the difference in the offering characteristics of VC-backed and non-VC-backed IPOs. Two alternative statistics were computed in order to test whether the null hypothesis that the difference in the means of the two samples is equal to zero. First, as this study does not assume perfect matching, the following t-test is used

$$\frac{VC - NVC}{(S_{VC}^2 / N_1 + S_{NVC}^2 / N_2)^{1/2}} \qquad (6.1)$$

where VC, NVC, S_{VC}^2, S_{NVC}^2 are respectively the means and the variances of the venture capital and non venture capital sample characteristics.

Second, the non-parametric, Mann-Whitney test, for difference between groups is computed. This test consists of combining the VC-backed IPO and the non-VC-backed IPO into one set (N=N1+N2) element and ranking the new set from the smallest value (rank 1) to the largest. These rankings are resorted from the two original two samples and the sum of the rankings in each group is obtained. Then, the following statistic is computed.

$$U = N_1 N_2 + \frac{N_1(N_1 + 1)}{2} - W \qquad (6.2)$$

[44]

where W refers to the smallest sum of the rankings

Panel A shows that VC-backed IPOs have a high market capital. For instance the median of the VC-backed firms market capital is 42.5 million versus 27.5 million for non-VC-backed firms. As shown in panel B the difference in the mean offering price is significant at the 1 percent level using either the t-test or the nonparametric Man Whitney test. This to say that there is a difference in the offering size between the two samples and the probability that such a difference could be observed purely as a result of a random variation is less than 1 percent. The offering price of VC-backed IPOs range between 23 and 460 pence whereas it ranges between 12 and 290 pence for non-VC-backed IPOs.

[44]Mann-Whitney test (U) is compared to a table of critical values based on the sample size of each group. If U exceeds the critical value at some significance level (usually 0.05) it means that there is evidence to reject the null hypothesis in favour of the alternative hypothesis.

Table 6–5 Offering statistics of VC-backed and non-VC-backed IPOs

Panel A Offering size

Description	*VC-backed MarCap at floatation £M*	*Non-VC -backed MarCap at floatation £M*	*Difference in the means t-stat*	*Mann-Whitney test*
Mean	66.04	58.937	0.811	-3.43**
Median	42.5	27.5		
Maximum	472	464		
Minimum	4	5		
Standard Deviation	70.10604	85.24586		

Panel B Offering price

Description	*VC-backed MarCap at floatation £M*	*Non-VC -backed MarCap at floatation £M*	*Difference in the means t-stat*	*Mann-Whitney test*
Mean	152.6	118.1	4.562**	-4.795**
Median	144	115		
Maximum	460	290		
Minimum	23	12		
Standard Deviation	72.41	65.71		

** significant at the 5 % level

6.2 Results

6.2.1 Initial returns

Over the period of the study, the VC-backed IPOs appear to be less underpriced than the non-VC-backed IPOs. This is consistent with the first hypothesis and the findings reported on U.S. studies (see for example Megginson and Weiss (1991)). Table 6-6, panel A (see, p141), shows the VC-backed IPO distribution of the initial returns, the market index returns and the adjusted market returns over five years. As can be seen, about 27 percent (53 out of 191) of VC-backed IPOs were floated on 1994. A further look at panel A indicates that 1994 was the least underpriced year during the period of the study. On the other hand, VC-backed IPOs registered the greatest underpricing in 1995. This is to say that an investor, on average, would have obtained a return of 22,09 percent by buying VC-backed IPOs at the offering price and selling the stocks at the end of the first day of trading. In panel B, a similar, though less pronounced, pattern can be also seen for non-VC-backed IPOs. About 27 percent of non-VC-

backed IPOs were introduced in the London Stock Exchange in 1994. Similarly the year 1995 is the most underpriced year for non-VC-backed IPOs whereby an investor would obtain an average return of 26.27 percent by buying at the offer price and selling at the trading price.

The year 1996 could be described as a year where there was at least one hot issue period; many IPOs were brought to the market. According to Ritter (1991), one would expect investors to obtain, on average, a high initial return during this period. This is not the case with the sample under study where high initial returns were not obtained during 1996. This may be partly due to the fact that the initial returns reported in table 6-6 represent the average of the year. A comparison between the yearly adjusted returns of the two samples indicates that the initial adjusted returns of non-VC-backed IPOs are higher than the VC-backed IPOs over the 5 years, except for the year 1992. Thus apart from one year the results are in line with the expectation. The results reported in the year 1992 appear to be puzzling as no explanation could be given from the data available and the period covered in this study. It would be interesting to see whether this is a recurring phenomenon and what are its causes using studies covering grater periods of time.

The *t*-statistics, table 6-6, panel C (see, p141) shows that the average initial adjusted returns for both samples over 5 years are significant at the 1 percent level, suggesting the rejection of the null hypothesis that the initial adjusted returns are equal to zero. However, an investigation of the distribution of the initial returns indicates that the latter are not normally distributed. As can be seen, the Kolmorgov-Simirnov test of normality is significant for both samples suggesting that the normal distribution is not a good fit of the initial returns. Similarly, since the normal Q-Q plots (figures 6-1 and 6-2, p142) show that the initial returns are not normally distributed and they are not symmetric (positive skewness), the implication of the *t*-statistics should be treated with caution. Alternatively, the Wilcoxon non-parametric signed-rank test (Z-test) is reported. Correspondingly, the non parametric test rejects the null hypothesis of no significant median initial adjusted return. The initial adjusted return for 191 VC-backed IPOs is about 12 percent whereas the average initial return for 144 non-backed IPOs is 15 percent. These results indicate, on average, the returns that an investor would have obtained by buying IPOs at the offer price and selling at the

closing price of the first day of trading. These results appear to support the prevailing belief that VC-backed IPOs are regarded as less risky issues with comparison to non-VC-backed companies in the market. This is similar to saying that non-VC-backed IPOs need to underprice their issues more than VC-backed IPOs in order to attract investors. To put this in perspective, recall that the reputation hypotheses (regarding the underpricing phenomenon) presented in chapter III, section 3.1.3, p56 argued that when a firm sells shares for the first time its true value is imperfectly known by investors and therefore the issuers tend to underprice the issue in order to attract investor. However, if there is a third party such as a venture capitalist, with reputational capital at stake backing and asserting the IPO, issuers do not need to underprice as much, as IPOs that are not backed by venture capitalists. One of the reasons why venture capitalists can fulfil the role of the third party, as mentioned above, is that they are constantly present at the initial public offering market –by bringing companies in their portfolio to the market on an ongoing basis- and hence they have a strong incentive to establish a trustworthy reputation in order to retain access to the IPO market on favourable terms. It is in the interest of venture capitalists to disclose correct information at the IPO about companies that they back since they will be adversely and financially affected if that information turns out to be false. Finally, it could be argued that the initial returns documented in this study appear to provide further evidence that IPOs not backed by venture capitalist need to underprice more than venture capital backed IPOs in order to create demand for their shares.

Segmenting the initial adjusted returns according to the market at floatation, as reported in Panel D (table 6–6 p141), shows that companies that are floated on the AIM market need to underprice more than companies floated on the LSE main market irrespective of whether they are backed by venture capitalists or not. One possible explanation for the high underpricing of IPOs floated on the AIM market could be related to the fact that the requirements for the listing in this market are less stringent than in the LSE main market. As a consequence, investors would expect high underpricing since AIM IPOs are regarded as more risky than IPOs floated on the LSE main market.

6.2.2 Aftermarket returns

Long-term returns are computed for a period of 36 months after the first month of the floatation for both samples (VC-backed and non-VC-backed IPOs). Table 6–7 (p143) provides summary statistics for the returns of the periods 12 months, 24 months and 36 months after floatation for both samples. It also shows the results of tests about the distribution of the abnormal returns. As can be seen, buy and hold returns are more affected by skewness than cumulative returns. The majority of the buy and hold returns standardised skeweness statistics lies outside the range of -2 and +2. Similarly, the standard Kurtosis for buy and hold returns depart from the above range indicating that the latter may not be normally distributed and hence the test for significance (t-test) is not appropriate for such data[45].

6.2.2.1 Long-term returns with FTA benchmark

Table 6–8 (p145) reports the cumulative average returns using the FTA all shares index as a benchmark against 191 VC-backed IPOs and 144 non-VC-backed IPOs. At first glance it is apparent that VC-backed and non-VC-backed IPOs are outperforming the market benchmark in the first month after floatation. However, non-VC-backed IPOs are generating higher returns to investors than VC-backed IPOs. The abnormal return obtained by investing in non-VC-backed IPOs is significant at the 5 percent level for the first 3 months after floatation. Throughout the period of the study non-VC-backed IPOs are marginally outperforming both the FTA all share and the VC-backed IPOs. At the 36th anniversary after floatation, an investor would achieve a positive abnormal return by investing in non-VC-backed IPOs and a negative abnormal return by investing in VC-backed IPOs.

On the other hand, computing the abnormal returns using buy and hold method yields a different result from the one reported above. Table 6-9 (p146) reports the buy and holds long-term returns, as can be seen, these results appear to be in line with the hypothesis stating that VC-backed IPOs outperform the non-VC-backed

[45] As the significance tests in this study are reported on monthly basis rather than annually it is necessary to run the Kolmorgov-Smirnov test for normality to check whether the monthly buy and hold returns have a normal distribution. Regardless of the benchmark used to adjust for the returns it was found that only 12 percent of the series were significant, indicating non-normality. As a

IPOs. Unlike the CAR returns, the buy and hold average returns at the end of the first month is negative for both VC-backed and non-VC-backed IPOs. These are respectively -2.79 and -5.25 percent and they are statistically significant at the 5 percent level. This may suggest that the underpricing (reported in table 6-6, p141) adjusts quickly in the first weeks after the floatation. This is to say that IPO prices are adjusting upward reflecting the real value of the stocks after being sold at a low price at the time of the offering. An interesting result is that in the short run, up to one year after the floatation, non-VC-backed IPOs are outperforming both the market benchmark and the VC-backed IPOs abnormal return. However, a closer look at the series indicates that returns of both samples are dropping at and around the first year anniversary after the listing. This fall is more noticeable for VC-backed IPOs as their abnormal returns turn to negative values. This may be partly explained by the fact that this period (at and around the first year) coincides with the lock-up/lock-in agreement expiry date documented by Espenlaub, Gregory et al. (2000) for U.K. IPOs. Expressed in an other way, this means that stock prices tend to fall as the offer of shares increases since inside shareholders can sell their stakes in the market. Nonetheless, it is hard to find sustainable explanations to why VC-backed IPOs are more affected than the non-VC-backed IPOs at and around this period[46]. It would be interesting for further studies to investigate this issue as this period could be the period when venture capitalists exit from the investment. The market adjusted returns for VC-backed IPOs turn to a positive abnormal return series after the 16th month after floatation. Moreover, the VC-backed IPOs are outperforming the FTA all share index and the non-VC-backed IPOs. This is similar to saying that investing equal money on buying VC-backed and non-VC-backed IPOs at floatation would yield returns of 15.42 percent and 10.16 percent respectively at the 36th anniversary after the floatation. However, although the *t*-tests are adjusted for the skewness, the buy and hold returns are only significant in some cases at the 10 percent level from month 25 through to month 32.

consequence it was preferred to use the bootstrapped adjusted skewness suggested by Lyon and Barber, et al. (1999).

[46] Similar patterns are also documented when computing the cumulative average returns (table 6-8)

6.2.2.2 Long-term returns with HGSC benchmark

Tables, 6-10 and 6-11 (respectively, p147) report the long-term returns using Hoare Govett Smaller Companies (HGSC) index as a market benchmark. The results are not different from the above abnormal returns adjusted by the FTA all share index. As can be seen from figures 6-3 and 6-4 (p144) they appear to follow the same pattern. The CARs for VC-backed and non-VC-backed IPOs are respectively -1.34 percent and 3.13 percent at the end of the 36th month but not statistically significant. The non-VC-backed IPOs are only significant at the 10 percent level for the months 1 to 7, except month 4. Conversely, the buy and hold returns show that both samples are outperforming the HGSC index. Additionally, VC-backed IPOs are outperforming the non-VC-backed IPOs in the 3 years after floatation.

6.2.3 Aftermarket returns segmented by market at floatation

In order to gain further insights on the long-term returns reported in the above section, the following two analyses were conducted. First, companies which were floated on the AIM market were excluded from the computation of the long-term returns (i.e, only IPOs that were floated on the LSE main market were analysed). Second, the aftermarket returns of the VC-backed IPOs and the non-VC-backed IPOs floated on the AIM market were compared. From 191 VC-backed IPOs in the sample 24 were listed on the AIM market whereas from 144 non-VC-backed IPOs 31 companies were floated on the AIM market.

6.2.3.1 Aftermarket returns of IPOs floated on the LSE main market

After excluding IPOs that were floated on the AIM market, the VC-backed sample consisted of 167 IPOs and the non-VC-backed sample consisted of 113 IPOs. By and large, excluding IPOs floated on the AIM market does not appear to affect markedly the long-term returns reported above (see section 6.2.2). Similarly, the significance tests for the long-term returns are not affected. The only difference, if any, is that the aftermarket returns slightly tend towards positive values.

The results of the long-term returns of IPOs floated on the LSE main market are reported in Appendix 8.11 (p189). Table 8-8 (p189) shows the long-term cumulative

returns using FTA as benchmark. Both samples, VC-backed and non-VC-backed IPOs, are outperforming the FTA market index during the first 6 months after floatation. The non-VC-backed IPOs appear to generate higher returns to investors than the VC-backed IPOs, and these returns are significant at the 5 percent level. Over the period of the study, the non-VC-backed IPOs are outperforming both the FTA all share and the VC-backed IPOs. Following a strategy of buying IPOs at the offer price at floatation and selling at the 36th month after floatation, an investor would achieve a return of 5.04 percent by investing in non-VC-backed IPOs and a return of 2.21 percent by investing in VC-backed IPOs.

The long-term buy and hold returns for IPOs floated on the LSE main market are reported in table 8-9 (p190). As pointed out earlier, the buy and hold method yields a different result from the cumulative returns. In the short run, up to one year after the floatation, the non-VC-backed IPOs are outperforming both the FTA market index and the VC-backed IPOs abnormal return. However, in the long-term, up to 36 months after floatation, the VC-backed IPOs are outperforming the non-VC-backed IPOs. Thus, buying at the offering price and holding the VC-backed IPOs would have yielded a return of 17.83 percent. On the other hand, following the same strategy with the non-VC-backed IPOs would have yielded a return of 12.57 percent. These returns are slightly higher than those reported in table 6-9 (p146), which include IPOs floated on the AIM market. The bootstrapped *t*-tests for the non-VC-backed IPOs are significant at the 5 percent level between the third and the eight month; and between the fifteenth and the thirty second month; after floatation. Whereas, for the VC-backed IPOs, the returns are significant only between the twenty fifth and the thirty second month after floatation.

The patterns reported above regarding the long-term returns are similar to those found using the Hoare Govett Smaller Companies (HGSC) index as a market benchmark. These aftermarket returns are reported in tables, 8-10 and 8-11 in Appendix 8.11, p191 and p192 respectively. The CARs for VC-backed and non-VC-backed IPOs are marginally outperforming the HGSC at the end of the 36 month after floatation. Investing £1 in IPOs backed by venture capitalists would have yielded about £1.028 at the end of the third year after floatation. Equally, investing the same amount of money in IPOs that are not backed by venture capitalists at

floatation would have yielded about £1.060. On the other hand, computing the abnormal returns using the BHRs method and investing equal money would have generated a return of 18.79 percent for IPOs backed by VCs, and a return of 14.02 percent for IPOs that are not backed by VCs, at the end of the third year after floatation.

Excluding IPOs that were floated on the AIM market from the original sample showed that the abnormal returns tend toward positive values and are higher than the abnormal returns reported above (see section 6.2.2). The IPOs floated on the AIM market appear, in other words, to have a negative effect on the abnormal returns. Analysing the after market returns of IPOs floated on the AIM market needs to be undertaken using an appropriate benchmark.

6.2.3.2 Aftermarket returns of IPOs floated on the AIM market

As mentioned earlier, 24 VC-backed IPO and 31 non-VC-backed IPOs were floated on the AIM market, between 1995 and 1996, from the original sample of 191 and 144 IPOs respectively. Given that the AIM market is mainly characterised by the presence of smaller companies than those present in the LSE main market, the Hoare Govett Small Companies value weighted index is used as benchmark to compute the long-term returns. The aftermarket returns of IPOs floated on the AIM market can be found in Appendix 8.12 (p193). It should be noted, however, as the size of AIM IPO samples are small, the aftermarket returns together with the tests of significance reported should be treated with caution. As a consequence, the non parametric Wilcoxon test is used to test the significance of the buy and hold returns (BHRs) instead of the skewed adjusted bootstrapped t-test. The obvious reason for not computing the latter is that, as mentioned above, the size of the samples are too small to allow computer simulation of the critical values.

Both the CARs and the BHRs, reported in tables 8-12 and 8-13 (p193 and p194), show that the IPOs floated on the AIM market are underperforming the HGSC index in the long-term. The cumulative average returns for VC-backed IPOs are positive only between the third and the sixth month after floatation whereas the non-VC-backed IPOs appear to outperform the index in the period up to 12 months after

floatation. As for the period between one year and three year after floatation, both samples are underperforming the benchmark. The VC-backed IPOs are severely underperforming the HGSC index than the non-VC-backed IPOs. For instance, at the 36th anniversary after floatation, an investor would achieve a negative abnormal return of 39.05 percent, by investing in VC-backed IPOs, and of 2.1 percent by investing in VC-backed IPOs[47]. On the other hand, the buy and hold returns, reported in table 8–13 (p194), show that an investor, at the end of the third year after floatation, would generate negative returns of 16.08 percent and 19.98 percent by investing in AIM VC-backed IPOs and AIM non-VC-backed IPOs respectively.

Notwithstanding the fact that there are limits to the generality of the long-term AIM IPOs returns, reported above, due to the size and the time span of the sample, the results are of interest since they appear to suggest that a more severe underperformance of companies floated on the AIM market are underperforming the HGSC benchmark more than their counterpart companies floated on the main London stock exchange, regardless of whether these companies are backed by venture capitalists or are not. Thus, this is an area which can be explored further in future studies.

6.2.4 Survival analysis findings

In order to test the survival hypothesis, in what follows, first, the survival and the hazard functions of VC-backed and non-VC-backed IPOs are estimated and compared. Second, as highlighted in section 5.5 (p116), the presence of venture capitalists is tested using the Cox hazard regression model.

6.2.4.1 Univariate analyses

As pointed out in chapter V, survival is defined as firms that continue to operate independently as public corporations and have not ceased to be quoted for negative reasons. In other words, IPOs that ceased to be quoted in the LSPD database were considered as non survival companies. Those IPOs which did not cease to be quoted

[47] As the cumulative returns are not significant, the interpretation of the abnormal returns reported in table 8-12 should be treated with caution.

are considered as censor companies. To this end, all IPOs in the sample, floated between 1992 and 1996, were tracked until December 1999. The investigation showed that 71 VC-backed IPOs conducted either merged or have been acquired, and 9 ceased to be quoted because they were under administration or receivership[48]. From the 71 M&A companies, 55 have formed a new entity (company) and hence a new SEDOL number, whereas 16 companies have ceased to be quoted in the LSPD database because they were taken over by either foreign companies or by private companies, (i.e., companies not listed on the London stock exchange). The examination for the non-VC-backed IPOs showed that 39 firms have conducted a M&A[49], while only 3 firms ceased to be quoted and they were either under administration or receivership. The examination also showed that 11 IPOs (from the 39 IPOs) were taken over by foreign or private companies.

Figure 6-5 (p149) depicts the estimated survival function of VC-backed and non-VC-backed IPOs. The non-VC-backed IPOs curve is above that of VC-backed IPOs over the period of observation indicating that the former have a higher survival profile than the latter. Accordingly, the probability of survival-i.e., not to cease to be quoted for negative reasons- is higher for non-VC-backed IPOs than for VC-backed IPOs. At the end of the observation, the cumulative survival rates are 46.92 percent and 44.27 percent, for non-VC-backed and VC-backed IPOs respectively[50]. The hazard function, as shown in figure 6-6 (p149), of non-VC-backed IPOs remains below that of VC-backed IPOs over the period of the observation indicating that the risk profile of the latter is higher than that of the non-VC-backed IPOs. In short, the survival and the hazard functions showed that the presence of venture capitalists do not necessarily improve the survival and the risk profile of IPOs.

[48] M&A takes the code 5, administration and receivership take codes 16 and 20 in the LSPD. For more information on delisting codes see Appendix 8.10.

[49] The frequency of merger for VC-backed-IPOs appear to contradict that reported by Brav and Gompers (1997), on U.S. VC-backed IPOs, where merger was low and was mainly concentrated within the non-VC-backed IPOs sample. One possible explanation to the high merger frequency among U.K. VC-backed IPOs is that during the period 1994 and 1996 merger became popular in the market and venture capitalists may have used this opportunity to divest. The M&A event could also imply the exit of VC.

[50] The cumulative survival rate is computed using the follow-up life table. The basic idea of the life table is to subdivide the period of observation into month intervals. For each month, all IPOs which have been observed at least that long are used to calculate the probability of a terminal event occurring in that month. The probabilities estimated from each of the months are then used to estimate the overall probability of the event occurring at different time points.

However, as noted in Chapter V, the event of M&A could be regarded as positive event. Following this line of reasoning separate survival analyses are run whereby companies that conducted M&A are not considered as non-survival. Consistent with the survival results reported above, figures 6-7 and 6-8 (p150) show that the non-VC-backed IPOs have higher survival profile and low risk profile compared with the VC-backed IPOs. The cumulative survival rates are 96.41 percent for the non-VC sample and 93.41 percent for VC-backed IPOs.

6.2.4.2 Multivariate analyses

The results for the log-logistic of the AFT model, described in chapter V (p116), are presented in table 6–12 (p151). Model I refers to the results where M&A events are considered as non survival whereas in model II they are excluded. DVC and LSE are dummy variables indicating whether the IPO is backed by VC and whether the IPO is floated on the London stock exchange main market. The other variables are control variables that may influence the probability of survival. A positive coefficient implies a positive impact on the survival profile of the IPO and vice-versa.

The presence of venture capital, in model I, appears to have a negative impact on the survival of the IPO, but it is only significant at the 10 percent level. As expected, being floated on an established and more rigid market, like the LSE main market, has a significant positive impact on the survival (significant at 1 percent level). The coefficient of the risk, measured as the standard deviation of the initial returns at floatation, has the right sign (i.e, negative) and yet is not significant. Similarly, the size of the IPO is not significant. Excluding M&A events from non-survival did not appear to affect the results, as shown from the coefficients estimates in model II. The only difference is that venture capital involvement is not significant as reported in model I.

Contrary to the expectation, the survival analyses showed that VC-backed IPOs have a lower probability of survival than comparable non-VC-backed IPOs. Similar results were also reported by Manigaret, Baeyens et al. (2002), on the Belgian venture capital market. These findings, however, appear to be not consistent with

Jain and Kini (2000), who found a higher survival probability for U.S. VC-backed IPOs. One possible explanation for this difference may be the shorter time frame used in this thesis, this period is relatively short. Notwithstanding this limitation, the finding provides an interesting result which can be investigated further in future studies to gain a deeper understanding and allow cross comparisons. Another possible explanation, as pointed out by Wright and Robbie (1998) is that there is a difference between the definition of venture capitalist in the two countries. In the U.K., as discussed in chapter II, venture capitalists tend to invest in late stage companies such as management buy-outs and management buy-ins. In the U.S. venture capitalists invest mainly in early stages while investments in late stages are not considered to be part of the venture capital industry. This difference may partly explain the disparity in the findings.

6.3 Summary

The results reported in this chapter are consistent with previous studies stating that both samples are significantly underpriced. However, VC-backed IPOs are less underpriced than the non-VC-backed IPOs. This finding provides further evidence to the suggestion that investors regard the presence of venture capitalists in a public offering as a form of certification that reduces the risk of the issue. This is also to say that the findings support the notion that venture capitalists' experience and capability in monitoring investments can send a vital signal to investors at the time of an IPO. Similar results were also reported on U.S. studies (see for example Barry, Musceralla et al. (1990) and Megginson and Weiss (1991).

The comparison of the long-term IPOs performance of VC-backed and non-VC-backed IPOs yielded mixed results depending on the method used to compute the abnormal returns. The cumulative average returns showed that venture capital IPOs are underperforming market portfolios whereas non-venture backed IPOs have relatively outperformed the market portfolios at the end of the 36^{th} month after floatation. On the other hand, a rather contrasting result was found using the buy and hold method as a measure of the abnormal returns. Both venture capital and non venture capital IPOs appear to outperform the market portfolios. Similar results were

also documented by Shah (1995) and Allen, Morkel-Kingsbury et al. (1999) where IPOs on average outperformed the market indices. Moreover, the long-term returns were not statistically significant at the 5 percent level. In light of the lack of statistical evidence on one hand and the contrasting long-run returns documented throughout this chapter it is hard to state that VC-backed IPOs have outperformed non-VC-backed IPOs, or vice versa, at the end of the 3 years after floatation.

The long-term returns reported in this study do not appear to be underperforming the market benchmarks in the same magnitude as documented in previous U.K. IPO studies. For instance Levis (1990) examined U.K. IPOs and reported a cumulative average return of -11 percent. Similarly, Espenlaub, Gregory et al. (2000) reassessed the U.K. long-term returns and reported, over a period of 36 months, cumulative returns, irrespective of the benchmark adopted, ranging from -15.9 percent to -28.15 percent.

Segmentation of the returns according to the market floatation showed that IPOs floated on the AIM market are more underpriced and more underperforming than IPOs floated on the LSE market. One could say that at the time of the offering, venture capitalists do add value to the offer by reducing the uncertainty documented in the literature. Regarding long-term performance, this study supports others (see among others, Brav and Gompers (1997), Fama (1998) and Espenlaub, Gregory et al. (2000)) and argues that long-term returns are highly sensitive to the methodology employed as different methods can produce astoundingly unlike results. Further studies are clearly necessary in order to shed more light on whether venture capitalists play a leading role in enhancing the long-term performance of the companies that they back. Finally, contrary to the expectation, the survival analyses showed that VC-backed IPOs have a lower probability of survival than comparable non-VC-backed IPOs.

Table 6–6 Initial returns

between the offering price at subscription and the first trading day. Panel A and Panel B respectively show the yearly distribution of the initial returns. The third column shows the initial returns, the fourth shows the FTA all share returns whereas the fourth shows the initial adjusted market returns. Panel C provides the initial adjusted market returns over the period of the study which is measured as described in equation [5-4].The t-statistics for the initial adjusted returns is computed as described in equation [5-10]. The z statistic is based on the one sample Wilcoxon signed-rank test. Panel C also provides the Kolmorgov-Smirnov test and the standard skeweness and the standard Kurtosis, which can be used to determine whether the returns are normally distributed. Panel D shows the initial adjusted returns for IPOs segmented by market at floatation

Panel A: Venture Capital Initial Returns

Year	*Number of IPOs*	*Initial raw return (%)*	*Corresponding market return (%)*	*Initial market adjusted return (%)*
1992	12	15.9809	-0.2109	16.1918
1993	37	9.9727	-0.0232	10.0109
1994	53	7.2115	-0.0367	7.2482
1995	27	21.9825	-0.1061	22.0904
1996	62	12.2787	-0.1102	12.3873

Panel B: Non-Venture Capital Initial Returns

Year	*Number of IPOs*	*Initial raw return (%)*	*Corresponding Market return (%)*	*Initial Adjusted Return (%)*
1992	12	10.1721	0.2414	9.9307
1993	25	14.2322	-0.0296	14.2618
1994	39	12.5116	0.0911	12.4204
1995	18	26.1147	-0.1607	26.2753
1996	50	14.6107	0.0628	14.5479

Panel C Initial adjusted market returns for 5 years

	VC-backed IPOs	*Non-VC-backed IPOs*
Mean	12.07%	15.02%
t-test	6.16***	5.14***
Median	9.07%	8.40%
Z-test	14688***	9006.5***
Kolmorgov-Smirnov	2.64**	2.81**
Kurtosis	47.76	17.37
Skeweness	5.08	3.61

Panel D Initial adjusted returns segmented by market at floatation

	LSE		AIM	
	VC-backed IPOs	*non-VC-backed IPOs*	*VC-backed IPOs*	*non-VC-backed IPOs*
No of IPOs	167	113	24	31
Mean	12.85%	14.32%	16.64%	17.03
t-test	2.93**	3.25**	4.2**	5.6**
Median	10.12	9.78	11.19	13.45
z-test	950**	1298**	6005**	8294

Note : *** significance at the 1% level and ** Significance at the 5 % level.

Figure 6-1 Normal Q-Q Plot of VC-backed IPOs

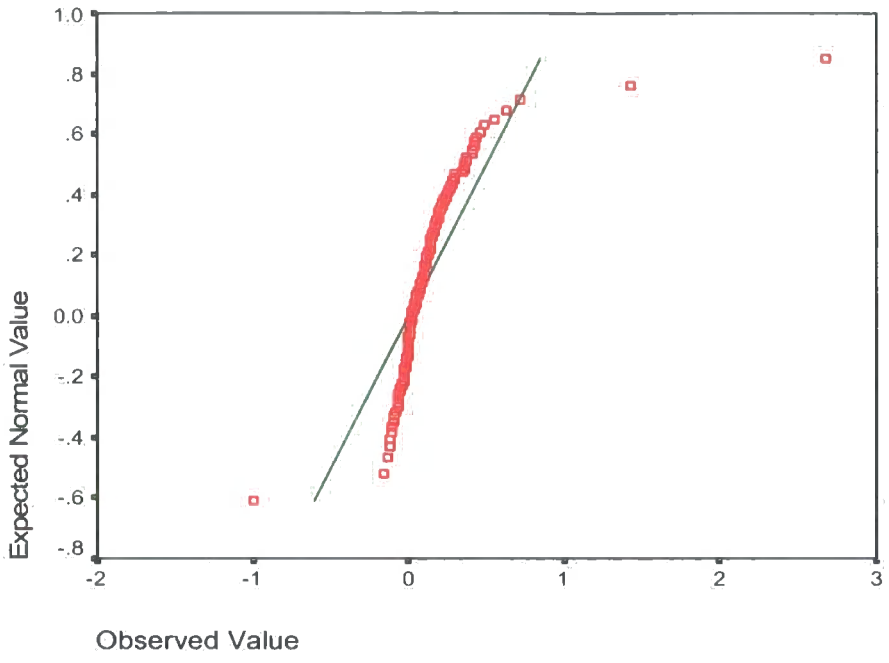


Figure 6-2 Normal Q-Q Plot of non-VC-backed IPOs

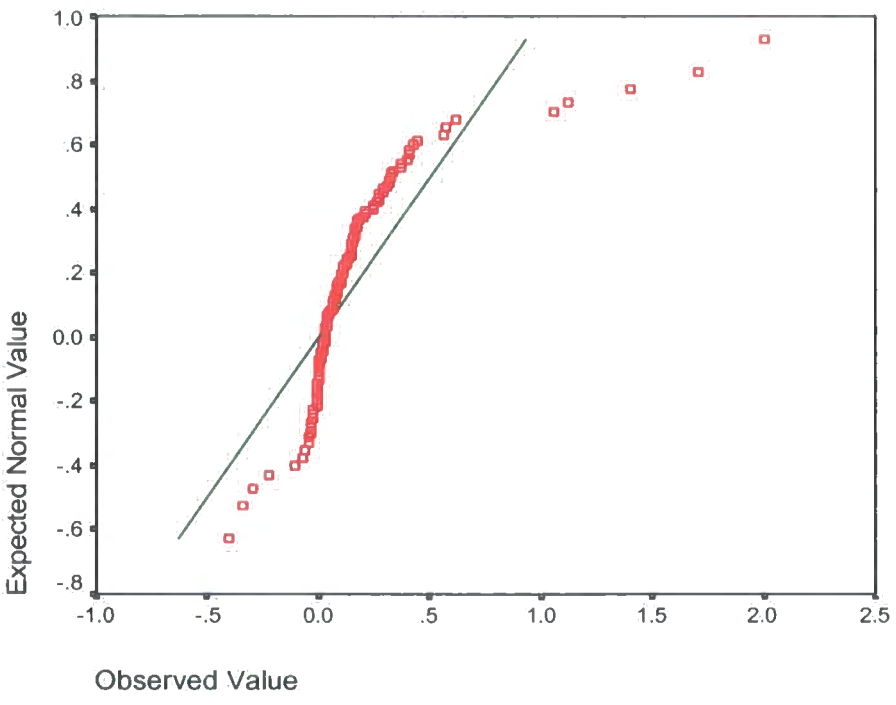


Table 6–7 Summary descriptive statistics for after market returns of IPOs

The table provides descriptive statistics of returns for 12 months, 24 months and 36 months after floatation of VC-backed and non-VC-backed IPOs. The left side of the panels shows the cumulative abnormal returns whereas the right side shows the buy and hold returns. The abnormal returns are adjusted by either the FTA all share or the HGSC benchmarks. The table includes measures of central tendency, variability and measures of shape.

Panel A 12 months cumulative returns and buy-and-hold-returns

	Cumulative returns				Buy-and-hold returns			
	VC-backed IPOs		*non-VC-backed IPOs*		*VC-backed IPOs*		*non-VC-backed IPOs*	
	FTA	HGSC	FTA	HGSC	FTA	HGSC	FTA	HGSC
Mean	-0.45%	-0.70%	4.07%	4.30%	-0.29%	0.12%	2.49%	3.94%
Median	-0.14%	-0.54%	3.76%	4.14%	-6.50%	-6.40%	-3.61%	-3.70%
Skewness	-0.8356	-0.82914	0.08796	-0.05474	3.94922	4.00631	3.11573	2.21173
Kurtosis	0.6373	0.60139	-1.53115	-0.45093	29.6325	30.8024	2.62168	2.61214
Minimum	-4.45%	-3.59%	2.73%	2.80%	-11.16%	-13.45%	-10.13%	-16.89%
Maximum	1.72%	1.10%	5.38%	5.51%	51.99%	56.10%	22.60%	21.95%

Panel B 24 months cumulative returns and buy-and-hold-returns

	Cumulative returns				Buy-and-hold returns			
	VC-backed IPOs		*non-VCbacked IPOs*		*VC-backed IPOs*		*non-VCbacked IPOs*	
	FTA	HGSC	FTA	HGSC	FTA	HGSC	FTA	HGSC
Mean	-2.90%	-2.08%	2.97%	3.87%	9.12%	12.91%	12.47%	14.92%
Median	-3.54%	-1.72%	3.45%	4.01%	-16.63%	-13.31%	-7.36%	-6.12%
Skewness	0.18886	-0.38169	-0.70496	-0.53572	4.79314	4.9762	2.3154	2.44769
Kurtosis	0.47226	-0.92894	-0.27991	-0.04418	33.4357	35.2674	2.29618	2.56086
Minimum	-7.21%	-5.83%	-0.72%	0.94%	-12.68%	-18.17%	-19.14%	-10.64%
Maximum	1.72%	1.10%	5.38%	6.35%	14.48%	53.41%	36.81%	14.64%

Panel C 36 months cumulative returns and buy-and-hold-returns

	Cumulative returns				Buy-and-hold returns			
	VC-backed IPOs		*non-VC backed IPOs*		*VC-backed IPOs*		*non-VC backed IPOs*	
	FTA	HGSC	FTA	HGSC	FTA	HGSC	FTA	HGSC
Mean	-2.60%	-1.09%	2.09%	3.32%	15.43%	16.85%	10.16%	12.25%
Median	-2.39%	-0.77%	2.08%	3.30%	-30.51%	-28.02%	-27.74%	-28.68%
Skewness	-0.10091	-0.2129	-0.01534	0.00394	4.36723	4.42089	2.92207	3.02824
Kurtosis	0.38759	-0.21266	-1.25174	-0.9363	29.6707	30.0935	11.1924	11.9134
Minimum	-7.21%	-5.83%	76.81%	0.52%	-10.22%	-12.11%	-6.33%	-9.93%
Maximum	1.72%	3.71%	5.38%	6.35%	16.90%	15.93%	17.42%	5.00%

Figure 6-3 After market adjusted returns for the period 1992-1996 (FTA)

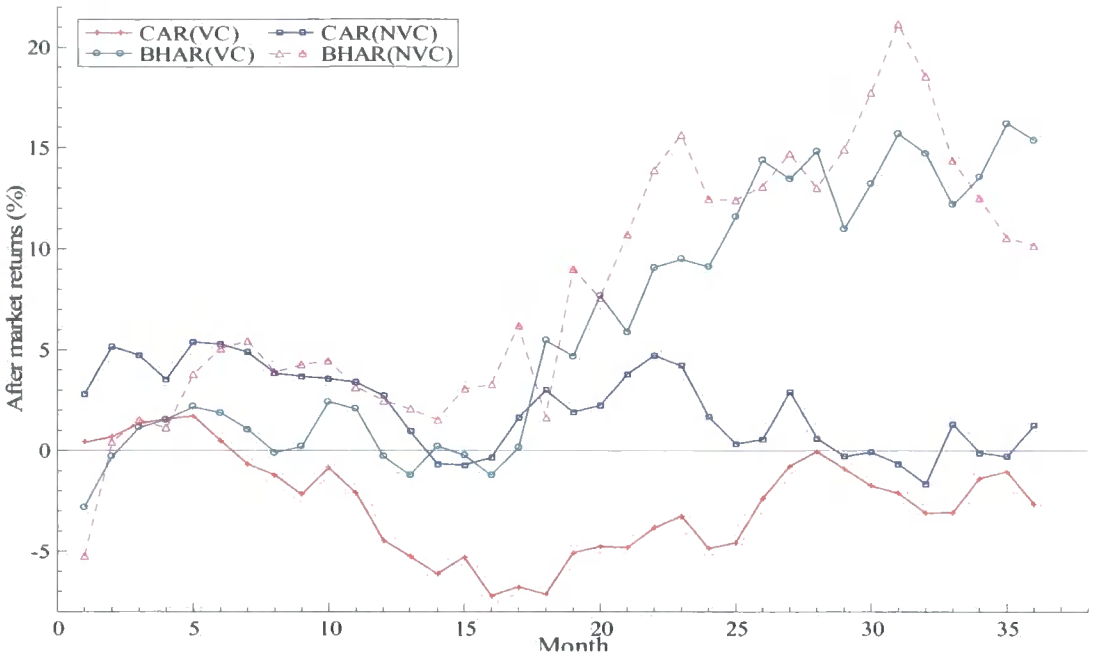


Figure 6-4 After market adjusted returns for the period 1992-1996 (HGSC)

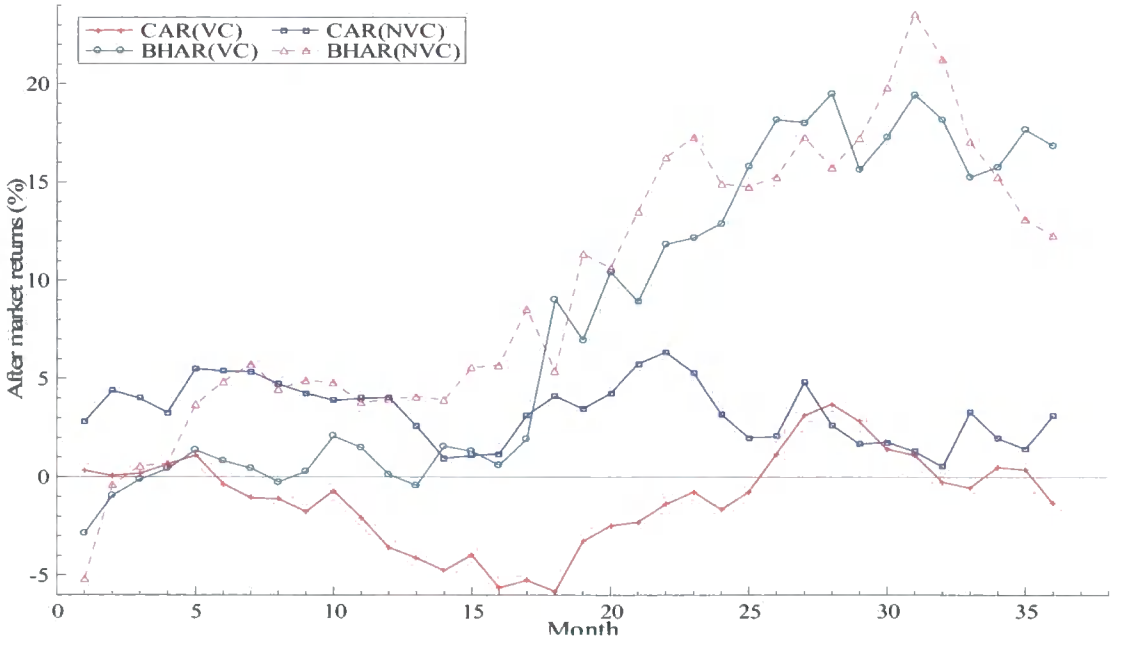


Table 6–8 long-term cumulative returns (FTA)

The table shows the results of the average market returns (ARt) and the cumulative average market adjusted returns (CARt) for the 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The FTA value weighted all shares is used as market benchmark. The average returns are computed as described in equation [5-6] and CARs are computed as described in equation [5-7]. The t-statistic is computed as described in equation [5-11] where Var is the average cross-sectional variance over 36 months and Cov is the first order auto-covariance of the average ARt series. The Var and Cov of VC-backed IPOs are 0.020666 and 0.000119 respectively. These values are 0.024388 and 0.000198 respectively for non-VC backed IPOs.

	VC-backed IPOs				Non-VC backed IPOs			
		$\overline{AR_t}$ FTA				$\overline{AR_t}$ FTA		
Month	Sample		CARt	t-CAR	Sample		CARt	t-CAR
1	191	0.4018	0.4018	0.3245	144	2.7858	2.7858	2.1407**
2	191	0.2741	0.6759	0.0368	144	2.369	5.1549	2.79***
3	191	0.6605	1.3364	0.1032	144	-0.4289	4.726	2.0855**
4	191	0.2153	1.5517	0.3104	144	-1.2049	3.521	1.3447
5	191	0.1671	1.7188	0.4851	144	1.8637	5.3847	1.8386*
6	191	-1.2359	0.4829	-0.1478	144	-0.1053	5.2794	1.6451*
7	191	-1.1624	-0.6795	-0.4011	144	-0.4125	4.867	1.4039
8	190	-0.5493	-1.2288	-0.389	144	-1.032	3.835	1.0346
9	190	-0.9564	-2.1852	-0.5863	143	-0.1591	3.6758	0.9316
10	189	1.3334	-0.8518	-0.2229	143	-0.109	3.5668	0.8575
11	189	-1.2777	-2.1296	-0.6192	143	-0.1904	3.3764	0.7739
12	186	-2.3172	-4.4467	-1.011	143	-0.6499	2.7265	0.5983
13	186	-0.808	-5.2548	-1.1197	143	-1.7529	0.9737	0.2053
14	185	-0.8739	-6.1286	-1.2391	142	-1.6311	-0.6575	-0.1331
15	184	0.8431	-5.2856	-0.996	142	-0.061	-0.7185	-0.1406
16	184	-1.9214	-7.207	-1.3657	142	0.369	-0.3495	-0.0662
17	183	0.4459	-6.7611	-1.2353	142	1.9819	1.6324	0.2999
18	181	-0.3688	-7.1299	-1.3231	142	1.3686	3.001	0.5357
19	181	2.0737	-5.0562	-0.7228	142	-1.0874	1.9136	0.3325
20	179	0.294	-4.7622	-0.5316	139	0.338	2.2516	0.3772
21	176	-0.0494	-4.8116	-0.4751	138	1.5488	3.8004	0.6191
22	175	0.9784	-3.8332	-0.2827	138	0.9276	4.728	0.7525
23	173	0.5843	-3.2489	-0.1517	136	-0.519	4.209	0.6504
24	173	-1.6055	-4.8544	-0.3178	136	-2.5269	1.6821	0.2545
25	171	0.2879	-4.5664	-0.145	136	-1.3463	0.3358	0.0498
26	171	2.1785	-2.3879	0.2125	136	0.2221	0.5579	0.0811
27	169	1.6262	-0.7618	0.5581	135	2.3683	2.9262	0.4158
28	169	0.7103	-0.0514	0.6522	134	-2.3083	0.6179	0.0859
29	165	-0.8523	-0.9037	0.4837	133	-0.9069	-0.289	-0.0394
30	165	-0.8439	-1.7477	0.2398	133	0.2098	-0.0792	-0.0106
31	161	-0.3563	-2.104	0.1803	133	-0.5714	-0.6506	-0.0857
32	159	-0.987	-3.091	-0.0427	133	-1.0066	-1.6573	-0.2147
33	159	0.0084	-3.0826	-0.0861	133	2.9578	1.3005	0.1659
34	159	1.7113	-1.3713	0.0755	133	-1.4007	-0.1002	-0.0126
35	158	0.3266	-1.0447	0.0556	133	-0.2045	-0.3047	-0.0378
36	158	-1.5882	-2.6329	-0.2016	133	1.5316	1.2269	0.1499

***, **, * Statistically significant at the 1%, 5% and 10%

Table 6–9 Long-term buy and hold returns (FTA)

The table shows the results of the buy and hold average market adjusted returns (BHARt) for 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The FTA value weighted all shares is used as market benchmark. The buy and hold average returns is computed as described in equation [5-9]. The bootstrapped adjusted skewness t-test reported below is described in equation [5-12]. The critical values at $\alpha = 5\%$ and at $\alpha = 10\%$ are reported in Appendix 8.

	VC-backed IPOs *FTA*			Non-VC-backed IPOs *FTA*		
Month	Sample	$\overline{BHAR_t}$	bootstrapped t-test	Sample	$\overline{BHAR_t}$	bootstrapped t-test
1	191	-2.7975	-2.272929519**	144	-5.253	-2.3333902**
2	191	-0.3047	-0.268848296	144	0.4259	0.1748806
3	191	1.1272	0.741128253	144	1.5215	0.6140818
4	191	1.5469	0.868019375	144	1.1177	0.455678
5	191	2.163	1.003340859	144	3.7976	1.3251006
6	191	1.8725	0.747227859	144	5.0529	1.5779126*
7	191	1.0485	0.393789674	144	5.4375	1.6240943**
8	190	-0.099	0.006357089	144	3.8875	1.212076
9	190	0.1962	0.098543029	143	4.2587	1.1702092
10	189	2.43	0.659074128	143	4.4524	1.2112481
11	189	2.0561	0.575570443	143	3.137	0.82836
12	186	-0.2915	-0.017492996	143	2.4885	0.666721
13	186	-1.2252	-0.213538673	143	2.0595	0.4906066
14	185	0.2245	0.104051972	142	1.5347	0.3335933
15	184	-0.2169	0.026538702	142	3.0611	0.5727051
16	184	-1.2188	-0.132397857	142	3.2692	0.5884427
17	183	0.1615	0.072683057	142	6.2304	1.0161511
18	181	5.4648	0.755823963	142	1.6602	0.2794553
19	181	4.69	0.703679651	142	9.0175	1.3024425
20	179	7.6978	1.00694942	139	7.5809	1.0548312
21	176	5.8921	0.7874579	138	10.7264	1.4648377*
22	175	9.0893	1.153525315	138	13.9254	1.7870829**
23	173	9.4897	1.23199716	136	15.6719	1.9868845**
24	173	9.123	1.110979125	136	12.4666	1.590228*
25	171	11.6212	1.33006923*	136	12.4408	1.4952666*
26	171	14.3868	1.621711981*	136	13.11	1.5251104*
27	169	13.4946	1.538882821*	135	14.7443	1.6197587**
28	169	14.8714	1.641531126*	134	13.03	1.3628926
29	165	11.008	1.229832148	133	14.9428	1.4432551*
30	165	13.2441	1.373761104*	133	17.7611	1.5598166*
31	161	15.7405	1.600641707*	133	21.2	1.7394208**
32	159	14.7617	1.475275255*	133	18.5659	1.5595191*
33	159	12.1922	1.203987803	133	14.4005	1.2467857
34	159	13.5692	1.26935467	133	12.528	1.100588
35	158	16.2429	1.397420034*	133	10.5686	0.8605646
36	158	15.4251	1.23816746	133	10.1633	0.7661863

**, * Statistically significant at the 5% and 10%

Table 6–10 Long-term cumulative returns (HGSC)

The table shows the results of average market returns (ARt) and the cumulative average market adjusted returns (CARt) for the 36 months after floatation, excluding the initial returns for VC-backed IPOs and non-VC-backed IPOs. The Hoare Govett Small Companies value weighted all shares is used as market benchmark. The average market returns are computed as described in equation [5-6]. The CARs are described in equation [5-7]. The t-statistic is computed as described in equation [5-11] where Var is the average cross-sectional variance over 36 months and Cov is the first order auto-covariance of the average series. The Var and Cov of VC-backed IPOs are 0.019318 and 0.000111 respectively. These values are 0.023423 and 0.000162 respectively for non-VC backed IPOs.

	VC-backed IPOs				non VC-backed IPOs			
		HGSC				*HGSC*		
Month	Sample	$\overline{AR_t}$	CARt	t-CAR	Sample	$\overline{AR_t}$	CARt	t-CAR
1	191	0.3263	0.3263	0.3245	144	2.7979	2.7979	2.1938**
2	191	-0.2739	0.0524	0.0367	144	1.5922	4.39	2.4257**
3	191	0.128	0.1804	0.1029	144	-0.4001	3.99	1.798**
4	191	0.4464	0.6268	0.3087	144	-0.719	3.2709	1.2758
5	191	0.4688	1.0957	0.4825	144	2.2411	5.512	1.9223*
6	191	-1.4613	-0.3656	-0.1462	144	-0.1416	5.3704	1.7093*
7	191	-0.7066	-1.0723	-0.3989	144	-0.013	5.3574	1.5784
8	190	-0.0426	-1.1149	-0.3879	144	-0.6497	4.7077	1.2973
9	190	-0.6674	-1.7823	-0.58	143	-0.4621	4.2456	1.0991
10	189	1.0662	-0.7162	-0.2217	143	-0.3556	3.8901	0.9553
11	189	-1.3708	-2.087	-0.6109	143	0.0998	3.9898	0.9342
12	186	-1.501	-3.5879	-1.0055	143	0.0482	4.038	0.9052
13	186	-0.5479	-4.1359	-1.1106	143	-1.4762	2.5618	0.5517
14	185	-0.6268	-4.7627	-1.2256	142	-1.6254	0.9364	0.1937
15	184	0.7889	-3.9737	-0.9878	142	0.1416	1.078	0.2154
16	184	-1.6537	-5.6274	-1.347	142	0.0844	1.1624	0.2249
17	183	0.3661	-5.2613	-1.2251	142	1.9752	3.1377	0.5888
18	181	-0.5691	-5.8304	-1.3046	142	0.982	4.1197	0.7512
19	181	2.5578	-3.2726	-0.7148	142	-0.6578	3.4618	0.6144
20	179	0.7898	-2.4828	-0.5255	139	0.7892	4.251	0.7276
21	176	0.1894	-2.2934	-0.4697	138	1.4974	5.7485	0.9566
22	175	0.8927	-1.4007	-0.277	138	0.6	6.3485	1.0322
23	173	0.6278	-0.7729	-0.149	136	-1.0577	5.2908	0.8352
24	173	-0.881	-1.6539	-0.3094	136	-2.104	3.1868	0.4925
25	171	0.8792	-0.7747	-0.1415	136	-1.1852	2.0016	0.3031
26	171	1.9326	1.1578	0.2081	136	0.0606	2.0622	0.3062
27	169	1.9594	3.1172	0.5463	135	2.7517	4.814	0.6988
28	169	0.5928	3.71	0.6385	134	-2.1572	2.6568	0.3773
29	165	-0.876	2.834	0.4703	133	-0.9775	1.6793	0.2335
30	165	-1.4054	1.4285	0.2368	133	0.103	1.7823	0.2436
31	161	-0.3228	1.1057	0.1769	133	-0.4787	1.3036	0.1753
32	159	-1.3732	-0.2675	-0.0417	133	-0.7833	0.5203	0.0689
33	159	-0.2806	-0.5481	-0.0842	133	2.8009	3.3212	0.4328
34	159	1.0358	0.4877	0.0733	133	-1.3592	1.962	0.2519
35	158	-0.122	0.3657	0.0545	133	-0.5308	1.4312	0.1811
36	158	-1.7101	-1.3444	-0.1963	133	1.6997	3.131	0.3907

***, **, * Statistically significant at the 1%, 5% and 10%

Table 6–11 Long-term buy and hold returns (HGSC)

The table shows the results of the buy and hold average market adjusted returns (BHARt) for 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The HGSC is used as benchmark. The buy and hold average returns are computed as described in equation [5-9]. The skewed adjusted bootstrapped t-test reported below is described in equation [5-12]. The critical values at $\alpha = 5\%$ and at $\alpha = 10\%$ are reported in Appendix 8.

	VC-backed IPOs *HGSC*			Non-VC-backed IPOs *HGSC*		
Month	Sample	$\overline{BHAR_t}$	bootstrapped t-test	Sample	$\overline{BHAR_t}$	bootstrapped t-test
1	191	-2.875	-2.41270051**	144	-5.2116	-2.3507888**
2	191	-0.9457	-0.8641307	144	-0.4018	-0.2026425
3	191	-0.1319	-0.09116701	144	0.5609	0.237594
4	191	0.4127	0.24765153	144	0.6602	0.279454
5	191	1.3643	0.65223831	144	3.6781	1.3142791
6	191	0.8043	0.34018705	144	4.8414	1.5374115*
7	191	0.4349	0.18664289	144	5.7472	1.7621861**
8	190	-0.2636	-0.04767304	144	4.4714	1.422045
9	190	0.2727	0.12155136	143	4.895	1.3815249
10	189	2.069	0.58061415	143	4.7758	1.3192816
11	189	1.4768	0.42886039	143	3.7688	1.0237298
12	186	0.1154	0.07501611	143	3.9424	1.0763029
13	186	-0.4398	-0.05083599	143	4.0763	0.9978404
14	185	1.5587	0.36146649	142	3.8977	0.859417
15	184	1.2936	0.30954984	142	5.5451	1.0796594
16	184	0.6059	0.16720571	142	5.6859	1.0609721
17	183	1.935	0.38322047	142	8.548	1.453213*
18	181	9.0286	1.28047891	142	5.3873	0.9308341
19	181	6.9583	1.07693356	142	11.3452	1.6954257*
20	179	10.4165	1.41604542*	139	10.6283	1.5400275*
21	176	8.9145	1.23004446	138	13.4902	1.9095756**
22	175	11.8411	1.5557457**	138	16.2511	2.1621532**
23	173	12.1579	1.63627779**	136	17.3042	2.2589125**
24	173	12.9079	1.63915851**	136	14.9209	1.9659348**
25	171	15.8103	1.89715662**	136	14.773	1.8233093**
26	171	18.1984	2.15265862**	136	15.2626	1.8195561**
27	169	18.0327	2.17476495**	135	17.2966	1.9528893**
28	169	19.518	2.28593535**	134	15.7416	1.6939113*
29	165	15.6281	1.84681376**	133	17.2412	1.7021914**
30	165	17.2966	1.88896805**	133	19.8211	1.7826656**
31	161	19.4592	2.059685**	133	23.5931	1.9791402**
32	159	18.1626	1.88421185**	133	21.2472	1.8199763**
33	159	15.2522	1.54957716*	133	17.0742	1.496259*
34	159	15.7753	1.51144507*	133	15.2501	1.3464568
35	158	17.6559	1.52786203*	133	13.0972	1.0692824
36	158	16.847	1.35439609*	133	12.2532	0.9201103

**, * Statistically significant at the 5% and 10%

Figure 6-5 Survival functions

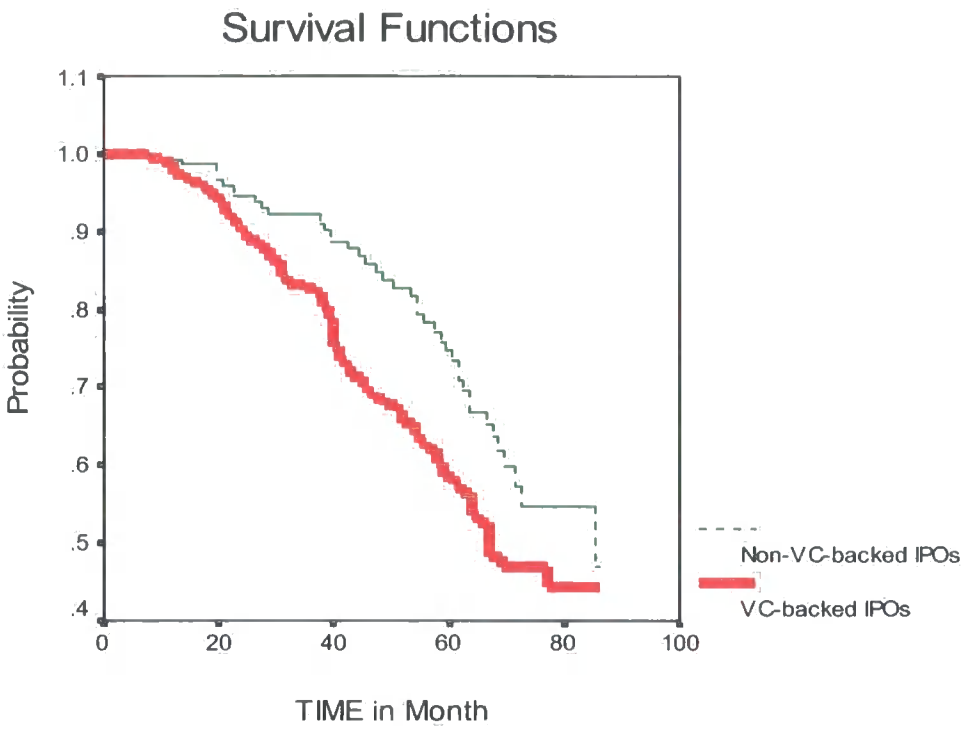


Figure 6-6 Hazard functions

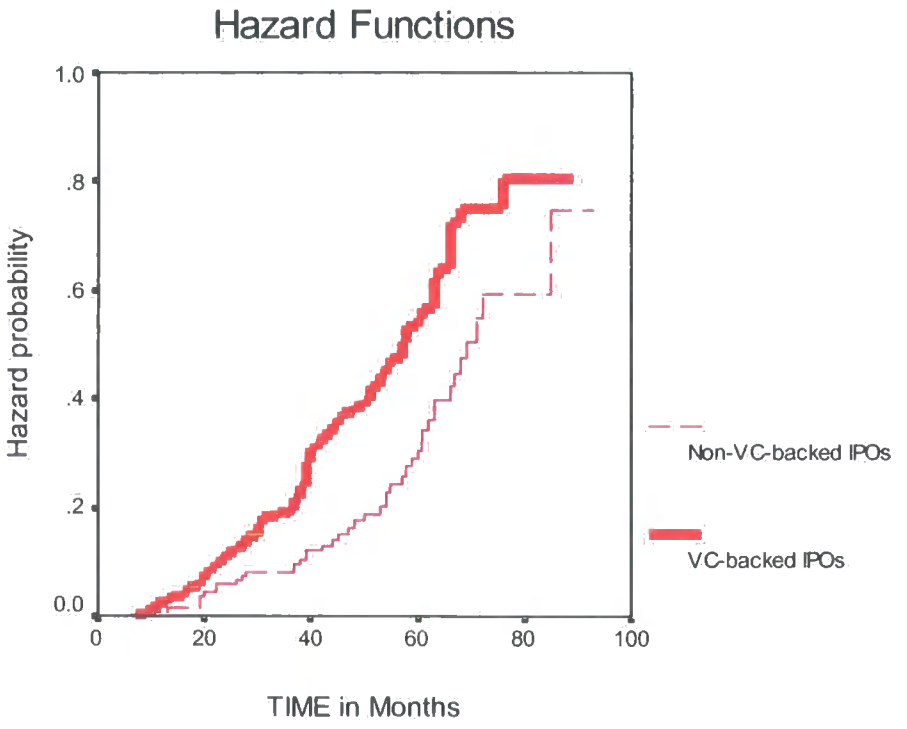


Figure 6-7 Survival functions excluding M&A

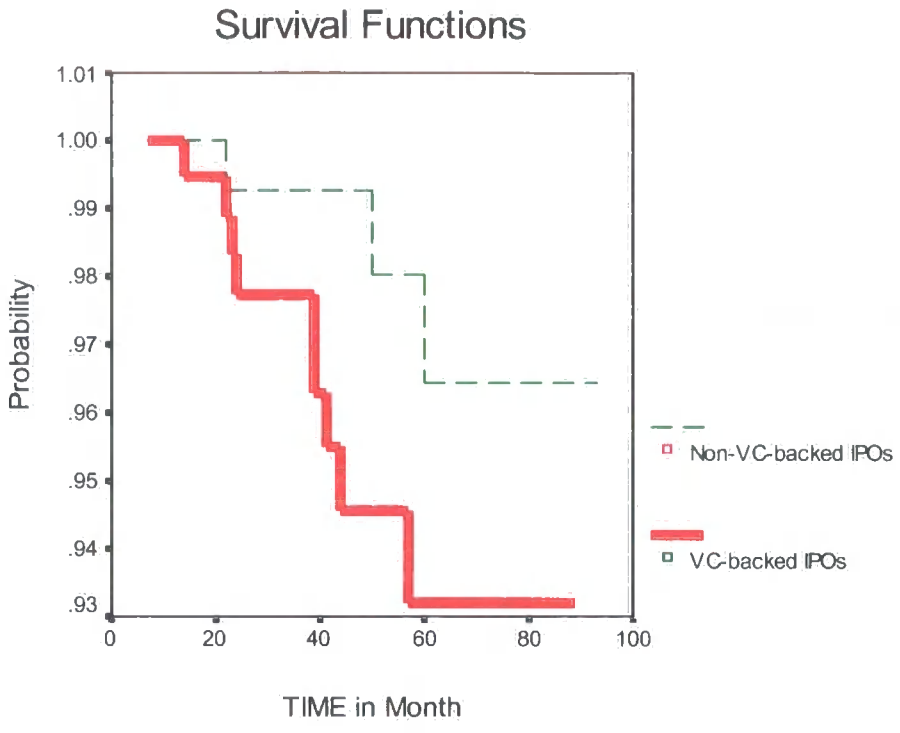


Figure 6-8 Hazard functions excluding M&A

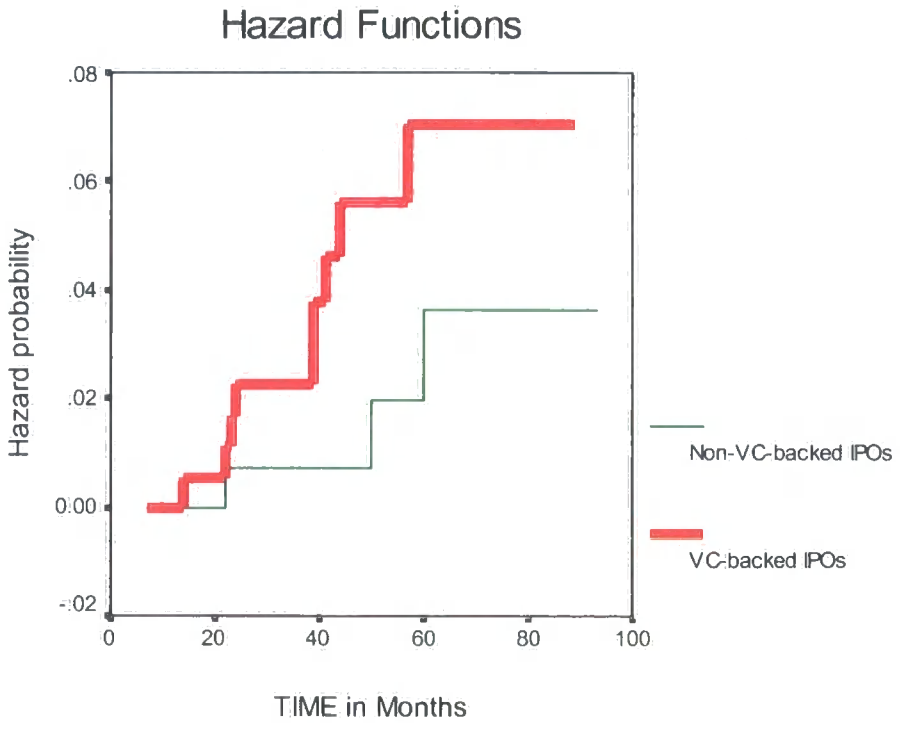


Table 6–12 The log-logistic regression results

Variables	Model I	Model II
Constant	3.5842***	3.5841***
	(-0.1156)	(-0.12622)
Risk	-0.0002	-0.0001
	(-0.0003)	(-0.0002)
DVC	-0.1605*	-0.1604
	(-0.0862)	(-0.0977)
Size	5.999E-08	5.999E-08
	(-4.12E-07)	(-4.44E-07)
LSE	0.4267***	0.4266***
	(-0.1189)	(0.131)
Sigma	0.4126***	0.4126***
	(-0.0308)	(-0.0567)
Log-likelihood	-305.7147	-272.0329

*** significant at 1 percent level
Standard deviation of coefficient estimates are between brackets

CONCLUSIONS & DISCUSSION

The objective of this study was twofold. The first aim was to investigate the impact of the involvement of venture capitalists on the performance of their portfolios. In undertaking such a task the initial public offering was chosen as a context for this study. Prior studies have documented that initial public offerings are underpriced and underperform market portfolios in the long-term. The presence of a venture capitalist at the initial public offering has been regarded as empirical evidence to test the theories advanced to explain the IPO's phenomenon. As argued, in chapter four, venture capital backed IPOs are expected to be less underpriced and outperform reference portfolios. As such, the second objective was to shed light on both underpricing and aftermarket performance.

A plethora of reasons has been put forward by researchers to explain why venture capital backed IPOs should exhibit superior performance to other IPOs. The first set of reasons is related to the nature of venture capitalists and the way in which they operate. It is argued that venture capitalists provide much more than financing for their portfolio. MacMillan, Kulow et al. (1989); Fried and Hisrich (1995) and Sapienza, Manigrat et al. (1996) argued that the role of venture capitalists includes providing business advice, monitoring, assisting venture managers in developing strategy and acting as a sounding board for the firm. Similarly, Bygrave and Timmins (1992) and Fried and Hisrich (1995) described venture capitalists as investors who take a long-term view of returns in the form of capital gains and thereby allow managers to focus on long-run issues more than is the case with alternative investors who might constantly call for short-term assessments of performance. This is similar to saying that venture capitalists through their experience and active involvement help unquoted companies to grow and perform better.

The second set of reasons is derived from the first set through it is still worth mentioning them explicitly. These reasons are related to the perception of market traders. It is argued that the latter regard the presence of venture capitalists in a public offering as a form of certification that reduces the risk of the issue at the

offering and could enhance long-term performance. The risk associated with the offering emanates from the fact that issuers and investors have different information sets concerning the value of the offering firm. Issuers are believed to have an incentive to delay the revelation of adverse information, if any, in order to sell shares at a higher price. Market traders are thought to be aware of this incentive and as a consequence they will offer a low average price for the offer at the floatation since they believe that accurate information has not been disclosed. If, however, there is a third party such as a venture capitalist with reputational capital at stake asserting the issue, the risk associated with the offer will be reduced. Venture capitalists bring companies in their portfolio to the market on an ongoing basis and hence they have a strong incentive to establish a trustworthy reputation. Market traders recognise this fact and tend to consider the companies backed by venture capitalists as less risky and therefore the information disclosed concerning the issue is believed to be more accurate. Similarly, in the aftermarket period market traders would tend to place high values on companies backed by venture capitalists. This market behaviour could be associated with the long-term perspective that venture capitalists bring to their investments. Expressed in an another way, this means that the image associated with venture capitalists lends credibility to the portfolio firm and sends positive signals to potential investors. As a consequence, it is expected that venture capital IPOs would outperform other reference portfolios in the long-term.

The majority, not to say all, of the above suggestions regarding the involvement of venture capitalists in their portfolios and the subsequent expectations on the IPO market were derived from studies on U.S. venture capital markets. No prior study has examined the effect of the presence of venture capitalists in U.K. initial public offerings. Thus the aim of this study was also to fill this gap by contributing both to the venture capitalists performance literature and to the initial public offering studies in the U.K. To establish whether the U.K. venture capitalist portfolios are regarded (by market traders) in a similar fashion as that described above in U.S. studies, a comparative study was carried out. This study compared the stock returns of two distinct samples, namely venture capital backed IPOs and non-venture capital backed IPOs, over two different periods. In the first period the initial returns of the two samples are compared. These returns are computed as the difference between the offering price and the closing price of the first trading day. In the second period the

aftermarket returns are compared. The latter are examined for a period of 36 months after floatation, where the first month is defined as the month following floatation. In doing so, the initial sample was comprised of 574 IPOs listed on the London Stock Exchange (LSE) and the Alternative Investment Market (AIM) between 1992 and 1996. The sample consisted of 231 IPOs backed by venture capitalists. After excluding all financial companies and considering only companies that were brought to the market through placement or offer for sale at a fixed price, the final sample consisted of 191 venture capital backed IPOs. In order to construct a matching sample of non venture capital backed companies, the following procedures were adopted. First, all companies which were not named in the list supplied by the British Venture Capital Association and floated either on the LSE or the AIM between 1992 and 1996 were classified as non-VC-backed IPOs. Second, the non venture capital backed IPOs were matched according to the size and the industrial classification number of the venture capital backed IPOs. Unlike prior studies, in this study size is measured as the market capital at the end of the first month after floatation rather than market capitalisation at floatation. The justification for measuring the size in this fashion stems from the overwhelming evidence that IPOs are underpriced, as documented in past studies. In addition to that, it is argued that the price of the IPO will adjust within the first weeks subsequent to floatation, reflecting its intrinsic value. Consequently, it can be said that size is better captured if measured at the end of the first month after floatation. Following this procedure 141 non venture capital backed IPOs were matched to the venture capital sample. Thus, the final sample consisted of 355 IPOs from which 191 were VC-backed IPOs and 144 were not VC-backed.

The results regarding the initial returns are consistent with previous studies. Both samples were shown to be significantly underpriced. This result implies that the underpricing can be regarded as a cost that issuers have to bear in order to enter the market regardless of whether they are risky or not risky. A comparison between venture capital backed IPOs and non venture capital backed IPOs showed that the former are less underpriced than the latter. Expressing this numerically, over the period of the study the average initial returns are respectively 12.07 percent and 15.02 percent. This may not appear to be conclusive evidence that the presence of venture capitalists in the initial public offering is regarded as a form of certification

that markedly diminishes the risk associated to the issue and hence should reduce underprincing, however these figures do appear to be in line with this notion. Barry, Musceralla et al. (1990) and Megginson and Weiss (1991) found similar results comparing samples of venture capital and non venture capital backed companies that went public on the U.S. stock exchanges.

A second interesting result appeared in this study by investigating the survival and risk profile of IPOs in the aftermarket period. Contrary to the expectation, the survival analyses showed that VC-backed IPOs have a lower probability of survival than comparable non-VC-backed IPOs. Correspondingly, the Cox hazard regression model did not show that the presence of venture capitalists have a positive impact on the survival of IPOs. In short, the survival analyses do not support the argument advanced in the literature which stipulates that venture capitalists enjoy the ability to influence and to guide the managing team on strategic resource allocation decisions that can lead to a competitive advantage and hence affect the post-IPO survival time, as pointed out by Jain and Kini (2000). It should be noted, however, that the results concerning IPOs survival, reported in this thesis, have to be treated with caution as the period covered is relatively short. To achieve a conclusive result one should consider a much longer period. Nevertheless, the low probability survival of VC-backed IPOs appears to be an interesting phenomenon that can be investigated further in future studies to gain a deeper understanding of its causes.

The long-term returns computed for the period of the 36 months following the floatation are not severely underperforming the market benchmarks used throughout this thesis. In other words, the abnormal returns of both samples are not underperforming the FTSE all share and the Hoare Govett Small Companies indices. These returns do not lend evidence to the U.K. IPO underperformance documented in prior studies (see for instance Levis (1993) and Espenlaub, Gregory et al. (2000). As there is no general consensus about the computation of the long-term returns, the latter are measured using both the cumulative average returns (CARs) and the buy and hold returns (BHRs). The former consisted in summing the average monthly returns whereas the BHRs are compounded over the period of the study. The main advantage of the BHRs is that they represent a good approximation to the returns earned and experienced by investor following a strategy of buying and holding

stocks. On the other hand, the compounded returns are severely skewed and hence the conventional parametric *t*-test can not be used to infer whether the abnormal returns are significantly different from zero. This bias does not affect the CARs in a similar magnitude as the returns are averaged and summed. Consistent with this, the central tendency tests conducted on the aftermarket returns showed clearly that the BHRs are more affected by the skewness than the CARs. It was therefore appropriate to use the skewness bootstrapped adjusted *t*-test proposed by Lyon, Barber et al. (1999) to test for the significance of the buy and hold returns. This is a modified *t*-test tailored for asymmetrical distribution based on the Edgeworth Expansion developed by Johnson (1978).

An analysis of the aftermarket returns up to one year after the floatation indicated that both samples are underperforming the market portfolios regardless of the method used to compute the returns. More specifically, in the period around and at the end of the first anniversary after the floatation the underperformance becomes acute. This underperformance appears to affect more the VC-backed IPOs than the non-VC-backed IPOs. It is argued that this period coincides with the expiry date of the ban for owners to sell their shares. As pointed out by Ritter and Welch (2002) at this point the prices fall because more public shares become available in the market. This may partly explain the short-run underperformance. However, with the data available to this study it is not possible to make a sound explanation as to why VC-backed IPOs are more affected by this underperformance in the short-run.

The comparison of the long-term IPO performance of the two samples yielded mixed results depending on the method used to compute the abnormal returns. The cumulative average returns showed that venture capital IPOs are underperforming market portfolios whereas non-venture backed IPOs have relatively outperformed the market portfolios at the end of the 36^{th} month after floatation. A contrasting result was found using the buy and hold method as a measure of the abnormal returns. Both venture capital and non venture capital backed IPOs appear to outperform the market portfolios. Neither the cumulative average returns nor the buy and hold returns are significant at the 5 percent level, albeit after adjusting for the skewness the latter are only significant at the 10 percent level in some periods.

Although there are other studies which found that IPOs are not undeperforming the reference portfolios in the long-term (see for example Shah (1995) and Allen ; Morkel-Kingsbury et al. (1999)), this is the first study which documents such a result in the U.K. As mentioned earlier, both samples did not show similar underperformance as documented in prior U.K. IPO studies. In addition to that the comparison of the long-term performance of VC-backed IPOs and non-VC-backed IPOs provided contrasting results. Based on these results it is hard to state that VC-backed IPOs have outperformed the non-VC-backed IPOs, or vice versa, at the end of the 3 years after floatation. However, the results of the long-term returns provide further evidence that the abnormal returns are highly sensitive to the methodology employed as different methods can produce different results.

In order to gain further insights on the long-term returns, IPOs were segmented according to market at floatation and abnormal returns were computed. The results showed that companies floated on the AIM market appear to be more underperforming market portfolios than companies floated on the LSE market, regardless whether these companies are backed or not venture capitalists. This finding appears to be consistent with the belief that smaller companies are more underperforming than larger companies (see for instance Ritter (1991); and Lerner and Gompers (1997)).

7.1 Implication of the results and further studies

Venture capital investment is often thought of as risk investment in unestablished companies. This understanding is mainly derived from studies on the U.S. venture capital market. A review of the U.K. venture capital market indicates that this understanding may not be entirely applicable to the British venture capital industry. As documented in chapter II, venture capital investments in the U.K. appear to be more concentrated in late stages, more precisely in management buy-ins and management buy-outs where risk is low. This suggests to some extent that there is a difference between the two markets. The role that venture capitalists play in their respective portfolios documented in the literature is derived from studies that investigated early stage companies such as seed capital and start-ups where venture capital expertise is much needed and goes beyond the provision of the financial

means. Thus it would be interesting for further studies to investigate the role of venture capital in late stage companies as it seems likely that there is a difference between the involvement of venture capitalists in these kinds of investments compared to the early stage investments. In other words, early stage investments require a lot of effort and time from the venture capitalists and their involvement is crucial. Clearly, studies investigating the involvement of venture capitalists in late stage companies are needed in order to cast some light on their relative impact on firm performance. Eventually, this will certainly help understanding and gain a wider picture about whether the presence of venture capitalists at the initial public offering matters. Although the results from this study showed that the venture capital sample is less underpriced than the non venture capital sample, the difference is not striking. Similarly, the fact that venture capitalists prefer to invest in late stage companies do not make them distinguishable from other conventional types of finance provider such as banks. This is similar to saying that investors in the British markets may not regard the presence of the venture capitalists in a similar fashion to that described in U.S. studies.

According to the reputation hypothesis presented in chapter III the risk associated with the offer could be reduced by the presence of a third party with reputational capital at stake asserting the issue. The reputation of the investment bank underwriting the issue has also been seen as a factor that could affect the underpricing of the IPOs. It would be interesting if further studies investigated whether there is an interaction between the venture capitalist and the underwriter of the issue. In other words it is unlikely that venture capitalists or underwriters act independently. For instance, it is quite possible that reputable investment bankers select to underwrite issues that are backed by venture capitalists. That is to say reputation underwriters ought to be selective in order to protect their reputation. In the same way, the presence of venture capitalists could reduce the uncertainty of the firm's value as well as the information asymmetry that occurs between the underwriters and the issuer firms. On the other hand, it could be argued that VC-backed IPOs could be underwritten by low reputable investment banks since the latter may not require a prestigious investment bank to further certify the quality of the issue. This implies that VC-backed IPOs could be underwritten either by a prestigious or low reputation investment bank. Research looking at whether there is a

difference between VC-backed IPOs underwritten by high and low reputation investment banks may shed some light on the impact of the venture capitalists on the underpricing phenomenon as in this study the results do not appear to be conclusive.

As mentioned in chapter II, the institutional investors such as pension funds are the main providers of finance to the British venture capital industry, approximately, 39 percent of investment in BVCA members between 1987 and 1998. As institutional investors are also the major investors in the stock exchange, one would expect that the latter would prefer to invest their money by holding IPOs backed by venture capitalists. Prior studies (see for instance Jain and Kini (1994)) have documented that long-term IPO performance is positively related to institutional holdings. It would be interesting for further studies to examine the interactive effects of venture capitalists and the institutional ownership on the long-term performance of IPOs instead of examining the role of these two factors independently.

7.2 Limitations of the study

There are a number of limitations associated with this study that must be acknowledged when evaluating the results. Fortunately, the limitations inevitably lead to opportunities for subsequent investigations. First the sample consists only of IPOs that were floated on the market between 1992 and 1996, it may be argued that 5 years is a short period and hence one may ask whether the results documented in this study would hold across different samples of IPOs and over longer periods. As mentioned earlier VC-backed IPOs had low probability of survival than non-VC-backed IPOs. Clearly, a larger sample is needed to gain a conclusive insight on the survival analysis documented in this study. Furthermore, this study considered only companies that were floated on the London Stock Exchange. What about companies that did not make it to the capital market? Do they exhibit higher performance than the comparable non-backed companies? According to the British Venture Capital Association (1992) trade sale is the most common exit used by U.K. venture capitalists. Thus the conclusions reached from studies based on the event study methodology provide only a partial picture of the venture capital performance. Alternative methods about performance measurement should be exploited, as the

stock-based approach methodology did not appear to provide a clear picture about whether venture capital companies are outperforming in the long-term the companies that did not receive backing from venture capital. Neither prior studies nor this study controlled for confounding events that may affect the long-term VC-backed performance. One such important event is the exit of venture capital from the company by selling the shares in the market. Further research may investigate the timing of such events and consequently examine its impact on the post exit IPO performance.

The interpretation of the long-term IPO returns have sparked an intuitive question about whether the IPOs should be treated as a separate group from the other firms already floated on the market. In other words, do market traders really regard the newly floated companies as different from the existing trading companies? Assuming that this holds then how long does it take for a so called IPO to be admitted to the club[51] (i.e., not being considered anymore as an IPO)? These are fundamental questions that should be addressed in the future when assessing the long-term IPO performance.

In spite of its limitations, this study has the potential to make contributions to knowledge primarily because it traversed uncharted territory. This is the first study that examines the impact of the involvement and the survival of venture capitalists in the U.K. IPO market. By so doing, this research has contributed to both the venture capital and the initial public offering literatures. It enhances the venture capital literature by further evaluating the value added of venture capital involvement in IPO firms. It also contributed to the initial public offerings by further shedding light on the underpricing and the long-term IPO performance. In addition to that it highlighted the main difficulties that further studies could overcome regarding data availability. Finally, it generated ideas for further investigation that may lead to broader understanding of the U.K. venture capital.

[51] Club refers to the existing companies trading in the stock exchange.

APPENDICES

8.1 Appendix 1 VC-backed IPOs characteristics

```
C*********************************************************************
C This program derives the following data from the Source file from
C the LSPD the issue date (G28, in the G records), the method of
C floatation (G8,in the G records),the issue price (G29,in the G
C records) and the first day closing price C (P3, in the P records)
C and the reasons, if any, for deletion or "type of death
C(G10, in the G records)
C*********************************************************************
C SUBROUTINE GETCOM(STR,DESC(1), DESC, CAP, DIV, U, PRI, SHCP, EPS,
C     NAM, NDESC, NCAP, NDIV, NU, NPRI, NSHCP, NEPS, NNAM,*)
C*********************************************************************
C ROUTINE TO READ IN A DESC(1)ANY RECandD
C STR  = TAPE INPUT STREAM
C DESC(1)  = DESC(1)ANY REFERENCE NUMBER
C DESC = ARRAY Fand DESCRIPTIVE DATA
C CAP= ARRAY Fand CAPITAL CHANGES
C DIV= ARRAY Fand DIVIDENDS
C U   = ARRAY Fand UNITS
C PRI= ARRAY Fand PRICES
C SHCP = ARRAY Fand SHARE CAPITAL
C EPS= EARNINGS PER SHARE
C NAM= ARRAY Fand NAMES
C NDESC= NUMBER OF DESCRIPTIVE RECandDS
C NCAP = NUMBER OF CAPITAL CHANGE RECandDS
C NDIV = NUMBER OF DIVIDENDS RECandDS
C NU  = NUMBER OF UNITS RECandDS
C NPRI = NUMBER OF PRICES RECandDS
C NSHCP= NUMBER OF SHARE CAPITAL RECandDS
C NNAM = NUMBER OF NAMES RECandDS
C * = END OF FILE
C*********************************************************************
C Declaration

    PROGRAM extract
    IMPLICIT INTEGER(A-Y)
    DIMENSION DESC(60),CAP(12,50),DIV(9,200),U(3,50),PRI(6,600)
```

```
      DIMENSION SHCP(2,50),NAM(16,40),nuv(231)
      DIMENSION EPS(4,50)
      integer i,nu
v
      DATA FIRST/0/,SEQ/0/
C*********************************************************************
      open(unit=10,file='SRCE1999',status='old')
      open(unit=11,file='VC1.dat',status='unknown')
      open(unit=12,file='Vnumero.dat',status='old')

C*********************************************************************
C Reading of the the SEDOL of VC-Backed IPOs; the SEDOL numbers
c were obtained from the Index file and sorted in "Vnumero.dat" file
 do i=1,231
     read(12,*) nuv(i)
    enddo
C*********************************************************************
C READ all Records in the source file

    DO K=1,6897
  READ (10,1000,END=70)MIN,comp,NDESC,NCAP,NDIV,NU,NPRI,NSHCP,NEPS,
  * NNAM
    READ (10,1000)MIN,comp,NDESC,NCAP,NDIV,NU,NPRI,NSHCP,NEPS,
   * NNAM
    IF(MIN.NE.-1) GOTO 80

C DESCRIPTIVE DATA
    READ (10,1005)(DESC(J),J=1,60)

C CAPITAL CHANGES
    IF(NCAP.GT.0)READ(10,1006)((CAP(I,J),I=1,12),J=1,NCAP)

C DIVIDENDS
    IF(NDIV.GT.0)READ(10,1007)((DIV(I,J),I=1,9),J=1,NDIV)

C UNITS
    IF(NU.GT.0)READ(10,1008)((U(I,J),I=1,3),J=1,NU)

C PRICES
    IF(NPRI.GT.0) READ(10,1009)((PRI(I,J),I=1,6),J=1,NPRI)
```

```
C SHARE CAPITAL
     IF(NSHCP.GT.0)READ(10,1010)((SHCP(I,J),I=1,2),J=1,NSHCP)

C NAME AND SEDOL NUMBER RECandDS
     DO 60 J=1,NNAM
      IF(NNAM.GT.0)READ(10,1012) (NAM(I,J),I=1,16)
 60   CONTINUE
C*****************************************************************
C Deriving and writing the VC-backed IPOs characteristics
   do i=1,231
      if(DESC(1).eq.nuv(i)) then
        write(11,1250) DESC(28),DESC(1),(DESC(J),J=33,41),DESC(8)
    *     ,DESC(10),DESC(29),DESC(17),PRI(4,1)
      endif
     enddo
     enddo
     close(10)
     close(11)
*****************************************************************
1000 FORMAT (I2,I5,8I4)
1002 FORMAT (I3,I5,8I4)
1003 FORMAT (I10,I3,I5,8I4)
1005 FORMAT (I5,3I3,2I2,2(I4,I2),2I5,I7,I6/,I8,
    !      3I3,6I4,I8/,I5,I3,2I6,I2,2A4,6A4/,
    !      3A4,4I9,5I2/3I2,5I8,2I2)
1006 FORMAT (2I6,2I2,I1,I6,6I5)
1007 FORMAT (4I6,3I3,I5,I6)
1008 FORMAT (I6,I2,I6)
1009 FORMAT (6I6)
1010 FORMAT (I2,I8)
1011 FORMAT (I2,3I5)
1012 FORMAT (2I4,I6,I2,2(I2,I6)/,8A4)
1013 FORMAT (2I4,'  ',I6,'  ',I2,' ',2(I2,I6)/,8A4)
1100 FORMAT (7I12)
1200 FORMAT (9I9)
1250 FORMAT (I6,4X,I6,4X,9A4,4X,I2,4X,I2,4X,I6,4X,I4,4x,I6)
3000 FORMAT(I3)
C*****************************************************************
    EN
```

8.2 Appendix 2 Industry codes derivation

```
C*********************************************************************
 This program derives the market capital (A4) of and the London tock
 stock exchange industrial classification (A11) of the VC-backed POs
 from the Archive file.

C*********************************************************************
 C Declaration
    program archives
     IMPLICIT INTEGER(A-Y)
    DIMENSION A(11,563839),nuv(315)

C*********************************************************************
    open(unit=10,file='ar96',status='old')

    open(unit=11,file='ARC1.dat',status='unknown')
    open(unit=12,file='Vnumero.dat',status='old')
 C
**********************************************************************
 Reading of the SEDOL of VC-Backed IPOs; the SEDOL numbers were
obtained from the Index file and sorted in "Vnumero.dat" file
  do k=1,231
     read(12,*) nuv(k)
     enddo

C*********************************************************************
 C Reading and deriving the data from the Archive file

 do I=1,563839
    READ(10,1000) (A(J,I),J=1,11)
    enddo

     do I=1,563839
      do K=1,216
      if(A(1,I).EQ.nuv(k)) then
      WRITE(11,10001) (A(J,I),J=1,2),A(4,I)
      endif
      enddo
```

```
      enddo
C*********************************************************************
     close(10)
     close(11)
1000 FORMAT (I6,3I9,3I6,I10,I7,I8,I4)
10001 FORMAT (I6,3I9,3I6,I10,I7,I8,I4)
C
*********************************************************************
     END
```

8.3 Appendix 3 Selection of non-VC-backed IPOs

```
C*********************************************************************
This program selects the non-VC-backed companies that were floated
in the LSE between 1992 and 1996, according to the market capital
(A4) and the London stock stock exchange industrial classification
(A11) of the VC-backed IPOs from the Archive file. This program is
for a pre-defined group (decile).
C*********************************************************************
C Declaration
    program NVC_archives
    IMPLICIT INTEGER(A-Y)
    DIMENSION A(11,46455),secnum(100)
 dimension num(865),sec(865),date(865),macap(865)
    integer kount,testnvc,nvc,quar(4)
 external testnvc
C*********************************************************************
    open(unit=10,file='ar96.dat',status='old')
    open(unit=11,file='arnv1.dat',status='unknown')
    open(unit=13,file='INDUS.dat',status='unknown')
 open(unit=14,file='arnv2.dat',status='unknown')
C*********************************************************************
C reading of the LSE industrial classification of the VC-backed IPOs
C decile. This is the industrial classification number saved in the
C vector INDUS (see section)
    do i=1,30
     read(13,2000) secnum(i)
    enddo
C*********************************************************************
      do i=1,46455
      READ(10,1000) (A(j,i),j=1,11)
   enddo
C*********************************************************************
C Find the sector classification number of all companies in the
database
 kount = 0
    do i=1,46455
  if( A(1,i).ne.A(1,I+1)) then
      kount = kount + 1
   sec(kount) = A(11,i)
```

```
      num(kount) = A(1,i)
     endif
  enddo
C*********************************************************************
C Selection of the non-VC-backed companies according to the
specified
C conditions.testnvc is a function which contains the VC-backed
C IPOs SEDOL numbers.The last part of the section writes the data of
the
C group selected in a file.
    kount = 0
    do I=1,46455
     if( A(1,i).ne.A(1,I-1)) then
      kount = kount + 1
   macap(kount) = A(4,i)
   date(kount) = A(2,i)
      if(macap(kount).gt.13 .and. macap(kount).le.19.4) then
    nvc = testnvc(num(kount))
    if(nvc.eq.1) then
     write(11,10001) num(kount),date(kount), macap(kount),sec(kount)
  do j=1,quar(1)
     if(sec(kount).eq.secnum(j)) then
     write(14,10001) num(kount), date(kount),
macap(kount),sec(kount)
     endif
  enddo
       endif
    endif
   endif
    enddo
C*********************************************************************
    close(10)
    close(11)
2000  FORMAT(I3)
1000 FORMAT (I6,3I9,3I6,I10,I7,I8,I4)
10001 FORMAT (I6,4X,I6,4X,I9,4X,I4)
    END
C*********************************************************************
C Exclude the VC-backed companies from the selection
    function testnvc(i)
    implicit none
```

```
    integer testnvc,i
    if( i.ne.VCnumero.)then
    testnvc = 1
    endif
 return
   end
```

8.4 Appendix 4 Non-VC-backed IPOs characteristics

```
C*****************************************************************
C This program derives the following data for the non-VC-backed IPOs
C from the Source file. The issue date (G28, in the G records),
C the method of floatation (G8,in the G records),the issue price
C (G29,in the G records) and the first day closing price
C (P3, in the P records)and the reasons, if any, for deletion or
C"type of death (G10, in the G records). The non-VC-backed IPOs were
C selected from the Archive file (see appendix 3). The SEDOL numbers
C of the latter were sorted in the NVC.dat to be used in this
routine.
C*****************************************************************
**
C Declaration
      PROGRAM extract
      IMPLICIT INTEGER(A-Y)
      DIMENSION DESC(60),CAP(12,50),DIV(9,200),U(3,50),PRI(6,600)
      DIMENSION SHCP(2,50),NAM(16,40),nuv(315)
C      DIMENSION EPS(4,50)
      integer i,nu
v
      DATA FIRST/0/,SEQ/0/
C*****************************************************************
      open(unit=10,file='SRCE1999',status='old')
      open(unit=11,file='NVC.dat',status='unknown')
      open(unit=12,file='nvc_nu.dat',status='old')
C*****************************************************************

C Reading of the SEDOL numbers retrieved (see Appendix 3)
 do i=1,216
       read(12,*) nuv(i)
      enddo
C*****************************************************************
**
C READ IN NO OF RECandDS
      DO K=1,6897
c      READ
(10,1000,END=70)MIN,comp,NDESC,NCAP,NDIV,NU,NPRI,NSHCP,NEPS,
c     * NNAM
```

```
      READ (10,1000)MIN,comp,NDESC,NCAP,NDIV,NU,NPRI,NSHCP,NEPS,
     * NNAM
c     print*, 'marker read'
c     WRITE (6,1003)
K,MIN,DESC(1),NDESC,NCAP,NDIV,NU,NPRI,NSHCP,NEPS,NNAM
      IF(MIN.NE.-1) GOTO 80
C DESCRIPTIVE DATA
      READ (10,1005)(DESC(J),J=1,60)
C CAPITAL CHANGES
      IF(NCAP.GT.0)READ(10,1006)((CAP(I,J),I=1,12),J=1,NCAP)
C DIVIDENDS
      IF(NDIV.GT.0)READ(10,1007)((DIV(I,J),I=1,9),J=1,NDIV)
C UNITS
      IF(NU.GT.0)READ(10,1008)((U(I,J),I=1,3),J=1,NU)
C PRICES
      IF(NPRI.GT.0) READ(10,1009)((PRI(I,J),I=1,6),J=1,NPRI)
C SHARE CAPITAL
      IF(NSHCP.GT.0)READ(10,1010)((SHCP(I,J),I=1,2),J=1,NSHCP)
C NAME AND SEDOL NUMBER RECandDS
      DO 60 J=1,NNAM
       IF(NNAM.GT.0)READ(10,1012) (NAM(I,J),I=1,16)
 60   CONTINUE
C*********************************************************************
**
C Deriving and writing the non-VC-backed IPOs characteristics
      do i=1,216
       if(DESC(1).eq.nuv(i)) then
       write(11,1250) DESC(28),DESC(1),(DESC(J),J=33,41),DESC(8)
     *  ,DESC(10),DESC(29),DESC(17),PRI(4,1)
       endif
      enddo
      enddo
      close(10)

      close(11)
      STOP
C*********************************************************************
**
1000 FORMAT (I2,I5,8I4)
1002 FORMAT (I3,I5,8I4)
1003 FORMAT (I10,I3,I5,8I4)
```

```
1005 FORMAT (I5,3I3,2I2,2(I4,I2),2I5,I7,I6/,I8,
   !      3I3,6I4,I8/,I5,I3,2I6,I2,2A4,6A4/,
   !      3A4,4I9,5I2/3I2,5I8,2I2)
1006 FORMAT (2I6,2I2,I1,I6,6I5)
1007 FORMAT (4I6,3I3,I5,I6)
1008 FORMAT (I6,I2,I6)
1009 FORMAT (6I6)
1010 FORMAT (I2,I8)
1011 FORMAT (I2,3I5)
1012 FORMAT (2I4,I6,I2,2(I2,I6)/,8A4)
1013 FORMAT (2I4,'  ',I6,'  ',I2,' ',2(I2,I6)/,8A4)
1100 FORMAT (7I12)
1200 FORMAT (9I9)
1250 FORMAT (I6,4X,I6,4X,9A4,4X,I2,4X,I2,4X,I6,4X,I4,4x,I6)
3000 FORMAT(I3)
C*****************************************************************
     END
```

8.5 Appendix 5 Name of companies included in the sample

Table 8–1 Venture capital backed IPOs

Nb	SEDOL number	Company Name		Name of the venture capitalists
1	8720	Kenwood Appliances plc	Household Appliances & Housewares	Candover
2	8723	Telegraph (The) plc	Publishing	3i
3	8724	British Biotech plc	Pharmaceuticals	Rothachild Asset Management, 3i, venture managers (PPM)
4	8725	Anglian Group plc	Building & Construction Materials	Candover
5	8730	Taunton Cider plc	Spirits, Wines & Ciders	Morgen Grenfell Dev Cap, HSBS
6	8743	Linx Printing Technologies plc	Electronic Equipment	MTI
7	8746	Wetherspoon (J D) plc	Restaurants, Pubs & Breweries	3i
8	8750	Critchley Group plc	Electrical Equipment	3i, MAM, Montagu private equity
9	8752	Hunters Armley Group plc	Printing	Yorkshire fund
10	8753	Tadpole Technology plc	Computer Hardware	3i
11	8754	National Express Group plc	Rail, Road & Freight	ECI, Natwest private equity
12	8756	International Food Machinery	Distributors, Others	3i
13	8759	Motor World plc	Vehicle Components & Assemblers	Candover
14	8765	Yorkshire Food Group plc	Food Manufacturers	Murray Johnstone Phildrew
15	8767	David Lloyd Leisure plc	Leisure	HBS private equity
16	8770	Quality Software Products plc	Software	3i, Advent
17	8772	Holliday Chemical Hldgs plc	Chemicals, Speciality	3i, Natwest private equity
18	8773	David Brown Group plc	Engineering, Diversified	Morgen Grenfell Dev Cap
19	8775	Stagecoach Holdings plc	Rail, Road & Freight	Murray Johnstone Phildrew
20	8779	Bruntcliffe Aggregates plc	Building Materials	3i
21	8783	Drew Scientific Grp plc	Medical Equipment & Supplies	Thompson Clive
22	8790	Inveresk plc	Paper	3i, Morgan grenfell, Natwest private equity
23	8791	RJB Mining plc	Leisure	Schroder
24	8797	Carpetright plc	Retailers – Soft Goods	Phildrew, Natwest private equity
25	8798	Anagen plc	Health Care	Schroder
26	8799	Metrotect Industries plc	Chemicals – Commodity	3i
27	8801	Devro plc	Food Processors	Charterhouse, 3i, Advent Intl
28	8804	Celsis International plc	Medical Equipment & Supplies	Granville
29	8810	Court Cavendish Group plc	Health Care	KBDC
30	8813	Quadramatic	Engineering – General	Granville
31	8817	Field Group plc	Packaging	Cinven

32	8830	Axis Shield plc	Medical Equipment & Supplies	Apax
33	8831	Hamlet Group plc	Distributors, Others	Causeway
34	8832	Parkdean Leisure plc	Leisure	3i, MPE
35	8833	Virtuality Group plc	Computer Services	Apax
36	8836	Scotia Holdings plc	Pharmaceuticals	Apax
37	8837	Cantab Pharmaceuticals plc	Pharmaceuticals	Abingrowth
38	8839	BSM Group plc	Education, Business Training & Employment Agencies	MGDC
39	8848	Roxboro Group plc	Electronic Equipment	Schroder
40	8849	Allders plc	Retailers – Multi Department	PPM, 3i
41	8858	Paramount Foods plc	Food Processors	3i
42	8860	Canadian Pizza Murray Johnstone	Restaurants, Pubs & Breweries	Murray Johnstone Phildrew
43	8862	Litho Supplies plc	Distributors – Other	3i
44	8864	Azlan Group plc	Computer Services	Cinven
45	8865	Badgerline group	Transport	F&C ventures
46	8870	Lilliput Group plc	Furniture & Furnishings	Lazards, North of England venture
47	8875	Firstgroup plc	Rail, Road & Freight	Na private equity
48	8883	Celltech Group plc	Pharmaceuticals	PPM, MPE, MAM
49	8892	MC Donnell Info Systems	Software	Baring, Charterhouse
50	8905	Slimma plc	Clothing & Footwear	Capital
51	8906	Coda Group plc	Computer Services	Na private equity
52	8913	Parkside International plc	Paper and Packaging	Capital
53	8921	Radstone Technology plc	Computer Hardware	3i, Apax. PPM
54	8922	Finelist Group plc	Vehicle Distribution	3i, Natwest private equity
55	8923	Chiroscience Group plc	Pharmaceuticals	Schroder
56	8924	Goldsborough Healthcare plc	Health Care	Natwest private equity
57	8932	Midland Independent Newsppr	Publishing	Candover
58	8933	Applied Distribution Group plc	Transport	CLDC,CVC
59	8934	Partco Group plc	Vehicle Distribution	Candover
60	8936	MDIS Group	Computer Services	Top technology
61	8939	United Carriers plc	Rail, Road & Freight	Phildrew,Cinven
62	8948	Domnick Hunter Group plc	Engineering – General	Granville
63	8952	Inspec Group plc	Chemicals, Speciality	Advent International
64	8953	Wainhomes plc	House Building	Cinven
65	8955	Novara plc	Retailers – Soft Goods	CLDC
66	8957	Trafficmaster plc	Rail, Road & Freight	Top technology
67	8960	Unipalm Group plc	Computer Services	3i
68	8967	Properties plc	Property	MPE, 3i
69	8971	Oxford Molecular Group plc	Pharmaceuticals	Baring, Charterhouse
70	8973	Ilion Group plc	Plantations	Natwest private equity
71	8979	Keller Group plc	Other Construction	Candover
72	8981	GRT Bus Group plc	Transport	3i
73	8983	Hamleys plc	Retailers – Hardlines	LDC,CVC
74	8985	My Kinda Town plc	Leisure Facilities	Apax, Cinven
75	8986	Vymura plc	Furniture & Furnishings	BDCL, 3i
76	8989	Healthcall	Healthcare	Electra, DLJ Phoenix

77	8992	DCC plc	Distributors – Other	3i
78	8993	Speciality Shops plc	Property	F&C ventures
79	8994	Nightfreight plc	Rail, Road & Freight	3i
80	8995	Norcor Holdings plc	Packaging	Phildrew, LDC
81	9005	Cassell plc	Publishing	Schroder, PPM
82	9006	Denby Group plc	Household Appliances & Housewares	3i
83	9009	Argent Group plc	Property	EM Warburg Pincus
84	9011	Aerostructures Hamble Hldgs	Engineering, Aerospace & Defence	L&G, Nash Sells
85	9013	UPF Group plc	Vehicle Components & Assemblers	Phildrew, LDC,BDCL
86	9014	Amey plc	Business Support Services	Close Investment
87	9019	Bloomsbury Publications plc	Publishing & Printing	ECI
88	9022	JBA Holdings plc	Software	LDC,Cinven
89	9023	UCM Group	Chemicals – Advanced Materials	3i
90	9029	EuroDollar (Holdings) plc	Transport	PPM, MGDC
91	9045	Pillar Property plc	Real Estate Holding & Development	Electra
92	9046	Chamberlain Phipps Grp plc	Textiles, Diversified	L&G
93	9050	Compel plc	Computer Services	LDC, 3i
94	9057	Ennemix plc	Building Materials	Nash Sells & Partners
95	9058	Games Workshop Group plc	Home Entertainment	Charterhouse, ECI
96	9063	Filtronic plc	Telecommunications Equipment	Advent International, Apax
97	9077	Ashbourne plc	Health Care	Electra, PPM
98	9078	Focus Dynamics plc	Engineering – General	Hambro Group
99	9091	Clydeport plc	Shipping & Ports	3i
100	9092	RAP Group plc	Distributors – Other	ABN AMRO
101	9094	RM plc	Software	3i
102	9098	MICE Group plc	Business Support Services	3i
103	9131	Zotefoams plc	Chemicals – Advanced Materials	3i, PPM, CDC
104	9135	Jazz FM plc	Broadcasting Contractors	APAX
105	9147	PTS Group plc	Builders Merchants	FIS, F&C
106	9149	Vision Group plc	Electronic Equipment	Quantum group
107	9150	Biocompatibles Intnl plc	Medical Equipment & Supplies	3i,Advent
108	9152	Precoat International plc	Steel	3i
109	9153	Rainford Group plc	Electrical Equipment	Granville
110	9157	General Cable plc	Packaging	3i
111	9163	Silk Industries plc	Other Textiles & Leather Goods	LDC, CVC
112	9167	Meconic plc	Chemicals – Speciality	Natwest private equity
113	9178	Kingsbury Group plc	Retailers, Chain Store	3i, PPM, Yorkshire fund
114	9179	Stoves plc	Household Appliances & Housewares	Candover
115	9184	Oasis Stores plc	Retailers – Soft Goods	Apax, Natwest private equity
116	9188	BTG plc	Business Support Services	Cinven, NW, KBDC
117	9192	McBride plc	Household Products	L&G, Cinven
118	9288	Creos International plc	Electrical Equipment	3i, Innovotec, Granville

119	9296	Enterprise Inns plc	Restaurants, Pubs & Breweries	Natwest private equity, L&G
120	9302	Vero Group plc	Electronic Equipment	Candover
121	9305	Tom Cobleigh plc	Restaurants, Pubs & Breweries	European Acquisition Capital
122	9314	The maiden group	Media Agencies	MGDC, 3i
123	9315	Peptide Therapeutics Group plc	Pharmaceuticals	Prelude Technology
124	9319	Cortworth plc	Engineering, Diversified	Natwest private equity
125	9321	Wilmington Group plc	Publishing & Printing	Schroder
126	9324	Gearhouse Group plc	Business Support Services	3i, Natwest private equity
127	9331	Century Inns	Restaurants, Pubs & Breweries	Schroder
128	9333	Unicorn International plc	Engineering, Diversified	Apax
129	9334	Victrex plc	Chemicals – Advanced Materials	CVC, Cinven
130	9348	Shire Pharmaceuticals Gp	Pharmaceuticals	3i, Schroder
131	9349	IOC International plc	Electronic Equipment	3i
132	9350	Streamline Holdings plc	Building Materials	CDC, Cinven
133	9358	Stadium Group plc	Engineering – General	Electra
134	9360	Macdonald Hotels plc	Hotels	RBDC, Dunedin Ventures
135	9367	Triad Group plc	Computer Services	MAM
136	9371	First Information Group plc	Publishing & Printing	3i, FIS
137	9396	FI Group plc	Computer Services	Schroder
138	9401	Cardcast plc	Business Support Services	MTI
139	9404	Active Imaging plc	Distributors Of Industrial Components & Equipment	Quester,3i
140	9425	Vanguard Medica Group plc	Pharmaceuticals	3i, Elctra
141	9426	C A Coutts Holdings	Packaging	3i
142	9436	Luminar plc	Restaurants, Pubs & Breweries	MAM
143	9442	Recognition Systems Group plc	Software	Hambro Group
144	9444	Whitecross Group plc	Healthcare	GLE, HSBS venture
145	9452	Hydro-Dynamic Products plc	Chemicals – Speciality	ECI ventures Ltd
146	9454	PPL Therapeutics plc	Pharmaceuticals	Apax, 3i, Civen
147	9457	Richmond Foods plc	Food Processors	Schroder
148	9462	City Technology Holdings plc	Electronic Equipment	3i, HSBS
149	9465	Sinclair Montrose Healthcare	Other Health Care	Abingworth
150	9468	Whittard of Chelsea plc	Food & Drug Retailers	Granville
151	9470	Jarvis Hotels plc	Hotels	Cavdover, Electra, KBDC
152	9471	Intelligent Environments Grp	Software	MT, Legal & General, Natwest private equity
153	9473	Vocalis Group plc	Software	Prelude Technology
154	9475	Circle Communications plc	Broadcasting Contractors	Gartmore Private capital
155	9477	AFA Systems plc	Software	Top technology
156	9484	Belhaven Brewery Group plc	Restaurants, Pubs & Breweries	CVC
157	9491	Allied Carpets Group plc	Retailers – Soft Goods	Cinven
158	9495	Digital Animations Group plc	Home Entertainment	3i
159	9498	Plasmon plc	Computer Hardware	Rothschild, MAM, FIS

160	9504	Treats group	Computer Hardware	3i
161	9502	Network Technology plc	Computer Hardware	3i
162	9512	Brunner Mond plc	Chemicals, Commodity	CVC
163	9513	Shalibane plc	Auto parts	3i
164	9514	Deltron Electronics plc	Plantations	FIS, LDC
165	9515	PNC Tele.com plc	Fixed-Line Telecommunication Services	F&C ventures
166	9516	Cantors	Telecommunications Equipment	Natwest private equity
167	9518	Airtech plc	Telecommunications Equipment	HBS private equity
168	9521	Ultra Electronics plc	Defence	Phildrew
169	9525	Lavendon Group plc	Business Support Services	Cinven
170	9533	Beechcroft plc	House Building	Quester
171	9534	Deep-Sea Leisure plc	Leisure Facilities	NVM, Scottish Entreprise, Dunedin
172	9536	Jardinerie Interiors Group p	Business Support Services	3i
173	9538	Britt Allcroft plc	Broadcasting Contractors	MAM
174	9540	Brands Hatch plc	Leisure Facilities	Apax
175	9542	Scottish Highland Hotels plc	Hotels	Dunedin
176	9543	Limelight plc	Retailers – Hardlines	Schroder
177	9544	Oliver Ashworth plc	Distributors Of Industrial Components & Equipment	Natwest
178	9545	Access plus	Media Agencies	Charterhouse Development
179	9547	Druid Group	Computer Services	Candover, DLj Phoenix
180	9548	Provend Group	Business Support Services	ECI, Candover
181	9553	Charterhouse Communications	Publishing & Printing	Schroder
182	9556	Car Group plc	Vehicle Distribution	Natwest
183	9559	Recycling Services Group plc	Environmental control	3i
184	9563	Semple Cochrane plc	Business Support Services	3i
185	9564	Cadcentre Group plc	Software	3i
186	9566	Parkwood Holdings	Business Support Services	3i
187	9569	Kier Group	Other Construction	Electra
188	9578	Crown Leisure plc	Gaming	Natwest
189	9579	Fountain Forestry Hldgs plc	Business Support Services	Royal Bank of scotland
190	9580	Linden plc	House Building	3i,MAM
191	9581	Xenova Group plc	Pharmaceuticals	Schroder

Table 8–2 Non Venture Capital Backed IPOs

Nb	SEDOL number	Company Name	Sector of Activity
1	8700	Rosebys plc	Retailers – Soft Goods
2	8706	Avonside Group plc	House Building
3	8707	Forth Ports plc	Shipping & Ports
4	8708	British Data Management plc	Business Support Services
5	8714	Hughes (TJ) plc	Retailers – Multi Department
6	8715	Slug & Lettuce Group plc	Restaurants, Pubs & Breweries
7	8716	Industrial Control Services Grp	Electrical Equipment
8	8718	Vega Group plc	Computer Services
9	8719	Country Casuals Hldgs plc	Retailers, Chain Store
10	8728	Quality Care Homes plc	
11	8742	Dennis Group plc	Vehicle Components & Assemblers
12	8757	OIS International Inspection	Business Support Services
13	8771	Full Circle Industries plc	Construction Materials
14	8781	Division Group plc	Software
15	8782	Capital Bars plc	Restaurants, Pubs & Breweries
16	8785	RPC Group plc	Packaging
17	8786	Phonelink plc	Publishing & Printing
18	8793	AG Holdings plc	Paper and Packaging
19	8800	Environmed plc	Medical Equipment & Supplies
20	8803	Business Post Group plc	Business Support Services
21	8829	VHE Holdings plc	Other Construction
22	8844	Crest Packaging plc	Paper and Packaging
23	8847	Abacus Polar plc	Plantations
24	8853	Dorling Kindersley Hldgs plc	Publishing
25	8855	Roxboro Group	Electronic Equipment
26	8857	Cleveland plc	Estate Holding & Development
27	8861	LITHO SUPPLIES	Distributors - Other
28	8863	WYEVALE GARDEN CENTRES	Retailers - Hardlines
29	8866	DFS Furniture plc	Retailers – Hardlines
30	8869	Northern Leisure	Leisure Facilities
31	8871	Ruberoid plc	Building & Construction Materials
32	8872	Biotrace International plc	Medical Equipment & Supplies
33	8873	Royal Doulton	Household Appliances & Housewares
34	8874	Allen	Other Construction
35	8879	On Demand Information plc	Publishing
36	8881	Primar-E plc	Computer Services
37	8884	Telspec plc	Telecommunications Equipment
38	8904	Rackwood Minerals Hldgs plc	Leisure
39	8908	CFS Group plc	Software
40	8914	Trifast plc	Plantations
41	8915	Clinical Computing plc	Software
42	8926	Cedar Group plc	Software
43	8927	Graham Group plc	Builders Merchants
44	8935	Wellington Holdings plc	Engineering – General
45	8937	Brightstone Properties plc	Property

46	8942	Waste Recycling Grp plc	Environmental control
47	8944	Beazer Group plc	House Building
48	8945	Robert Wiseman Dairies plc	Food Processors
49	8958	Groupe Chez Gerard plc	Restaurants, Pubs & Breweries
50	8972	Superscape VR plc	Software
51	8980	DRS Data & Research Service plc	Computer Services
52	8984	Go-Ahead Group plc	Rail, Road & Freight
53	8991	Redrow Group plc	House Building
54	8998	Automotive Precision Hldgs	Auto parts
55	9008	London Clubs International	Gaming
56	9010	Spargo Consulting plc	Computer Services
57	9025	CPL Aromas plc	Food Processors
58	9026	VCI plc	Publishing
59	9033	Colombus Group plc	Publishing & Printing
60	9034	Yates Brothers Wine Lodges	Restaurants, Pubs & Breweries
61	9036	InterX	Plantations
62	9041	Magnum Power plc	Electrical Equipment
63	9044	Osmetech plc	Electrical Equipment
64	9047	Copyright Promotions Grp plc	Media Agencies
65	9049	Independent Parts Group plc	Vehicle Components & Assemblers
66	9051	Ryland Group plc	Vehicle Distribution
67	9053	Fleming Natural Ressources	Geographical Specialists - Developed Markets
68	9066	Calluna plc	Computer Hardware
69	9068	Churchill China plc	Household Appliances & Housewares
70	9071	TLG plc	Electrical Equipment
71	9072	Tele-Cine Cell Group plc	Broadcasting Contractors
72	9076	JJB Sports plc	Retailers – Soft Goods
73	9079	Telewest Communications plc	Fixed-Line Telecommunication Services
74	9080	JJB SPORTS	Retailers - Soft Goods
75	9096	Advanced Medical Solutions	Medical Equipment & Supplies
76	9102	Hill Hire plc	Rail, Road & Freight
77	9126	LIBERfabrica	Publishing & Printing
78	9130	GET Group plc	Electrical Equipment
79	9138	Dailywin Group	Household Appliances & Housewares
80	9140	Datrontech Group plc	Plantations
81	9151	Coral Products plc	Packaging
82	9162	Gradus Group plc	Building Materials
83	9180	Character Group plc	Media Agencies
84	9213	Consolidated Coal plc	Leisure
85	9217	Hay & Robertson plc	Clothing & Footwear
86	9221	Media Business Group plc	Media Agencies
87	9231	Universal Salvage plc	Business Support Services
88	9280	Ask Central plc	Restaurants, Pubs & Breweries
89	9282	Morrison Construction Group plc	Other Construction
90	9297	Heritage Bathrooms plc	Furniture & Furnishings
91	9299	Viewinn plc	Publishing
92	9311	Gardner (L) Group plc	Engineering – General
93	9317	CMG plc	Computer Services
94	9329	Polymasc Pharmaceuticals plc	Pharmaceuticals
95	9340	Ballynatray Hldgs plc	Property
96	9343	MediaKey plc	Publishing & Printing
97	9352	Visual Action Holdings plc	Broadcasting Contractors
98	9363	Fulmar plc	Publishing & Printing
99	9376	ILP Group plc	Packaging

100	9380	Systems Integrated Research plc	Publishing & Printing
101	9382	Dicom Group plc	Plantations
102	9389	Harvey Nichols Group plc	Retailers – Multi Department
103	9390	La Senza plc	Retailers, Chain Store
104	9406	Dairy Crest plc	Food Processors
105	9412	London & Edinburgh Publishg	Publishing & Printing
106	9415	Millennium & Copthorne Hotels plc	Hotels
107	9416	Phytopharm plc	Pharmaceuticals
108	9417	Sira Business Services plc	Business Support Services
109	9418	Stentor plc	Fixed-Line Telecommunication Services
110	9423	Reflec plc	Chemicals – Speciality
111	9424	Maiden Group plc	Media Agencies
112	9429	Premier Group plc	Education, Business Training & Employment Agencies
113	9431	Thomas Potts plc	Publishing & Printing
114	9448	Carisbrooke Shipping plc	Shipping & Ports
115	9458	Theo Fennell plc	Furniture & Furnishings
116	9460	Fibernet Group plc	Fixed-Line Telecommunication Services
117	9466	Staffware plc	Software
118	9467	Solid State Supplies plc	Electrical Equipment
119	9469	Pace Micro Technology plc	Electrical Equipment
120	9481	Pordum Foods plc	Food & Drug Retailers
121	9482	Lotteryking Holdings plc	Gaming
122	9488	Alizyme plc	Pharmaceuticals
123	9490	UNO plc	Retailers – Hardlines
124	9496	Robert Walters plc	Education, Business Training & Employment Agencies
125	9497	Atkins (WS) plc	Business Support Services
126	9500	AND International Publishers	Publishing
127	9508	Sopheon plc	Software
128	9510	Weeks Group plc	Business Support Services
129	9511	AEA Technology plc	Business Support Services
130	9519	Interoute Telecom plc	Packaging
131	9520	Oriental Restaurant plc	Restaurants, Pubs & Breweries
132	9531	John David Sports plc	Retailers – Soft Goods
133	9535	Mondas plc	Software
134	9539	Beaufort Group plc	Business Support Services
135	9541	Majestic Wine plc	Food & Drug Retailers
136	9546	Barrasford Holdings	Property
137	9554	Future Integrated Telephony	Fixed-Line Telecommunication Services
138	9555	Advanced Power Components	Electrical Equipment
139	9557	Minerva plc	Real Estate Holding & Development
140	9567	Colt Telecom Group	Fixed-Line Telecommunication Services
141	9568	SDX Business Systems plc	Electrical Equipment
142	9570	Oxford Biomedica plc	Pharmaceuticals
143	9571	Yeoman Group plc	Computer Hardware
144	9585	Sunderland A F C	Leisure Facilities

8.6 Appendix 6 Monthly returns derivation

```
C*********************************************************************
This program derives the monthly returns. The SEDOL numbers of the
IPOs are sorted in the file 'number.dat'.

C*********************************************************************
C Declaration
    program return
    IMPLICIT INTEGER(A-Y)
    DIMENSION ZRET(540),DATES(540),MCAP(45),nu(198)
    integer year,month,nu,N
    parameter (N=198)
    CHARACTER RNAME*32
C*********************************************************************
    open(unit=12,file='RETS1999',status='old')
    open(unit=13,file='vcr.dat',status='unknown')
    open(unit=14,file='number.dat',status='old')
C*********************************************************************

C Read the files 'number.dat' and the file 'RETS1999'
 do i=1,N
 read(14,3000) nu(i)
 enddo
 close(14)
     do kk=1,7146
      Read(12,100) comp,SEDOL,RNAME,DTI,FREQ,START
   *  ,END,NOBS,SAMP,INDY,
   *   MVAL,NTRADE,FTPR,DYLD,PER,DMARK,NETASS,VELOCITY,
   *  (ZRET(J), J=1,540),(DATES(J), J=1,540)
   *   ,(MCAP(K), K=1,45)

    do ii=1,N
     if(comp.eq.nu(ii)) then
       do i=1,540
```

```
C*********************************************************************
C The below section compute the year and the month corresponding to
Cthe company i
C*********************************************************************
        year= 1955 + int(i/12)
        month= mod(i,12)
        if(month.eq.0) then
         month=12
         year=year-1
        endif

C ************************************************************
C The section below derive the monthly series (ZRET). The series
C are organised in blocks. The first line of the block provides
C the SEDOL number of the company, the remainder of the block
C contains a matrix where the first column refers to the year,
C the second column gives the month and the third column provides
C the monthly returns.
C************************************************************
        if(year.gt.1991) then
         write(13,300) year,month, ZRET(i)
        endif
       enddo
   endif
   enddo
   enddo
C ************************************************************


       close(12)
    close(13)
100  format(2I8,A32,15I8,540F8.4,540I2,45I5)
200  format('company name',' ',A32)
300  format(2I5,4X,F8.4)
400  format(12X,I8)
600  format(3I8)
900  format(A32,2x,I8,2x,I8,2x,I8)
2000  format(2I5)
3000  format(I4)
C ************************************************************
    END
```

8.7 Appendix 7 Excel's Macro

```
Sub copy()
'
' copy Macro
' Macro recorded by Yacine
' This is macro organises the monthly series derived from appendix 5
by columns
' in Excel
Dim x, y, z As Integer
Dim a As Integer
Dim b As Integer

a = InputBox("Enter the final row number please", "Final Row", 1)
z = InputBox("Enter the column reference please", "row selection",
1)
x = 1
y = 97
b = 1

Do
  Sheets("data").Select
  Range(Cells(x, z), Cells(y, z)).Select
  Selection.copy
  Sheets("results").Select
  Cells(1, b).Select
  ActiveSheet.Paste
  Sheets("data").Select
  x = x + 97
  y = y + 97
  b = b + 1

Loop Until x > a

End Sub
```

8.8 Appendix 8 Bootstrappe's algorithm

```
C*********************************************************************
 This program is run on the statistical software R. It computes the
critical values of the bootstrapped skeweness adjusted t-statistic
for alpha = 5 percent

C*********************************************************************
function (fy, alpha = 0.05)
{
  yd = read.table(fy, sep = ",", header = T, na.strings = "M")
  t = c()
  for (j in 1:dim(yd)[2]) {
    yy = yd[, j]
    yy = yy[!is.na(yy)]
    S = mean(yy)/var(yy)^0.5
    L = sum((yy - mean(yy))^3)/(length(yy) * var(yy)^1.5)
    T = sqrt(length(yy)) * (S + L * S^2/3 + L/(6 * length(yy)))
    tsb = c()
    for (i in 1:1000) {
      zz = sample(yy, length(yy)/4)
      Sb = (mean(zz) - mean(yy))/var(zz)^0.5
      Lb = sum((zz - mean(zz))^3)/(length(zz) * var(zz)^1.5)
      Tb = sqrt(length(zz)) * (Sb + Lb * Sb^2/3 + Lb/(6 *
        length(zz)))
      tsb = c(tsb, Tb)
    }
    stsb = sort(tsb)[c(alpha/2 * 1000, (1 - alpha/2) * 1000)]
    t = rbind(t, c(length(yy), T, stsb, T < stsb[1] || T >
      stsb[2]))
  }
  t
}
```

8.9 Appendix 9 bootstrappe critical values

Table 8–3 Venture capital sample bootstrapped critical value at α = 5 percent

	FTA as benchmark		HGSC as benchmark	
Month	*Lower*	*Uper*	*Lower*	*Uper*
1	-1.66346	3.672571	-1.73627	3.800193
2	-1.8809	2.047892	-1.925545	2.173247
3	-2.06413	1.866866	-1.92652	1.879588
4	-2.01289	2.102024	-2.029697	1.795362
5	-2.17645	1.786811	-2.142735	1.675763
6	-2.18976	1.763032	-2.158132	1.785742
7	-2.17991	1.734418	-2.256149	1.566793
8	-2.18811	1.778132	-2.203372	1.625055
9	-2.33692	1.734173	-2.311558	1.721188
10	-2.57594	1.600933	-2.525914	1.621223
11	-2.25387	1.65171	-2.282098	1.642598
12	-2.33866	1.626549	-2.502189	1.640477
13	-2.27714	1.672013	-2.406296	1.699573
14	-2.48223	1.625939	-2.374043	1.694842
15	-2.24918	1.63957	-2.308458	1.536934
16	-2.1364	1.618878	-2.282853	1.537905
17	-2.04565	1.698024	-1.987682	1.750874
18	-2.64335	1.700221	-2.545572	1.558151
19	-2.2649	1.471445	-2.515839	1.600819
20	-2.37428	1.636755	-2.744798	1.615269
21	-2.33016	1.654976	-2.584143	1.568601
22	-2.41178	1.646358	-2.544616	1.497526
23	-2.46727	1.569227	-2.258364	1.553903
24	-2.59201	1.631633	-2.743845	1.54029
25	-2.55736	1.531377	-2.4034	1.548754
26	-2.39461	1.632882	-2.596067	1.449332
27	-2.55864	1.577288	-2.451127	1.705021
28	-2.22123	1.691413	-2.250756	1.64332
29	-2.09935	1.530289	-2.087687	1.797935
30	-2.433	1.72249	-2.213409	1.538138
31	-2.3009	1.60151	-2.364829	1.533482
32	-2.10226	1.691796	-2.123454	1.534859
33	-2.04742	1.607781	-2.221818	1.587288
34	-2.15484	1.529322	-2.0741	1.665889
35	-2.25494	1.595057	-2.365129	1.573532
36	-2.19741	1.634749	-2.108028	1.527194

Table 8–4 Venture capital sample bootstrapped critical value at α = 10 percent

	FTA as benchmark		HGSC as benchmark	
Month	*Lower*	*Uper*	*Lower*	*Uper*
1	-1.34894	3.302541	-1.36962	3.634894
2	-1.5968	1.751464	-1.48254	1.741584
3	-1.56542	1.53201	-1.62505	1.461157
4	-1.61474	1.584359	-1.67883	1.41191
5	-1.85416	1.431526	-1.90884	1.484393
6	-1.74658	1.472753	-1.73995	1.501464
7	-1.83863	1.502457	-1.87309	1.502605
8	-1.6998	1.509729	-1.7898	1.495878
9	-1.83682	1.395239	-1.92705	1.348638
10	-1.93644	1.455551	-2.1052	1.428591
11	-1.96704	1.515098	-1.9275	1.491806
12	-1.83118	1.411041	-2.05469	1.536499
13	-1.70714	1.455735	-2.0268	1.36883
14	-2.07291	1.362942	-2.13971	1.348651
15	-1.92583	1.335506	-1.94471	1.415604
16	-1.94611	1.418776	-1.92025	1.437045
17	-1.89828	1.410859	-1.78885	1.431788
18	-2.06913	1.334226	-2.20482	1.349181
19	-1.8448	1.373645	-2.18905	1.41721
20	-2.1107	1.430712	-2.26913	1.402734
21	-2.14128	1.380467	-2.18354	1.334796
22	-2.01202	1.343932	-2.16965	1.315486
23	-2.13039	1.334075	-2.09087	1.429617
24	-2.16977	1.38144	-2.3137	1.452192
25	-2.15335	1.261538	-2.26529	1.329022
26	-2.1018	1.319804	-2.10171	1.29691
27	-2.17008	1.289812	-1.83667	1.347665
28	-2.03538	1.362086	-1.93554	1.347459
29	-1.89587	1.421336	-1.85789	1.410679
30	-1.75904	1.291732	-1.73089	1.448882
31	-1.64412	1.364625	-1.9368	1.392512
32	-1.85578	1.472966	-1.94782	1.432349
33	-1.8095	1.412734	-1.80998	1.353204
34	-1.83807	1.303757	-1.61914	1.415268
35	-1.8999	1.371831	-1.80522	1.383591
36	-1.88693	1.34013	-1.97848	1.34067

Table 8–5 Non-venture capital sample bootstrapped critical value at α = 5 percent

	FTA as benchmark		HGSC as benchmark	
Month	*Lower*	*Uper*	*Lower*	*Uper*
1	-1.57453	4.221136	-1.64893	5.214035
2	-2.04204	2.375674	-1.84134	2.808848
3	-2.32587	1.896192	-2.35673	1.927908
4	-2.20374	2.037307	-2.08683	1.946548
5	-2.641	1.65196	-2.49389	1.615167
6	-2.45967	1.62399	-2.63896	1.603615
7	-2.32445	1.579833	-2.60486	1.703305
8	-2.20276	1.576624	-2.17034	1.488508
9	-2.22182	1.638157	-2.24667	1.634464
10	-2.1333	1.678774	-1.95947	1.670476
11	-2.06747	1.672472	-2.06263	1.708118
12	-1.87049	1.75003	-2.06991	1.871911
13	-2.042	1.613911	-2.20136	1.653457
14	-1.94155	1.773755	-2.13723	1.643658
15	-2.30747	1.809973	-2.18861	1.739955
16	-2.1755	1.743949	-2.16238	1.743978
17	-2.12767	1.783617	-2.2282	1.705151
18	-1.76072	1.653072	-1.96475	1.64158
19	-2.05509	1.729349	-2.14599	1.713026
20	-2.05784	1.69213	-1.92309	1.58589
21	-1.80716	1.585903	-2.20161	1.583031
22	-2.20565	1.737413	-1.9181	1.602412
23	-2.04279	1.695059	-2.10179	1.642717
24	-1.9798	1.649986	-1.97657	1.476816
25	-2.07928	1.759466	-2.28016	1.677315
26	-2.21552	1.641174	-1.98677	1.732211
27	-2.22122	1.604512	-2.10938	1.652461
28	-2.23586	1.704604	-2.33996	1.724121
29	-2.32218	1.629975	-2.33981	1.671647
30	-2.46792	1.560317	-2.31229	1.669883
31	-2.68054	1.602837	-2.44015	1.584619
32	-2.394	1.563444	-2.54887	1.610012
33	-2.31169	1.572536	-2.18606	1.601614
34	-2.15423	1.697552	-2.32877	1.644028
35	-1.95284	1.541374	-2.15985	1.708731
36	-2.88412	1.528168	-2.62751	1.5703

Table 8–6 Non-venture capital sample bootstrapped critical value at α = 10 percent

	FTA as benchmark		HGSC as benchmark	
Month	*Lower*	*Uper*	*Lower*	*Uper*
1	-1.4113	1.455344	-1.395411	1.339162
2	-1.43968	2.322143	-1.547378	2.221941
3	-2.06024	1.763542	-1.918594	1.659173
4	-1.77683	1.701359	-1.81828	1.738794
5	-2.08742	1.605007	-2.161217	1.442505
6	-2.04562	1.445172	-2.347661	1.370171
7	-1.79455	1.497086	-2.078054	1.451109
8	-1.72457	1.399861	-1.581527	1.463242
9	-1.86491	1.438647	-1.838747	1.426357
10	-1.62651	1.513151	-1.729765	1.440877
11	-1.71786	1.447261	-1.69376	1.443765
12	-1.54195	1.444218	-1.445047	1.466242
13	-1.76477	1.491834	-1.547893	1.433199
14	-1.54208	1.383664	-1.651967	1.442534
15	-1.68687	1.354074	-1.872324	1.477393
16	-1.68535	1.353637	-1.760569	1.410785
17	-1.76967	1.421677	-1.673649	1.434351
18	-1.44246	1.451301	-1.509751	1.346648
19	-1.73096	1.567864	-1.686009	1.46991
20	-1.66644	1.354338	-1.669233	1.467636
21	-1.66499	1.386189	-1.655612	1.298851
22	-1.65119	1.468418	-1.621937	1.41484
23	-1.56568	1.48665	-1.499884	1.433938
24	-1.59471	1.49448	-1.739079	1.384411
25	-1.76058	1.417429	-1.787182	1.380381
26	-1.87376	1.450625	-1.75031	1.417141
27	-1.99619	1.390567	-1.747234	1.40448
28	-1.93862	1.415353	-1.729015	1.389318
29	-1.94285	1.396427	-1.98673	1.328017
30	-2.03588	1.404815	-2.047885	1.452504
31	-2.15553	1.388361	-1.952097	1.375329
32	-1.88006	1.366893	-1.887675	1.365567
33	-1.83235	1.450916	-1.822783	1.398214
34	-1.75607	1.346876	-1.762734	1.396171
35	-1.7371	1.357549	-1.674746	1.369915
36	-1.97257	1.443073	-1.872189	1.323387

8.10 Appendix 10 LSPD's delisting codes

Table 8–7 Codes and reasons of why a security ceased to be quoted

5	Acquisition/takeover/merger
6	Suspension/cancellation with shares acquired later. Meanwhile, may be traded under rule 163(2)
7	Liquidation (usually valueless, but there may be liquidation payments)
8	Quotation cancelled (maybe suspended initially) as company becomes a private company, or there is insufficient trading in the shares. Dealings continue under rule 163(2) or (3)
9	As for 8, but no dealings under rule 163
10	Quotation suspended – if suspended for more than three years, this may lead to automatic cancellation
11	Voluntary liquidation, where value remains and was / is being distributed
12	Changed to foreign registration
13	Quotation cancelled for reason unknown. Dealings continue under rule 163(2) or (3)
14	As for 13, but no dealings under rule 163
15	Converted into an alternative security for the same company
16	Receiver appointed/liquidation. Probably valueless, but not yet certain
17	Unitisation of an investment or financial trust
18	Nationalisation
19	Enfranchisement
20	In Administration/Administrative receivership
21	Cancelled and assumed valueless

8.11 Appendix 11 Results of IPOs listed on the main market (LSE)

Table 8–8 LSE long-term cumulative returns (FTA)

The table shows the results of the average market returns (ARt) and the cumulative average market adjusted returns (CARt) for the 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The FTA value weighted all shares is used as market benchmark. The average returns are computed as described in equation [5-6] and CARs are computed as described in equation [5-7]. The t-statistic is computed as described in equation [5-11] where Var is the average cross-sectional variance over 36 months and Cov is the first order auto-covariance of the average ARt series. The Var and Cov of VC-backed IPOs are 0.18277 and 0.000114 respectively. These values are 0.16686 and 000241 respectively for non-VC backed IPOs.

	VC-backed IPOs				Non-VC backed IPOs			
		FTA				FTA		
Month	Sample	$\overline{AR_t}$	CARt	t-CAR	Sample	$\overline{AR_t}$	CARt	t-CAR
1	167	1.05	1.05	0.9991	113	2.82	2.82	2.315**
2	167	-0.1	0.96	0.6415	113	1.35	4.17	2.404**
3	167	0.26	1.21	0.6622	113	0.15	4.31	2.027**
4	167	0.04	1.24	0.5875	113	-0.55	3.76	1.531**
5	167	0.47	1.71	0.7243	113	2.3	6.05	2.201**
6	167	-0.81	0.9	0.3469	113	0.97	7.02	2.33**
7	167	-1.07	-0.18	-0.0615	113	-0.97	6.06	1.86*
8	167	-0.37	-0.54	-0.1815	113	-2.26	3.81	1.0921
9	167	-0.67	-1.21	-0.3824	113	0.81	4.61	1.2485
10	166	1.77	0.57	0.1681	113	0.88	5.49	1.4084
11	166	-1.12	-0.56	-0.1582	113	-0.42	5.07	1.2418
12	164	-1.8	-2.35	-0.6385	113	-0.53	4.55	1.0662
13	164	-0.9	-3.24	-0.8459	113	0.36	4.9	1.1036
14	163	0.02	-3.23	-0.8099	113	-0.83	4.08	0.8837
15	162	1.26	-1.98	-0.4766	110	1.28	5.35	1.1051
16	162	-1.83	-3.8	-0.8875	109	0.55	5.89	1.1743
17	161	1.15	-2.66	-0.6003	109	4.41	10.3	1.991**
18	159	0.08	-2.58	-0.5623	109	2.15	12.44	2.338**
19	159	1.73	-0.85	-0.1803*	109	-0.27	12.18	2.226**
20	157	-0.06	-0.9	-0.1849*	109	0.79	12.96	2.31**
21	155	0.12	-0.78	-0.1557*	109	1.51	14.46	2.515**
22	154	0.87	0.09	0.0174*	109	1.64	16.09	2.735**
23	153	0.86	0.95	0.1799*	108	-1.68	14.41	2.384**
24	152	-0.75	0.21	0.0375	107	-2.52	11.9	1.9178*
25	151	0.62	0.83	0.1484	107	-1.35	10.56	1.6668*
26	151	2.75	3.57	0.6316	107	0.4	10.95	1.6955*
27	149	1.32	4.89	0.8436	107	1.95	12.89	1.9591*
28	149	1.4	6.28	1.0645	107	-1.31	11.59	1.7293*
29	146	-0.55	5.74	0.9457	107	-0.64	10.95	1.6055*
30	146	-0.73	5.01	0.8118	107	0.31	11.25	1.6223*
31	143	-0.27	4.75	0.7491	107	-1.45	9.81	1.3909*
32	141	-1.2	3.55	0.5479	107	-2.13	7.68	1.072
33	141	-0.52	3.04	0.4613	107	-1.45	6.24	0.8574
34	141	0.35	3.39	0.5066	107	-1.76	4.48	0.6068
35	140	0.58	3.96	0.582	107	-0.73	3.76	0.5012
36	140	-1.76	2.21	0.32	107	1.29	5.04	0.6635

***, **, * Statistically significant at the 1%, 5% and 10%

Table 8–9 LSE long-term buy and hold returns (FTA)

The table shows the results of the buy and hold average market adjusted returns (BHARt) for 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The FTA value weighted all shares is used as market benchmark. The buy and hold average returns is computed as described in equation [5-9]. The bootstrapped adjusted skewness t-test reported below is described in equation [5-12].

	VC-backed IPOs *FTA*			Non-VC-backed IPOs *FTA*		
Month	Sample	$\overline{BHAR}_t$	bootstrapped t-test	Sample	$\overline{BHAR}_t$	bootstrapped t-test
1	167	-0.83	-0.717	113	0.94	0.474
2	167	1.05	1.046	113	3.3	1.856
3	167	1.56	1.053	113	3.71	1.852**
4	167	1.93	1.064	113	4.2	2.198**
5	167	2.95	1.329	113	7.1	2.547**
6	167	2.85	1.098	113	7.8	2.764**
7	167	2.25	0.791	113	6.96	2.289**
8	167	1.31	0.463	113	4.31	1.31
9	167	1.66	0.514	113	5.75	1.575
10	166	4.59	1.16	113	6.6	1.813**
11	166	3.2	0.82	113	6.4	1.663
12	164	1.59	0.392	113	5.91	1.494
13	164	0.75	0.201	113	7.11	1.573
14	163	3.12	0.605	113	7.66	1.509
15	162	3.16	0.62	110	10.37	1.815**
16	162	2.23	0.417	109	11.29	1.901**
17	161	3.56	0.625	109	16.81	2.656**
18	159	10.06	1.294	109	14.85	2.423**
19	159	8.32	1.164	109	22.08	3.169**
20	157	11.16	1.372	109	22.01	3.028**
21	155	9.35	1.167	109	23.88	3.175**
22	154	12.42	1.477	109	25.77	3.235**
23	153	12.43	1.512	108	22.57	2.78**
24	152	13.23	1.511	107	18.59	2.295**
25	151	15.48	1.689**	107	17.72	2.064**
26	151	18.8	2.041**	107	18.93	2.111**
27	149	17.75	1.952**	107	21.31	2.245**
28	149	19.49	2.083**	107	19.91	1.963**
29	146	15.65	1.699**	107	19.86	1.832**
30	146	16.97	1.746**	107	23.35	1.984**
31	143	18.62	1.858**	107	22.95	1.857**
32	141	17.82	1.752**	107	18.96	1.58**
33	141	14.83	1.435	107	14.55	1.235
34	141	15.68	1.433	107	11.41	0.993
35	140	18.48	1.572*	107	9.77	0.778
36	140	17.83	1.418	107	12.57	0.925

**, * Statistically significant at the 5% and 10%

Table 8–10 LSE long-term cumulative returns (HGSC)

The table shows the results of average market returns (ARt) and the cumulative average market adjusted returns (CARt) for the 36 months after floatation, excluding the initial returns for VC-backed IPOs and non-VC-backed IPOs. The Hoare Govett Small Companies value weighted all shares is used as market benchmark. The average market returns are computed as described in equation [5-6]. The CARs are described in equation [5-7]. The t-statistic is computed as described in equation [5-11] where Var is the average cross-sectional variance over 36 months and Cov is the first order auto-covariance of the average series. The Var and Cov of VC-backed IPOs are 0.016489 and 0.00106 respectively. These values are 0.015933 and 6.322E-05 respectively for non-VC backed IPOs.

	VC-backed IPOs				non VC-backed IPOs			
		HGSC				*HGSC*		
Month	Sample	$\overline{AR_t}$	CARt	t-CAR	Sample	$\overline{AR_t}$	CARt	t-CAR
1	167	0.91	0.91	0.9072	113	2.81	2.81	2.3644**
2	167	-0.76	0.15	0.1018	113	0.32	3.12	1.8584*
3	167	-0.37	-0.23	-0.1284	113	0.09	3.21	1.5567*
4	167	0.17	-0.07	-0.031	113	-0.05	3.16	1.3302
5	167	0.69	0.63	0.2805	113	2.56	5.72	2.1487**
6	167	-1.16	-0.54	-0.2175	113	0.66	6.37	2.1847**
7	167	-0.62	-1.16	-0.4354	113	-0.61	5.77	1.8315*
8	167	0.04	-1.12	-0.3933	113	-2.16	3.61	1.073
9	167	-0.57	-1.68	-0.5583	113	0.65	4.26	1.1929
10	166	1.29	-0.4	-0.1255	113	0.13	4.38	1.1635
11	166	-1.33	-1.73	-0.5154	113	-0.16	4.23	1.0703
12	164	-0.96	-2.68	-0.7671	113	-0.18	4.05	0.9819
13	164	-0.6	-3.28	-0.8974	113	0.48	4.52	1.0538
14	163	0.04	-3.24	-0.8517	113	-0.89	3.64	0.8174
15	162	1.17	-2.08	-0.527	110	1.36	4.99	1.068
16	162	-1.5	-3.57	-0.8757	109	0.84	5.82	1.2004
17	161	1.09	-2.49	-0.5872	109	4.1	9.92	1.9838**
18	159	-0.16	-2.64	-0.6058	109	1.8	11.72	2.2774**
19	159	2.36	-0.29	-0.0626	109	-0.28	11.44	2.1641**
20	157	0.45	0.16	0.0345	109	1.13	12.57	2.317**
21	155	0.27	0.43	0.0883	109	1.36	13.93	2.5056**
22	154	0.82	1.24	0.2518	109	1.48	15.41	2.7074**
23	153	0.82	2.06	0.4079	108	-2.03	13.38	2.2895**
24	152	-0.17	1.89	0.3669	107	-2.01	11.38	1.8973*
25	151	1.07	2.96	0.5615	107	-1.32	10.07	1.6447*
26	151	2.45	5.4	1.0005	107	0.19	10.25	1.6421*
27	149	1.57	6.97	1.2661	107	2.14	12.39	1.9472*
28	149	1.19	8.16	1.4408	107	-1.15	11.24	1.7349*
29	146	-0.5	7.66	1.3293	107	-0.58	10.66	1.6171*
30	146	-1.16	6.5	1.0976	107	0.19	10.85	1.618*
31	143	-0.1	6.41	1.0566	107	-1.13	9.73	1.4271
32	141	-1.42	4.99	0.8106	107	-1.79	7.95	1.1477
33	141	-0.61	4.39	0.701	107	-1.34	6.62	0.9411
34	141	-0.16	4.23	0.6637	107	-1.41	5.21	0.7305
35	140	0.23	4.46	0.6895	107	-0.98	4.24	0.586
36	140	-1.65	2.81	0.4282	107	1.86	6.09	0.8299

***, **, * Statistically significant at the 1%, 5% and 10%

Table 8–11 LSE Long-term buy and hold returns (HGSC)

The table shows the results of the buy and hold average market adjusted returns (BHARt) for 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The HGSC is used as benchmark. The buy and hold average returns are computed as described in equation [5-9]. The skewed adjusted bootstrapped t-test reported below is described in equation [5-12].

	VC-backed IPOs *HGSC*			Non-VC-backed IPOs *HGSC*		
Month	Sample	$\overline{BHAR}_t$	bootstrapped t-test	Sample	$\overline{BHAR}_t$	bootstrapped t-test
1	167	-0.96	-0.861	113	0.93	0.476
2	167	0.26	0.283	113	2.16	1.219
3	167	0.07	0.06	113	2.37	1.135
4	167	0.51	0.299	113	3.46	1.797**
5	167	1.78	0.815	113	6.64	2.419**
6	167	1.23	0.493	113	7.09	2.523**
7	167	1.03	0.384	113	6.66	2.22**
8	167	0.39	0.171	113	4.08	1.252
9	167	0.8	0.274	113	5.3	1.459
10	166	3.05	0.79	113	5.42	1.475
11	166	1.38	0.376	113	5.36	1.395
12	164	0.75	0.215	113	5.29	1.329
13	164	0.14	0.078	113	6.66	1.487
14	163	2.79	0.564	113	7.24	1.442
15	162	2.82	0.575	110	10	1.78**
16	162	2.29	0.44	109	11.21	1.914**
17	161	3.7	0.665	109	16.42	2.603**
18	159	12.06	1.591**	109	15.29	2.512**
19	159	8.93	1.29	109	21.12	2.977**
20	157	12.23	1.547**	109	21.4	2.921**
21	155	10.57	1.356	109	22.99	3.028**
22	154	13.36	1.624	109	24.64	3.081**
23	153	13.31	1.658*	108	21.09	2.599**
24	152	14.95	1.753**	107	17.85	2.214**
25	151	17.79	2.003**	107	17.1	1.998**
26	151	20.88	2.338**	107	18.09	2.016**
27	149	20.39	2.328**	107	20.67	2.173**
28	149	22.03	2.448**	107	19.28	1.905**
29	146	18.04	2.03**	107	19.38	1.79**
30	146	18.86	2.005**	107	22.79	1.942**
31	143	20.68	2.112**	107	22.95	1.863**
32	141	19.65	1.975**	107	19.55	1.639**
33	141	16.66	1.639**	107	15.25	1.299
34	141	16.76	1.553**	107	12.49	1.088
35	140	19.2	1.632*	107	10.82	0.862
36	140	18.79	1.491	107	14.02	1.027

**, * Statistically significant at the 5% and 10%

8.12 Appendix 12 Results of IPOs floated on the AIM market

Table 8–12 AIM long-term cumulative returns

The table shows the results of the average market returns (ARt) and the cumulative average market adjusted returns (CARt) for the 36 months after floatation for IPOs floated in the AIM market, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The Hoare Govett Small Companies value weighted all shares is used as market benchmark. The average market returns are computed as described in equation [5-6]. The CARs are described in equation [5-7]. The t-statistic is computed as described in equation [5-11] where Var is the average cross-sectional variance over 36 months and Cov is the first order auto-covariance of the average series. The Var and Cov of VC-backed IPOs are 1.12489 and 0.00200 respectively. These values are 0.062762 and 0.005051 respectively for non-VC backed IPOs. The Wilcoxon one sample test (Z-test) for monthly average returns is also reported

	VC-backed IPOs					Non-VC backed IPOs				
		HGSC					*HGSC*			
Month	Sample	$\overline{AR_t}$	Z_test	CARt	t-CAR	Sample	$\overline{AR_t}$	Z-test	CARt	t-CAR
1	24	-3.68	50***	-3.68	-0.1698	31	2.77	194	2.77	0.614
2	24	3.1	166	-0.59	-0.019	31	6.39	179	9.15	1.3832
3	24	3.54	195	2.96	0.0789	31	-2.15	156	7.01	0.854
4	24	2.52	180	5.48	0.1262	31	-3.15	150	3.86	0.4051
5	24	-1.2	126	4.28	0.0883	31	1.02	226	4.88	0.4563
6	24	-3.86	103	0.43	0.008	31	-3.08	196	1.8	0.1534
7	23	-1.35	123	-0.92	-0.0157	31	2.33	197	4.13	0.3245
8	23	-0.67	141	-1.59	-0.0254	30	4.8	221	8.92	0.6454
9	23	-1.5	121	-3.09	-0.0465	30	-4.79	156	4.13	0.2815
10	23	-0.64	86	-3.72	-0.0531	30	-2.2	170	1.94	0.1252
11	23	-1.79	67	-5.5	-0.0749	30	1.21	165	3.14	0.1934
12	23	-5.97	88	-11.47	-0.1495	30	1	196	4.14	0.2434
13	23	-0.18	90	-11.65	-0.1458	29	-10.3	50	-6.17	-0.3429
14	23	-6.31	62	-17.95	-0.2166	29	-4.98	84	-11.15	-0.5972
15	23	-2.4	86	-20.35	-0.2372	29	-4.88	130	-16.03	-0.8291
16	23	-3.08	55	-23.43	-0.2644	29	-3.68	48	-19.7	-0.9868
17	23	-5.4	62	-28.82	-0.3155	27	-7.26	73	-26.96	-1.2637
18	23	-4.23	49	-33.04	-0.3516	27	-2.84	133	-29.79	-1.3569
19	23	4.38	96	-28.67	-0.2969	27	-2.36	133	-32.15	-1.425
20	18	3.84	67	-24.83	-0.2218	27	-0.99	70	-33.14	-1.4311
21	18	-0.47	61	-25.3	-0.2205	26	2.32	78	-30.82	-1.2745
22	17	1.72	71	-23.59	-0.1952	26	-4.34	75	-35.16	-1.4201
23	17	-1.29	54	-24.87	-0.2013	26	4.44	92	-30.72	-1.2135
24	16	-8.61	31	-33.48	-0.2573	26	-2.64	93	-33.35	-1.2897
25	16	-1.43	29	-34.9	-0.2628	26	-0.42	81	-33.77	-1.2792
26	16	-3.19	23	-38.09	-0.2812	26	-0.96	31	-34.73	-1.2898
27	16	5.84	55	-32.25	-0.2337	26	6.94	49	-27.79	-1.0128
28	16	-6.25	19	-38.49	-0.2739	26	-8.91	23	-36.69	-1.3131
29	16	-6.4	10	-44.89	-0.3138	26	-4.03	37	-40.72	-1.4318
30	17	-3.81	35	-48.69	-0.345	26	-0.41	89	-41.13	-1.4216
31	17	-3.05	29	-51.73	-0.3606	26	2.97	109	-38.16	-1.2976
32	17	-0.89	19	-52.62	-0.361	26	5.5	69	-32.67	-1.0932
33	17	3.92	36	-48.71	-0.3291	26	28.57	123	-4.11	-0.1353
34	17	16.1	52	-32.61	-0.217	26	-1.14	104	-5.24	-0.1701
35	17	-3.88	42	-36.48	-0.2393	26	2.39	57	-2.86	-0.0913
36	17	-2.57	16	-39.05	-0.2526	26	0.76	74	-2.1	-0.0662

Table 8–13 AIM Long-term buy and hold returns

The table shows the results of the buy and hold average market adjusted returns (BHARt) for 36 months after floatation, excluding the initial returns for both samples, VC-backed IPOs and non-VC-backed IPOs. The HGSC is used as benchmark. The buy and hold average returns are computed as described in equation [5-9]. The Wilcoxon one sample test for the significance (Z-Test) is also reported.

	VC-backed IPOs			Non-VC-backed IPOs		
		HGSC			*HGSC*	
Month	Sample	$\overline{BHAR}_t$	Z-Test	Sample	$\overline{BHAR}_t$	Z-test
1	24	-16.26	29**	31	-27.6	105**
2	24	-9.32	101	31	-9.74	135**
3	24	-1.52	155	31	-6.04	142**
4	24	-0.21	174	31	-9.52	138**
5	24	-1.48	187	31	-7.12	168
6	24	-2.16	174	31	-3.35	193
7	23	-3.87	141	31	2.45	236
8	23	-4.96	143	30	5.92	246
9	23	-3.5	154	30	3.4	216
10	23	-5.01	146	30	2.36	224
11	23	2.25	163	30	-2.19	193
12	23	-4.81	117	30	-1.13	207
13	23	-4.89	114	29	-5.64	196
14	23	-7.92	98	29	-9.12	156
15	23	-10.47	91	29	-11.82	151
16	23	-12.34	86	29	-15.81	136*
17	23	-12.23	82	27	-22.11	115**
18	23	-15.06	79	27	-34.57	70**
19	23	-9.52	78	27	-29.19	77**
20	18	-6.33	67	27	-33.25	71**
21	18	-6.14	68	26	-27.91	83**
22	17	-1.89	67	26	-23.51	90
23	17	1.23	67	26	-3.32	83
24	16	-6.34	57	26	-1.86	75
25	16	-7.18	38	26	0.72	67
26	16	-15.25	29	26	-2.82	54
27	16	-11.17	29	26	-5.42	52
28	16	-11.62	29	26	-7.66	52
29	16	-13.64	29	26	1.12	40
30	17	-1.72	24	26	-4.32	30
31	17	0.23	17	26	29.83	27
32	17	-5.1	17	26	39.29	24
33	17	-9.55	15	26	36.43	24
34	17	-1.32	15	26	51.58	24
35	17	-24.75	14	26	46.42	23
36	17	-65.08	14	26	-42.99	23

**, * Statistically significant at the 5% and 10%

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