UK Venture Capital and Private Equity as an Asset Class for Institutional Investors

Research Report

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Dr Oliver Burgel

Foundation for Entrepreneurial Management
London Business School
Sussex Place
London NW1 4SA
e-mail: oburgel@london.edu

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Executive Summary

Introduction

The terms venture capital and private equity describe equity investments in unquoted companies. In the UK and much of continental Europe, venture capital is synonymous with the term private equity. In the US, however, venture capital usually refers to the provision of funds for young, entrepreneurial businesses whereas private equity is mainly associated with the financing of leveraged management buy-outs and buy-ins.

This report has been written as a result of the declining share of UK institutional investors among the providers of funding of the UK venture capital and private equity industry. It has a dual objective: Its first part will explain the concept of private equity finance and the fundraising and investment processes of venture capitalists. The second part will examine the characteristics of venture capital and private equity. We will analyse the returns, the risk and the cash-flow implication of venture capital investments in order to assess the suitability of this asset class for institutional investors. From an investor's perspective, the characteristics of venture capital and private equity are very similar, i.e. investments in this asset class are predominantly handled by limited partnerships operating fixed-life funds. We will therefore use both terms interchangeably during this report.

The key findings of the report can be summarised as follows: The long-term performance of the UK venture capital industry since 1980 stands at 14.2% per annum. Over the period between 1987 (the first year for which individual fund valuations are available) and 1998, its cumulative returns have outperformed all principle UK comparators. The analysis of annual returns revealed a movement parallel to public equity return indices. However, the spread of returns of individual funds is quite large. Diversification is therefore of utmost importance when investing in this asset class. Finally, private equity investments have particular cash-flow properties. Individual funds start making net contributions to investors after between three and five years. An appropriately structured private equity portfolio will finance itself after an initial net investment period and continue to generate substantial positive cash-flows for several years. This characteristic of private equity can be attractive for pension funds irrespective of their maturity.

Venture Capital and Private Equity

Venture capital and private equity are mechanisms of financing companies that represent an alternative to raising funds on public equity or debt markets. This is frequently the case because risk, uncertainty or simply the long time horizon associated with the investment deter debt providers from funding these firms. These conditions apply especially in high-technology environments, where the commercial potential of innovations is difficult to estimate for potential backers. However, private equity is not limited to technology-based firms or growth-oriented start-up businesses. It has also become a common mechanism to finance the separation of non-core assets from a parent company, to facilitate management succession in family-owned firms or de-list undervalued firms from the stock market ("public to private transactions").

Venture capital providers become co-owners of these companies and share risk and returns to the extent in which they participate in them. Their returns directly depend on the growth and profitability of the investee firm. Venture capitalists realise their returns through selling their stakes in investee companies. Successful investments are usually exited through trade sales or offerings on the stock market.

In the UK, the main providers of formal private equity are venture capital firms. The majority of these firms are *independent* venture capital firms, which raise their funds for investment from external sources, mainly institutional investors such as banks, insurance companies and pension funds. *Captive* venture capital firms obtain their funds from parent organisations which are usually financial institutions. Increasingly, some of these captives also raise funds from institutional investors. They are known as *semi-captives*. For institutional investors, fixed life funds managed

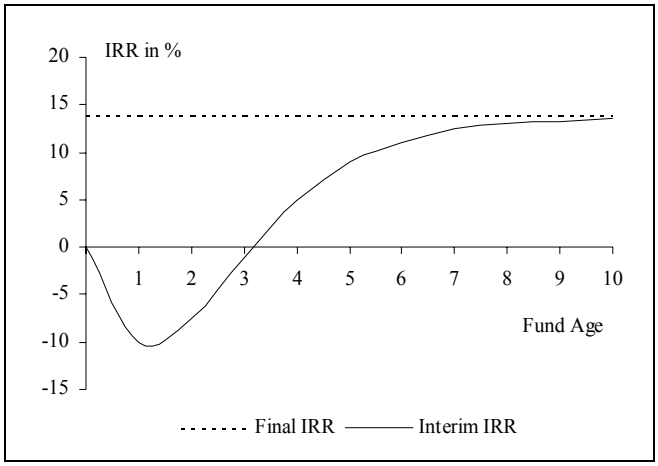
through independent and semi-captive *limited partnerships* are the primary vehicles to invest in private equity.

In limited partnerships, institutional investors constitute the *limited partners* and venture capital firms act as *general partners*. The minimum investment considered by most venture capital firms usually amounts to 1% of the total funds being raised. The maximum investment usually accepted from a single investor corresponds to about 10% of the total fund size. The majority of limited partnerships include between ten and 30 limited partners. A limited partnership usually has a fixed ten-year life during which the general partners select investments, structure deals, monitor investments and design the appropriate exit strategies on behalf of the limited partners. In exchange, they receive a *management fee* and a share of the overall returns of the fund. The latter is referred to as *carried interest*. The partnership's funds will usually be invested by the general partners within three to five years. Despite being set up with an intended life of ten years, nearly all funds continue to exist beyond that period because some investments will not be fully exited within the intended life of the fund. When all investments are fully divested, a limited partnership can be terminated or "wound up."

Performance Measurement of Venture Capital Funds

The Internal Rate of Return (IRR) method is the most appropriate method to measure the performance of venture capital and private equity funds. The time-weighted rate of return method used to measure pension funds will often produce misleading results when applied to a private equity fund. The definitive return of a private equity fund can only be calculated when a fund is wound up. Between inception and termination of a fund, its returns follow the so-called J-curve pattern (Figure 1).

Figure 1
The Evolution of Venture Capital Returns over Time: The J-Curve Pattern



Note: The graph shows an illustrative example

The common practice of paying the management fee and start-up costs out of the first draw-downs will not produce an equivalent book value. As a result, a private equity fund will initially show a negative return. When the first realisations are made, the fund returns start to rise quite steeply. After about three to five years, the interim IRR will give a reasonable indication of the definitive IRR. This period is shorter for buy-out funds than for early stage and development funds. Funds that are four years and older are considered "mature funds."

A one-year IRR is a meaningless measure at the individual fund level. At the industry level, it is a hypothetical measure that is indicative of the industry's performance. However, short-term industry IRRs should be discussed in conjunction with the level of investment activity, since a low or negative industry IRR can simply be caused by a surge of investment activity (the J-curve

pattern). Conversely, unusually high short-term industry IRRs can be the result of a few large funds that made successful exits. As a rule of thumb, most industry-level performance statistics are determined to a large extent by the performance of MBO funds which dominate the industry in terms of net cash-flows.

The Returns of the UK Venture Capital and Private Equity Industry

In order to assess the performance of the UK private equity industry, we calculated the returns based on the monthly cash-flows and annual valuations. Four different analyses were carried out: First, we calculated the industry-level IRRs by investment stage and vintage year. These returns were calculated over different time periods. The results of this analysis are displayed in Table 1. Second, we compared these figures to the returns of the US and European private equity industries. Third, we compared private equity returns to the returns that one could have generated by investing the identical cash-flows in various other UK asset classes. Fourth, we looked at the capital realisations in absolute terms. All returns are net of all management fees and carried interest. The results of these analyses can be summarised as follows:

- In 1998, the industry had a particularly successful year with an aggregate one-year return of 37.5% for mature funds and 28.3% for all funds. The negative one-year IRR for early stage funds is to a large extent caused by a 65% increase in investment activity in 1998, which - due to fund start-up costs and conservative valuation guidelines – has not yet resulted in an equivalent creation of book value (the J-curve phenomenon). The exceptionally high returns for generalist funds are caused by the divestments of two individual funds. The returns of MBO funds are remarkable since they have been generated despite a 45% increase of investment activity over the same period.

Table 1
Performance by Investment Stage (in %)

Investment Focus	One year 1998	Two Year 1997-98	Three Year 1996-98	Four Year 1995-98	Five Year 1994-98	Six Year 1993-98	Seven Year 1992-98	Eight Year 1991-98	Nine Year 1990-98	Ten Year 1989-98
Early Stage	-27.5	0.9	4.0	44.2	7.4	26.7	26.9	19.3	13.8	7.9
Development	13.5	20.7	25.5	26.5	23.3	26.6	20.1	17.2	12.4	7.7
Mid MBO	17.9	14.7	28.7	29.6	26.5	32.8	26.5	20.1	14.8	12.0
Large MBO	26.2	25.5	26.2	42.8	27.4	42.3	33.6	29.4	19.1	17.1
Generalist	64.0	34.2	34.5	35.3	20.5	21.7	20.4	26.3	23.6	11.0
Total	28.3	24.6	27.7	37.6	24.3	32.3	27.3	25.1	18.1	12.7
Number of funds	188	176	143	134	134	118	108	102	90	77
Mature funds only	37.5	25.7	25.8	39.3	22.5	38.5	27.3	23.0	17.1	8.3
Number of funds	134	118	108	102	90	77	59	42	30	22

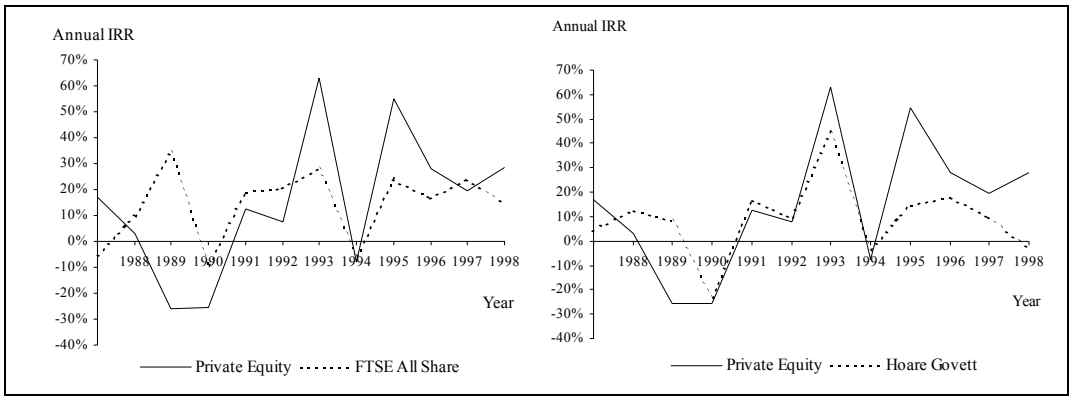
Source: LBS Calculations

- The long-term industry performance since 1980 of the entire industry stands at 14.2% per annum. This indicator is arguably the most reliable indicator of the long-term performance potential of this asset class.

- Over the period from 1987 (the earliest year for which fund valuations are available) to 1998, the cumulative annualised venture capital returns were slightly higher than public equity returns (14.8% and 14.6% respectively). All other major UK asset classes were outperformed by a substantial margin of 240 to 460 basis points. Since 1992, cumulative private equity returns have outperformed UK equities by a substantial margin of 910 basis points and other

UK asset classes by a margin of 1270 and 1520 basis points. These figures are based on a comparison between historical private equity cash-flows and identical cash-flows invested in and divested from index-tracking derivatives for other asset classes.

Figure 2:
Annual Private Equity Returns Relative to Public Equity Returns



- Private equity returns appear to be cyclical. During most of the period for which data is available, they moved in parallel with the public equity market. The similarity of the movements between the small cap segment of the UK stock market and private equity returns is particularly striking (Figure 2). The upward and downward spikes are much more pronounced, which suggests that public equity market changes are amplified in the private equity market. Since our data on private equity valuations only goes back to 1987, our analysis covers a very short time period. The results should therefore be interpreted bearing in mind this important limitation.

- During the 1990s, the UK buy-out and generalist segment of the industry have outperformed their US and European peers. In the early stage and development area, the returns of the UK venture capital firms were lower than those of their US and European counterparts during most years.

- Compared to the US, there has been a stronger performance in the recent past in terms of aggregate performance across all investment stages. Short and mid-term industry IRRs are above the US level up to a five-year investment horizon (24.3% for the UK; 20.5% for the US). At the current stage, the longer term track record still points in favour of the US private equity industry which has generated returns of 16.9% and 17.1% over a ten and twenty-year period. This compares to 12.7% and 14.2% for the UK respectively. The pooled returns of the British private equity industry were consistently higher than those of the European industry as a whole, irrespective of the chosen time horizon.

- When looking at the history of absolute returns, we found that the sum of distributions and retained asset values currently stands at 175% of the funds drawn down by the general partners to investors.

- Several young funds that have not yet reached the stage of maturity have already produced returns in excess of 15%. Since the returns of these funds are likely to increase as they reach maturity and exit their investments, the dynamics of industry-level performance measurement will result in industry level returns above 20% for a few years. However, this is good news for current investors only since these returns reflect past investment decisions.

The Spread of Returns of Venture Capital and Private Equity Funds

After looking at the performance of the venture capital and private equity industry, we examined the risk associated with investments in these funds. To this end, we analysed the spread and the distribution of the returns at the fund level. The results are displayed in Table 2.

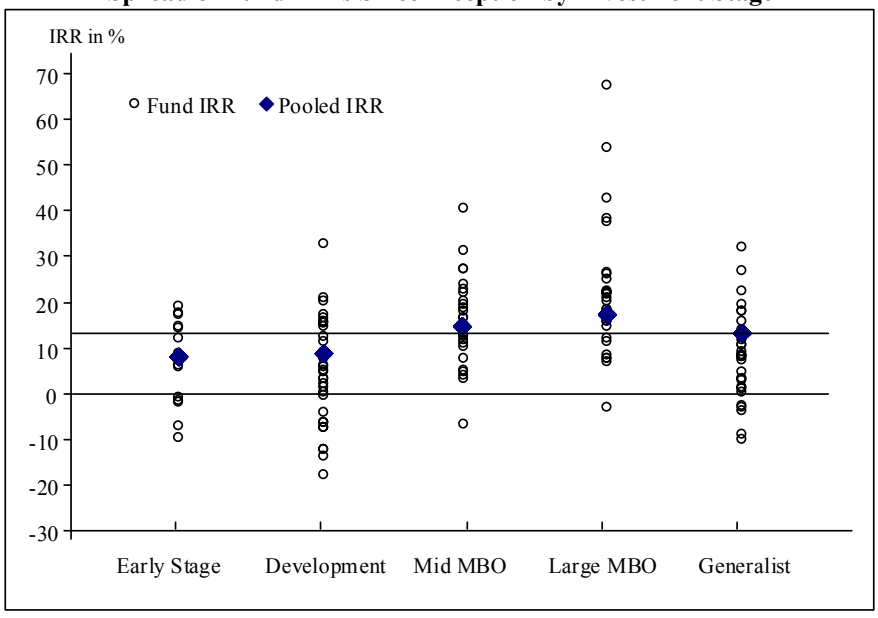
Table 2
Range of Returns of Mature Funds by Investment Stage

Investment Stage	Number of funds	Pooled IRR	Mean IRR	Median IRR	Minimum	Maximum	Range	Standard Deviation
Early Stage	17	8.2	6.9	8.1	-9.6	18.9	28.5	8.7
Development	34	9.1	4.6	4.8	-17.7	32.9	50.6	11.6
Mid MBO	27	16.4	15.7	14.9	-6.6	40.6	47.2	9.8
Large MBO	26	17.8	22.3	20.5	-3.0	67.3	70.3	15.3
Generalist	30	12.0	8.1	7.9	-9.9	32.0	41.9	9.8
All Funds	**134**	**14.3**	**11.3**	**10.8**	**-17.7**	**67.3**	**85.0**	**13.1**
Technology Funds only	26	9.8	10.2	9.1	-0.2	20.2	20.4	6.2

Source: LBS calculations
Note: The table shows IRRs since 1980 for mature funds started before 1995.

- The analysis of the spread of returns shows that there is considerable variation at the fund level. Since 1980, the returns of individual funds ranged from –17.7% to 67.3%. Additional analyses also show that the spread of returns is not a function of the presence of successful or unsuccessful outliers. Instead, their distribution is close to a normal distribution around the mean IRR by investment stage and fund size.

Figure 3
Spread of Fund IRRs Since Inception by Investment Stage



Source: LBS calculations

- To date, the *aggregate* risk-return profile of mature funds has been more favourable for later stage investments and larger funds. Nonetheless, attractive returns have been generated by *individual* funds irrespective of vintage year, investment stage and fund size. Partnership selection skills are likely to have a large impact on the performance of the private equity portfolio.

- Technology-focused venture capital funds, the group of funds conventionally associated with the highest risk, have in the past actually been the least risky when considering risk in terms of IRR fluctuations and the possibility of not recovering invested funds.

- Due to the considerable spread of returns, diversification is of utmost importance for investors. Investors should make appropriate asset allocation decisions to allow for an effective diversification rather than invest in just one or two funds. Alternatively, they should consider an indirect investment via a fund of funds.

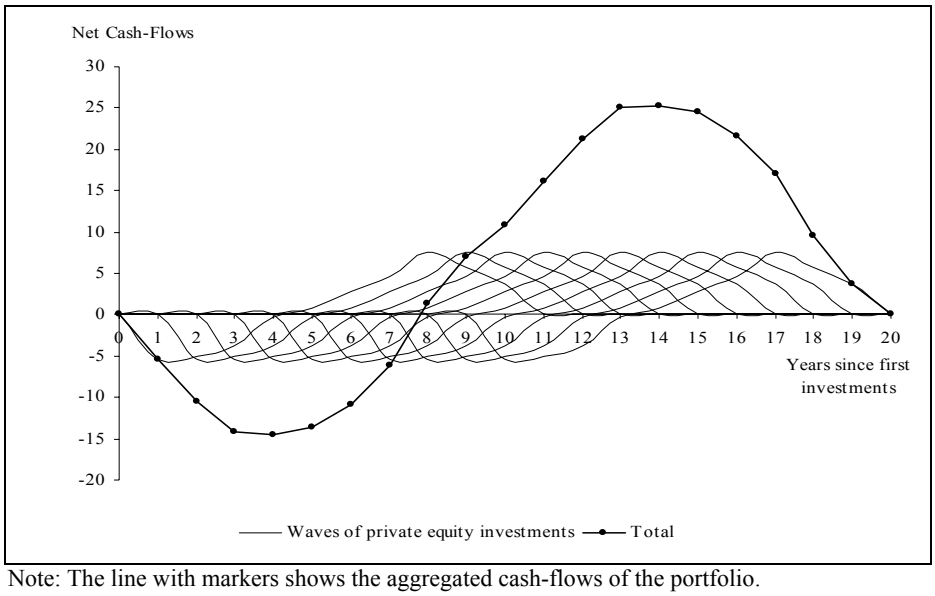
The Cash-flow Implications of a Venture Capital Investment

An investor who commits a certain amount to a limited partnership should be aware that this is a theoretical maximum amount. In practice, the maximum commitment is rarely solicited from an investor. According to our data, private equity funds that specialise in large MBOs will usually draw down up to 90-95% of total commitments. Funds that focus on investing in smaller firms will request on average 80-90% of the committed money. Usually, investors receive a notification shortly before the money is drawn down by venture capital firms. Some of the larger funds will have monthly draw-downs that vary in their amounts. Our results with regard to the cash-flow implications can be summarised as follows:

- Private equity funds usually generate positive net cash-flows after three to five years. This period tends to be shorter for MBO funds than for early stage and development funds.

- Depending on the investment opportunities and fund size, monthly cash-flows can vary considerably in their amount. Diversification into several private equity funds will therefore smooth the cash-flow pattern considerably and make it more predictable.

Figure 4
Simulation of Long-Term Cash-Flow Implications of Private Equity Investments



Note: The line with markers shows the aggregated cash-flows of the portfolio.
Source: LBS calculations

- The final part of our analysis consists of a cash-flow simulation for a private equity portfolio over a twenty year period. The results are displayed in Figure 4. In our example based on the average historical cash-flows, a portfolio that consists of ten annual waves of investments will require annual net contributions until the eighth year and generate positive returns for a further 12 years.

Recommendations for Institutional Investors

- Our analyses have shown that the aggregate historic returns currently stand at 14.2%. Since 1987, cumulative venture capital returns have outperformed UK public equity returns by a narrow margin and all other major UK asset classes by a substantial margin of 240 to 460 basis points. These returns are net of all management fees and carried interest. Since 1992, cumulative private equity returns have outperformed UK equities by a substantial margin of 910 basis points and other UK asset classes by a margin of 1270 and 1520 basis points.

- Overall, the decision to invest in this asset class should be taken with a long-term perspective in mind. Since venture capital returns follow the J-curve pattern, it takes three to five years before investors experience positive returns and net cash-flows.

- The term "committed capital" does not imply that an equivalent amount of money is working during the entire life of the limited partnership. The return figures above therefore do not represent the compound returns of the assets allocated by pension funds to private equity. This is a consequence of two related investment practices. First, funds are usually drawn down on a deal-by-deal basis. Second, the committed capital is usually the maximum amount made available to the partnership since general partners draw between 80% and 95% of committed capital from investors. Institutional investors that seek a target range of absolute returns should therefore be prepared to make higher nominal fund allocations to this asset class.

- While the aggregated returns have been attractive, there are considerable fund-level differences in terms of returns and cash-flows. Diversification is thus of **utmost** importance when investing in this asset class. Diversification smoothes positive and negative cash-flows and substantially reduces the return spread.

- Institutional investors that want to reduce diversifiable risk should be prepared to make appropriate commitments to this asset class. For smaller investment funds, we would not recommend direct investment in this asset class unless a sufficient share of funds is allocated to private equity to build up a diversified portfolio or unless they invest via a fund of funds or in a selection of quoted investment trusts.

- As an alternative to direct investments in limited partnerships, first-time and smaller investors can invest in this asset class indirectly via gatekeepers that operate funds of funds. In exchange for a management fee, one can access the full benefits of diversification. First-time investors, in particular, can benefit from the gatekeepers' experience and thus start building up in-house expertise over the years.

- The managers of private equity portfolios should be subjected to different organisational procedures than the managers of public equity portfolios. Different monitoring processes and incentive structures for investment managers are required to take into account the particular characteristics of this asset class. For example, a measurement of private equity returns on a quarterly basis only makes sense if the managed portfolio comprises a very large number of individual private equity participations. Furthermore, the assessment of track-records and selection of venture capital firms - skills that have a large impact on the returns of a private equity portfolio - require an expertise which is quite different from analysing public equity markets. We would therefore recommend that pension funds appoint dedicated private equity managers and subject them to different incentive and monitoring procedures.

- A well structured private equity portfolio has attractive cash-flow implications. Initially, it will require net contributions over several years. After this period, such a portfolio will generate positive net cash-flows for a longer period. Both the aggregate amount and the timing of cash-flows can be influenced by the structure of the portfolio. Despite the common belief that pension funds approaching maturity should not invest in private equity for reasons of illiquidity, we believe that an appropriately structured private equity portfolio can be attractive for all pension funds irrespective of their maturity since it generates substantial positive net cash-flows after an initial investment period.

- More recently, the growing secondary market has led to a substantial improvement of the liquidity situation of the private equity industry. Stakes in limited partnerships can thus be liquidated before the partnership is wound up.

Recommendations for the Venture Capital and Private Equity Industry

- In our view, the industry would be ill-advised to sell the high short-term returns as the level of returns that investors can expect in the long run. The present high returns reflect a number of very successful years for the industry as a whole, which is partly due to a buoyant stock market. Given the time horizons of the investment process, the high returns also reflect investments made between three and seven years ago and, to a lesser extent, those made more recently. The aggregate returns of mature funds are likely to stay at current levels for a few years, since many younger funds have already generated attractive returns. However, it is unlikely that future annual returns can be sustained at current annual levels of around 30% for an extended period of time. Communication should therefore mainly focus on the long-term returns which have outperformed its main comparators.

Recommendations for Government and Regulators

- While the recent appeals to institutional investors to invest in venture capital funds in order to increase the provision of funds for growth-oriented, entrepreneurial businesses is laudable, the British Government should also realise that the Minimum Funding Requirement (MFR) has provided a barrier to achieving this very objective. Pension funds that invest in this asset class for the first time will experience a deterioration of their MFR position. However, given that the average pension fund's asset allocation to private equity is below 5%, the actual effect on a scheme's MFR position is quite small in absolute terms. Nonetheless, the indirect impact is not to be underestimated, since it biases trustees' asset allocation decisions against those asset classes that are not used as yardsticks for valuing MFR liabilities. As a result, trustees of funds that have not decided to allocate assets to venture capital have a disincentive to do so in the future. We therefore hope that the current review of the MFR will correct its potentially harmful effects on allocation decisions and pension fund performance.

1. Introduction / Objective of the Report

"Entrepreneurship and innovation are central to the creative process in the economy and to promoting growth, increasing productivity and creating jobs. Entrepreneurs sense opportunities and take risks in the face of uncertainty to open new markets, design products and develop innovative processes." (Our Competitive Future: Building the Knowledge Driven Economy. Report presented to Parliament by the United Kingdom Secretary for Trade and Industry, December 1998).

Efficient financial markets play a prominent role among the infrastructure factors that influence the level of entrepreneurial activity in an economy (Global Entrepreneurship Monitor, 1999 Executive Report). Besides the provision of debt, growth-oriented, entrepreneurial firms of all stages access venture capital or private equity finance. According to the traditional definition, venture capital is provided for young, growth-oriented firms who cannot obtain sufficient funds by raising debt alone. The term private equity, on the other hand, is normally used for describing transactions of unquoted equity to finance the divestment of non-core assets by corporate owners, to facilitate the succession of management in family-owned firms, help firms in financial distress and to take under-valued public firms private.

The UK venture capital and private equity industry has grown steadily over the past two decades. In 1984, a total of £190 million was invested in 480 firms. Fifteen years later, in 1998, the investments amounted to £4,919 million (1332 firms). This report has been triggered by the finding that UK pension funds invest less in private equity and venture capital than their US counterparts. The declining involvement of the UK pension fund industry in the overall funding of this asset class coincided with the venture capital industry's most successful years. This report therefore comes at a timely moment to assess the suitability of venture capital and private equity as an asset class for pension funds. Those that advocate a stronger participation of UK institutional investors in this asset class argue that the failure of British pension funds to invest in private equity deprives plan beneficiaries of attractive returns. Some pension funds, on the other hand, claim that their earlier experiments with venture capital have produced below-average returns and do not justify the time and investment in the expertise required to manage this asset class.

The report has a dual objective. First, it will describe the venture capital fundraising and investment processes. It will highlight the particular characteristics of the fixed life investment fund, the main vehicle open for institutional investors interested in this asset class. Second, it will assess the suitability of venture capital and private equity as an asset class for pension funds in terms of returns, risk and cash-flow implications. For the remainder of this report we will use the terms "private equity" and "venture capital" interchangeably since - from an investor's perspective - they are very similar in terms of their characteristics. The data used for this report is based on the annual performance survey of the members of the British Venture Capital Association (BVCA) carried out by The WM Company (WM). 86% of the member funds that raise money from

institutional investors participated in the 1998 performance survey which makes it one of the most complete country-specific datasets on the performance of VC funds in the world.

2. Venture Capital and Private Equity

2.1. Debt versus Equity

There are several ways by which firms can raise capital to finance future projects. Firms can access capital markets either by raising debt or by issuing equity. In the former case, lenders have the legal right to interest payments and repayment of the debt, irrespective of success or failure of the firm. In contrast, equity is provided in exchange for the redemption of ownership rights. Equity providers thus become co-owners of the firms and share risk and returns to the extent in which they participate in the firm. Their returns therefore directly depend on the growth and profitability of the firm. Equity providers realise their returns through selling their stakes in investee companies.

Since it is one of the most expensive forms of finance, private equity is usually required by firms that cannot raise sufficient funds on the debt market or on the public equity market by listing on a stock exchange. This is frequently the case because risk, uncertainty or simply the long time horizon associated with the investment deter debt providers from funding these firms. These conditions apply especially in high-technology environments, where the commercial potential of innovations is difficult to estimate for potential backers. Accordingly, venture capital is an instrument to finance those projects that are deemed too risky by debt providers. The greater probability of incurring losses is offset by the greater upside through ownership and thus direct participation in the gains in case of a successful investment.

However, private equity is not limited to technology-based firms or start-up businesses. It has also become a common mechanism to finance the separation of non-core assets from a parent company, to facilitate management succession in family-owned firms or delist undervalued firms frrom the stock market ("public to private transactions"). [1] In the first two cases, the parent company has the choice between floating these assets on a public equity market or selling the assets to an interested party, usually industrial buyers. The sheer cost of the transaction relative to the assets' value may be one reason why a flotation is not desirable. In addition, it is not always possible to find industrial buyers for these non-core assets. As a result, the last two decades have seen an increasing number of management buy-outs and buy-ins (MBO/MBIs), where the firm is sold to management teams from inside or outside the firm respectively. These transactions can rarely be financed with bank debt alone. Private equity houses have thus made it a speciality to arrange a

[1] There are a number of reasons why a firm may want to shed non-core assets. These assets could be business units that no longer fit in the long-term strategy of the firm. An additional reason may be that regulators demand the separation of assets after a merger in order to prevent the firm from achieving a dominant market position.

combination of equity and debt for the prospective management teams in return for a share of the ownership of the break-away assets.

2.2. Types of Venture Capital and Private Equity by Stage of Investment

The terms venture capital and private equity are used for a variety of investments in firms at different stages of their life cycle. In the United States, there is a quite marked difference between the financiers of leveraged buy-outs (LBOs) and MBO/MBIs on the one hand, which refer to themselves as private equity firms, and providers of early stage and development capital for young, entrepreneurial businesses, known as venture capitalists, on the other. In the UK and much of continental Europe, however, venture capital is synonymous with the term private equity, meaning the equity financing of unquoted companies ranging from seed and start-up companies to large management buy-outs. Furthermore, a substantial proportion of funds is invested through "generalist" funds which invest in firms ranging from start-ups to mid-sized and large buy-outs.

A further distinction must be made between formal and informal venture capital and private equity. Informal providers of venture capital, so-called "business angels", are frequently wealthy individuals with business experience in the industry of their investee firms. They often provide the funds to finance the seed and start-up stage of many technology-based ventures. Larger transactions are usually handled through providers of formal venture capital. Since it is the stated objective of this report to assess the suitability of venture capital as a financial asset for institutional investors, business angels who usually invest their own accumulated capital will not be discussed in this report.

For the purpose of this report, we include the entire spectrum of formal private equity investments in the UK. The agreed definitions of the members of the BVCA distinguish between various investment types or stages. Funds that provide seed capital (to fund concepts and prototypes), early stage capital (firms that are less than three years old) and early development capital are grouped under the heading *early stage funds*. *Development funds* are directed towards firms in their expansion phase. These firms usually seek additional funds to fund working capital, to fund a major investment such as an acquisition or a new plant and smaller buy-outs and buy-ins which require up to £2 million of equity. Additional classes are *mid-sized buy-outs and buy-ins* (between £2 million and £10 million equity invested) and *large buy-ins and buy-outs* (more than £10 million equity invested). Finally, there are so called *"generalist funds"* which invest in firms across different stages.

2.3. Institutional / Organisational Aspects of the Private Equity Industry

At the most basic level, venture capitalists can be understood as *intermediaries* between institutional investors, such as pension funds, banks and insurance companies, which act as

providers of capital, and investee companies, the *issuers of equity*, that seek to raise finance for future projects.[2] Of course, this is far from being a passive role, since venture capitalists screen and originate investment opportunities, structure deals, monitor their investments, assist the management teams and develop appropriate divestment strategies. In the UK, the main providers of formal private equity are venture capital firms (formal venture capital excludes business angels). The majority of these firms are *independent* venture capital firms, which raise their funds for investment from external sources, mainly institutional investors such as banks, insurance companies and pension funds. *Captive* venture capital firms obtain their funds from parent organisations which are usually financial institutions. Increasingly, some of these captives also raise funds from institutional investors. They are known as *semi-captives*. Table 1 gives an overview over the venture capital firms by type of organisation.

Table 1
Investment by type of venture capital organisation

Type of venture capital organisation	Amount invested (£m)			% of amount invested		
	1998	1997	1996	1998	1997	1996
Organisations which only invest for a parent (captives)	323	299	280	7	7	9
Organisations which only manage funds (independents)	2,998	2,713	1,937	61	65	60
Organisations which do both (semi-captives)	1,598	1,172	1,021	32	28	31
Total Investment	**4,919**	**4,184**	**3,239**	**100**	**100**	**100**
UK Investments	3,775	3,066	2,806	77	73	87
Overseas Investments	1,143	1,118	432	23	27	13

Source: BVCA 1998 Report on Investment Activity

The table reveals that 93% of invested capital is managed through independents and semi-captives. The organisational form adopted by most independents and semi-captives to manage their funds is the *limited partnership*, which represents a contractual arrangement between the limited partners (the investors) and general partners (venture capitalists). Limited partnerships usually have a fixed life of ten years. In addition to the limited partnerships, there are two types of quoted funds, the venture and development capital investment trusts (VDCIT) and, since 1995, the venture capital trusts (VCTs). VCTs were developed with two objectives in mind. First, they aim to encourage investment in smaller companies with up to £10 million in assets. Second, they provide an easier access to the UK private equity market for the general public. Accordingly, VCTs offer tax incentives for private investors in exchange for a five-year commitment. A further 20 funds are structured as venture and development capital investment trusts. These are quoted vehicles which share the basic features of other quoted investment trusts. Since they can be treated like

[2] There can be various additional intermediaries. Professional services firms, for example, play an increasing role in assisting buy-out and buy-in teams in selecting the appropriate venture capitalist. During the fundraising process, specialised "gatekeepers" and funds of funds and placement agents mediate between the venture capitalists and institutional investors (see also section 2.4.1).

investments in other quoted stocks, institutional investors should not encounter difficulties with investments in private equity via such a trust.

However, the primary avenues to invest in private equity are fixed life funds managed through independent and semi-captive limited partnerships. Historically, some institutional investors have made direct equity investments in selected companies which have not produced the expected returns. The majority of industry observers thus argue that institutional investors lacked the skills and time required for direct equity investments in unquoted firms. Given the difficulty and long time horizons required for private equity investments, the dominance of the limited partnership and the fixed life investment vehicle is widely considered as a result of increasing specialisation of the involved parties. Sophisticated contractual arrangements have been developed to address the substantial information asymmetries and incentive problems that arise in the private equity market (Fenn, Laing and Prowse 1995). Due to the dominance of the fixed life investment fund in the UK venture capital industry, we will primarily discuss the suitability of this arrangement from the perspective of an institutional investor.

2.4. Operation of the Fixed-Life Investment Fund

2.4.1. Involved Parties

In limited partnerships, institutional investors constitute the *limited partners* and professional private equity managers or venture capitalists act as *general partners*. Since venture capitalists raise new funds every three to five years, a venture capital firm usually comprises several limited partnerships which are each set up between several investors and the venture capital firm's management. A limited partnership usually has a fixed ten year life during which the general partners select investments, structure deals, monitor investments and design the appropriate exit strategies on behalf of the limited partners. In exchange, they receive a management fee and a share of the overall returns of the fund. The latter is referred to as carried interest. Despite being set up with an intended life of ten years, nearly all funds continue to exist beyond that period. While the investment activity of general partners is usually completed after three to five years, limited partners will often continue to receive distributions beyond year ten. These distributions come from investments that have not been fully exited. [3] In practice, however, the majority of cash-flows will occur within the ten year period. When all investments are fully divested, a limited partnership can be terminated or "wound up."

Other participants in the venture capital investment process include various intermediaries. There are several intermediaries between institutional investors and venture capitalists. So-called "gatekeepers" advise on venture capital fund selection. Some also operate "funds of funds" which

[3] In some cases, these distributions can be the result of liquidation proceedings from investments that had to be written off. They may occur over periods as long as twenty years. Since these "tail-end" cash-flows are usually very low, they have hardly any impact on fund performance. A longer duration of the partnership does, however, result in additional annual administrative and legal costs for the partners.

invest in a spread of venture capital funds. They invest in venture capital funds on behalf of institutional investors that do not want to build up in-house selection skills or do not want to allocate the funds required to build a diversified portfolio of venture capital funds. These funds of funds receive a management fee and a share of the profits in excess of a target rate of return. Some private equity firms have started to make use of placement agents during the fundraising process. They are usually employed when general partners solicit the involvement of foreign institutional investors. They will charge a fee based on the amount they raise for the venture capitalist.

More recently, some firms have specialised in buying participations in private equity partnerships from institutional investors. The emergence of this "secondary market" has created the possibility of an exit route if the investors wish to do so for one reason or another. They have thus improved the liquidity situation of an asset class otherwise perceived as illiquid. Finally, there are intermediaries between venture capitalists and the management teams of investee companies. These professional services providers help the management teams select the appropriate venture capitalist and advise on various aspects of the deal structuring. Overall, the emergence of these specialised intermediaries can be seen as an indicator of the increasing maturity and efficiency of the UK private equity market. Specialist intermediaries help to reduce the cost of information and deal making in this market. The contact details of various intermediaries and a more detailed description of their activities can be obtained from the member handbook of the British Venture Capital Association.

2.4.2. Fundraising

Venture capitalists usually start raising a new fund when their existing one nears the stage of full investment. This means that, on average, new funds are raised by venture capital firms every three to five years. The average fund size raised in 1997 and 1998 was £233 million. The median fund raised £84 million. The largest fund started during that period raised £1.3 billion. The minimum investment considered by most venture capitalists usually amounts to 1% of the total funds being raised. The maximum investment usually accepted from a single investor corresponds to about 10% of the total fund size. The majority of limited partnerships include between ten and 30 limited partners. Since UK legislation on these partnerships imposes a maximum limit of 20 partners, this means that several parallel funds are established to accommodate a greater number of partners.

When an investor commits a certain amount to the limited partnership, this should be interpreted as a theoretical maximum commitment. In practice, the maximum commitment is rarely solicited from an investor. According to our data, private equity funds that specialise in large MBOs will usually request up to 90-95% of total commitments. Funds that focus on investing in smaller firms will request on average 80-90% of the committed money. These transfers from investors to venture capitalists are called "draw-downs."[4] Usually, investors receive a notification shortly

[4] Due to the practice of paying the annual management fee (see section 2.4.4.) out of the initial draw-downs, the percentage of funds invested is slightly lower than the figures given above.

before the money is drawn down by the venture capitalists to fund a specific investment. Some of the larger funds will have monthly draw-downs that vary in their amounts.

Since the key performance benchmark of a venture capital fund, the internal rate of return (this measure will be discussed in detail in section 5.1), is driven by the time that the money has been working, venture capitalists started to operate a "just-in-time" cash flow management, i.e. they request money only when it is needed to finance a deal. As a rule of thumb, the annual amounts invested by the general partners usually range between 20% and 40% of committed funds. Venture capitalists argue that this practice reflects their investors' preferences who prefer putting uninvested funds at work themselves in order to minimise the amount of profits of the partnership to be shared. In practice, this means that the amount of capital working for an institutional investor at any point in time will be lower than the committed capital. Gatekeepers estimate that, on average, roughly two thirds of committed funds are working at any time for the investor. Note, however, that this is also a consequence of venture capitalists distributing the proceeds of their divestments after perdiods as short as two years. Investors that expect a certain target return in terms of absolute amounts should therefore be prepared to commit larger amounts of capital to private equity. The practice of "just-in-time" cash-flows also means that the returns stated by venture capitalists only apply to the drawn amounts and the duration during which they are managed. However, it also means that the share of the profits accruing to venture capitalists is minimised (see section 5.1.6.). Pension fund trustees should therefore be aware that the internal rates of return reported by venture capitalists will not represent the aggregate returns of the assets allocated to private equity. To avoid the opportunity costs that stem from not investing committed funds, investment managers should therefore invest funds that are not yet drawn in liquid assets, for example in a derivative of a stock market index.

2.4.3. The Venture Capital Investment Process

As already mentioned above, venture capital firms can be understood as intermediaries between providers of capital (usually institutional investors such as pension funds, banks and insurance companies) and investee companies (the issuers of equity that seek to raise finance for future projects). On behalf of the investors, venture capitalists select firms for investment, structure deals, perform due diligence and monitor the performance of the investee companies. Some venture capitalists will play a very active role in directing and controlling the strategies of their investee firms. Other venture capitalists will have a more "hands-off" approach and intervene only in case of unexpected problems. Venture capitalists regularly report to their investors on the deals carried out and the valuations of their portfolio companies. Some investee companies will receive several rounds of finance over time by the same venture capitalist. Value is added not just through the provision of finance but also the provision of coaching, expertise and access to a network of contacts. Investments in firms that seek equity are sometimes syndicated between venture capitalists in order to increase their level of diversification.

After an appropriate period of time, an exit strategy will be chosen to realise the returns of the investment. As a rule of thumb, the majority of involvements last between three to seven years. This duration is usually shorter for MBO/MBIs (two to four years) than for early stage investments and development capital (five to eight years). There are several ways to exit a venture capital investment ("divestment") and to realise capital gains. Table 2 gives an overview over the most popular exit strategies of UK venture capital firms. The majority of divestments are achieved through a trade sale where the investee company is sold to another firm, usually within the same industry. If the buyer has strategic reasons for buying the firm, it can sometimes fetch a higher price than would otherwise be possible through a stock market flotation.

Table 2
Divestments of UK Venture Capital Firms in 1998

Type of divestment	Amount divested (£m)		Number of divestments **		Number of companies **	
	Amount	%	No	%	No	%
Divestment on flotation*	103	6	80	7	41	5
Sale of quoted equity*	224	12	229	19	177	21
Trade sale	947	52	345	29	242	28
Sale to another venture capital firm	147	8	52	4	19	2
Sale to financial institutions	138	8	14	1	8	1
Sale to management (buy-back)	95	5	117	10	99	12
Divestment by other means (not including loan repayments)	55	3	173	14	105	12
Write-off	100	6	195	16	159	19
Total divestments	**1,809**	**100**	**1,205**	**100**	**850**	**100**

Source: British Venture Capital Association

Notes:
* Divestment on flotation and sale of quoted equity are different, because venture capitalists may not sell their shares directly after the IPO.

** "Number of divestments" differs from "Number of companies" because there can be more than one divestment in any one company during the year. This is mainly due to the practice of investment syndication.

The sale of quoted equity after a stock market flotation is the second most popular exit route. Equity is sold either directly at flotation or at a later stage. The latter is usually done on the limited partners' request if they believe that a substantial increase in the valuation of the stock would arise after the flotation. It is also done when the venture capitalist is restricted in the amount that may be sold at flotation. IPOs have received a further impetus in recent years with the creation of second tier stock markets such as the Alternative Investment Market (AIM) and Easdaq whose listing requirements are easier to meet for smaller companies than those of the London Stock Exchange. Nonetheless, the majority of IPOs occur on the London Stock Exchange followed by the AIM.[5] Additional exit strategies include investee company share buy-backs and sales to other venture capital companies. The financial returns from divestments are split up between

[5] Note also that the underperformance of shares of British smaller companies during the last years has made IPOs a less desirable exit route.

institutional investors and the venture capitalists as described in section 2.4.4. below. Usually, the proceeds are disbursed to the investors ("distributions") immediately after the realisation rather than re-invested.

2.4.4. Remuneration of General and Limited Partners

The share of the partnership's returns are governed by sophisticated contractual arrangements. In return for their investment services, general partners receive a management fee and a share of the profits. The latter is known as carried interest or simply carry. Over the last decades, fee structures have reached a certain degree of uniformity. Venture capitalists and observers alike argue that this convergence has resulted in efficient contractual arrangements to address the complex incentive problems that arise in the private equity industry (see also Fenn, Laing and Prowse 1995). We will describe the remuneration structure in more detail below. Note, however, that the figures provided here are indicative. Individual funds may operate on different terms.

Many venture capital funds charge a management fee of 2.5% of committed capital. Some of the large funds have settled with a lower management fee. Usually, this management fee is paid up to the sixth year. After six years, the management fee is gradually phased out in order to take account of realised investments. In addition to the management fee, general partners receive a share of the benefits of the partnership. Historically, the profits are shared on an 80/20 basis with 80% going to the limited partners and 20% to the general partners. In addition, many partnership contracts include a so-called "hurdle rate".[6] These hurdle rates can take two forms. In the case of a *pure hurdle*, benefits *in excess of the hurdle* rate are shared between limited and general partners. In contrast, a *catch-up hurdle* means that all benefits are shared according to the agreed rule. It is only a hurdle in so far as it gives limited partners a *preferential access* to the profits of the partnership if the total returns are insufficient. It thus eliminates part of the downside risk for institutional investors. Based on an 80/20 arrangement and a catch-up hurdle rate of 8%, the distribution preferences would be as follows:

- First, all proceeds from divestments will be paid to investors until they equal the sum of drawn-down capital, or, in some partnerships, committed capital. This means that investors cannot lose money and yet pay venture capitalists a performance fee.
- Second, investors will receive further proceeds until a target return ("hurdle") of 8% is realised. In essence this means that limited partners have received preferential access to the proceeds until their investments produce a return of 8%.
- Third, the venture capitalists receive proceeds until their distributions equal 25% of the investors' surplus, commonly known as the "catch-up phase". This means that the 80/20 share of proceeds is re-established ('20' being 25% of '80').
- Fourth, all remaining proceeds are distributed according to the 80/20 rule.

[6] Usually, there are no hurdle arrangements in early stage funds.

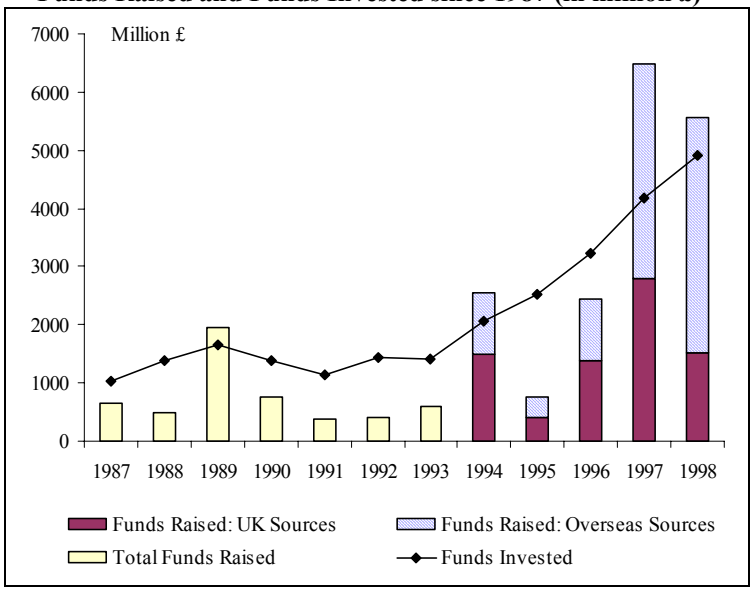
The distributions to the investors will then be added up and used to calculate the "IRR net of carried interest", the standard performance measure of the private equity industry. A more detailed numerical example to illustrate these distribution preferences and the resulting internal rate of return can be found in Appendix 2.

3. History of the Investment Activity of the UK Venture Capital Industry

3.1. Fundraising

Over the past fifteen years, the UK private equity industry has been one of the fastest growing segments of the financial services industry. The two most widely used indicators to measure the size of the industry, the amount of *funds raised* and the amount of *funds invested,* show a steady increase. Note however, that *funds raised* (or funds committed) are subject to stronger annual fluctuations than *funds invested*. This is due to the fact that several private equity firms have recently raised funds of around £1 billion, thus creating upward spikes which can distort annual trends. Due to these large funds and the lag effect (raised funds usually take up to six years to be invested), there can be substantial differences between the amounts for funds raised and funds invested in individual years.

Figure 1
Funds Raised and Funds Invested since 1987 (in million £) [7]



Source: BVCA 1998 Report on Investment Activity

[7] From 1994 onwards, the BVCA has gathered more detailed data on the sources of funds by country of origin. The diagonally striped bar (1994 onwards) represents funds from overseas sources (Source: BVCA 1998 Report on Investment Activity).

Figure 1 shows the evolution of the funds raised and invested of members of the BVCA. The funds raised have shown a steady increase from £645 million in 1987 to £5.6 billion in 1998. The funds invested have gone up from £1.03 billion in 1987 to £4.9 billion in 1998. Between 1987 and 1993, the levels of fundraising by BVCA members have been fairly even with annual funds raised ranging between £400 million and £760 million. An exception was the year 1989, which saw the creation of three large buy-out funds that raised more than £200 million each, a hitherto unreached size. In 1994, the industry raised £2.5 billion which represented a fourfold increase compared to the average of the previous years. The years since 1996 have seen a spectacular rise in the fundraising levels with a record amount of £6.5 billion being raised in 1997. In 1998, a total of £5.6 billion was raised by BVCA members (BVCA 1998 Report on Investment Activity). These funds are managed principally from the BVCA members' UK offices. The BVCA estimates that about 50% of these funds will be made available to British firms with the remainder being invested abroad.

This dramatic recent growth can be partly attributed to the creation of several very large buy-out and generalist funds. Since 1997, six members of the BVCA have raised sums in excess of £500 million each. But this trend is also manifest by the growth of the median fund size. In the period between 1980 and 1990, the median venture capital fund raised £18 million. Between 1990 and 1995, the median venture capital fund raised £33.5 million, and since 1996, the median fund size amounted to £80.5 million. Industry observers and venture capitalists attribute this trend of increasing fund size to the presence of considerable economies of scale present in the venture capital industry. They argue that the cost structure of venture capitalists requires a certain critical size. Beyond that size, further increases in investment activity do not result in substantial cost increases. Venture capitalists also have a strong incentive towards setting up larger funds due to the annual management fee even though the percentage of committed capital charged is usually lower for larger funds than for smaller funds. Furthermore, private equity firms have increasingly ventured into areas that were hitherto the domain of industrial players. The recent past has seen several syndicated transactions led by private equity houses that exceeded the £1 billion mark. This segment has traditionally been a domain of the largest industrial buyers but is now actively contested by UK and US private equity houses.

Traditionally, the largest contributors to the funding have been institutional investors. Figure 1 shows that the increase in fundraising is to a large extent supported by the influx of funds from foreign investors. In 1998, the contributions of UK institutional investors have declined in both relative and absolute terms. Table 3 and Figure 2 give a more detailed overview of the providers of funding to the UK private equity industry. It shows that UK pension funds' contributions increased from £437 million in 1994 to £553 million in 1998. However, their 1996 contribution exceeded their 1998 contribution in absolute terms. In relative terms, their share of overall funds increased from 17% in 1994 to 30% in 1996. In the two following years, it declined to 10%. The figures provided by the 1998 annual survey of the members of the National Association of Pension Funds (NAPF) state that by 1998, respondents had invested £2.2 billion in venture and development

capital funds. Given the total amount of respondents' assets of £415 billion, this amounts to 0.5% of managed assets. The recent trend is mixed for other UK institutional investors. UK banks have contributed 15% of total funds in 1994. Their contribution has dropped sharply in 1995, but has been steadily increasing since. UK insurance companies have provided 17% of funds in 1995 and 1997. Like pension funds, however, they have sharply reduced their involvement in private equity in 1998.

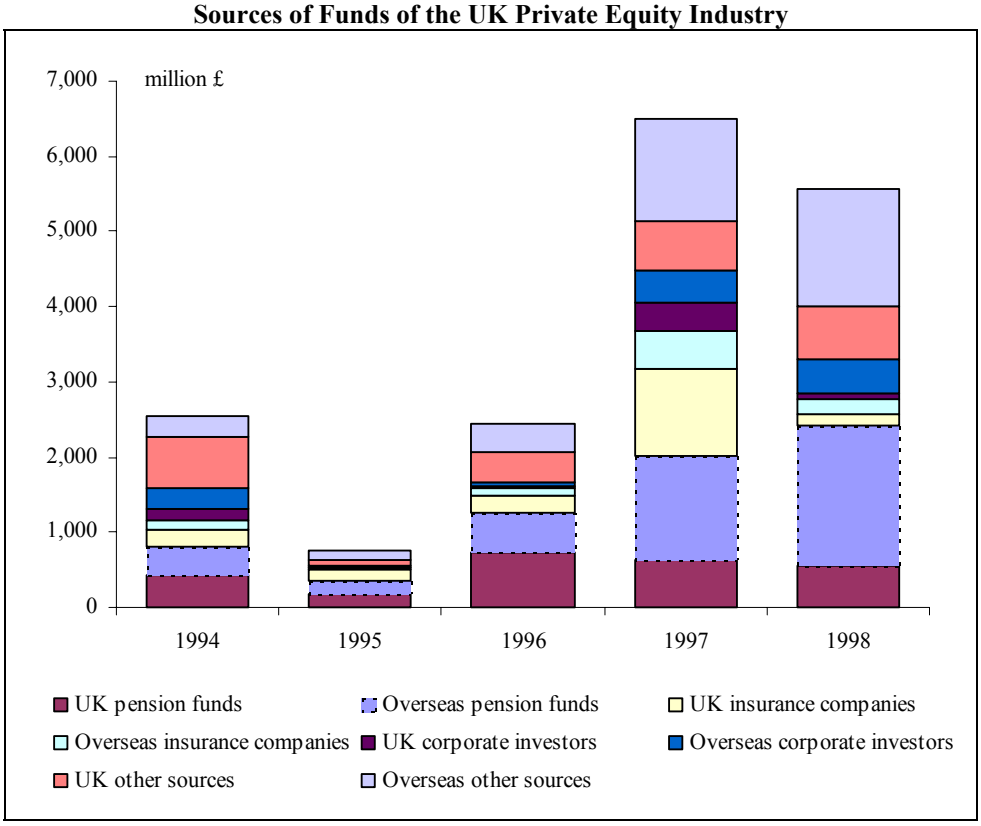
Table 3
Sources of Funds of the UK Private Equity Industry

Type of source	Amount raised (£m)					% of amount raised				
	1998	1997	1996	1995	1994	1998	1997	1996	1995	1994
Pension funds: UK	553	622	734	170	437	10	10	30	23	17
Overseas	1,875	1,397	519	191	359	34	21	21	25	14
Total	2,428	2,019	1,253	361	796	44	31	51	48	31
Insurance companies: UK	152	1,160	221	131	240	3	17	9	17	9
Overseas	193	505	104	12	128	3	8	4	2	5
Total	345	1,665	325	143	368	6	25	13	19	14
Corporate investors: UK	83	376	29	32	144	1	6	1	4	6
Overseas	432	428	51	18	280	8	6	2	2	11
Total	515	804	80	50	424	9	12	3	6	17
Banks: UK	383	238	68	7	391	7	4	3	1	15
Overseas	640	467	153	42	201	11	7	6	6	8
Total	1,023	705	221	49	592	18	11	9	7	23
Government agencies and academic institutions: UK	5	10	56	4	22	-	0	2	1	1
Overseas	434	234	82	63	23	8	4	4	8	1
Total	439	244	138	67	45	8	4	6	9	2
Private individuals: UK	157	164	68	43	52	3	3	3	6	2
Overseas	152	142	108	4	44	3	2	4	-	2
Total	309	306	176	47	96	6	5	7	6	4
Other sources: UK	182	228	207	25	218	3	4	8	3	8
Overseas	329	525	45	7	12	6	8	2	1	1
Total	511	753	252	32	230	9	12	10	4	9
Total from UK sources	1,515	2,798	1,383	412	1,504	27	43	57	55	59
Total from overseas sources	4,055	3,698	1,062	337	1,047	73	57	43	45	41
Grand total	**5,570**	**6,496**	**2,445**	**749**	**2,551**	**100**	**100**	**100**	**100**	**100**

Source: BVCA 1998 Report on Investment Activity

Overall, the most remarkable development is the steady increase of funds coming from overseas investors. The share of UK investors has steadily declined from 59% in 1994 to 27% in 1998. Foreign investors now make up 73% of capital committed to UK venture capital and private equity partnerships. According to the BVCA, institutional investors from the US account for 51% of all investments in the UK venture capital industry.

Figure 2
Sources of Funds of the UK Private Equity Industry



Source: BVCA 1998 Report on Investment Activity

3.2. Investment Activity

The increasing levels of fundraising have of course translated into increasing investment activity. However, the number of companies in which venture capitalists invested has increased to a lesser extent. Tables 4 to 6 display selected data on investment activity. In 1994, over £2 billion was invested in 1208 firms. Four years later, the amount invested increased to £4.9 billion and 1332 firms received private equity financing. Over the same period, the average investment size has increased from £ 2.6 million in 1995 to £ 3.4 million in 1998.

Table 4
Investment activity of BVCA members

	1998	1997	1996	1995	1994
Total amount invested (£m)	4,919	4,184	3,239	2,535	2,074
Number of UK companies financed	1,122	1,116	1,060	1,030	1,101
Number of overseas companies financed	210	156	140	133	107
Total number of companies financed	1,332	1,272	1,200	1,163	1,208

Source: BVCA 1998 Report on Investment Activity

Table 5
Average amount invested by stage (investment size)

Financing stage	Average amount invested (£000s)		
	1998	1997	1996
Start-up	964	515	490
Other early stage	1,404	949	895
Average early stage	**1,194**	**725**	**710**
Expansion	1,422	1,548	890
Secondary purchase	1,828	3,146	2,294
Refinancing of bank debt	533	844	2,809
Average expansion	**1,466**	**1,656**	**1,138**
MBO	9,767	6,053	6,341
MBI	5,254	4,917	4,747
Average MBO/MBI	**8,328**	**5,731**	**5,852**
Average Amount	**3,365**	**2,747**	**2,647**

Source: BVCA 1998 Report on Investment Activity

Table 6
Investment by financing stage (UK firms only)

Financing stage	Number of companies			% of companies			Amount invested (£m)			% of amount invested		
	1998	1997	1996	1998	1997	1996	1998	1997	1996	1998	1997	1996
Start-up	130	131	95	10	10	8	130	76	47	3	2	1
Other early stage	179	120	117	13	9	10	276	114	98	6	3	3
Total early stage	**309**	**251**	**212**	**23**	**20**	**18**	**406**	**190**	**145**	**8**	**5**	**4**
Expansion	568	517	434	43	41	36	932	934	535	19	22	17
Secondary purchase	76	100	88	6	8	7	133	310	180	3	7	6
Refinancing bank debt	7	9	97	1	1	8	6	8	54	0	0	2
Total expansion	**651**	**626**	**536**	**49**	**49**	**45**	**1071**	**1252**	**769**	**22**	**30**	**24**
MBO	259	288	273	19	23	23	2805	2192	1684	57	52	52
MBI	113	107	249	8	8	21	637	550	640	13	13	20
Total MBO/MBI	**372**	**395**	**356**	**28**	**31**	**30**	**3442**	**2742**	**2324**	**70**	**66**	**72**
Total	**1332**	**1272**	**1200**	**100**	**100**	**100**	**4919**	**4184**	**3238**	**100**	**100**	**100**

Source: BVCA 1998 Report on Investment Activity

The average investment size in the early stage area was just under £1.2 million. The largest transactions were made in the buy-out area with an average contribution of £9.8 million. According to the BVCA, 86% of companies received sums of less than £5 million. Since venture capitalists sometimes syndicate deals, the average amount that an investee firm receives can be larger. In the buy-out area, additional funds will also be provided by mezzanine houses and banks so that the total transaction sizes are much larger than the amounts stated here. When looking at the tables, it becomes apparent that the overwhelming majority of funds are invested in the buy-out area. For the last three years, the share of buy-outs of the total amounts invested ranged between

66% and 72%. Early stage funds make up the smallest segment of the UK private equity industry (8% of invested funds in 1998).

The investments in technology-based firms have been an area of particular concern for policy makers and industry observers. Traditionally, venture capital is seen as a means to finance early stage, high-technology companies whose projects are too risky to be financed through debt. However, due to the disappointing initial experience with such investments in the 1980s, UK venture capitalists started to focus increasingly on buy-outs and buy-ins. Over the past two years, however, there has been a notable increase in technology investments. In 1996, venture capitalists invested £319 million in 184 UK technology-based firms (17.4% of the total number of investments). This represented 11.3% of total funds. In 1998, a total of £707 million (18.7 %) was invested in UK technology-based firms. Venture capitalists backed 351 UK technology-based firms (31.2% of the total number of investments), the majority (84%) of which were early stage and expanding businesses. Investment in these early stage and expanding firms accounted for 48% of total funds invested in high-technology firms (BVCA 1998 Report on Investment Activity).

3.3. New Areas of Private Equity Activity

The UK venture capital industry has seen a number of new developments in the last few years. One has to mention the increasing number of "public to private" transactions where firms listed on the stock exchange are delisted. These transactions are motivated by the belief that the public market undervalued some of these firms. As a result, they face problems in raising funds for future expansion. This recent trend also has to be seen in conjunction with the underperfomance of the "small caps" segment of the London Stock Exchange during the past years. The majority of these investments are later exited through trade sales. Another recent development has been the "buy and build" strategies pursued by some venture capitalists. Here, a number of smaller firms are purchased and later merged into a single entity in order to realise synergies. Venture capitalists that engage in these strategies believe that value can be created through the consolidation and restructuring of their investee firms, but it is too early to assess the performance of these strategies.

4. Venture Capital and Private Equity in the United States

Before discussing the suitability of private equity and venture capital as an asset class for institutional investors, we will briefly look at the situation in the United States. The US has the largest and most developed venture capital and private equity markets in the world. Whatever the chosen indicator, the past decades have seen the steady rise of this particular segment of the financial services sector. The birth of the venture capital industry is widely linked with the creation of the American Research and Development Company (ARD) in 1946. Today, the National Venture Capital Association (NVCA) counts nearly 300 venture capital firms. In addition, the database of the information provider Venture Economics covers 287 partnerships that invest in

leveraged buy-outs. The investment activities of these venture capital and leveraged-buy-out partnerships ranges from seed capital to multi-billion dollar leveraged buy-outs. In 1997, an estimated $13.6 billion in venture capital and at least a further $38 billion in private equity transactions was invested (Source: Venture Economics 1998 Investment Benchmark Report, US Venture Capital and Private Equity Issues). Note that there is a stricter separation between buy-out and venture capital activity in the US. In contrast, the "generalist" model where venture capital funds invest in firms from the start-up to the buy-out stage is more common in the UK venture capital industry.

Among the factors that are usually associated with the growth of venture capital in the US are its entrepreneurial culture, the size of its domestic market, the presence of well developed financial markets that provide attractive exit opportunities, the development of a complementary support infrastructure of firms servicing start-ups and the favourable regulatory environment for these investments. We will first look at the regulatory environment before reporting on investment activity and performance.

4.1. Regulatory Influences

Among the regulatory changes, three stand out as having particularly benefited the private equity industry. The earliest dedicated initiative to increase the supply of finance to small, entrepreneurial businesses has been the Small Business Investment Incentive Act of 1958 which led to the creation of Small Business Investment Companies (SBICs). These SBICs benefited from subsidised loans and tax benefits, yet certain restrictions with regard to size of the companies they invested in applied. Despite suffering from several draw-backs, these SBICs provided previously unmatched amounts to start-ups and they served as a training ground for many venture capitalists who would later set up their own partnerships. Today, SBICs are responsible for only about 5% of venture capital investment in the US.

A change in the Employee Retirement Income Security Act (ERISA), initially adopted in 1974, is widely credited with a further surge of capital inflows into venture capital and private equity partnerships (Fenn, Laing and Prowse 1995). Up to 1978, pensions funds were effectively prevented from investing in venture capital by the existing ERISA provisions. The 1978 ERISA "prudent man" ruling of the US Department of Labor reversed that situation by stating that investments in venture capital and securities issues by small or young companies were compatible with ERISA pension schemes as long as they did not endanger an entire portfolio. Two additional changes, the 1980 ERISA "safe harbor" ruling and the 1980 Small Business Incentive Act, further increased venture capital activity. Both facilitated the structuring of limited partnerships and the performance-related remuneration of venture capitalists.

In this context, one has to mention two additional regulatory changes which had a wide-ranging effect. Entrepreneurs, venture capitalists and institutional investors benefited particularly from

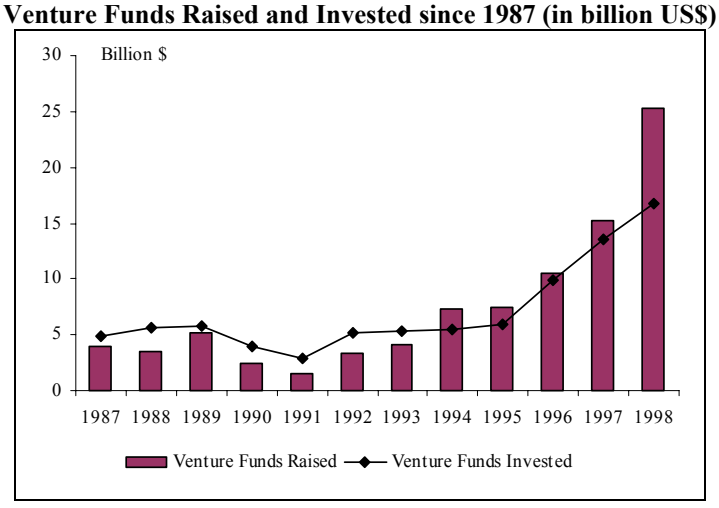
them, since they are instrumental in increasing venture capital financed entrepreneurship. The first is the substantial reduction of capital gains, initially in 1978 when the rate was reduced from 49.5% to 28% and later in 1981 when it was reduced to 20%. The second was the Stock Options Law of 1981 which decreed that taxes on share options are to be paid when shares are sold, instead of when options were exercised.

Almost all studies on US private equity activity conclude that these changes were instrumental in increasing the flow of capital into the industry (e.g. Bygrave and Timmons 1992; Fenn, Laing and Jones 1995; Gompers and Lerner 1998). Taken together, these changes had the simultaneous effect of increasing both the supply of and demand for private equity. The ERISA "prudent man" rule in particular is credited with the fact that pension funds became the dominant suppliers of capital during the last two decades.

4.2. Fundraising and Investment Activity

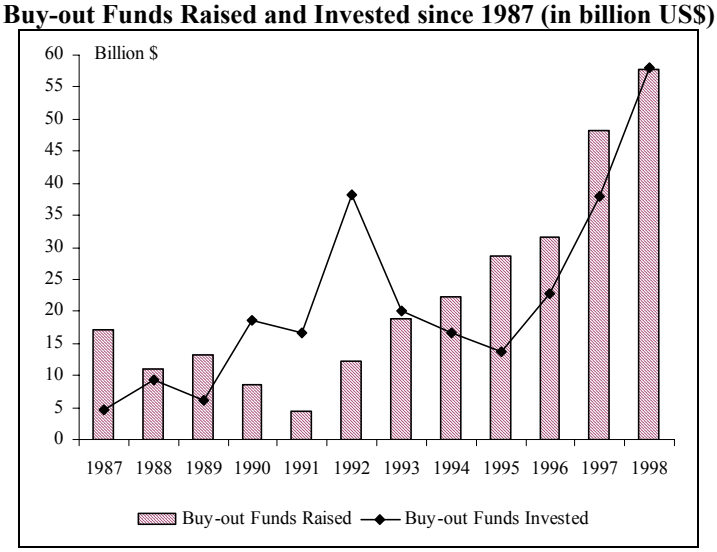
Due to the stricter separation between buy-out and traditional venture capital activity in the US, it is more difficult to obtain statistics comparable to those provided by the BVCA. For example, the statistics provided in the NVCA Yearbook cover similar indicators as the BVCA. Comparable data on the fundraising and investment activity of US buy-out funds is not available since partnerships operating in this area are not organised in a comparable industry association. As a result, we will present selective data compiled from the NVCA 1999 Yearbook and various issues of the Venture Economics Investment Benchmark Reports on Venture Capital and Private Equity. Figure 3 and Figure 4 give an overview of the size of the venture capital and buy-out areas in the US. After several years of relatively stable levels of fundraising, one could observe a spectacular increase in the years 1997 and 1998. In the venture fund area, commitments have gone from $10.5 billion in 1996 to $25.3 billion in 1998. In the buy-out arena, commitments went from $31.5 billion to $57.8 billion.

Figure 3
Venture Funds Raised and Invested since 1987 (in billion US$)



Source: NVCA 1999 Yearbook

Figure 4
Buy-out Funds Raised and Invested since 1987 (in billion US$)



Source: Venture Economics Buy-out Investment Benchmarks

According to the NVCA, the largest contributors to *venture funds* are pension funds who provided 60% of its funds in 1998. Similar statistics on the buy-out segment of the private equity market are not available. However, there is some data on the involvements of US institutional investors in this asset class. The investment bank Goldman Sachs and investment consultants Frank Russell carry out a biannual survey on alternative investments by US pension funds and endowments. At the time of writing this report, the latest available figures were from the 1997 survey. According to this survey, the responding US pension funds invested 7.6% of their assets in alternative investments. Among these, venture capital (in the narrow sense of the definition including mainly early stage firms) represented 18.6%, leveraged buy-outs 52.9%, international private equity 9.3% and mezzanine finance 4.0%. Using a definition comparable with the UK treatment of this asset class, the total assets invested in US venture capital and private equity therefore amount to 71.5% of all alternative assets or 5.4% of total assets. Including international private equity and mezzanine, the investment in these alternative assets amounted to 84.8% of alternative assets and 6.4% of total assets in 1997. According to the survey, the respondents' share of traditional venture capital in the narrow sense of the term has decreased from 26.1% in 1992 to 18.6% in 1997. During the same time, however, pension funds have steadily increased their participations in buy-out funds from 41.0% to 52.9%. International private equity, an asset class not surveyed in 1992, has increased from 5.8% in 1995 to 9.3% in 1997.

Evidence from the NVCA corroborates this trend. In the same period from 1992 to 1997, capital commitments by pension funds directed towards funds managed by NVCA members which predominantly focus on venture capital in the narrower sense increased from $1.41 billion to $5.77 billion. The share of US pension funds of total funding has thus declined slightly from 42% to 38% (Source: NVCA 1999 Yearbook). The year 1998, however, saw a substantial increase of US pension funds' commitment to this asset class. Pension funds nearly tripled their investment and

committed a total sum of $15.03 billion to venture capital. They thus provide 59% of the total funds of $25.3 billion raised by the US venture capital industry. Note that these figures exclude the contributions of pension funds to the buy-out area.

Table 7
US Pension Fund Commitments to Private Equity (in %)

Asset Class	1997		1995		1992	
	% of alternative assets	% of total assets	% of alternative assets	% of total assets	% of alternative assets	% of total assets
Venture Capital *	18.6	1.4	22.3	1.4	26.1	n/a
Leveraged Buy-outs	52.9	4.0	43.9	2.7	41.0	n/a
Sub-Total	**71.5**	**5.4**	**66.2**	**4.1**	**67.1**	n/a
International Private Equity	9.3	0.7	5.8	0.4	-	n/a
Mezzanine	4.0	0.3	6.5	0.4	10.0	n/a
Sub-Total	**13.3**	**1.0**	**12.3**	**0.8**	**10.0**	n/a
Sub-Total Private Equity	**84.8**	**6.4**	**78.5**	**4.9**	**77.1**	n/a
Other Alternative Investments **	15.2	1.2	21.5	1.3	22.9	n/a
Total	**100**	**7.6**	**100**	**6.2**	**100**	n/a

Source: Goldman Sachs Frank Russell 1997 Report on Alternative Investing by Tax Exempt Organisations

Notes:
* Venture Capital is used in the narrow sense of the definition, including mainly early stage and expansion financing for young firms.

** Other alternative investments include oil and gas programs, timber and farmland. Property and Real Estate are excluded from the Goldman Sachs Frank Russell definition.

Overall, it can be confirmed that the asset allocation of US institutional investors is several times the level of their UK counterparts. However, this contrast cannot be attributed to different investment preferences alone. It is also stemming from structural differences between the US and the UK pension fund industries. For example, among the largest 100 pension funds in the world, 62 are from the US and only 11 from the UK (Source: Pensions and Investment, 1999 Survey). The number of US pension funds above the critical size recommended for private equity investments, and consequently the number of potential providers of venture capital and private equity is much higher.

The investment performance of US private equity and venture capital partnerships will be discussed in section 5.2.3. in conjunction with returns of the UK and European venture capital industry.

5. Assessment of the Suitability of UK Private Equity as an Asset Class for Institutional Investors

After describing the basics of the private equity fundraising and investment processes, we are now going to address the second main objective of the report, the assessment of the suitability of private equity as an asset class for institutional investors. To this end, we are going to examine the returns of the private equity industry and the risk and cash-flow implications of these investments. Before that, we are going to discuss the dataset, methodological aspects and the particular characteristics of private equity and venture capital which distinguish it from other asset classes. We would like to remind readers that investments in this asset class via venture capital investment trusts can be treated like investments in other quoted equities. We will therefore refrain from discussing them in this report.

5.1. Methodology

5.1.1. Description of the Dataset

For the purpose of the evaluation of private equity as an asset class for institutional investors, we use the dataset of the 1998 BVCA performance survey. This report is carried out annually by The WM Company on behalf of the BVCA. For the 1998 performance survey, data from 64 out of the 117 full members of the BVCA was available. The remaining 53 funds are split up as follows: 24 funds are captives which obtain funds from their parent organisation. An additional 16 limited partnerships do not raise funds from institutional investors. These funds typically draw money from government development agencies or wealthy individuals. 3 funds were excluded because their organisational structure makes performance comparisons with other funds difficult. 10 venture capital firms declined to participate in the annual performance survey. The remaining 64 funds that participated therefore constitute 86.5% of all independent and semi-captive funds that could have participated in the survey.

Table 8
1998 Performance Survey - Participating Venture Capital Funds

Full BVCA members	Number	%
Participating firms	**64**	**54.7**
Ineligible for performance survey	**43**	**36.7**
Captives	24	20.5
Funds not open for institutional investors	16	13.7
Different organisational structure	3	2.6
Non-participating firms	**10**	**8.5**
Full BVCA members	**117**	**100.0**

Source: BVCA, WM

Table 8 gives an overview of the participation of venture capital firms in this survey. The venture capital managers provided data on 216 venture capital funds. 28 venture capital funds had to be excluded for either being too young (less than one year) or due to missing information on one or more of the asked questions. Altogether, the dataset thus consists of the monthly cash-flows and annual net asset values of 188 venture capital funds.

For the annual performance report, all venture capital funds are grouped into the following classes. Funds that provide seed capital (to fund concepts and prototypes), early stage capital (firms that are less than three years old) and early development capital are grouped under the heading *early stage funds*. *Development funds* are directed towards firms in their expansion phase. These firms usually seek additional funds to fund working capital, to fund a major investment such as an acquisition or a new plant and smaller buy-outs and buy-ins which require up to £2 million of equity. Additional classes are *mid-sized buy-outs and buy-ins* (between £2 million and £10 million of equity invested) and *large buy-ins and buy-outs* (more than £10 million of equity invested). Finally, there are so called *"generalist funds"* which invest in firms across different stages.

5.1.2. Methodological Aspects of Assessing Private Equity

Using the standard methods of financial theory in order to assess the performance, risk and liquidity of the private equity industry is a somewhat awkward exercise. In principle, it is possible to apply many theoretical concepts of corporate finance to this sector of the financial services industry. In practice, however, this is often made difficult if not impossible by the peculiar nature of the dominant investment vehicle, the fixed-life fund. Several parameters required for the standard evaluation methods can only be calculated approximately. The following example will illustrate this point.

In order to make an assessment of the variability of the returns of a sample of funds, individual fund returns are required. Yet, in order to calculate the *definitive* rate of return of a fund, one needs a final and definitive valuation of the residual asset value. Almost by definition, this valuation can only be made when the fund is wound up. Despite the fact that limited partnerships have an agreed fixed life of ten years, the fund will often show a residual asset value for a considerable time beyond those ten years before it is finally wound up. This sum represents those investments that have not been realised and where the underlying investee companies still have value. As a result, of the 216 funds raised since 1980 covered by the present dataset, only 23 (10.6%) have been fully wound up to date. Most calculations therefore show *interim* returns which fluctuate around the definitive rate of return. While one can get a good picture of the performance of an individual fund after a few years, certainty can only be obtained much later. Nonetheless, it will be shown below that workable assumptions can be made regarding these fluctuations in order to estimate the aggregate returns of the industry. We will now illustrate the dynamics of investment decisions in this asset class. Such an exercise requires a number of assumptions concerning the chosen

measurement method and the factors that drive the evaluation method. We will address these issues in the sections below.

5.1.3. Methods of Performance Measurement: The Internal Rate of Return (IRR)

The standard measure to assess the performance of a venture capital partnership is the internal rate of return (IRR). The calculation of IRRs (sometimes also called money-weighted rate of return) requires data on the amounts and dates of the cash-flows that occurred during the period under consideration. In addition, for *interim* IRR calculations, the residual value of the fund has to be entered in the equation.[8] As already mentioned above, *definitive* IRRs can only be calculated when the fund is wound up. In practice, this means that the majority of fund IRRs used for the annual performance survey are interim IRRs.

In essence, the IRR is a measure that calculates the rate of return at which cash-flows are discounted so that the net present value amounts to zero. For venture capital performance evaluations the net present values entered in the equation are net of management fees and carried interest. Thus, the formula is similar to the calculation of net present values based on discounted cash-flows and the IRR amounts to the equivalent of the discount rate of the cash-flows. Appendix 1 lists the formula required to calculate an IRR.

In practice, the calculation of the IRR involves several steps. The calculation of the IRR after management fees is straightforward since it requires only the net cash flows, residual portfolio value and dates at which these have been measured. Computer spreadsheets such as Excel (IRR and XIRR function) or Lotus 123 (IRR function) are usually used to perform these iterative calculations. However, in order to calculate IRRs net of carried interest, the principal benchmark used to assess the venture capital *industry*, a number of intermediate steps have to be performed. These steps take into account a hurdle rate (if adopted) and share the returns according to the agreed procedure after the returns exceed the hurdle (see also section 2.4.4). Therefore, the IRRs shown by venture capitalists are usually net of all fees. This is in contrast to the returns shown for pension funds, which are gross. The appropriate management fees would have to be deducted at the end of the year for a fair comparison.

5.1.4. Average IRR versus Pooled IRR

In order to assess the performance of an *individual* venture capital fund, IRRs are calculated as above. There are several ways of measuring the returns of the private equity *industry*. One possible way of doing so would be to calculate an average IRR. This method, however, would not reflect the overall performance of the industry, since it attaches equal weight to all funds irrespective of the amounts under management. To resolve this, one could also calculate a capital-weighted IRR

[8] For calculation purposes, the residual value is interpreted as the final distribution to investors.

in order to reflect the size differences of funds. However, that method does not take into account the different time periods that the money has been under management. For this reason, monthly cash-flows are usually pooled and then the IRR is calculated based on the net cash-flows of the industry. This method is referred to as *pooled IRR* and is used for most private equity performance measurement exercises (see also Venture Economics 1999). Nonetheless, the use of average IRRs does have advantages for certain analytical purposes. This is particularly useful in order to examine the properties and dynamics of fund performance pattern. Nonetheless, inferences about the industry performance should be made with caution since averages do not reflect overall industry performance.

5.1.5. Defining Fund Maturity: Convergence of interim IRR and definitive IRR

Before assessing the returns of the UK private equity industry, we have to investigate a further issue. As already explained above, it is very important to note that a definitive evaluation of an individual fund can only be made when a fund is wound up. Since the annual performance measurement report of the UK venture capital industry uses interim IRRs, it is important to ascertain the reliability of these IRRs relative to the final IRRs. The standard method to approach this issue is to look at the convergence between interim and final IRRs. Using this method, fund age becomes the main criteria for maturity.[9]

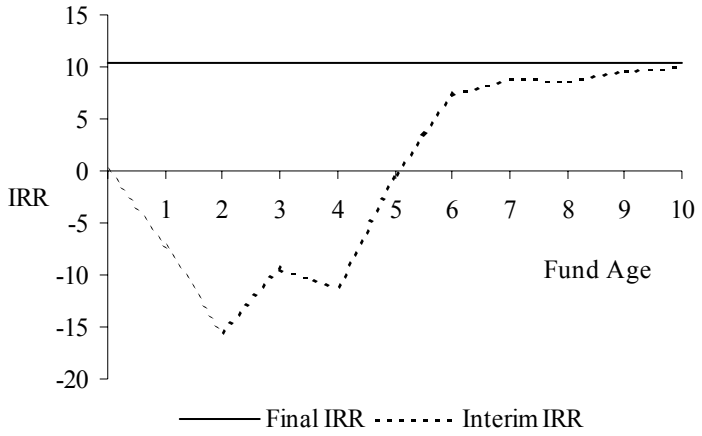
During the early years of a fund, the values of the IRRs tend to be 0 or negative. This is due to two factors. First, the management fee and start-up costs of a limited partnership are usually financed out of the first draw-downs. This means that part of the sums drawn down during the first year do not create net book value for the limited partnership. The later the general partners start to invest, the higher the initial negative impact of these fixed start-up costs. The second factor is related to the conservative valuation guidelines of the venture capital industry. According to the BVCA guidelines, it is recommended that members should value investments *at cost* during the first years. Adjustments of the values are only made when an investee firm has witnessed a substantial increase in value.[10] Furthermore, some investments do not perform and may have to be written off. Since these losses usually impact earlier on fund performance than successful realisations, interim valuations of young funds tend to be very low or even negative. Only when the first successful realisations are made does the return curve start to rise steeply. For buy-out funds, the time period required to reach positive IRRs is usually shorter than for early stage and development funds.

This pattern is known as the J-curve. In order to test whether the facts fit the story, we calculated the final IRRs by year of all funds wound up to date. Up to now, 23 funds set up since 1980 have been wound up and final valuations are available. Figure 5 illustrates the J-curve pattern. The figure illustrates that IRRs are negative during the first years of a venture capital fund's life. Only

[9] Alternative criteria to assess fund maturity are discussed in Appendix 3.
[10] The BVCA Guidelines for the Valuation and Disclosure of Venture Capital Portfolios provide detailed guidance on how to value investee firms.

after a period of several years, one can get a reasonable indication concerning the overall performance of the funds. Interim IRRs tend to approach their final IRRs the longer the time period under consideration. After seven to eight years, large changes in performance are unlikely. We also calculated the difference between IRRs of funds that have been completely wound up and their interim IRRs for each year up to ten years. It shows that interim IRRs after ten years are on average 40 basis points lower than the final IRRs for these funds. Unfortunately, this analysis can only be applied to 23 funds in the database (12% of the total BVCA funds). Nonetheless, they show that over a ten year period, interim IRRs and final IRRs have virtually converged.

Figure 5
Convergence of Interim and Final IRRs (the "J-Curve")



Note: Average IRRs are shown
Source: LBS Calculations

Figure 5 should be interpreted with great care. Above all, there are only 23 funds out of the 188 funds in the database for which final valuations are available. Secondly, the figure shows the arithmetic average of the individual funds. Since they are not pooled and weighted by amounts of their cash-flows, they do not represent the aggregate performance for these 23 funds. Thirdly, the convergence towards an IRR of 10% reflects the returns generated for funds started up in the early 1980s. Returns during that period were lower compared to the long-term industry average and many venture capitalists did not practise just-in-time deal-based cash-flow management. Furthermore, many funds set up in the 1990s which could not be included in this analysis since they are less than 10 years old have produced positive IRRs after as little time as two years. The same analysis would result in a convergence towards 15% if it was based on all funds instead of only those 23 for which final valuations are available. Finally, one has to mention that there is a small minority of funds, whose return pattern did not follow the J-curve. This can be the case when general partners make a number of successful investments in the early phase of a fund's life, but where later investments have to be written off.

The annual performance survey of the UK venture capital industry carried out by The WM Company uses four years as a cut-off date to define maturity. The Venture Economics survey carried out in the US uses five years as cut-off. Based on the graphical analysis in Figure 5, we would be inclined to choose the more conservative threshold of five years for the purpose of performance evaluation. However, the downside of that approach is that more funds have to be excluded from the analysis. We will therefore stick with the practice adopted by The WM Company and the BVCA and define mature funds as being at least four years old at the time of the performance review.

There is an additional reason for our choice of four years as the appropriate cut-off. All other things being equal, a shorter cut-off will produce higher aggregate returns when exit markets are attractive or when venture capitalists manage to realise their investments over shorter time periods. This effect can outweigh the influence of the otherwise usually negative IRRs at the beginning of a fund's life. However, a shorter cut-off will lead to a decrease of the return figures as shown in the annual statistics when bearish exit markets make early realisations unattractive. As will be shown below, the UK capital industry has recently experienced several years with high returns. With the present dataset, choosing a cut-off of three, four or five years has a negligible impact on the overall aggregated industry returns, yet it substantially increases the size of the analysis sample. We thus chose four years as the cut-off.

5.1.6. The Drivers of the IRR:

Having taken a closer look at the formula used to calculate IRRs (see Appendix 1), one realises that returns are driven by a number of factors. These are the amounts and timing of cash-flows and the net asset value at the time of the valuation. All other things being equal, IRRs will increase:

1) the higher the capital gains realised through divestments;
2) the lower the draw-downs requested from investors;
3) the shorter the period between draw-down and distribution (the time period the money has been "working" in the fund).

Note that the second condition can be a function of a lack of attractive investment opportunities. As a result, an increase of the pooled industry IRR can be caused merely by the fact that venture capitalists invest less in one particular year while experiencing unchanged divestment levels. Conversely, drops in the pooled IRR can be caused by a surge of investments. Such a drop would be fully in line with the J-curve pattern discussed in section 5.1.5.

Due to the third condition, venture capitalists have an incentive to drive up the IRR as high as possible by running just-in-time cash management. As a result, venture capitalists draw funds from investors on a deal-by-deal basis and - despite the ten year life of the partnership - the period of time during which the committed capital is working for an investor may sometimes be as short as

three years. According to venture capitalists, the practice of just-in-time cash management is also a result of requests from institutional investors. Investors can thus invest committed yet unsolicited funds in other, more liquid assets themselves. Accordingly, they get the full access to the returns from these interim investments that would otherwise have been shared with venture capitalists according to the carried interest arrangement had the latter invested the funds themselves. Consequently, institutional investors have to be aware that an IRR of 15% does not signify that a compound return of 15% over a ten year period is achieved for the totality of committed capital. As a result, the returns of the partnership reported by venture capitalists only refer to the amounts of drawn funds and the time during which they have been working for the fund's portfolio.

In order to assess the long-term return implications of private equity investments, one should also look at their capital realisations. For institutional investors, there is a trade-off. Should they be interested in obtaining the highest possible IRR for their investments, or the highest amount of capital realisations? In principle, institutional investors should request higher capital realisations as long as the marginal IRR equals the returns of the next best performing asset class plus an appropriate premium for risk and illiquidity (if this is an issue). Venture capitalists, however, raise money for further funds based on their past performance. Since the latter is mainly assessed through the IRR method, venture capitalists therefore would have an incentive to drive up the IRR as high as possible by shortening the investment period rather than achieving the highest realisations. In order to address that incentive problem, VCs receive a share of the absolute value added (carried interest), thus encouraging them to trade-off IRR and multiples to an appropriate level.

5.1.7. Individual Fund Performance versus Industry Performance

Overall, despite the fact that there have recently been funds that generated impressive returns after periods as short as two years, the graphical analysis in Figure 5 illustrated that judging individual funds over periods as short as one or two years will often produce misleading results. We argued that individual funds should be assessed over periods that cover at least four years. It is, however, possible to assess the venture capital industry over periods as short as one year based on pooled IRRs. Note, however, that *a one-year industry IRR is a hypothetical performance measure*. Since investments in a fixed life fund are fairly illiquid, such a measure represents the return equivalent to asset value increase or decrease given the cash-flows that occurred during the period under observation. For institutional investors, it is not possible to invest in this asset class for a period as short as one year other than through investing in venture capital investment trusts.

A one-year IRR is frequently used to assess whether the industry as a whole had a good or a bad year. However, such an interpretation has to be treated with caution. A good year can be a result of several factors. In many cases, it is an indicator of high divestment frequency and attractive divestment valuations. However, it can also be driven by the lack of attractive investment opportunities and therefore a low amount of draw-downs relative to the realisations. Conversely, a

"bad" year in terms of IRR performance can simply be driven by an abundance of attractive investment opportunities thus resulting in high pooled annual draw-downs relative to divestments. Remember from section 5.1.5 that this is the effect of the J-curve pattern of IRRs. A short-term industry IRR should therefore be discussed in conjunction with these factors since it is not in isolation an appropriate indicator to assess the industry-level performance of this asset class.

5.1.8. Internal Rate of Return versus Time-weighted Rate of Return

It has been suggested that the private equity industry should adopt the standards of the pension fund industry in order to make performance comparisons and communication with institutional investors more transparent. Institutional investors usually rely on the method of *time-weighted returns* (TWR) in order to measure the performance of pension fund managers. In order to calculate time-weighted rates of return, fund valuations for the beginning and end of the period under observation are required. This means that for industry-wide measurement exercises such as the pension fund performance reports produced by WM or CAPS, fund valuations have to be reported in identical intervals for the entire industry (such as quarterly or annual intervals). Yet, there are a number of related reasons why the time-weighted rate of return method applied to the private equity industry will produce misleading results. We will briefly summarise these below (A more technical discussion of calculation of IRRs and TWRs can be found in Appendix 1):

- First, a meaningful application of the TWR method to private equity would require that a fund valuation is carried out every time when general partners record a cash-flow. The following example will illustrate the implications of this point. Suppose a fund's value on January 1st 1998 is £100 million. On July 1st 1998, a further £30 million is invested in this fund. After one year, it is valued at £150 million. An IRR calculation on this investment would result in an IRR of 17.5%. A return calculation that ignores the cash-flows would produce a return of (150/100)-1 = 50%. However, one immediately realises that the value at the end of the period is partly driven by the additional investment received in June. In order to calculate a meaningful return, one would therefore have to value the fund on July 1st. For example, a valuation of £110 million on July 1st produces a time-weighted return of (110/100) x (150/(110+30))-1 = 17.9%. In the case of pension funds, the availability of market prices for bonds and equities allow an instantaneous portfolio valuation at any moment in time. The effects of cash-flows can thus be taken into account and the TWR will approximate the IRR. In the case of private equity, however, a meaningful calculation of the TWR can only be made if venture capitalists carried out valuation exercises *every time they record a cash-flow*. In the absence of these valuations, it is impossible to determine whether a high return (determined by high end-of period valuations) stems from good investment performance or simply an increase of money under management.

- Second, in order to make the results comparable to TWRs of other asset classes, venture capitalists would have to carry out valuations of their portfolios in the same intervals as

investment fund managers. In principle, this is possible. However, the results are irrelevant during the initial investment period of a private equity fund because of the negative impact of the management fee and start-up costs during the first year of a fund. Furthermore, venture capital investments are valued at cost during the first years and the participations in some companies have to be written off during that period. As a result, the calculated returns are usually zero or negative during the early years of the fund's life. Only when the first realisations are made, the return curve would start to rise steeply (see also Figure 5, which explains the "J-curve" pattern of private equity returns). From time to time, private equity portfolios will therefore show sudden upward jumps which are a function of both the timing and attractiveness of the divestments. As a comparator to the performance of other asset classes, the TWR used for pension funds is therefore inappropriate when applied to *individual* private equity funds that have not reached a certain maturity.

- Third, the TWR was originally developed as a relative performance measure of investment *fund managers* rather than a true rate of return. This was motivated by the fact that investment managers have limited discretion over the timing of cash-flows of funds allocated to them by their clients. The TWR thus attaches an equal weight to each period during which it is measured. Private equity managers, however, can actively decide when they want to enter or exit an investment opportunity and therefore exert a direct influence on their returns. Suppose that venture capitalists were subject to quarterly TWR measurement and that it was possible to value their portfolios each time they experienced a cash-flow. The funds under management would usually rise until they reached a peak in year four of the partnership's life. After that, the ongoing effect of divestments would lead to a reduction of money under management. Towards the end of the fund's life, only small residual asset values would remain. Attaching an equal weight to all of these periods, irrespective of the amounts of funds under management, would seriously distort the overall return calculation for individual funds.

- Fourth, venture capitalists usually calculate IRRs based on the distributions after their fees and share of profits have been subtracted. In contrast, the TWRs of investment funds in the industry performance statistics provided by WM are based on gross asset values, irrespective of management costs involved in managing the portfolio.

While the latter point could in practice be overcome through making appropriate adjustments, it is the former three that are likely to prevent the use of the TWR as performance benchmark of the venture capital industry. In essence, we would therefore recommend that the private equity industry continues to use the IRR as the main performance benchmark. In giving this recommendation, we are in line with guidelines established by the Association of Investment Management Research (AIMR) and private equity industry associations (NVCA, EVCA and BVCA) which advocate the use of the IRR to appraise private equity investments.

5.2. Performance Assessment of Private Equity

In order to assess the returns of the UK venture capital industry, we will chose three performance appraisal methods. The first one will be based on an evaluation of IRRs. We will calculate the pooled IRRs for all funds raised since 1980. We will give a breakdown of these figures by investment stage and by vintage year. This part of the analysis will follow the methodology chosen by The WM Company for the annual performance survey. We will then compare the returns of the UK private equity industry with those of its US and European counterparts. After that, we will compare the performance of private equity relative to other asset classes. We will then compare the IRRs from venture capital investments with the hypothetical returns that one could have made from investing the identical cash-flows in other asset classes. Finally, we will look at the capital realisations of private equity funds. We will examine distributions and residual fund value and will compare them to the sum of paid-in capital (draw-downs).

5.2.1. Assessment of Private Equity Returns: Industry IRRs

We will base our discussion of the performance of private equity on the results of the 1998 WM/BVCA performance survey of. [11] Since 1996, this performance assessment exercise has been carried out by WM. Tables 9 and 10 give an overview of the returns of the private equity industry. We display IRRs for the different investment stages and vintage years. In addition, we will report the IRRs for the entire database and for mature funds only. As mentioned above, a fund is considered a mature fund if it is at least four years old. This means, for example, that all funds started since 1994 will be included in the calculation of 1998 one-year returns for all mature funds.

We would like to remind the readers again of the main implications of our methodological discussion in section 5.1. IRRs that are calculated over periods as short as one or two years do not represent appropriate yardsticks to assess the performance at the individual fund level. At the aggregated industry level, they do give an indication whether the private equity industry had a good or a bad year. However, a discussion of one-year IRRs should be made in conjunction with reporting the level of investment and divestment activity. We would like to repeat that one should not be surprised by the large fluctuations in annual private equity returns in certain years, since high IRRs can be caused by a small number of attractive divestments and low IRRs by a surge of new funds starting their investment activity. In order to assess the attractiveness of this asset class, we recommend looking at the long-term returns starting over a period that covers at least four years.

Tables 9 to 10 display the performance of UK private equity by investment stages and by vintage year. An analysis by investment stage has to be interpreted in the light of the different investment cycles. Accordingly, there is usually a lot of fluctuation between the different investment stages

[11] Due to the re-classifications of several funds, there are small differences to the figures in the 1998 performance report.

when looking at short-term IRRs. This reflects the fact that early stage and development funds will have a higher proportion of unrealised assets during their early years whereas buy-out funds can have realisations after periods as short as one year. The vintage year analysis can account for differences with regard to fund age and the economic cycle. Due to the limited number of observations, we have grouped all funds set up between 1980 and 1984 together.

Table 9
Performance by Investment Stage (in %)

Investment Focus	One year 1998	Two Year 1997-98	Three Year 1996-98	Four Year 1995-98	Five Year 1994-98	Six Year 1993-98	Seven Year 1992-98	Eight Year 1991-98	Nine Year 1990-98	Ten Year 1989-98
Early Stage	-27.5	0.9	4.0	44.2	7.4	26.7	26.9	19.3	13.8	7.9
Development	13.5	20.7	25.5	26.5	23.3	26.6	20.1	17.2	12.4	7.7
Mid MBO	17.9	14.7	28.7	29.6	26.5	32.8	26.5	20.1	14.8	12.0
Large MBO	26.2	25.5	26.2	42.8	27.4	42.3	33.6	29.4	19.1	17.1
Generalist	64.0	34.2	34.5	35.3	20.5	21.7	20.4	26.3	23.6	11.0
Total	28.3	24.6	27.7	37.6	24.3	32.3	27.3	25.1	18.1	12.7
Number of funds	188	176	143	134	134	118	108	102	90	77
Mature funds only	37.5	25.7	25.8	39.3	22.5	38.5	27.3	23.0	17.1	8.3
Number of funds	134	118	108	102	90	77	59	42	30	22

Source: LBS calculations

Both tables show that the past years have been very successful for the venture capital industry as a whole. The one-year IRR achieved over the 1998 period stands at 28.3 %. When looking at mature funds only, the industry recorded an exceptional 37.5% in 1998. The analysis over a longer time period reveals that the private equity industry had a number of successful years. Based on 1998 data, the three year returns stand at 27.7% and the five-year returns at 24.3%. Only when looking at the time horizons going back to nine and ten years respectively, we find that returns start to decline. This drop reflects both the lower returns that the venture capital industry generated during the late 1980s and the J-curve induced return drop due to a surge of investment activity after 1987. Over the last eight years, however, the UK private equity industry generated returns of over 25% on capital invested.

Note that there are big differences when looking at the returns by investment stage. 1998 has been a very successful year, particularly for generalist funds, whereas funds with an early stage focus recorded a negative aggregated IRR of -27.5%. However, the high pooled one-year return for generalist funds is largely caused by two funds that made exceptionally high realisations. When excluding these two funds from the analysis, the 1998 IRR for generalist funds drops from 64% to 26%. The low IRR for early stage funds can be explained by the surge of investment in technology-based start-up companies during the last three years (see also section 3.1). In 1997 and 1998, overall investments in this group of funds amounted to £79 million which represents 30% of all funds invested in early stage since 1980. Due to the combined impact of fund start-up costs,

management fees and the longer periods before these investments are exited, the IRRs of early stage funds which predominantly have a technology focus are inevitably 0 or negative in the short run. *This negative one-year IRR is therefore not an indicator of the long-term performance of early stage investments.* Due to the lagged effect of investment activity on performance in this segment of the venture capital industry, early stage funds should report substantially higher returns in the next five years.

Table 10
Performance by Vintage Year (in %)

Vintage Year	One year 1998	Two Year 1997-98	Three Year 1996-98	Four Year 1995-98	Five Year 1994-98	Six Year 1993-98	Seven Year 1992-98	Eight Year 1991-98	Nine Year 1990-98	Ten Year 1989-98
1980-84	09.0	-18.8	21.0	14.2	12.6	14.7	14.1	23.7	15.3	3.8
1985	192.6	32.9	15.2	10.6	16.1	40.1	28.4	28.7	15.4	12.0
1986	2.0	15.8	26.9	41.3	26.4	49.3	29.6	21.1	22.1	10.4
1987	14.8	30.7	33.5	38.2	15.8	22.8	24.0	20.6	12.7	9.9
1988	19.1	38.6	31.3	33.1	23.3	38.8	31.2	22.1	27.9	16.5
1989	12.5	14.4	22.7	51.4	23.7	47.7	25.8	26.5	17.0	14.3
1990	51.2	24.7	23.0	32.1	23.8	27.1	30.6	29.0	17.0	n/a
1991	26.6	43.8	31.6	80.7	28.8	33.7	25.1	22.3	n/a	n/a
1992	-1.1	25.8	34.0	37.9	31.6	22.0	20.0	n/a	n/a	n/a
1993	59.2	30.3	17.2	41.0	15.8	16.8	n/a	n/a	n/a	n/a
1994	46.4	37.0	44.4	39.2	32.2	n/a	n/a	n/a	n/a	n/a
1995	48.7	27.1	25.5	22.6	n/a	n/a	n/a	n/a	n/a	n/a
1996	7.9	13.9	9.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1997	18.2	9.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1998	-14.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	28.3	24.6	27.7	37.6	24.3	32.3	27.3	25.1	18.1	12.7
Number of funds	188	176	143	134	134	118	108	102	90	77
Mature funds only	37.5	25.7	25.8	39.3	22.5	38.5	27.3	23.0	17.1	8.3
Number of funds	134	118	108	102	90	77	59	42	30	22

Source: LBS calculations

Additional evidence for the investment cycle specific return pattern in early stage is provided when looking at longer time horizons. In Table 9, one can observe the reverse of the 1998 situation given that there are several periods over which early stage funds have outperformed generalist funds. The data therefore supports our argument that one-year IRRs can at best give only an approximate indication of the industry's returns. They should be interpreted with extreme care since exceptional performances of individual funds can have an overwhelming effect on the aggregated return. Very high and very low one-year IRRs should always be interpreted with realisations and investment activity in mind. It would therefore be more appropriate to look at a longer time horizon in order to assess the long-term potential of this asset class. We therefore calculated the returns since 1980 by investment stage and vintage year. Tables 11 and 12 show the results of this analysis.

Table 11
Performance since 1980 by Investment Stage (in %)

Investment Focus	1980 to 1998	1980 to 1997	1980 to 1996	1980 to 1995
Early Stage	8.0	10.7	8.9	9.1
Development	8.9	8.7	7.8	6.7
Mid MBO	14.5	14.1	14.6	13.5
Large MBO	17.4	16.6	15.9	13.8
Generalist	13.0	10.1	10.0	8.5
Total	14.2	13.1	12.6	11.0
Number of funds	188	176	143	134
Mature funds only	14.3	13.4	12.8	11.1
Number of funds	134	118	108	102

Source: LBS calculations

The tables show that private equity has historically generated long-term returns of around 14% annually. Based on the excellent performance in recent years, the long-term industry returns have gradually risen by roughly 1% annually since 1995. The returns have been highest for buy-out funds, followed by generalist, early stage and development funds. Note also that there are few differences between the pooled IRRs of all funds and the IRRs for mature funds only. The analysis by vintage year reveals that funds started in 1991 and 1994 were the most successful ones. Funds started in 1986 and 1987 had the lowest returns. The vintage year analysis also reveals that the relatively young funds set up in 1994 and 1995 have already produced good returns. Their returns are likely to increase over time. Due to the dynamics of IRR measurement, this means that aggregate industry returns for mature funds are likely to stay at their current level for the next few years. Whether the overall performance (including young funds) will remain at the current annual level of nearly 30% and whether the cumulative returns are likely to rise further will depend on whether UK venture capitalists find sufficient attractive investment opportunities in the future.

Finally, we carried out a further analysis with a different cut of the data. We identified all funds that have an almost exclusive investment focus on technology-based firms. This resulted in a subgroup of 32 funds (17 early stage, 8 development funds, 7 generalist funds). We then calculated the pooled IRRs for these funds. The analysis revealed that the long-term returns since 1980 of technology-focused venture capital funds stand at 9.6%. The pooled IRRs increase significantly when looking at shorter time horizons. The three year returns of technology funds stand at 31.3%, five year returns at 23.3% and ten year returns at 16.5%. Yet, similar to the early stage segment, one can observe a negative one-year IRR of -18.9% which partly reflects the surge of investment activity into technology funds during the past two years.

Table 12
Performance since 1980 by Vintage Year (in %)

Vintage Year	1980 to 1998	1980 to 1997	1980 to 1996	1980 to 1995
1980-84	10.0	10.0	10.2	9.8
1985	13.1	12.8	12.8	13.0
1986	8.9	9.0	8.8	8.3
1987	6.8	6.7	5.7	4.2
1988	13.6	13.5	12.6	11.9
1989	14.2	14.3	14.2	12.6
1990	17.0	16.0	16.1	15.4
1991	22.3	22.1	18.6	17.9
1992	20.0	21.5	19.0	13.5
1993	16.3	8.4	12.4	14.3
1994	32.2	28.3	27.8	n/a
1995	22.1	9.3	12.5	-8.1
1996	9.5	11.4	n/a	n/a
1997	9.0	n/a	n/a	n/a
1998	-14.0	n/a	n/a	n/a
Total	14.2	13.1	12.6	11.0
Number of funds	188	176	143	134
Mature funds only	14.3	13.4	12.8	11.1
Number of funds	134	118	108	102

Source: LBS calculations

5.2.2. The Returns of the UK Venture Capital Industry Compared to its US and European Counterparts

As a next step, we compare the returns generated by the UK venture capital industry with those generated by its US and European counterparts. The return statistics are compiled from various issues of the 1999 Investment Benchmark Reports on US venture capital, US private equity and European Private Equity produced by Venture Economics. Note, however, that these statistics are not directly comparable, since Venture Economics uses different definitions for investment stages from the BVCA. As mentioned earlier, private equity (mainly leveraged buy-outs) is seen as a different activity from traditional venture capital. Still, the category "balanced venture", for example, is comparable with a UK generalist fund which invests in companies at different stages of their life cycle. Statistics on the European private equity industry also have to be interpreted with great care, since 51% of partnerships (66% of funds managed) that are covered by the Venture Economics database are from the UK. Furthermore, due to the small number of funds included for some member countries of the EVCA, the European performance statistics are available only in aggregate form. The returns displayed below therefore reflect to a large extent the dominant influence of Uk limited partnerships in the Venture Economics dataset. Also, the 1998 EVCA return figures have not yet been released at the time of writing this report. We should therefore base any comparison between UK and European returns on the long-term returns. Nonetheless, there are certain insights to be gained from a careful comparison. Like in the

previous chapter, we would like to point out that such a comparison should mainly focus on the long-term returns and not on the sometimes misleading short-term one-year IRRs alone. We will therefore examine both indicators. Tables 13 to 15 give an overview of the returns in the three markets.

Table 13
US Venture Capital and Private Equity Returns (Period Ending December 1998)

Investment Focus	One year 1998	Three Year 1996-98	Five Year 1994-98	Ten Year 1989-98	Twenty Year 1979-98
Early / Seed Stage	25.7	37.7	33.7	19.7	16.8
Later Stage Venture	26.5	27.3	29.8	23.9	18.2
Balanced Venture	10.8	23.6	24.2	16.1	14.0
Total Venture Capital	**17.2**	**27.9**	**27.4**	**17.7**	**15.1**
Buy-outs	10.9	19.2	17.2	16.4	19.6
Mezzanine	11.7	10.4	10.4	10.2	10.8
Total	**12.8**	**22.0**	**20.5**	**16.9**	**17.1**

Source: Venture Economics, Venture Capital Journal, July 1999 Issue

The main differences between the UK and these benchmark markets are as follows. The US venture capital industry has experienced several strong years in the area of early stage and seed financing. The one-year industry IRR for 1998 stands at 25.7% for early stage and 26.5% for later stage development venture capital. More importantly, the long-term returns of that segment of the US private equity industry have also been very attractive, standing at 19.7% and 23.9% respectively over the last ten years. Both in the short and long-term, the US early stage funds have thus substantially outperformed both their UK and European counterparts. As mentioned already in the previous chapter, UK one-year IRRs for early stage funds stand at -27.8%. More importantly, the ten-year returns stand at 7.9%. Note, however, that the early stage segment in the UK has been subject to stronger fluctuations with six to eight-year returns standing between 26.7% and 19.3% (Table 9).

Table 14
UK Venture Capital and Private Equity Returns (Period Ending December 1998)

Investment Focus	One year 1998	Three Year 1996-98	Five Year 1994-98	Ten Year 1989-98	Fifteen Year 1984-98
Early Stage	-27.5	4.0	7.4	7.9	8.0
Development	13.5	25.5	23.3	7.7	8.9
Mid MBO	17.9	28.7	26.5	12.0	14.5
Large MBO	26.2	26.2	27.4	17.1	17.4
Generalist	64.0	34.5	20.5	11.0	13.0
Total	**28.3**	**27.7**	**24.3**	**12.7**	**14.2**

Source: LBS calculations

Table 15
European Venture Capital and Private Equity Returns
(Period Ending December 1997)[12]

Investment Focus	One year 1997	Three Year 1995-97	Five Year 1993-97	Ten Year 1988-97
Early / Seed Stage	51.8	24.4	22.4	17.5
Development	12.1	13.0	12.5	7.2
Balanced Venture	13.2	23.2	11.7	7.8
Total Venture Capital	**25.7**	**19.8**	**15.5**	**10.1**
Buy-outs	23.2	16.8	14.8	14.6
Generalist Private Equity	37.2	19.2	14.4	8.5
Total	**27.1**	**18.2**	**14.9**	**11.5**

Source: Venture Economics 1998 Investment Benchmark Report

European early stage figures for 1997 indicate ten-year returns of 17.5% for early stage and 7.2% for funds with a focus on development finance. UK early stage returns are thus lower than both aggregate US and European early stage returns. In the development sector, UK funds recently experienced some stronger years and their returns are half way between US and European IRRs.

A different picture can be painted for buy-out and generalist funds. Here, UK funds consistently outperformed their US peers in the recent past. Short-term IRRs stand at 26.2% and 17.9% for UK large and mid-sized MBOs respectively. Their US counterparts recorded 10.9%. In the mid term, UK buy-out funds have also consistently outperformed US buy-out funds by a substantial margin. Over ten years, the US returns are at roughly the same levels than UK buy-out returns. Generalist funds have outperformed balanced venture funds from both the US and Europe over the short run. Over a ten-year period, however, US and UK balanced/generalist funds generated comparable returns of 14.0% and 13.0% respectively. European short-term IRRs for buy-out funds are at levels comparable to the UK. Over the mid and long run, however, UK buy-out funds have outperformed European ones.

Overall, we can therefore conclude that the returns in the early stage segment of the venture capital markets have been substantially higher in the US compared to the UK and Europe. This applies to both short-term and long-term returns. This confirms the attractiveness of US venture capital and again highlights the difficulties experienced in the UK with early stage investments. To a large extent, these were amplified by the absence of dedicated second tier stock markets in Europe and the resulting lack of attractive exit opportunities. For UK buy-out and generalist funds, however, the picture is different. On most indicators, UK funds have outperformed their US and European peers in the recent past. In the long run, their returns are above their European counterparts and

[12] At the time of writing this report, the 1998 European venture capital and private equity performance statistics were not yet available.

roughly at the same levels than US buy-out funds. Finally, when looking at the aggregate returns of this asset class, we can state that UK private equity has consistently outperformed the European industry as a whole, irrespective of the chosen time horizon. Compared to the US, there has been a stronger performance in the recent past. Short and mid-term industry IRRs are above the US level up to five year investment horizon (24.3% for the UK; 20.5% for the US). At current stage, the longer term track record still points in favour of the US private equity industry which has generated returns of 16.9% and 17.1% over a ten and twenty year period. This compares to 12.7% and 14.2% for the UK respectively.

5.2.3. Performance of Private Equity Relative to Other UK Asset Classes

The performance statistics provided above suffer from a draw-back. From the perspective of an institutional investor, the IRR method can be seen as an incomplete decision yardstick, since its results are close - but not identical to the TWR method applied to other asset classes. As mentioned in the methodology section (section 5.1.8), the TWR does not represent a true rate of return but a measure to compare fund managers with their peers. We also noted that TWRs should not be applied to private equity funds *since valuations are not carried out every time a fund records a cash-flow*. A further method is increasingly used to address this issue.[13] In essence, this method consists of comparing the returns of the private equity industry to the returns obtained from investments in other asset classes based on identical cash-flows. We can thus assess the returns of private equity while taking into account the opportunity costs of investing in other asset classes. Put simply, this means that IRRs for investments in other asset classes are calculated since it is not possible to apply the time-weighted method to private equity. To this end, we will construct a comparator which can be thought of as "virtual benchmark tracking fund." We can therefore start the analysis based on cash-flows from January 1987 onwards since BVCA data on fund valuations go back to December 1986. The pooled fund values of the private equity industry as of December 1986 are treated as one initial draw-down to this tracking fund. The subsequent cash-flows (draw-downs and distributions) are then discounted by the index return realised over the period under observation. The method is explained in more detail in appendix 4.

This method has two drawbacks. First, the tracker-fund returns are gross of management costs whereas private equity returns are net of carried interest and fees. The tracker returns for other asset classes therefore overstate the true returns to investors by a small margin. Second, there are some small differences between the TWRs shown by performance measurement companies such as CAPS and WM and our virtual tracker fund which are due to the timing of the cash-flows. For example, an index such as the FTSE All-Share may increase substantially during the first half of a particular year and stay flat during the second half. If venture capitalists make the majority of their investments during the second half of the year, the index-tracker returns based on the equivalent

[13] Referring to its origins, Venture Economics have decided to call this method Bannock, Long, Nickles, Coller method (BLNC). The method is documented in the Investment Benchmark Reports published annually by Venture Economics (see Venture Economics 1999).

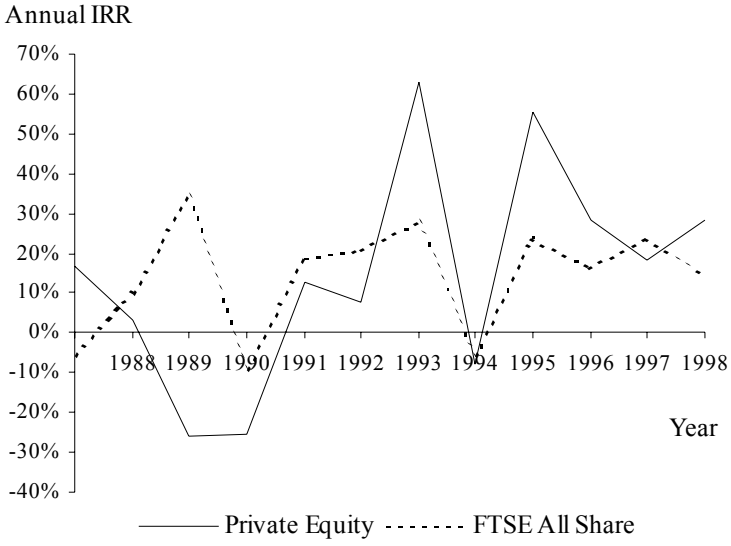
cash-flows will automatically be lower than the TWRs for the same year. In our case, the positive and negative annual differences were within a margin of 200 basis points. Over a longer measurement period, these differences should not matter and the cumulative IRRs of the respective index-tracking funds over a longer period converge with the TWRs for the various asset classes.

To conclude, this method compares the value created by venture capitalists with the value created by investing identical cash-flows in other assets. It therefore represents the most appropriate method developed to date of assessing the performance of private equity relative to other asset classes. We will carry out the analysis on a cumulative and a year-by-year basis. To this end, we chose four benchmark indices as comparators. We took the *total return indices* for the FTSE All-Share Index, the Hoare Govett Smaller Companies Index, the JP Morgan UK Government Bond Return Index and the FTA Index for UK Government Index-linked bonds. The Hoare Govett Index was obtained directly from Hoare Govett. The values for other three indices were downloaded from Datastream.

5.2.3.1. Private Equity Compared to Public Equity

Figure 6, Figure 7 and Table 16 show the results of the comparison of the annual industry-wide returns of the private equity industry with returns that one would have realised if the cash-flows had been invested in and divested from a FTSE All-Share tracker fund. Figure 6 shows the annual IRR whereas Figure 7 shows the cumulative annualised IRRs.

Figure 6
Annual IRRs of UK Private Equity Compared to FTSE All-Share Total Return Index



The analysis reveals that the venture capital industry reported low IRRs during the late 1980s. This reflects both a poorer performance and the initial performance drag associated with a growing industry (J-curve IRR pattern). Venture capitalists openly acknowledge that the early years of the industry were marked by their lack of experience. For example, during that period, some funds would draw the entire sum of committed capital during their first year thus inevitably increasing the time period and driving down IRRs. In addition, the low annual returns also reflect that there has been a steady influx of capital into the industry. Due to the lag effect of capital influx on performance, sustainable positive returns were recorded only much later.

Figure 7
Cumulative Annualised IRR of UK Private Equity Compared to FTSE All-share Total Return Index

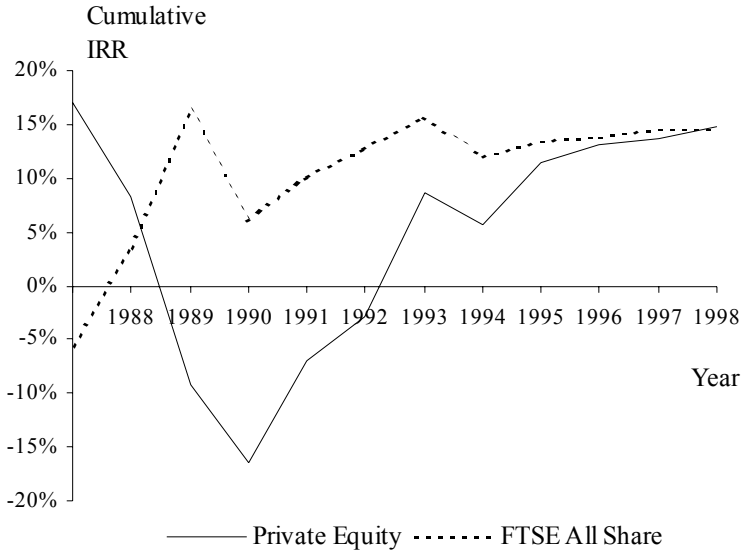


Table 16
IRRs of UK Private Equity Compared to FTSE All-Share Total Return Index

	Annual IRR		Cumulative Annualised IRR	
	Private Equity	FTSE All-Share	Private Equity	FTSE All-Share
1987	16.9%	-5.7%	16.9%	-5.7%
1988	3.1%	9.7%	8.2%	3.5%
1989	-25.9%	34.3%	-9.3%	16.3%
1990	-25.5%	-9.4%	-16.4%	6.1%
1991	12.6%	19.0%	-6.9%	10.2%
1992	7.6%	20.7%	-2.9%	12.8%
1993	63.0%	28.0%	8.6%	15.7%
1994	-7.8%	-6.0%	5.7%	11.9%
1995	55.6%	23.8%	11.5%	13.5%
1996	28.4%	16.4%	13.2%	13.8%
1997	18.3%	23.9%	13.6%	14.6%
1998	28.3%	14.4%	14.8%	14.6%

Source: LBS calculations

With the exception of 1987, which saw a stock market crash in the month of October, the FTSE All-Share Index outperformed annual UK private equity returns every year until 1992. Note that due to the choice of 1987 as base year, we are giving the public equity index the advantage of the lowest possible base year during the period under consideration, thus inflating public equity returns relative to private equity returns. From 1993, however, annual private equity returns were substantially higher than FTSE All-Share IRRs during most years. Overall, this led to a catching up of the cumulative annualised IRRs over the years. In 1998 for the first time, the cumulative private equity IRR exceeded its FTSE All-Share equivalent. Based on this conservative scenario, the overall cumulative annualised returns for the period since 1987 stand at 14.8% and 14.6% for the FTSE All-Share Index.

The findings of this analysis are in line with the result of the 1998 performance survey of the BVCA which show that, in the UK, long-term private equity returns are roughly equal to long-term equity returns. The annual venture capital IRRs range from -31% in 1989 to 67% in 1993. Note also that one can observe a parallel movement between annual private equity and public equity returns, albeit with more pronounced spikes in the private equity area. This indicates that private equity returns are very sensitive to market changes and again highlights that they should not be assessed on an annual basis alone. Furthermore, the annual changes are amplified by the arbitrary choice of a particular month, December, as start and end of the valuation period. Institutional investors should therefore look at the IRR pattern over a period of several years before assessing private equity performance.

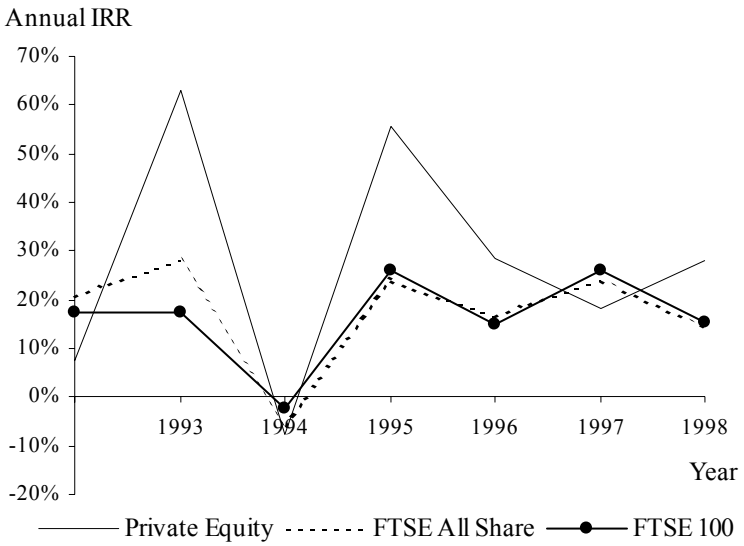
The Impact of the Base Year

In order to assess the impact of the choice of the 1987 base year on our results, we perform an identical analysis using 1992 as a base year. This date has been chosen because it allows for the inclusion of the FTSE 100 total return index which was introduced in 1992. In the 1998 BVCA performance assessment carried out by WM, the FTSE 100 was the only segment of the UK stock market that outperformed British private equity and venture capital returns over a ten year period. Over a five-year period, however, the IRRs of the private equity industry were higher than the TWRs of the FTSE 100. We will compare these differences with the returns of our virtual index-tracking fund based on the index values for 1992. Figures 8 and 9 and Table 17 show the results of this exercise.

Both figures and the table show that UK private equity and venture capital have consistently outperformed both the FTSE 100 and the FTSE All-Share since 1992. The cumulative annualised industry IRRs are 920 basis points above the returns that one would have received by orienting the identical cash-flows (draw-downs and distributions) to funds tracking exclusively the FTSE All-Share or the FTSE 100. This shows that the results of any industry-level comparison strongly

depend on the chosen base year. The previous section used a very conservative approach. Its base year 1987 produced the highest possible returns for public equity. On the other hand, it deflated the returns of the private equity industry since unsuccessful funds from the early years of the industry were included. Despite this, the pooled industry returns of the private equity and venture capital industry have been slightly higher than public equity returns. When choosing a different base year, however, the results of this analysis show a substantial outperformance of private equity compared to public equity. While this is partly due to the exlusion of some of the industry's earliest and often least successful funds, venture capitalists are keen to point out that the higher returns of the 1990s also reflect the learning effects and increasing maturity of their industry.

Figure 8
Annual IRR of UK Private Equity Compared to Equity Total Return Indices
(Base Year 1992)



Second, the analysis again highlights the interrelationship of private equity and public equity returns. Until 1995, public and private equity markets have moved in parallel with private equity being subject to larger swings. The traditional explanation for this parallel movement would be to highlight the fact that venture capitalists use public equity valuations as yardstick for their transactions. Lower private equity IRRs may therefore simply reflect less attractive divestments due to lower stock market valuations. Since 1996, however, the public and private equity returns have ceased to move in the same direction. Instead, one can observe an almost diametrically opposed pattern where private equity returns decreased to the same degree as public equity returns increased and vice versa. If that pattern was to continue in the long run, it would make private equity a good diversifier for public equity. Unfortunately, it is too early to state whether this pattern will continue in the future or whether it is a mere coincidence and public and private equity returns will move again in parallel in the future. The results of this analysis regarding the co-variation between the returns therefore have to be interpreted with utmost care.

Figure 9
Cumulative Annualised IRR of UK Private Equity Compared to Equity Total Return Indices (Base Year 1992)

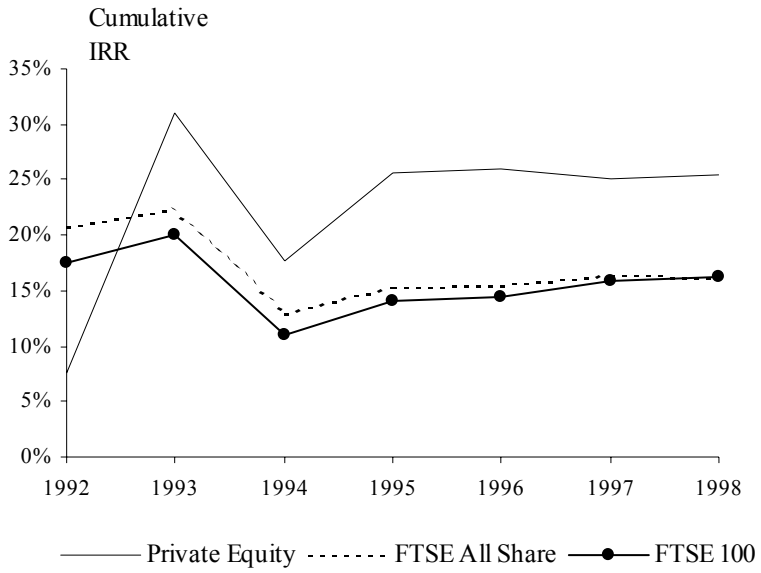


Table 17
IRR of UK Private Equity Compared to Equity Total Return Indices (Base Year 1992)

	Annual IRR			Cumulative Annualised IRR		
	Private Equity	FTSE All-Share	FTSE 100	Private Equity	FTSE All-Share	FTSE 100
1992	7.6%	20.7%	17.5%	7.6%	20.7%	17.5%
1993	63.0%	28.0%	17.5%	31.1%	22.5%	20.0%
1994	-7.8%	-6.0%	-2.4%	17.7%	13.0%	11.0%
1995	55.6%	23.8%	26.1%	25.6%	15.4%	14.2%
1996	28.4%	16.4%	15.0%	26.0%	15.5%	14.4%
1997	18.3%	23.9%	26.2%	25.0%	16.4%	16.0%
1998	28.3%	14.4%	15.4%	25.4%	16.3%	16.2%

Source: LBS calculations

5.2.3.2. Private Equity Compared to Small Cap Stocks

In a next step, we decided to compare the annual IRRs from private equity investments to the IRRs that one would have obtained by investing identical cash-flows in a fund that tracks stocks of firms with a smaller market capitalisation. The purpose of this exercise is to contrast private equity returns with returns of investments in an asset class which arguably resembles more closely the investee firms backed by venture capitalists. In order to do so, we chose the Hoare Govett Smaller

Companies Index as a comparator.[14] Figure 10, Figure 11 and Table 18 show the results of the comparison. Figure 10 shows the annual IRR whereas Figure 11 shows the cumulative annualised IRRs.

Figure 10
Annual IRR of UK Private Equity Compared to Hoare Govett Total Return Index

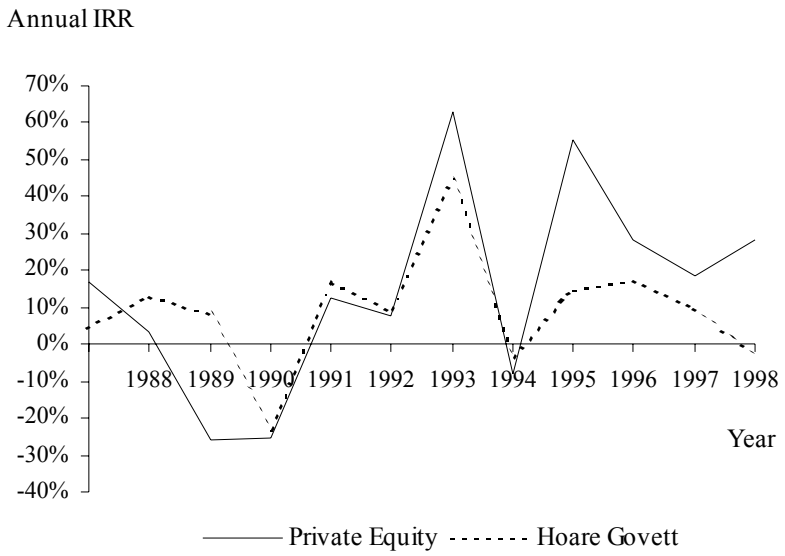
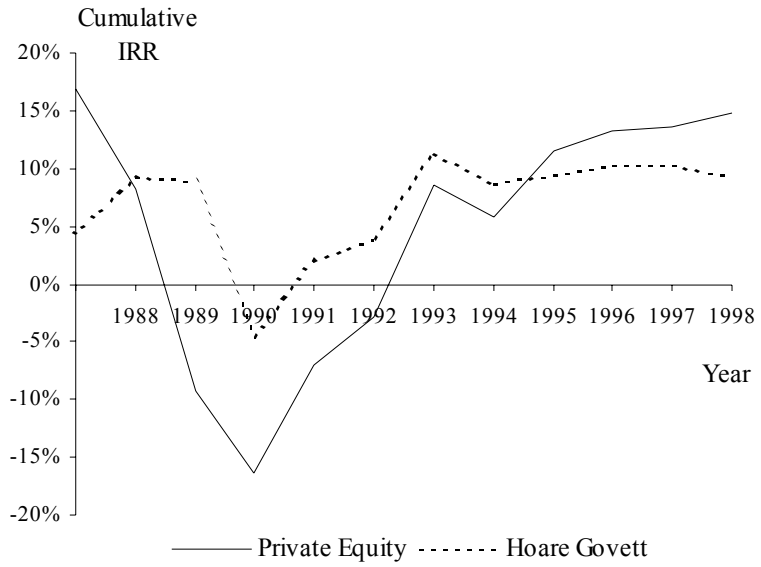


Figure 11
Cumulative Annualised IRR of UK Private Equity
Compared to Hoare Govett Total Return Index



[14] We decided against the FTSE SmallCap index, since data for this index goes only back to 1993. Furthermore, the Hoare Govett family of indices is rebalanced in regular intervals in order to guarantee the coverage of the bottom two percent of equity value of the UK stock market.

Table 18
IRRs of UK Private Equity Compared to Hoare Govett
Smaller Companies Total Return Index

	Annual IRR		Cumulative Annualised IRR	
	Private Equity	Hoare Govett	Private Equity	Hoare Govett
1987	16.9%	4.2%	16.9%	4.2%
1988	3.1%	12.8%	8.2%	9.3%
1989	-25.9%	8.5%	-9.2%	8.9%
1990	-25.5%	-23.3%	-16.4%	-4.7%
1991	12.6%	16.7%	-6.9%	2.1%
1992	7.6%	9.2%	-2.9%	3.9%
1993	63.0%	44.5%	8.6%	11.3%
1994	-7.8%	-3.8%	5.7%	8.7%
1995	55.6%	14.5%	11.5%	9.5%
1996	28.4%	17.7%	13.2%	10.3%
1997	18.3%	9.7%	13.6%	10.3%
1998	28.3%	-3.4%	14.8%	9.2%

Source: LBS calculations

When looking at both figures and the table, one immediately realises the similarity of the return pattern of private equity IRRs and the IRRs of the Hoare Govett Smaller Companies tracker fund. The annual and cumulative annualised return pattern between the two data-series follow each other very closely with private equity being characterised by slighty larger swings. Since 1995, one could observe that private equity returns have outperformed Hoare Govett returns considerably. To date, the cumulative annualised returns since 1987 stand at 14.8% for private equity and 9.2% for a fund tracking the Hoare Govett Index. This of course reflects the recent phenomenon of smaller stocks having underperformed the rest of the stock market during the past five years.

5.2.3.3. Private Equity Compared to Bond Returns

We carried out identical analyses in order to compare private equity IRRs to bond IRRs. Figure 12, Figure 13 and Table 19 show the results of the comparison. Figure 12 shows the annual IRR whereas Figure 13 shows the cumulative annualised IRRs.

The table and the two figures show that the annual and cumulative annualised IRRs of bonds and index-linked have been moving in parallel. During the period under observation, the IRRs of index-linked were roughly 200 basis points lower than bonds. As already stated above, private equity returns were poor during the late 1980s and early 1990s due to both lower performance and the lag effect of industry growth on returns. In 1992 and every year since 1995, however, annual private equity IRRs have been substantially higher than bond returns. This has the effect that, despite their poor start, cumulative private equity returns exceed bond market returns from 1995 onwards by roughly 200 basis points.

Table 19
IRRs of UK Private Equity Compared to Bond and Index-Linked Bond Return Index

	Annual IRR			Cumulative Annualised IRR		
	Private Equity	Bond	Index-Linked	Private Equity	Bond	Index-Linked
1987	16.9%	14.4%	5.5%	16.9%	14.4%	5.5%
1988	3.1%	6.4%	12.0%	8.2%	9.4%	9.4%
1989	-25.9%	7.9%	14.1%	-9.2%	8.7%	11.5%
1990	-25.5%	11.3%	6.9%	-16.4%	9.5%	9.7%
1991	12.6%	16.3%	5.1%	-6.9%	11.6%	8.3%
1992	7.6%	18.8%	16.6%	-2.9%	13.4%	10.4%
1993	63.0%	21.7%	18.8%	8.6%	15.1%	12.1%
1994	-7.8%	-7.3%	-7.3%	5.7%	11.2%	8.7%
1995	55.6%	16.5%	11.8%	11.5%	11.9%	9.1%
1996	28.4%	7.0%	6.0%	13.2%	11.3%	8.8%
1997	18.3%	14.9%	13.7%	13.6%	11.6%	9.2%
1998	28.3%	19.8%	20.0%	14.8%	12.4%	10.0%

Source: LBS calculations

Figure 12
Annual IRR of UK Private Equity Compared to Bond and Index-Linked Return Index

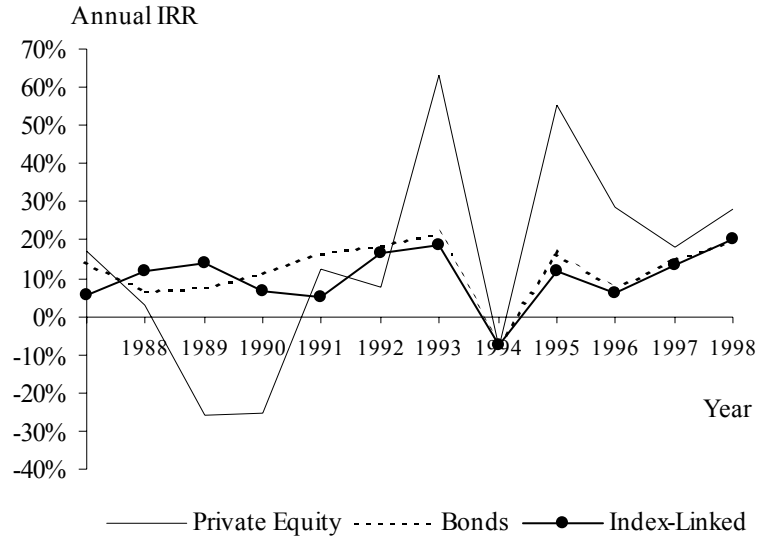
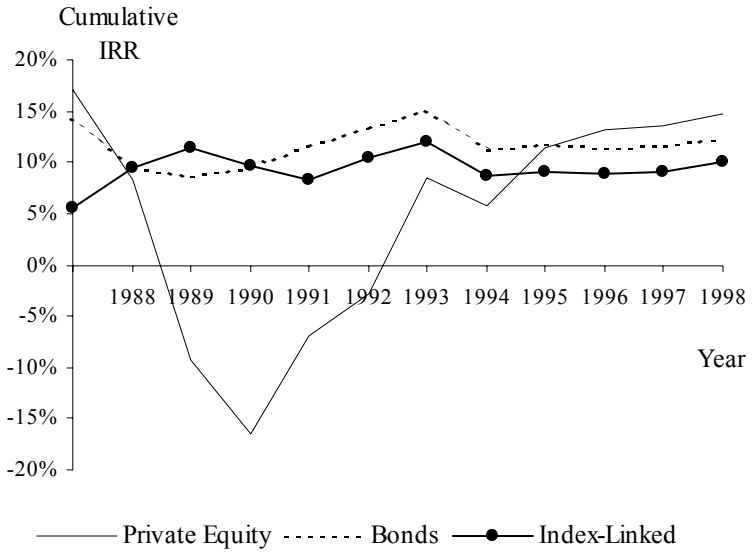


Figure 13
Cumulative Annualised IRR of UK Private Equity
Compared to Bond and Index-Linked Return Index



Finally, Table 20 shows the cumulative annualised IRR and residual asset values for the private equity industry and the "virtual funds" which tracked our respective indices. Overall, the findings of this analysis method can be summarised as follows. The UK private equity industry was characterised by poor returns during the late 1980s and in 1994. Despite the poor start, however, the cumulative private equity IRRs are slightly higher than FTSE All-Share returns and outperformed all other comparators by a substantial margin between 240 and 460 basis points. Since 1992, annual private equity returns have been consistently higher compared to most comparators.

Table 20
Residual Asset Values*

	Private Equity	FTSE All-Share	Hoare Govett	Bonds	Index-Linked
Residual Asset Value (in million £)	5902	5524	3346	4602	3517
Cumulative Annualised IRR	14.8%	14.6%	9.2%	12.4%	10.0%

Source: LBS Calculations
* Investment period between January 1987 and December 1998

During the period under observation, private equity IRRs have been subject to substantial upward and downward swings which are roughly in line with ups and downs in the public equity market. The similarity between the Hoare Govett Smaller Companies Total Return index and private equity returns was particularly striking. This interrelation of public and private equity returns is

not surprising since public equity valuations are usually taken as yardstick for private equity valuations during divestments and the annual valuation exercises. The results suggest also that private equity is more sensitive to market swings. However, one also has to be aware that these swings are amplified by choosing one-year cut-offs for the purpose of valuation. Only since 1995, one could observe that public and private equity returns ceased to move in parallel. Unfortunately, it is too early to say whether this trend will continue in the future.

Note that for all graphs and tables shown above, the base years in the late 1980s were characterised by low IRRs in the venture capital industry. This reflects *both* the poorer performance and the lag effect of capital influx on performance in a fixed life fund as illustrated by the J-curve. We showed that choosing a different base year resulted in a different graphical representation of the cumulative annualised returns and revealed that private equity has outperformed public equity by 910 basis points between 1992 and 1998. To conclude, we believe that this evaluation method produces an important additional piece of information for institutional investors interested in private equity. We would therefore recommend this analysis be carried out annually and included in the BVCA performance statistics. In addition, this analysis can be easily carried out by institutional investors who wish to monitor their private equity participations over a longer period.

5.2.4. Private Equity Realisations in Relation to Paid-in Capital (Absolute Returns)

As a final element of our analysis of returns, we looked at the capital realisations of private equity investments. As already mentioned in the methodology chapter, venture capitalists draw funds from investors on a deal-by-deal basis. As a result, the period of time during which the committed capital is working for an investor may sometimes be as short as three years. In order to assess the attractiveness of private equity investments, one should also look at capital realisations, the absolute returns paid back to investors. To this end, we contrast the draw-downs (paid-in capital) with the distributions and the residual asset value in the funds. Residual asset values should be subject to conservative valuations and should represent the lower limit of capital to be distributed at a later stage. The ratio of the sum of past distributions and residual value to paid-in capital therefore represents the minimum multiple that investors can expect from private equity investments. Tables 21 and 22 show the results of this analysis by investment stage and by vintage year.

The figures displayed indicate that investors receive on average 175% of their initial money over the life of a limited partnership. By 1998, all mature funds have already paid back 131% of the paid-in capital. 44% of paid-in capital is retained at conservative valuations in the portfolios. The total returns of 175% of paid-in capital are therefore likely to underestimate the final capital realisations.

Table 21
UK Priavte Equity Capital Realisations by Investment Stage (Mature Funds Only)

Investment Stage	Number of funds	Capital raised	Paid-in capital (draws)	Distri-butions (1)	Residual Value (2)	Total Value (3)	(1) as % of paid-in capital	(2) as % of paid-in capital	(3) as % of paid-in capital
Early Stage	17	193	190	220	82	301	115	43	158
Development	34	515	486	629	155	784	130	32	162
Mid MBO	27	868	844	1164	284	1448	138	34	171
Large MBO	26	3095	3221	4249	1319	5569	132	41	173
Generalist	30	1032	1001	1262	663	1924	126	66	192
Total	134	5703	5742	7523	2503	10026	131	44	**175**
Technology Funds only	26	383	359	566	108	674	158	30	188

Source: LBS calculations

Table 22
UK Private Equity Capital Realisations by Vintage Year

Vintage Year	Number of funds	Capital raised	Paid-in capital (draws)	Distri-butions (1)	Residual Value (2)	Total Value (3)	(1) as % of paid-in capital	(2) as % of paid-in capital	(3) as % of paid-in capital
1984	11	154	141	291	6	297	206	4	210
1985	11	206	194	397	13	410	204	7	211
1986	8	174	173	269	12	281	156	7	163
1987	12	456	456	588	63	652	129	14	143
1988	17	582	592	983	122	1105	166	21	187
1989	18	1016	995	1369	366	1735	138	37	174
1990	13	1116	1100	1662	284	1946	151	26	177
1991	12	278	279	427	80	506	153	29	181
1992	6	183	178	238	58	296	134	33	166
1993	10	331	340	267	266	533	79	78	157
1994	16	1206	1295	1033	1233	2266	80	95	175
Total	134	5703	5742	7523	2503	10026	131	44	**175**

Source: LBS calculations

The highest realisations were reported by generalist funds followed by buy-out and development funds. To date, the lowest realisations are found among early stage venture capital funds. However, this is partly related to the BVCA valuation guidelines which treat early stage investments in a more conservative way than other investments in order to account for the higher risk. Early stage funds are therefore likely to move closer to the performance of other funds over time. We carried out the same analysis for the sub-sample of technology funds. We found that they have in the past distributed 158% of paid-in capital to investors. In addition, they retain net asset values of 30% of paid-in capital. The total capital realisations therefore stand at 188% which is exceeded only by the generalist segment. Among the different vintage years, funds started in 1986 and 1987 have produced relatively low returns. Funds started in 1991 have performed very well so

far. Note also that funds started in 1994 have already outperformed funds started in 1993 and 1992 thus confirming the attractiveness of that vintage year already reported in section 5.2.1.

5.3. Private Equity and Risk

While the long-term performance analysis confirmed the attractiveness of UK private equity returns, no discussion of returns is complete without a consideration of the risk involved with investments in this asset class. Of course, any examination of risk first requires a discussion whether the standard measures of risk from finance theory can be applied to private equity investments. The majority of textbooks usually refer to private equity and venture capital as high-risk asset class (e.g. Brealey and Myers 1996). However, the nature of risk involved with investing in this asset class is rarely discussed since risk analysis for private equity is still in its infancy.

In this report, we will examine three aspects of risk. In a first step, we will analyse the spread of returns around the average and pooled industry returns. After that, we will examine the risk of losing money in absolute terms and contrast these findings with those funds that have already produced guaranteed net returns despite being still in operation. Finally, we will comment on the benefits of diversification of private equity participations. Before reporting the results of our analysis, we will briefly discuss the nature of risk experienced by individual funds.

According to conventional wisdom, venture capital is perceived as highly risky. When looking at *individual* investments made by venture capitalists, this statement is arguably true. In the seed and early stage area, it is not uncommon to observe that between 25-35% of investments in portfolio companies have to be written off after periods as short as two to three years. Yet, a minority of divestments will be highly profitable. Due to the cash-flows generated by this minority of successful investments, the overall performance of the large majority of these early stage and development funds is positive. Within early stage and development funds we therefore have a highly skewed distribution of returns *at the deal level*. In the buy-out arena, the individual risk associated with an investment made by the venture capitalists is much lower and positive returns are usually generated from the majority of investee companies. The distribution of intra-fund IRRs is therefore more even for this segment of the venture capital industry.

However, the intra-fund, deal-specific risk should be an area of concern to the general partners rather than the investors. It is the general partners' responsibility to diversify into a sufficient number of investee firms to achieve overall attractive returns at reasonable risk for the partnership. Given the intra-fund distribution of returns, early stage funds should invest in a larger number of firms than funds in the buy-out area. Needless to say that this is also a function of the sums required to finance a deal, which is usually much lower for early stage investments. Accordingly, the largest buy-out funds may have portfolio sizes as small as ten firms. The larger generalist and early stage funds will sometimes invest in up to 50 portfolio firms. Thus, despite the considerable uncertainty surrounding individual intra-fund investments, the return spread of private equity

funds is distributed within much narrower boundaries. There is therefore an element of diversification at the partnership level which substantially reduces the variability of returns of the limited partnership. Yet, institutional investors can benefit from a second level of diversification when they invest in several partnerships. The risk of investments in this asset class is thus substantially lower for an institutional investor than implied by the term "venture capital." A diversified portfolio of private equity participations can reduce the risk for investors to a manageable level which should justify the returns reported in the previous chapter. We will now look at the spreads of returns.

5.3.1. The Spread of Private Equity Returns

In order to assess the risk associated with private equity investments, we looked at the spread of returns for this asset class. For a discussion of risk and the spread of returns, one should look at mature funds only. The spread of IRRs will automatically be larger when looking at younger funds since some of them report high negative IRRs during their first and second year of operation ("J-curve"). Table 23 gives an overview of pooled, mean and median IRRs since 1984 and the range and standard deviations for mature funds. The table shows that mean and median IRRs are highest for funds with an investment focus on mid-sized and large buy-outs. Development funds have the lowest mean and median IRRs. There are large differences of fund performance and the spread of returns ranges between 28.5% and 70.3%. The difference between the pooled and mean IRR gives an indication about the impact of larger funds among the different segments. Among each segment with the exception of the large buy-out area, the largest funds have performed better than their smaller counterparts.

Table 23
Range of Returns of Mature UK Private Equity Funds by Investment Stage in %

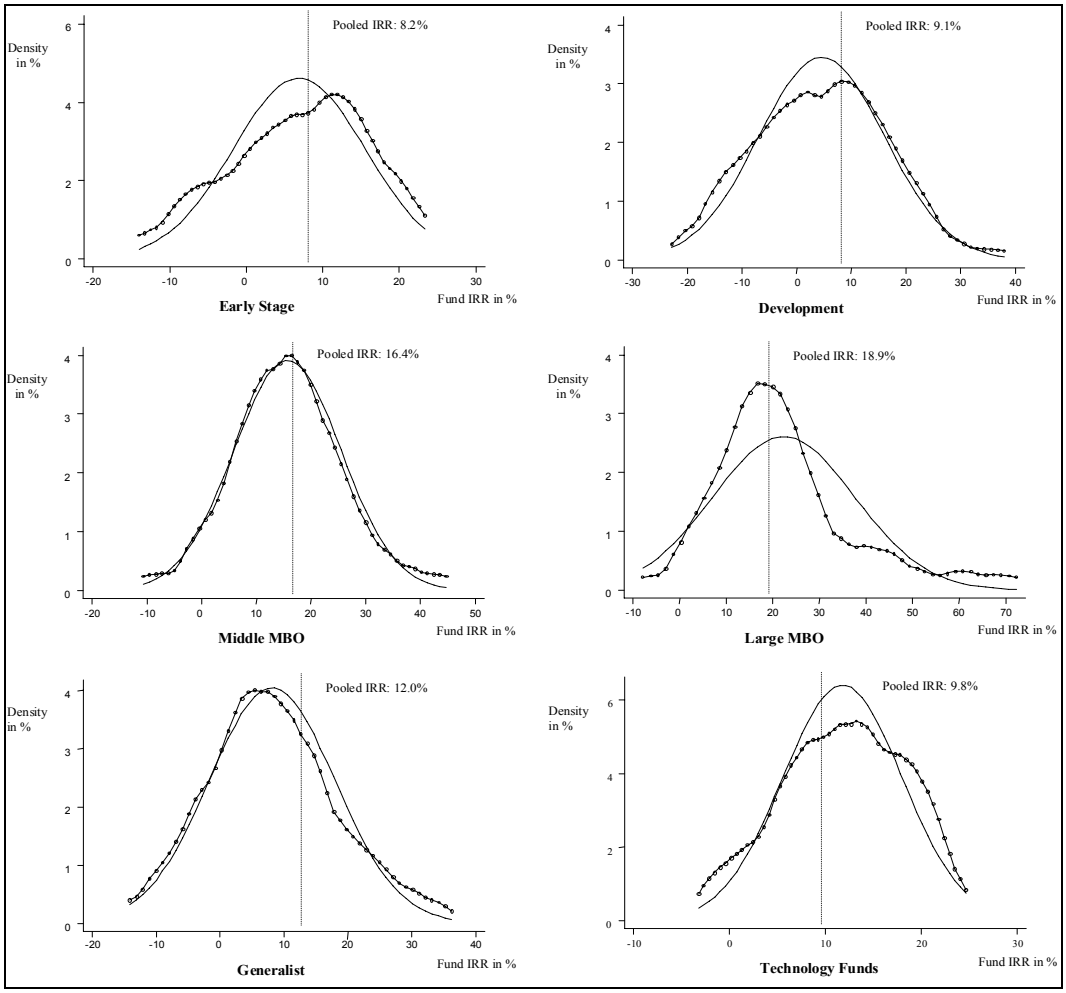
Investment Stage	Number of funds	Pooled IRR	Mean IRR	Median IRR	Minimum	Maximum	Range	Standard Deviation
Early Stage	17	8.2	6.9	8.1	-9.6	18.9	28.5	8.7
Development	34	9.1	4.6	4.8	-17.7	32.9	50.6	11.6
Mid MBO	27	16.4	15.7	14.9	-6.6	40.6	47.2	9.8
Large MBO	26	17.8	22.3	20.5	-3.0	67.3	70.3	15.3
Generalist	30	12.0	8.1	7.9	-9.9	32.0	41.9	9.8
All Funds	**134**	**14.3**	**11.3**	**10.8**	**-17.7**	**67.3**	**85.0**	**13.1**
Technology Funds only	26	9.8	10.2	9.1	-0.2	20.2	20.4	6.2

Source: LBS calculations
Note: The table shows IRRs since 1980 for mature funds started before 1995.

We then looked at our sub-sample of technology-focused funds. It is curious to observe that, given the roughly equal number of observations per segment, the standard deviation (the indicator of variation) of technology fund returns is lower than for any other segment. In addition, only one

mature technology fund had a negative interim IRR (-0.2%). However, compared to the other segments, one also has to mention that there is no star performer among the technology funds. Nonetheless, this means that the group of funds conventionally associated with the highest risk has in the past actually been the least risky when considering risk in terms of IRR fluctuations and the possibility of not recovering invested funds.

Figure 14
Distribution of UK Private Equity IRRs by Investment Stage



Source: LBS Calculations

Yet, looking merely at the spreads may give a misleading picture since the magnitude of the range of returns can be driven by the presence of a few successful or unsuccessful outliers. In order to have a closer look at the distribution of returns, we carried out a graphical analysis of the spread. Figure 14 gives a graphical overview over the distribution of IRRs by investment stage. We calculated the distribution using the method of kernel density estimation.[15] We overlaid the resulting function with a normal distribution to facilitate its interpretation.

[15] This method is a non-parametric estimation very similar to a histogram. The main difference between the two is that a histogram divides the data in several non-overlapping intervals, so-called bins. The observed

One can see from the graphical representation that the IRRs among most segments of the venture capital industry are normally distributed. Only in the large buy-out area can we observe a distribution skewed to the right. This indicates that, compared to the large MBO sub-sample average, there are several funds that have performed exceptionally well. Overall, Figure 14 indicates that the return spreads are not driven by outliers but rather represent a normal distribution around the mean IRR. One could argue that the buy-out market is less risky than the early stage and development areas because venture capitalists invest in firms and teams with a proven track record. Accordingly, there should be fewer funds with negative returns in the buy-out area. The data confirms that hypothesis. Not only are the pooled, average, median and maximum IRRs higher, but there are also fewer funds with low or negative IRRs. This indicates that the overall risk-return profile of early stage and development funds is less favourable than the risk-return profile of the other segments. However, this does not mean that investments in early stage firms or technology-based start-ups are unattractive, as indicated by the figures and the graph on technology funds, since many of these investments are made by generalist funds which reported strong overall returns.

We then looked at the distribution of funds by vintage year. The results displayed in Table 24 shows again that there are large differences in fund performance by vintage year. But, likewise with the analysis by investment focus, the IRRs by vintage year are also normally distributed within those years where a sufficient number of observation is present to undertake this kind of analysis in a meaningful way (graphical analysis not shown here).

Table 24
Range of Returns of Mature UK Private Equity Funds by Vintage Year in %

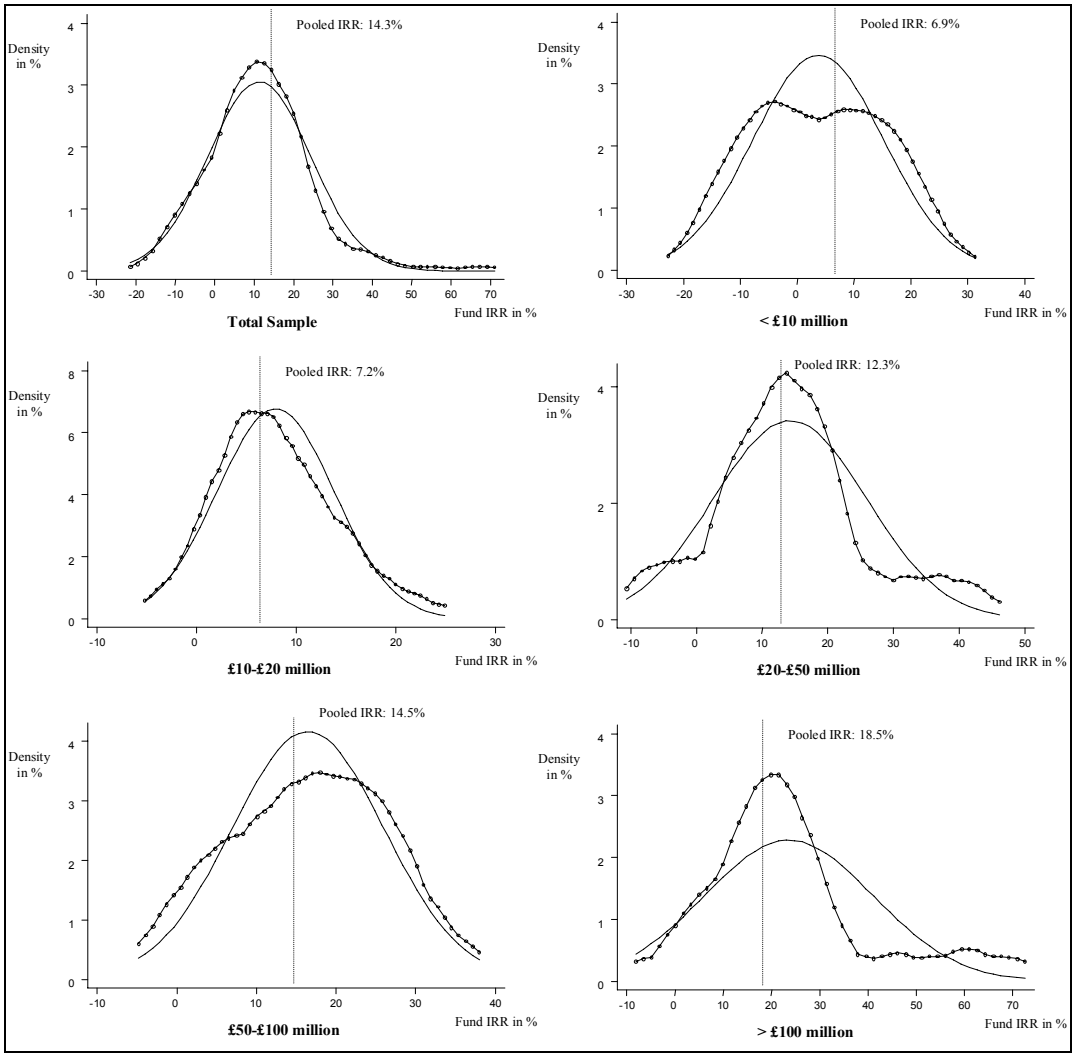
Vintage Year	Number of funds	Pooled IRR	Average IRR	Median IRR	Minimum	Maximum	Range	Standard Deviation
1984	11	10.0	8.8	8.1	-9.9	22.1	32.0	8.6
1985	11	13.1	7.5	5.7	-9.6	27.2	36.8	10.2
1986	8	8.9	7.5	9.0	-6.5	18.4	24.9	9.4
1987	12	6.8	7.8	7.5	-4.2	18.7	22.9	6.3
1988	17	13.6	7.9	7.8	-17.7	25.0	42.7	9.4
1989	18	14.2	9.9	10.4	-13.7	32.0	45.7	11.8
1990	13	17.0	15.4	11.3	-12.2	40.6	52.8	17.0
1991	12	22.3	14.9	18.7	-7.6	37.4	45.0	15.2
1992	6	20.0	14.4	14.4	3.1	22.5	19.4	6.7
1993	10	16.3	4.7	1.8	-12.1	26.3	38.4	12.6
1994	16	32.2	22.7	19.2	-6.3	67.3	73.6	18.0
All Funds	**134**	**14.3**	**11.3**	**10.8**	**-17.7**	**67.3**	**85.0**	**13.1**

Source: LBS calculations

pattern therefore depends to a large extent on the chosen number of bins. In order to avoid that problem, the kernel density estimation method allows intervals to overlap and estimates the centre point of these intervals. Accordingly, the dots in the figures do not represent individual funds, but mark the estimated shape of the overall distribution. (for a detailed explications of this method see, for example, Tapia and Thompson 1978).

Due to the sometimes quite large differences between pooled and median IRRs, we looked at the spread of returns by fund size. The results are displayed in Table 25 and show that larger funds have generated higher IRRs irrespective of the measure used. Our findings with regard to the spread of IRRs corroborate the above results. Within each size class, there are substantial differences between fund IRRs. Figure 15 shows that, with the exception of the middle size class (£20-£50 million) and the largest size class, the returns are normally distributed. In the middle size class, we find that the return spread is driven by outliers. Among the largest size class, we find predominantly funds with an investment focus on large MBOs. Like in Figure 14, we find a skewed distribution which indicates the presence of several funds that have substantially outperformed the average large MBO fund. Overall, we can state that the risk-return profile of larger funds is more attractive than the risk-return profile of smaller funds.

Figure 15
Distribution of IRRs by Fund Size



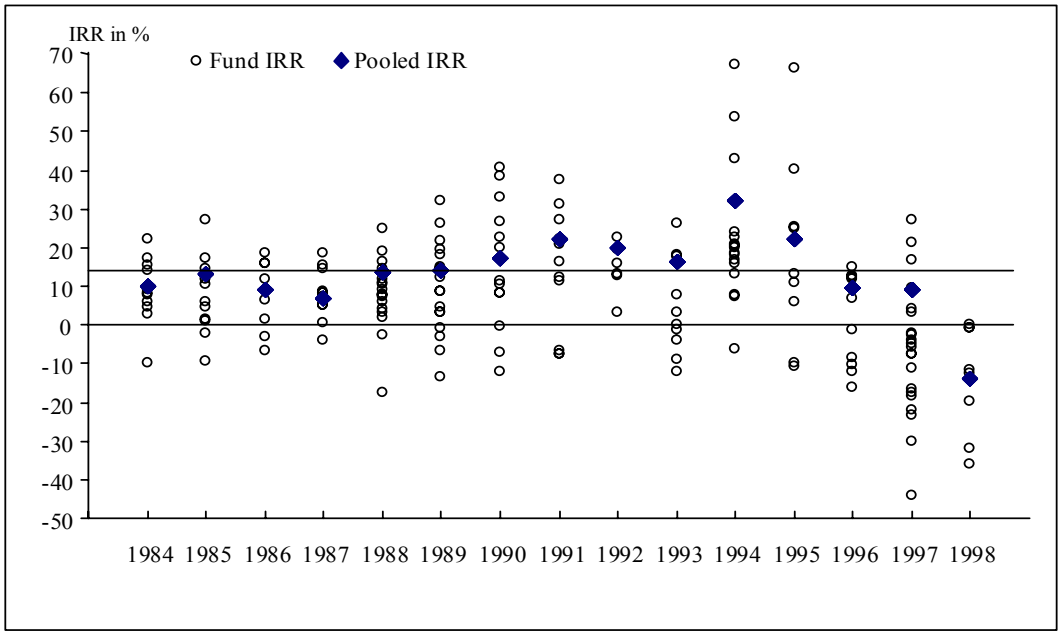
Source: LBS Calculations

Table 25
Range of Returns of Mature UK Private Equity Funds by Fund Size in %

	Number of funds	Pooled IRR	Average IRR	Median IRR	Minimum	Maximum	Range	Standard Deviation
< £10 million	39	6.9	3.7	3.1	-17.7	26.3	44.0	11.5
£ 10-20 million	25	7.2	7.9	7.8	-2.7	22.4	25.1	5.9
£ 20-50 million	41	12.3	14.2	14.7	-7.2	42.8	50.0	11.7
£ 50-100 million	13	14.5	16.5	19.5	0.4	32.9	32.5	9.6
> £ 100 million	16	18.5	23.6	21.3	-3.0	67.3	70.3	17.5
All Funds	**134**	**14.3**	**11.3**	**10.8**	**-17.7**	**67.3**	**85.0**	**13.1**

Source: LBS calculations

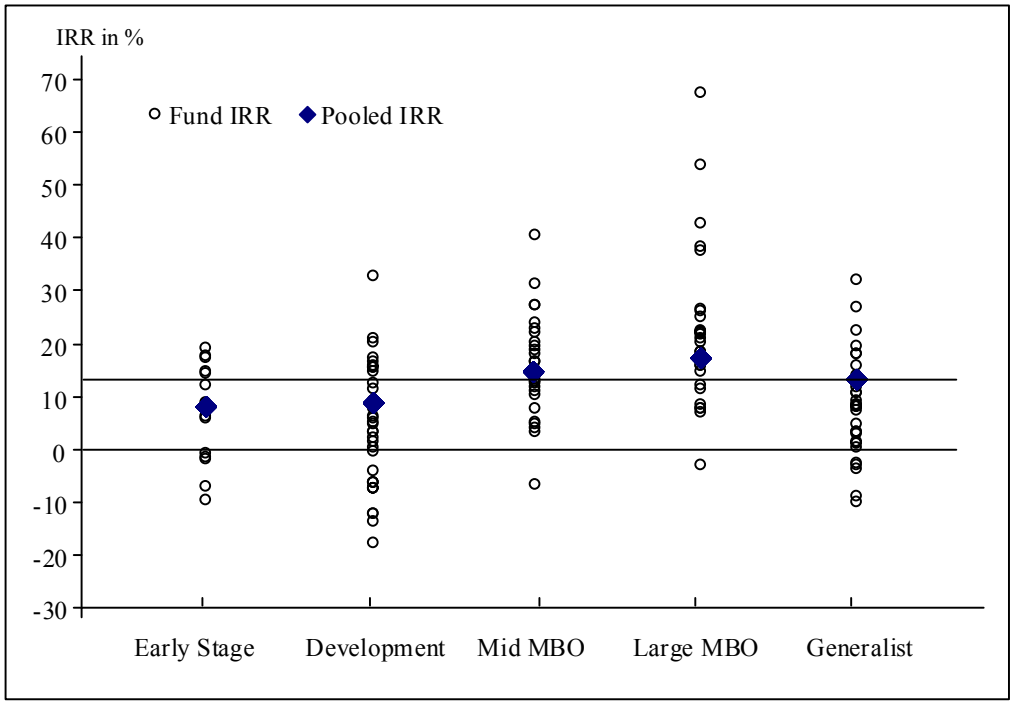
Figure 16
UK Private Equity IRRs Since 1984 by Vintage Year



Source: LBS calculations

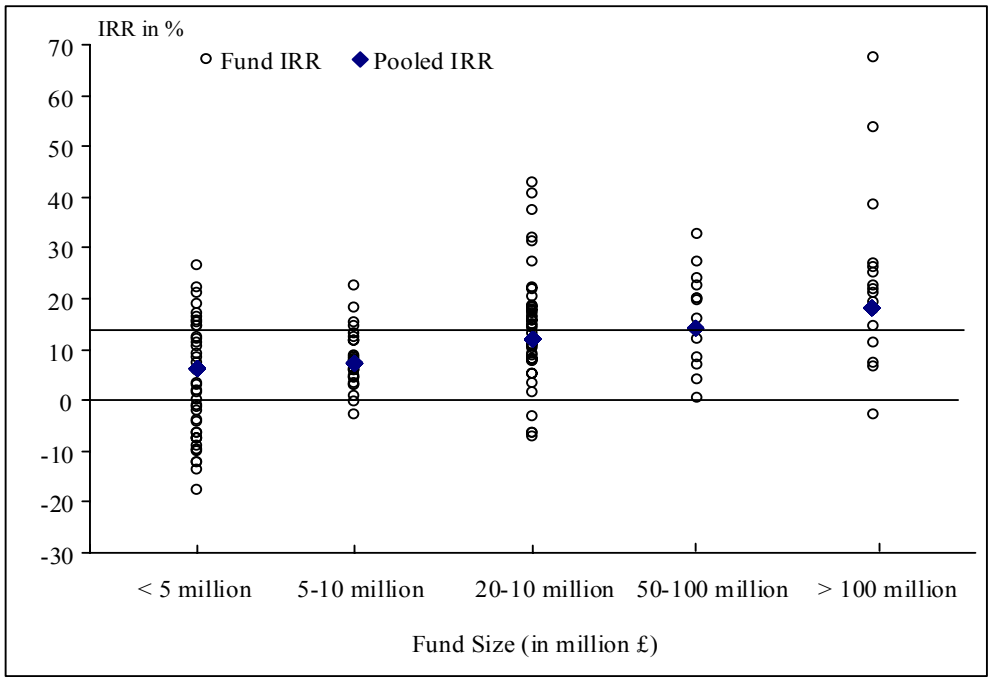
As a summary, Figures 16 to 18 provides a different graphical analysis of the spreads of returns. The small circles show the individual fund IRRs and the triangles show the pooled IRRs for the vintage year. The horizontal lines represent 0 and the historical long-term industry IRR of 14%. The scatterplot shows that there is a wide range of returns even within an individual vintage year. We also display the range of returns for the younger funds. Not surprisingly, the median fund IRR for funds set up in 1997 and 1998 is negative. Note that the pooled industry returns for 1995, 1996 and 1997 are already relatively high given their young age. One can see that after 1990, it has been increasingly common to observe highly successful funds that generated returns in excess of 25% per annum to their investors. With the exception of 1993, funds started in the 1990s have produced aggregate returns over 20%. We repeated the same exercise by plotting the range of fund IRRs by investment stage (Figure 17) and by fund size (Figure 18).

Figure 17
UK Private Equity IRRs Since 1984 by Investment Stage



Source: LBS calculations

Figure 18
UK Private Equity IRRs Since 1984 by Fund Size



Source: LBS calculations

For institutional investors, we can therefore provide a clear message. While aggregate private equity returns have historically generated IRRs of about 14%, we can observe a quite large spread of returns at the individual fund level. The magnitude of these spreads cannot be attributed to the presence of exceptionally successful and unsuccessful outliers alone, but is fully in line with a normal distribution around the mean fund IRRs.

The historical risk-return profile has been less favourable for dedicated early stage and development funds and for smaller funds.[16] *However, attractive returns have been generated by individual funds irrespective of vintage year, investment focus and size class. Furthermore, technology-focused venture capital funds, the group of funds conventionally associated with the highest risk, have in the past actually been the least risky when considering risk in terms of IRR fluctuations and the possibility of not recovering invested funds.* This suggests that fund performance is driven in large part by the experience and skills of the general partners rather than structural characteristics of the fund. In the absence of data on the management characteristics of the general partners, we can however only speculate on the causes of performance differentials.

These findings underline that institutional investors should build up a diversified portfolio of private equity participations. Unless they consistently outperform the private equity industry average, investors that invest in only one or two partnerships rather than build up a portfolio will face considerably higher uncertainties about the expected returns. This applies particularly to the backers of only one or two very large funds. Given that attractive returns have been generated by individual funds irrespective of size and investment preference, investors should bear in mind that partnership selection skills are likely to have a large impact on the performance of a private equity portfolio.

5.3.2. Analysis of Absolute Returns

The second part of our analysis of the risk involved in UK private equity investments will look at those funds that have lost money in absolute terms. In a first step, we looked at all limited partnerships that have been terminated. Among those 23 wound-up funds, 2 have generated negative returns to their investors (8.7%). With the exception of these two, even the venture capital

[16] Most early stage and development funds are actually the smallest funds in the dataset. The question then arises whether lower returns are related to either fund type or size or a combination of both (see Murray and Marriott, 1998, for a theoretical discussion on the impact of fund scale on performance). We looked at this problem by estimating a series of regression models. In the regression models, lower IRRs were related to both smaller fund size and early stage and development funds in all models which considered the two separately and simultaneously (the adjusted R^2 ranged from 0.27 to 0.33). An interaction effect between the two was not significant thus suggesting that possible scale related problems are not amplified for early stage funds. Overall, this indicates that both small fund size and focus on early stage are negatively related to the IRR independently of each other. Note also that most dedicated early stage funds (15 out of 23) have been set up in the period before 1990. However, when dummy variables for vintage years are entered into the regression, the variables for early stage and development maintain their significance. The regression results are available from the author upon request.

funds that have underperformed the industry average have actually paid their money back to investors. Out of the remaining 111 mature funds, there are several with negative IRRs. At the current stage, there are 8 funds with IRRs between -1% and -5%. 13 mature funds have IRRs of lower than -5%. Five funds have negative IRRs despite a life of over 12 years. It is highly unlikely that the latter will ever generate positive IRRs. Of course, a definitive evaluation can only be made when the funds are finally wound-up.

Due to this uncertainty with regard to final valuations, we also looked at this issue from the opposite direction by examining funds that have already generated guaranteed positive returns. The last section of the previous chapter on the returns of private equity compared the sum of distributions and residual asset values to the paid-in capital. We reported the pooled value to paid-in capital ratio of the private equity industry currently stands at 175%. In Table 26, we report the results of a similar analysis carried out at the fund level.

Table 26
Guaranteed Positive Returns: Distributions to Paid-in Capital by Vintage Year

Vintage Year	Number of Funds	Number of funds with distributions exceeding draw-downs	%	Number of funds with sum of distributions and residual value exceeding draw-downs	%
1984	11	10	90.9	10	90.9
1985	11	7	63.6	9	81.8
1986	8	6	75.0	6	75.0
1987	12	11	91.7	11	91.7
1988	17	14	82.4	15	88.2
1989	18	11	61.1	14	77.8
1990	13	7	53.8	10	76.9
1991	12	7	58.3	9	75.0
1992	6	5	83.3	6	100.0
1993	10	2	20.0	6	60.0
1994	16	3	18.8	15	93.8
Total	**134**	**83**	**61.9**	**111**	**82.8**

Source: LBS calculations

We identified the share of funds whose historic distributions have exceeded the sum of paid-in capital. These funds have already generated guaranteed positive net returns even if their residual asset values were written off entirely. At the current stage, 83 out of the 134 mature funds (62%) have already paid back more to investors than they received. In addition, they still retain asset values and will thus continue to distribute the proceeds of their divestments to investors. If one includes residual asset values in the calculation of total value, the share of mature funds with positive returns increases by 21%. Altogether, 83% of all mature funds have a total value (sum of distributions and residual asset values) in excess of paid-in capital. Due to the conservative guidelines that are usually applied to the valuation of private equity asset values, it is highly likely that most of these marginal funds will ultimately generate positive returns.

We therefore would like to conclude that up to 10% of older funds have historically operated at a loss. At the current stage, 62% of funds have already produced guaranteed positive returns to investors and a further 20% retain assets at conservative valuations which should result in positive returns. *We therefore conclude that a diversified portfolio of private equity participations is therefore extremely unlikely to result in absolute losses to investors.* Despite the considerable variation at the individual fund level, the risk of a diversified portfolio of private equity should be at a level which is manageable for investors

5.3.3. Private Equity Risk and Diversification

The above analysis has shown that the private equity industry as a whole has historically generated long-term returns of roughly 14%. However, there is considerable variation at the individual fund level. We therefore strongly recommend that institutional investors should diversify their investments and build up portfolios of private equity participations.

According to modern portfolio theory, investors should seek to build up *efficient portfolios*. An efficient portfolio maximises the return for a given standard deviation or minimises the standard deviation for a given return. Unfortunately, it is not possible to apply this standard concept of financial theory to the construction of a private equity portfolio. For individual stocks, it is possible to establish fluctuations on a daily, monthly or annual basis. This also permits the calculation of indicators such as the "beta", a measure of the variability of a stock's value relative to market fluctuations. These calculations are based on the assumption that changes in stock prices reflect investors' beliefs in their underlying value.

With private equity funds, the valuations depend to a large extent on the investment and divestment decisions of the general partners. Annual valuations also reflect to a large extent the timing of these decisions. Fluctuations of individual fund values do therefore not necessarily reflect any intrinsic variability of returns and hence an underlying risk. But even if that was the case, and if it was possible to calculate measures such as standard deviations, correlations, covariances and betas comparable to those of public equities, this could only be done over a certain period of a fund's life. Of course this applies to any asset class. The crucial difference is that while any quoted stock can be purchased after such an analysis, this is not possible in the case of private equity. Therefore, the information resulting from such an analysis is irrelevant for a private equity investor, since it is available only *after* his decision to acquire a stake of a general partnership and since, in the usual course of events, the stake in a fixed-life fund is not traded. Thus we have a paradoxical situation where the information required to construct an efficient portfolio is only available several years later when it is too late to influence the outcome. This illustrates why it is not possible to apply the majority of concepts of portfolio theory to private

equity. However, it remains evident that diversification reduces the spread of expected returns and hence the risk to institutional investors.[17]

What are the implications of our recommendations to diversify? Consider the following. According WM, the average fund size in the WM All Funds Universe is £319 million. The median fund is much smaller and manages £54 million. In our dataset, the average private equity fund has a committed capital of £233 million. The median private equity fund set up during the last two years raised £84 million. Remember from the discussion of the fundraising process that the minimum share from an individual investor usually considered by a venture capitalist amounts to 1% of committed capital. For our median private equity funds, this would mean that a minimum participation of £840,000 is requested from an institutional investor. Due to the considerable spread in terms of private equity returns, we strongly recommend that institutional investors build up diversified portfolios. A participation in ten to 12 limited partnerships should eliminate the largest part of the diversifiable risk. Based on the above figures, such a number of participations would require a commitment between £8.4 and £10.08 million for an investor. For the median pension fund, this would represent 15.5% – 18.7% of their assets. This quick calculation shows that smaller pension funds that wish to eliminate the diversifiable risk entirely would have to allocate substantial amounts of their assets to this asset class. We therefore recommend that smaller funds should not invest in this asset class directly (i.e. directly in limited partnerships) unless they make commitments that allow them to build up a diversified portfolio. In giving this recommendation, we are in line with the BVCA who states that direct investments in limited partnerships should only be considered by funds that manage assets of at least £100 million. According to WM, 34 % of funds (i.e. 520 funds) in their All Fund Universe indicated a fund size above £100 million. Smaller pension funds wishing to participate in the attractive returns of the private equity industry without commiting more than, say, 5% of their assets should therefore consider an investment via a fund of funds operated by a gatekeeper. These organisations usually accept lower contributions from smaller institutional investors than venture capitalists.

We would therefore like to conclude that the returns of the UK private equity industry returns present themselves in conjunction with a considerable variation at the individual fund level. Given the potential to generate returns superior to other asset classes, we believe that institutional investors should seriously consider an investment in this asset class. For larger funds, this decision requires an appropriate allocation of funds in order to reduce the diversifiable risk. We believe that smaller funds are best served by investing in this asset class via a fund of funds managed by a gatekeeper or via a selection of venture and development capital investment trusts. This allows for a pooling of returns and risk. In addition, investment managers can benefit from the transfer of experience from gatekeepers and the familiarisation with this asset class. In the short run, the

[17] It is in principle possible to perform a Monte Carlo simulation on the range of returns for different combinations of historical cash-flow situations. However, the value of that information should be contrasted with the time required to produce it. To date, it has not been possible to identify a software package that combines a Monte Carlo simulation of an iterative IRR calculation based on pooled cash-flows without a substantial programming requirements.

uncertainty of private equity is and will remain larger relative to public equity and bonds due to the time horizons involved in such a decision. However, we believe that this is a manageable uncertainty which is justified by the level of returns.

Ironically, the risk associated with venture capital is increasingly shifted towards the public market (Venture Capital Journal, July 1999). In the United States, the appetite of investors for internet and other high-technology stocks has resulted in firms with uncertain future sources of revenues being offered on the stock market. This trend is also observable, albeit to a lesser extent, in the UK and continental Europe. This is manifest in the recent IPO and subsequent share price movements of firms like Freeserve in the UK or some firms on Germany's Neuer Markt despite the considerable uncertainty about their future sources of revenues. The question whether the risk-return profile is better managed through participations in a diversified portfolio of private equity funds or a diversified portfolio of promising high-tech stocks, however, remains unanswered.

5.4. The Cash-Flow Implications of Private Equity

After having discussed the returns and risks of UK private equity, we will now look at the cash-flow implications of an investment in this asset class. The conventional view frequently expressed by investment managers is that private equity investments are illiquid. As a result, the managers of mature funds have traditionally avoided investments in this asset class. We will first examine the cash-flow pattern at the industry and fund level. The second element of our analysis will examine the long-term cash-flow implications of a portfolio of private equity participations.

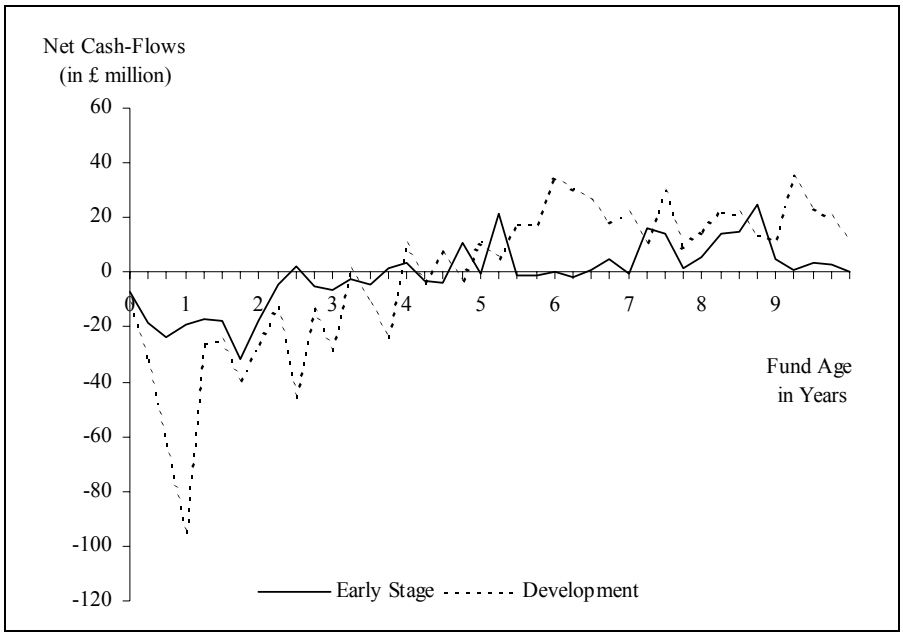
5.4.1. Cash-Flow Profiles of Private Equity Funds

In order to examine the cash-flow implications of venture capital and private equity investments, we decided to plot the net cash-flows (distributions to investors minus paid-in capital) by fund age. This analysis will be carried out by investment stage and by vintage year. Figures 19 to 20 and Tables 27 to 28 show the pooled quarterly cash-flows that occurred during the first ten years of the entire industry's funds. Since this analysis includes young funds, the aggregated negative cash-flows until year four are slightly overstated relative to the positive cash-flows. Figure 19 shows the quarterly cash-flows for early stage and development capital funds. Figure 20 shows the results for buy-out and generalist funds.

The graphical analysis reveals that private equity funds generated positive net cash-flows starting between their third and fifth year since their inception. When looking at the different investment stages (Table 27), we realise that large buy-out funds and generalist funds started distributing more funds to their investors than they drew after three years. As expected, early stage and development funds require a slightly longer period before generating sustained positive net cash-flows. During their fifth year of operation, they started distributing return in excess of paid-in capital. The

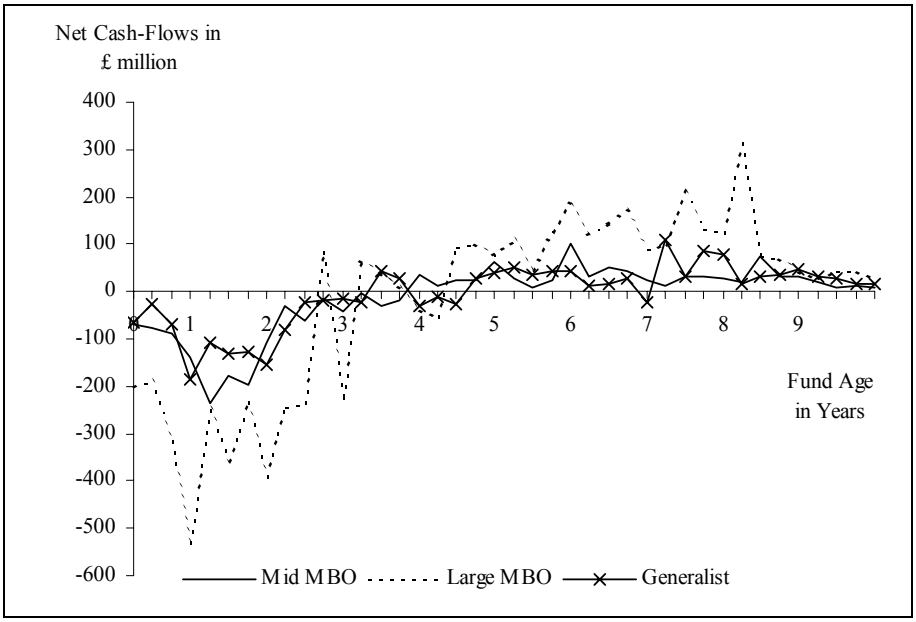
vintage year analysis shows that funds started in 1994 were particularly successful. They started making substantial net contributions during their fourth year of operation. In contrast, funds set up in the recession years of 1988 and 1990 returned distributions in excess of drawdowns only after five years. Note that these figures represent the aggregate industry cash-flows. Some individual funds that have managed to achieve positive net cash-flows after periods as short as two years.

Figure 19
UK Private Equity Quarterly Net Cash-Flows by Investment Stage



Source: LBS Calculations

Figure 20
UK Private Equity Quarterly Net Cash-Flows by Investment Stage



Source: LBS Calculations

Table 27
UK Private Equity Yearly Net Cash Flows by Fund Age (in million £)

	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
Early Stage	-68.3	-83.7	-13.6	-2.6	3.5	19.6	3.8	36.9	57.7	7.2
Development	-201.2	-117.5	-100.2	-24.8	10.8	74.8	96.5	64.2	70.4	90.3
Mid MBO	-372.0	-718.8	-146.8	-15.8	125.3	160.9	147.8	104.5	159.4	47.1
Large MBO	-1236.0	-1233.0	-618.8	75.9	217.4	463.9	523.7	571.7	499.2	146.5
Generalist	-348.1	-517.4	-139.0	16.4	26.8	170.8	37.1	308.0	126.9	89.7
Total	**-2225.6**	**-2670.3**	**-1018.4**	**49.0**	**383.8**	**889.9**	**808.8**	**1085.4**	**913.7**	**380.6**

Source: LBS calculations

For institutional investors, the implications are clear. A portfolio of venture capital funds should, on past evidence, result in positive net cash-flows after four to five years. A well structured portfolio can therefore become a net cash generator after an initial period. Overall, an investment fund's cash management should be able to accommodate the sometimes substantial positive and negative monthly cash-flows arising at the occasion of draw-downs and distributions. While the amount of the individual cash-flows cannot be planned, the diversification over a range of private equity partnerships leads to smoother, relatively regular cash-flow patterns.

Table 28
UK Private Equity Yearly Net Cash Flows by Fund Age (in million £)

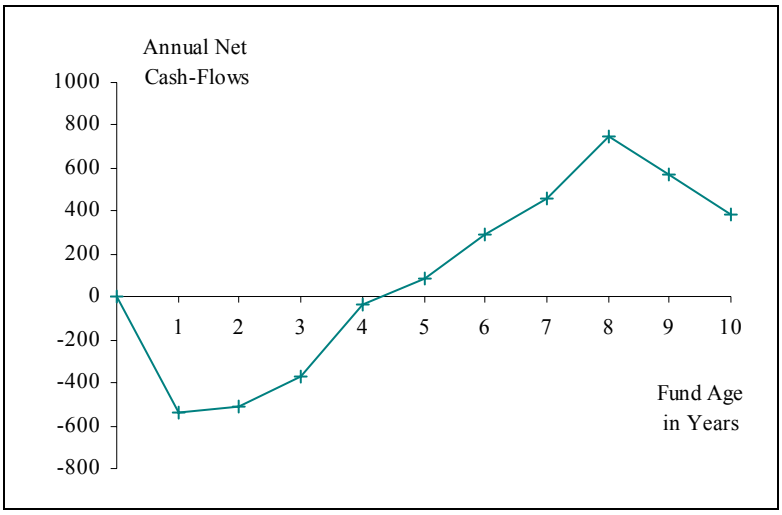
	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years	9 years	10 years
1985	-70.5	-43.2	-17.7	-18.3	29.9	29.7	26.3	23.6	112.8	34.8
1986	-49.2	-41.8	-17.2	13.2	41.2	8.5	8.1	25.2	50.5	26.1
1987	-148.0	-130.8	-57.6	54.4	9.6	79.5	26.8	29.6	49.8	81.5
1988	-142.1	-82.7	-91.5	-23.0	-104.7	86.2	207.5	174.0	184.9	133.2
1989	-118.1	-232.9	-191.5	-80.5	81.9	72.4	177.5	442.0	135.5	91.2
1990	-246.0	-101.2	-122.7	-84.2	-31.3	337.6	243.2	223.0	343.8	0.0
1991	-29.5	-38.0	-37.2	-34.3	22.1	65.7	85.3	113.6	0.0	0.0
1992	-34.6	-33.7	-40.2	31.8	70.7	48.1	17.8	0.0	0.0	0.0
1993	-26.5	-97.5	-83.8	-39.4	26.3	150.8	0.0	0.0	0.0	0.0
1994	-203.1	-289.2	-140.9	157.2	213.5	0.0	0.0	0.0	0.0	0.0
1995	-131.0	-142.1	-126.5	49.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	-192.1	-249.9	-98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	-547.2	-1208.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	-275.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**-2225.6**	**-2670.3**	**-1018.4**	**49.0**	**383.8**	**889.9**	**808.8**	**1085.4**	**913.7**	**380.6**

Source: LBS calculations

The above analysis suffers from one drawback. In our calculation of net cash-flows, we also included young venture capital funds that have not yet started to distribute returns to investors. As a result, the cash-flow profiles shown above overstate the initial negative cash-flows for a given portfolio of mature funds. While this analysis has the advantage of representing the *entire industry*, overstated initial negative cash-flows are an undesirable property for life cycle and portfolio structuring simulations. To address this issue, we constructed a subsample of funds. We chose a very conservative threshold and included only those funds that have been operating for at least ten years. This cut-off resulted in an analysis sample of 79 funds and covers all funds set up between 1980 and 1989.

Figure 21 shows the aggregated net cash-flows for all 79 funds operating for at least ten years. Corroborating the evidence in the above tables on net cash-flow by vintage year, the graph shows that the pooled cash-flows of the venture capital funds started to be positive after roughly four years. We thus conclude that during an initial period, the money invested in private equity participations is illiquid. After a period of four to five years, however, the average fixed-life fund will start to generate positive cash-flows.

Figure 21
Pooled Annual Industry Net Cash Flows by Fund Age
(all funds older than 10 years)



Source: LBS Calculations

5.4.2. Long-Term Cash-Flow Pattern of a Portfolio of Private Equity Participations

In order to examine the long-term cash-flow implications for institutional investors, we carried out a simple simulation exercise. Based on the cash-flow pattern of this subsample of mature funds, we then calculated the cash flow pattern of a *portfolio* of private equity participations. The exercise is based on two assumptions. First, we will assume that an average participation in a private equity fund will have the same cash-flow pattern as the pooled sample of mature funds

displayed in Figure 21.[18] Second, we will assume that the institutional investor invests the equal amount in every private equity fund. These annual investments will be made over a ten-year period starting in year one. Figure 22 plots the cash-flow pattern of these ten successive waves of investments. In addition, we show the sum of the net cash-flows. After ten years, no additional capital will be committed.

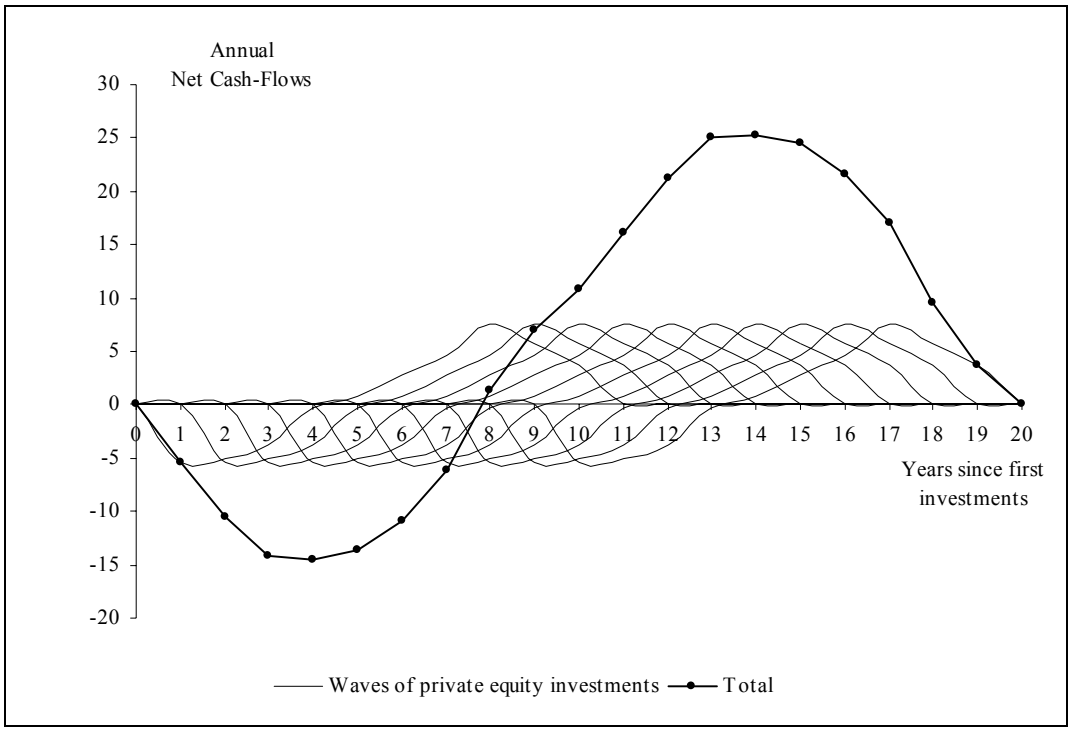
Figure 22 reveals that based on the assumption that the cash-flows follow their past long-term pattern, the portfolio starts generating positive net cash-flows after eight years. This means that further investments in the portfolio (which occur until year 14) will be entirely funded by the distributions of returns from past investments for a further six years. In our example, the private equity portfolio will require net investments for a period of eight years. After that it will continue to generate positive net returns for another 12 years. Note that these simulations are based on performance data on funds of the vintage years 1980 to 1989. Funds set up in the mid 1990s produced higher positive cash-flows within a five or six year period than the older funds for which data over the complete life cycle is available. Furthermore, cash-flows after ten years are assumed to be 0, which is not the case in reality. It is not uncommon for funds to distribute returns over 15 years and longer. The simulations therefore represent conservative estimations.

We then made a modification to our simulation. After four years of annual new investments in private equity, the portfolio manager decides to abstain from further investments for a period of two years. In year seven, investments in private equity start again. Figure 23 shows the implication of this strategy. In this case, the point of self-financing of the portfolio is reached after six years. The portfolio will generate positive net cash-flows over a further period of 15 years. However, the earlier self-sufficiency of the portfolio comes at the cost of foregone future returns as illustrated by the drop of the net cash-flow curve in year 12. In principle, it is possible to cut the period between first investment and self-sufficiency to about four years through making large investments in year one and then wait four years before investing the net returns. However, despite the fact that this instrument will only take four years to be self-funding, it will lead to a slower building up of a performing portfolio and to lower future returns. Institutional investors that invest in a diversified portfolio of private equity participations should therefore realistically count between six and eight years before the portfolio becomes self-financing.

Of course one can set up a similar instrument for other asset classes. However, we wanted to demonstrate that private equity is not as illiquid as commonly thought by investment managers. There is no doubt that a long-term private equity involvement will be illiquid during the initial investment period. *However, an ongoing investment in this asset class will have positive long-term net cash-flows* and thus improve the funding of a pension plan. Our simulations showed that the duration during which negative net cash-flows occur can be shortened through a careful structuration of a private equity portfolio - albeit at the cost of foregone future returns.

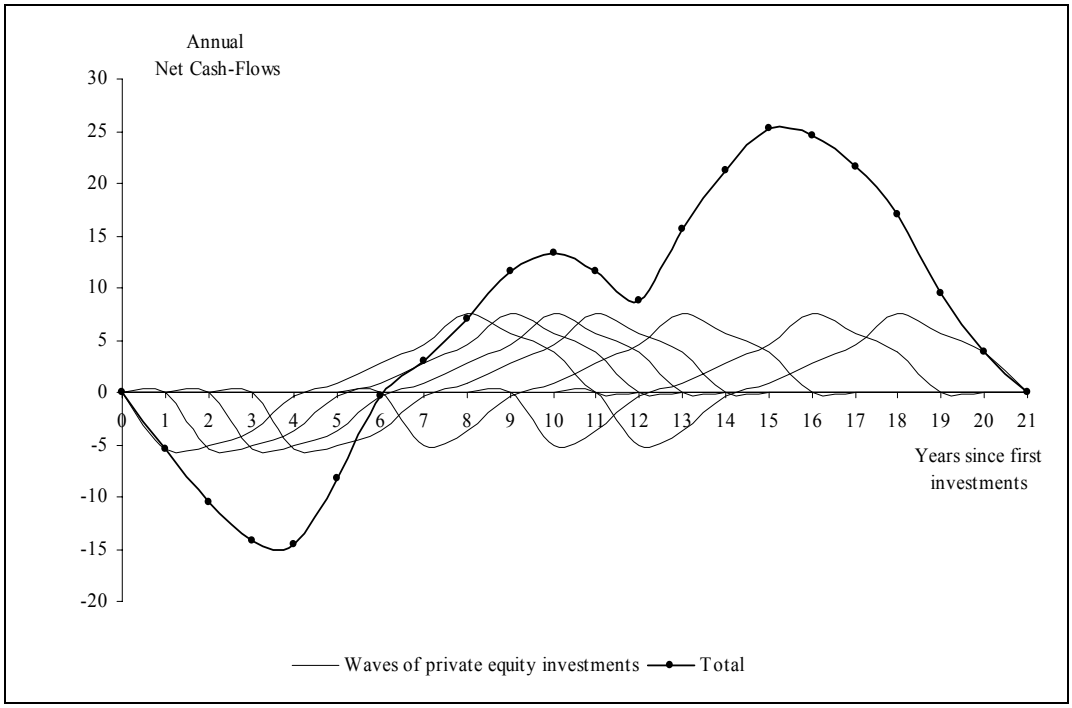
[18] This is actually a very conservative assumption since many funds make distributions beyond year ten. Furthermore, funds set up in the mid-90s have often recorded positive net cash-flows after as little as two years.

Figure 22
Simulation of Long-Term Cash-Flow Implications of Private Equity Investments



Source: LBS calculations

Figure 23
Simulation of Long-Term Cash-Flow Implications of Private Equity Investments



Source: LBS calculations

We would like to conclude by stating that the start-up investments to build up a performing portfolio of private equity participations are illiquid during an initial period of time. A carefully structured portfolio based on equal annual investments is unlikely to require further cash injections after eight years. We would therefore conclude from this exercise that even relatively mature pension funds should consider private equity investments since they can be used as long-term cash generators.

5.4.3. Secondary Markets

An appropriate yardstick to compare the liquidity implications of private equity investments would consist of an analysis of the average period during which a public stock is held by an institutional investor. The widespread practice of index-tracking in conjunction with the relatively stable composition of the major stock market indices has resulted in a situation where many equity positions are held over a longer time period than private equity participations. Yet, the fundamental difference with regard to liquidity - the fact that public equity positions can be easily be sold whereas stakes in private equity partnerships are held until the fund is wound up - remains. By becoming partners in a ten year fixed-life fund, investors accept the illiquidity of such a private equity investment. However, there can be a range of unexpected situations in which an institutional investor may want to reduce his allocation to private equity, change his investment strategy or terminate investments in this asset class altogether. It is therefore important to stress that exits prior to the divestment decisions of general partners are possible. This is due to the development of an increasingly active secondary market which has substantially improved the liquidity situation of private equity investments.

The secondary market has steadily grown since the early 1990s and several UK-based specialists reported the closing of dedicated secondary funds in 1999. Yet, there is no reliable data on the size of the secondary market and estimates provided by industry observers range from 0.5% to 3% per annum of the size of the overall private equity pool. Most secondary funds are usually structured along similar lines as conventional private equity partnerships, i.e. they are organised as limited partnerships, they operate fixed-life funds and general partners receive a share of the profits.

Secondary market players provide liquidity in a range of circumstances. Most decisions to sell a private equity participation to a secondary fund are triggered by one or more of the following reasons:

- trustees' decisions to reduce or eliminate a fund's asset allocation to private equity for strategic reasons or due to regulatory influences (see also section 5.5.2.);
- changes of a manager's private equity investment strategy, such as concentration of the allocated funds to fewer partnerships or exit from underperforming partnerships;

- the liquidation of tail-ends of funds to reduce costs and administrative burden for investment managers;
- the decision to liquidate a private equity participation if it is too small to have an impact on performance that justifies the associated administrative costs;
- the transfer of the mandate to another investment manager who is not interested in managing a holding in the former manager's private equity fund;
- strategic changes experienced by pension plan sponsors (e.g. mergers) which lead to the re-organisation or merger of the pension schemes and subsequent alignment of investment strategies.

When analysing a potential investment, secondary funds carry out bottom-up valuations of the underlying companies based on expected exit scenarios. Increasingly, these participations are sold through auctions involving several secondary funds putting in a bid. Institutional investors should carefully consider the costs and benefits involved of keeping or selling their stake in the limited partnership. Secondary funds are under certain circumstances prepared to offer a premium over the existing valuations if they believe that investments are valued too conservatively by venture capitalists or if they have a more optimistic view on the divestment scenarios. On balance, however, most participations will be traded at discounts to their final realisations due to the fact that private equity participations are usually valued in a conservative way prior to the divestment.

To conclude, we would like to affirm that secondary markets have markedly improved the liquidity in the private equity area. Given that there can be a range of unexpected circumstances in which the sale of a stake in a private equity partnership is desirable prior to the termination of the partnership, secondary market players provide a valuable service to institutional investors. Before entering into a sale, however, we would recommend that institutional investors carefully assess the involved costs and benefits of an exit via the secondary market.

5.5. Additional Aspects

5.5.1. Carried Interest

The 80/20 division of benefits which allows for potentially huge upside profits for the general partners has been a bone of contention between general and some limited partners. Opponents of this arrangement argue that the incentives for venture capitalists are strong enough with a 10% or 15% carry. On the other hand, venture capitalists reply that the carry is a successful incentive structure which can only benefit the general partners after attractive returns have been realised.

Given the current level of returns generated by the UK venture capital industry which are *net of costs* it is doubtful that general partners will accept a lower carry unless forced to do so by an unfavourable track-record. Furthermore, since partnerships that have been successful in the past usually do not encounter many problems in raising additional funds, lower carries will be accepted

only by general partners that lack a favourable track record. Research findings from the US confirm this hypothesis since younger firms without an established track-record were found to be more willing to accept less favourable terms than their more experienced counterparts (Gompers and Lerner 1999). Accordingly, one can regard the carry as a reward for a skilled and experienced group of investment professionals.

In this context, we would like to remind readers that the 80/20 division has survived over 50 years of successful investment activity in the US, the largest private equity market in the world. If there is a trend towards altering the current arrangement, it goes in the opposite direction, since several successful venture capital firms have recently managed to raise funds that have a 70/30 division of benefits. This arrangement is usually accompanied by a higher hurdle rate. This means that venture capitalists must commit themselves to delivering higher returns but they get a larger share of the benefit if they reach their performance target. This is a high-powered incentive that will make successful venture capitalists gain even more. At the same time, it caps the downside risk for institutional investors, since a catch-up hurdle means that they get preferential access to the returns.

From a research perspective, the level of the carry does not matter *per se*. The supply and demand for both capital and private equity management skills will inevitably determine whether venture capitalists settle for a carry 15%, 20% or even 30%. However, it would be interesting to investigate whether different arrangements impact on the level of performance of the partnership. Unfortunately, this assessment cannot be made due to the absence of data on partnerships rewards. This report can therefore not give a formal recommendation whether the 80/20 division should be maintained or altered for the purpose of maximising the industry's returns. We would, however, take the position that, from an investor's point of view, the decision whether or not to invest in this asset class should not depend on the level of rewards for the venture capitalists, but on a careful analysis of whether the expected net returns justify the level of risk and the necessary investment in management-picking skills.

5.5.2. The Impact of the Minimum Funding Requirement (MFR)

In 1997, the UK government introduced legislation that obliges pension funds to comply with the so-called Minimum Funding Requirement (MFR). The objective of the MFR is to set a minimum level of funding in defined benefit pension schemes. If a pension scheme is underfunded, the employer has to make financial contributions to render the scheme MFR-compliant within specified deadlines.

The legislation obliges pension funds to have MFR valuations carried out every three years by their actuaries. For these valuations, the scheme's assets are valued in line with prescribed actuarial assumptions. This applies to all asset classes, including foreign bonds and equities and alternative investments such as property and private equity. Following an MFR valuation, a Schedule of

Contributions must be prepared which is constructed so as to ensure that the MFR continues to be met over the following five years. A new certificate must be prepared each year and, if it appears that the contributions may not be sufficient to meet the MFR, a new MFR valuation may be required. Thus, a check is applied to the MFR funding level annually.

The main restriction placed on pension funds by the MFR stems from the fact that the regulations leave little discretion in the way that future liabilities are calculated. In essence, the value of future entitlements for existing pensioners is determined by reference to UK gilt returns. The value of future liabilities for active members and deferred pensioners is related to dividend yield of UK equities.[19] The process leads to an "MFR-matching" portfolio consisting solely of UK equities and bonds.

As a result of the MFR, the future liabilities of a scheme move in line with the UK bond and equity market, whereas its assets may not. The MFR has thus created a disincentive for pension funds to invest in asset classes that are not used as valuation yardsticks. This includes all foreign equities and bonds and also alternative asset classes such as property and private equity or venture capital. Pension funds that want to avoid the risk of becoming underfunded in MFR terms therefore have an incentive to invest in UK bonds and equities. Funds that follow a long-term asset allocation strategy that involves foreign assets can become underfunded if UK bond and stock markets perform differently from, say, continental European and US bond and equity markets. This was the case in 1998/1999 when strong capital returns and falling yields in the UK gilt markets led to a sudden inflation of the value of pension funds' future liabilities. Given that a short-term market change can require a mandatory adjustment of long-term strategies, the MFR legislation effectively limits the freedom of action of pension funds. This short-term solvency test can therefore have a damaging impact on pension funds' long-term performance.

In practice, the MFR has produced an important disincentive to investing in alternative asset classes and foreign assets. Trustees of funds that have invested 20% of their assets in foreign bonds and equities may be reluctant to allocate a further 5% to private equity. Remember also from the above discussion on the performance dynamics of private equity investments (chapter 5.2), that the returns from a limited partnership may only become positive several years after the initial investments (the J-curve effect). While liabilities increase in line with UK bond and equity returns, the assets allocated to private equity will initially be valued at cost. An investment into private equity will therefore almost automatically lead to a deterioration of the MFR funding situation for a pension fund. However, pension fund trustees should be aware that this effect is very small. Since the average asset allocation of a UK pension fund currently stands at less than 5%, a private equity investment is well below a level that can put a pension fund at risk of non-compliance with the MFR. This is due to several factors. First, venture capitalists request funds on a deal-by-deal basis. This means that between 20% and 40% of funds made available to the

[19] This applies until active scheme members get within ten years of "normal pension age". After that, a mix of gilts and equities is used as a yardstick.

partnership are invested annually until all commitments are drawn. Committed yet uninvested funds can therefore be invested into other assets and generate returns. For example, if these funds are invested into a derivative of UK bonds and equities reflecting the composition of a pension fund's MFR-matching portfolio, this will have a neutral effect on the MFR position. Second, even if 40% of the 5% asset allocation is invested during the first year, it would usually be valued at cost. Given a hypothetical UK bond return of 10%, such an investment would reduce the MFR funding situation by about 0.25% during this year.[20] Limited partners will experience an effect of similar magnitude in the second and third year of the partnership's life. However, as soon as venture capitalists adjust valuations or successfully exit their investments, investors will experience an improvement of their MFR funding situation. Overall, it is extremely unlikely that an allocation of 5% of a pension fund's assets to a diversified private equity portfolio will lead to a deterioration of the MFR position of more than 0.6%. Furthermore, it is only a short-term effect experienced by *first-time investors* or investors still in the process of building up a private equity portfolio to match their target allocation. If a pension fund's diversified private equity portfolio generates returns above bonds and quoted equities – which has been the case at the industry level during the 1990s - an investment in this asset class will even have a positive impact on the MFR position.

We would therefore conclude that, while a private equity investment will result in an almost automatic short-term deterioration of a pension fund's MFR situation for first-time investors, the actual effect is so small that it should not prevent interested funds from allocating money to this asset class. The indirect impact, however, is not to be underestimated, since it biases trustees' asset allocation decisions against those asset classes that are not used as a yardstick for valuing MFR liabilities. As a result, trustees of funds that have not decided to allocate assets to private equity have a disincentive to do so in the future. The MFR is currently under review by the Department of Social Security and the Faculty and Institute of Actuaries. It is hoped that this review will correct its potentially harmful effects on allocation decisions and thus pension fund performance.

[20] This value takes into account the start-up costs and management fees.

6. Industry Outlook: Is there "too much money chasing too few attractive deals?"

According to one industry observer, the statement "there is too much money chasing too few attractive deals" has been accompanying the UK and US venture capital industry for the last 15 years. Over the same period the industry has been steadily growing in both countries while generating increasingly attractive returns. Nonetheless, the question of the availability of attractive future investment opportunities is a pertinent one. The dramatic increase in the levels of fundraising by British venture capitalists in the past three years (see chapter 3) does require a careful consideration of the capacity of private equity markets to absorb these amounts.

Foreign institutional investors seem to believe that the returns of the UK venture capital industry will remain attractive. During the past years, their contributions to the overall funding of the British venture capital industry have steadily increased. They now provide 73% of the industry's funds. So far, the majority of them have been rewarded with returns in excess of those of public equity. The attractiveness and future opportunities in the UK and European private equity and venture capital sector have also led a few US partnerships that specialise in the buy-out area to set up offices in the UK. While their arrival in the European market place will make the large buy-out segment of the private equity industry more competitive, it is unlikely that this will lead to an erosion of the returns in the other segments.

Unfortunately, an exhaustive assessment of the future attractiveness of the British private equity industry cannot be accomplished by this report since the data required to carry out such an assessment is not yet available. However, it is possible to highlight some macro-level trends that are likely to have an impact on the attractiveness of the industry as a whole. We will therefore make a more qualitative assessment of the attractiveness of the industry.

6.1. External Factors Influencing Private Equity Returns

The attractiveness of the venture capital and private equity industry depends to a large extent on the availability of attractive investment and exit opportunities. The majority of these opportunities will be either in the area of buy-outs of established companies or start-up and expansion of young companies. Attractive opportunities in the latter area depend on the start-up rates for businesses with strong growth aspirations. Yet, there is no historic data available on this topic. We can therefore only provide selective evidence. A starting point has been provided by the Global Entrepreneurship Monitor, a multinational consortium of researchers who attempt to follow entrepreneurial activity in ten industrialised countries. Its 1999 executive report compares start-up rates for firms with a "growth orientation." It states that the UK is in the intermediate group. While the UK has more growth-oriented start-ups than France, Italy and Japan, it is lagging slightly behind Germany and to a larger extent behind the US, Canada and Israel (Global Entrepreneurship Monitor, 1999 Executive Report). Overall, the start-up rate of all UK firms, irrespective of their

growth orientation, has remained at stable levels during the four years. Future editions of the Global Entrepreneurship Monitor will hopefully answer the question of whether there is a trend towards increasing start-up rates of growth oriented firms. In the meantime, the UK government should continue its efforts to create a more favourable environment for the creation of entrepreneurial firms.

A similar picture can be painted when looking at the market for buy-outs. International competition and the rise of shareholder capitalism has in the past put pressure on companies to improve their profitability and will continue to do so in the future. Accompanied by the notion that a concentration on "core competencies" will result in higher levels of profitability, large multinational corporations and mid-sized firms alike have started to restructure, shed non-core business units and acquire complementary assets. Accordingly, the past decade has seen an unprecedented surge in mergers, acquisitions, buy-outs and buy-ins. In addition, buy-outs and buy-ins are increasingly seen as instruments to deal with the succession in family-owned firms. Statistics from the Centre for Management Buy-Out Research (CMBOR) at the University of Nottingham show an increase of buy-out activity from 369 transactions in 1986 to 669 in 1998 (CMBOR, Spring 1999 Report). These figures also included non-venture backed buy-outs. During the past seven years, the share of buy-outs and buy-ins of all M&A activity has been subject to annual fluctuations, but, by and large, remained stable between 50% and 60%. Overall, it is unlikely that the above trends will be reversed in the near future. While the competitive pressures in this segment have undoubtedly increased, not least as a consequence of attractive past returns, one also has to mention that the UK private equity industry has reacted by developing new "products", such as public to private and secondary transactions. In addition, the absolute increase in M&A activity in conjunction with the historically relatively stable share of buy-out and buy-ins among all transactions suggests that this segment of the UK private equity industry will remain an attractive area for investors and general partners alike.

Finally, as a further factor influencing the attractiveness of the venture capital industry, one has to mention the creation of second-tier stock markets in most Western European countries. Back in the early 1990s, most venture capitalists that considered the IPO exit option for their portfolio firms were faced with choosing between NASDAQ and the London Stock Exchange. The creation of EASDAQ and several second-tier stock markets such as the Nouveau Marché in France, the Neuer Markt in Germany and their equivalents in Italy, the Netherlands and Belgium, has substantially improved the of exit opportunities available to venture capitalists. To date, it is too early to quantify the systemic impact of the improved exit options on industry-level venture capital returns. Note also that the majority of IPOs staged in 1998 by members of the BVCA were flotations on the London Stock Exchange (Source: BVCA 1998 Report on Investment Activity).

In any case, several UK private equity partnerships have ceased to focus on their domestic market alone and have actively started to expand into the European market. Their different business models range from a full provision of services by local subsidiaries to a core-satellite model where

partnerships retain their key investment staff in the UK. Since the UK venture capital industry is the largest, best developed and most experienced in the EU, it is arguably well prepared for playing a prominent role in European private equity markets. According to the EVCA 1998 Investment Benchmark Report on European Private Equity compiled by Venture Economics and Bannock Consulting, partnerships from the UK accounted for 51% of funds and 66% of amounts invested in 1998.[21] Its strength lies chiefly in its track record as largest and most experienced industry in Europe. Furthermore, in certain areas, it has in the past been more profitable than its US counterparts (see section 5.2.2.). Whether its experience will result in a further extension of its dominant position in continental Europe depends partly on how quickly the local private equity sectors are catching up and on the impact of the increasing competition from US partnerships.

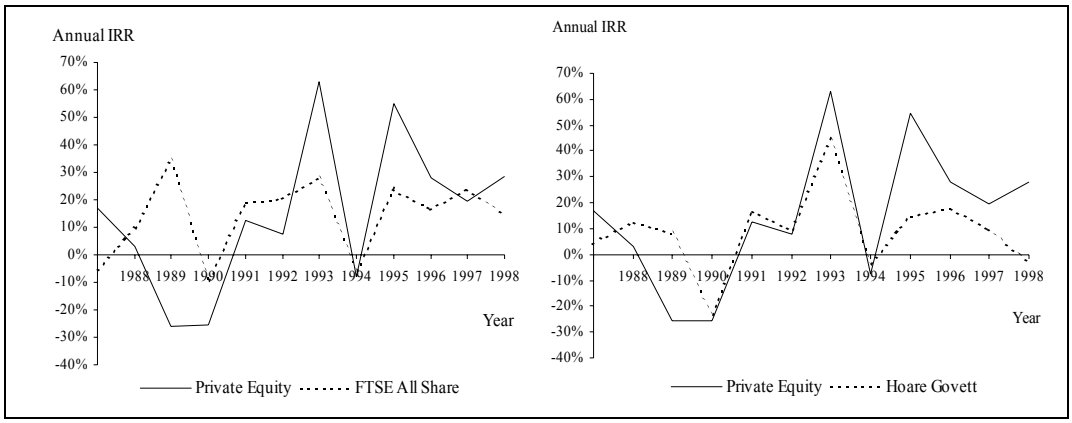
6.2. Cyclical Aspects: The Relationship between Public Equity and Private Equity Returns

According to our analyses in section 5.2.3., private and public equity returns have moved in parallel between 1987 and 1995, with private equity returns being subject to larger upward and downward swings. This is not surprising, since returns in the buy-out segment, which counts for the majority of invested capital, depend in part on the valuations at the buying time and exit time. Both are strongly influenced by the stock market whose quoted companies provide the benchmarks for valuations. Nonetheless, the similarity between the movement of the small cap segment of the stock market (as represented by the Hoare Govett index) and the annual private equity returns is striking.

During the past two years, however, it appears that private and the FTSE All-Share Index have started to move in a diametrically opposite way (see also Figure 24). Furthermore, the annual changes of the private equity returns were not as marked as in the late 1980s and early 1990s, but were comparable to the changes of the FTSE All-Share returns. At the current stage, it is too early to state whether this trend is likely to continue in the future or whether is a coincidence resulting from short-term influences such as changes in investment activity and valuations which have a strong impact on annual private equity IRRs. Irrespective of this recent pattern, we feel that it is impossible to come to a more definitive assessment of the extent to which private equity returns are influenced by the movement of public markets. Since our data on private equity valuations goes only back to 1987, our analysis can only cover a very short time period. The parallel movement up to 1995 present in our dataset should therefore be interpreted with this important limitation in mind.

[21] Unfortunately, the European Private Equity database of Venture Economics does not have an exhaustive coverage of European venture capital and private equity partnerships. Its biggest shortcoming is the poor coverage of the German market. It counts nine German funds in 1998 whereas for other countries, it seems to be more complete. The figures provided above therefore exaggerate the importance of the UK venture capital industry. Nonetheless, there is broad consensus that it is by far the largest in Europe.

Figure 24
Annual UK Private Equity Returns Relative to Public Equity Returns



Source: LBS Calculations

Overall, we believe that it is a fair assessment to state the annual returns of the industry will remain at levels above 20% per annum for a few years. This is mainly due to the J-curve lag effect of investment activity on performance and the fact that many young funds that have not been included in the 1998 performance survey carried out by WM have already produced good returns. It is therefore a likely scenario that the annual returns reported by the UK venture capital industry will continue to be above returns from other asset classes over the short-term. Note that this is good news only for currently active investors because the annual returns are a hypothetical measure which reflects the performance *of past investment decisions* made a couple of years earlier. However, it is not clear whether the annual returns in excess of 25% as experienced recently will be sustainable in the long run, since they are influenced by the buoyant stock market throughout most of the 1990s. The venture capital industry would therefore be ill-advised to promise their investors returns of the high levels experienced during the past four successful years.

7. Recommendations

As a result of our analyses, we would like to give the following recommendations to institutional investors, the UK private equity industry and Government:

7.1. Recommendations for Institutional Investors

- Our analyses have shown that the aggregate historic returns currently stand at 14.2%. Based on a simulation where the cash-flows invested in private equity were invested in benchmark tracking funds, we found that, since 1987, cumulative private equity returns have outperformed UK equity returns by a narrow margin and all other major UK asset classes by a substantial margin between 240 and 460 basis points. These returns are net of all management fees and carried interest. Since 1992, cumulative private equity returns have outperformed UK equities by a substantial margin of 910 basis points.

- Overall, the decision to invest in this asset class should be taken with a long-term perspective in mind. Since private equity returns follow the J-curve pattern, it takes three to five years before investors experience positive returns and net cash-flows.

- The term "committed capital" does not imply that an equivalent amount of money is working during the entire life of the limited partnership. The return figures above therefore do not represent the compound returns of the assets allocated by pension funds to private equity. This is a consequence of two related investment practices. First, funds are usually drawn down on a deal-by-deal basis. Second, the committed capital is usually the maximum amount made available to the partnership since general partners draw between 80% and 95% of committed capital from investors. Institutional investors that seek a target range of absolute returns should therefore be prepared to make higher nominal fund allocations to this asset class.

- While the aggregated returns have been attractive, there are considerable fund-level differences in terms of returns and cash-flows. Diversification is thus of **utmost** importance when investing in this asset class. Diversification smoothes positive and negative cash-flows and substantially reduces the return spread.

- Institutional investors that want to reduce diversifiable risk should be prepared to make appropriate commitments to this asset class. For smaller investment funds, we would not recommend direct investment in this asset class unless a sufficient share of funds is allocated to private equity to build up a diversified portfolio or unless they invest via a fund of funds or in a selection of investment trusts.

- As an alternative to direct investments in limited partnerships, first-time and smaller investors can invest in this asset class indirectly via gatekeepers that operate funds of funds. In exchange for a management fee, one can access the full benefits of diversification. First-time investors, in particular, can benefit from the gatekeepers' experience and thus start building up in-house expertise over the years.

- The managers of private equity portfolios should be subjected to different organisational procedures than the managers of public equity portfolios. Different monitoring processes and incentive structures for investment managers are required to take into account the particular characteristics of this asset class. For example, a measurement of private equity returns on a quarterly basis only makes sense if the managed portfolio comprises a very large number of individual private equity participations. Furthermore, the assessment of track-records and selection of venture capital firms - skills that have a large impact on the returns of a private equity portfolio - require an expertise which is quite different from analysing public equity markets. We would therefore recommend that pension funds appoint dedicated private equity managers and subject them to different incentive and monitoring procedures.

- A well structured private equity portfolio has attractive cash-flow implications. Initially, it will require net contributions over several years. After this period, such a portfolio will generate positive net cash-flows for a longer period. Both the aggregate amount and the timing of cash-flows can be influenced by the structure of the portfolio. Despite the common belief that pension funds approaching maturity should not invest in private equity for reasons of illiquidity, we believe that an appropriately structured private equity portfolio can be attractive for all pension funds irrespective of their maturity since it generates substantial positive net cash-flows after an initial investment period.

- More recently, the growing secondary market has led to a substantial improvement of the liquidity situation of the private equity industry. Stakes in limited partnerships can thus be liquidated before the partnership is wound up.

7.2. Recommendations for the Venture Capital and Private Equity Industry

- In our view, the industry would be ill-advised to sell the high short-term returns as the level of returns that investors can expect in the long run. The present high returns reflect a number of very successful years for the industry as a whole, which is partly due to a buoyant stock market. Given the time horizons of the investment process, the high returns also reflect investments made between three and seven years ago and, to a lesser extent, those made more recently. The aggregate returns of mature funds are likely to stay at current levels for a few years, since many younger funds have already generated attractive returns. However, it is unlikely that future annual returns can be sustained at current annual levels of around 30% for an extended period of time. Communication should therefore mainly focus on the long-term returns which have outperformed its main comparators.

7.3. Recommendations for Government and Regulators

- While the recent appeals to institutional investors to invest in venture capital funds in order to increase the provision of funds for growth-oriented, entrepreneurial businesses are laudable, the British Government should also realise that the Minimum Funding Requirement (MFR) has provided a barrier to achieving this very objective. Pension funds that invest in this asset class for the first time will experience a deterioration of their MFR position. However, given that the average pension fund's asset allocation to private equity is below 5%, the actual effect on a scheme's MFR position is quite small in absolute terms. Nonetheless, the indirect impact is not to be underestimated, since it biases trustees' allocation decisions against those asset classes that are not used as yardsticks for valuing MFR liabilities. As a result, trustees of funds that have not decided to allocate assets to private equity and venture capital have a disincentive to do so in the future. We therefore hope that the current review of the MFR will correct its potentially harmful effects on allocation decisions and pension fund performance.

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Glossary of Terms:

Carried Interest ("Carry"): Carried interest or simply "carry" represents the share of a private equity fund's profit (usually 20%) that will accrue to the venture capitalist.

Committed Funds (or raised funds or committed capital): Capital committed by investors; this will be requested or *"drawn-down"* by venture capitalists on a deal-by-deal basis. For two reasons, this amount is different from *invested funds*: Firstly, most partnerships will invest only between 80% and 95% of committed funds. Second, one has to deduct the annual management fee which is supposed to cover the cost of operation of a fund.

Distributions: Payments to investors after the realisation of investments of the partnership.

Divestments (or realisations or exits): Exits of investments, usually via a trade sale or an IPO (Initial Public Offering) on the stock market.

Draw-downs: Payments to the partnership by investors in order to finance investments. Funds are drawn down from investors on a deal-by-deal basis.

Fund of Funds: Private equity funds whose principal activity consists of investing in other private equity and venture capital funds. Investors in funds of funds can thereby increase their level of diversification.

Gatekeepers: Specialist advisers that assist institutional investors in their allocation decisions to private equity. Some, but not all of them, operate funds of funds.

Hurdle Rate: Arrangement that caps the downside risk for investors. It allows investors to get preferential access to the profits of the partnership. In the absence of reaching the hurdle return, venture capitalists will not receive a share of the profit (*carried interest*). A hurdle rate of 10% means that the private equity fund needs to achieve a return of at least 10% before the profits are shared according to the *carried interest* arrangement.

Interim Return: The definitive rate of return of a private equity investment can, by definition, only be calculated when the fund is wound up. Most return calculations therefore produce interim IRRs which approach the definitive rate of return after between three and six years. This period is usually shorter for buy-out funds than for early stage and development capital funds.

Internal Rate of Return (IRR): The IRR method is the most appropriate method for calculating the returns of a private equity fund. In essence, the IRR represents the rate at which positive and negative cash-flows are discounted so that the net present value of the fund amounts to zero.

Investment Stage: In this report, the term investment stage refers to the fund's investment preferences. In accordance with the cut-offs used for The WM Company's annual BVCA performance survey, we divided funds into early stage funds, development funds, mid-sized MBO funds, large MBO funds and generalist funds.

J-Curve: The J-Curve illustrates the IRR pattern of a fund over time. During their first one or two years, a private equity fund will show a negative return. This is due to the impact of the start-up costs and the annual management fee which do not result in the creation of book-value. The fund's returns will start to rise as soon as the first realisations are made. After between three and six years, the fund's interim IRR will be very close to its final IRR.

Limited Partnership: Most private equity firms operate their funds as limited partnerships. Investors represent the *limited partners* and venture capitalists the *general partners*.

Management Fee: A fee levied by the *general partners* in order to cover the cost of operation of the fund. It has traditionally been set at about 2.5%, although some of the largest funds of the industry charge as little as 1% of committed capital per year.

Pooled IRR (or aggregate IRR): Method of pooling the cash-flows for an analysis group before calculating the group's rate of return.

Secondary Market: The secondary market enables institutional investors to sell their stakes in a private equity partnership before it is wound up.

Time-Weighted Rate of Return (TWR): Method of measuring the performance of investment managers. The TWR seeks to eliminate the distorting effect of cash-flows on the calculation of fund returns. It should not be applied to measure the returns of private equity funds.

Trade Sale: Sale of the equity share of an investee company to another company

Vintage Year: Year of the fund's closing, i.e. the year in which the fund raised an initial sum of capital and started its investment activity.

Appendix

Appendix 1: The Internal Rate of Return (IRR) and Time-Weighted Rate of Return (TWR)

The internal rate of return *i* for a fund over a period of one year is given by

$$M_0(1+i) + C_{t1}(1+i)^{1-t1} + C_{t2}(1+i)^{1-t2} + C_{t3}(1+i)^{1-t3} + ...C_{tn}(1+i)^{1-tn} = M_1$$

or

$$M_0(1+i) + \sum_{r=1}^{n} C_{t_r}(1+i)^{1-t_r} = M_1$$

where M_0 = the value of the fund at the beginning of the year

M_1 = the value of the fund at the end of the year

C_t = the cash-flow at time t_r with (r = 1, 2, …n)

This formula has to be solved by iteration. Computer spreadsheets are usually used to perform this task. A numerical example of an IRR calculation is given in Appendix 2.

The time-weighted rate of return (TWR) was developed to eliminate the distorting effects of cash-flows on return calculations. It is therefore widely used to compare the performance of investment managers irrespective of the amount of funds under their management. The time-weighted rate of return *i* over a period of one year is given by

$$(1+i) = \frac{M_{t1}}{M_0} \times \frac{M_{t2}}{M_{t1} + C_{t1}} \times ... \times \frac{M_1}{M_{tn} + C_{tn}}$$

where M_0 = the value at the beginning of the year

M_1 = the value at the end of the year

$M_{t1}…M_{tn}$ = the value of the fund at time t_r (r = 1, 2, …n)

$C_{t1}…C_{tn}$ = the amount of cash-flow at time t_r (r = 1, 2, …n)

Consider the following example: A fund's value at the beginning of a given year is 100. After three months, the value is 120, after six months 140, after nine months 130 and after twelve months 120. There are positive cash-flows of 10 after three months, 5 after six months and a negative cash-flow of 20 after nine months. The annual time-weighted return of that fund would be calculated as follows

$$(1=i)=\frac{120}{100}\times\frac{140}{130}\times\frac{130}{145}\times\frac{120}{110}$$

thus resulting in a return *i* of 26.4%. The example is based on choosing quarterly evaluation intervals. The method can in principle be used using much shorter time intervals, such as daily intervals, if valuations and cash-flow data for these shorter intervals are available. However, since the method attaches an equal weight to each period, the length of the individual intervals has to be identical.

Appendix 2: A Numerical Example of Calculating the IRR Net of Carried Interest[22]

The IRR example is based on the following assumptions. We evaluate the performance of a fund that raised £20 million. The first draw-downs started on 1st February 1992. By 31st December 1996, the total draw-downs amount to £17 million (85% of committed capital), distributions amount to £12.25 million and the fund retains a residual net asset value (before carried interest) of £15 million. The table shows the dates and amounts of the individual draw-downs.

Cashflow Date	Amount (£)	Comment
1-Feb-92	-2,000,000	10% draw-down from Investors
10-Jun-92	-2,000,000	10% draw-down from Investors
25-Nov-92	-2,000,000	10% draw-down from Investors
3-Apr-93	-2,000,000	10% draw-down from Investors
9-Sep-93	-2,000,000	10% draw-down from Investors
12-Dec-93	-2,000,000	10% draw-down from Investors
5-May-94	-2,000,000	10% draw-down from Investors
15-Oct-94	1,500,000	Cash *distribution* to Investors
11-Nov-94	-1,000,000	5% draw-down from Investors
29-Mar-95	2,500,000	Cash *distribution* to Investors
27-Jun-95	1,000,000	Cash *distribution* to Investors
18-Sep-95	-2,000,000	10% draw-down from Investors
29-Apr-96	3,000,000	Cash *distribution* to Investors
12-Aug-96	1,500,000	Cash *distribution* to Investors
15-Dec-96	2,750,000	Cash *distribution* to Investors
31-Dec-96	15,000,000	Residual Net Asset Value

The following distribution priorities have been agreed between the general and limited partners (Note that these priorities can vary per fund).

[22] The example is based on a scenario developed by Mark Drugan of Westport Private Equity.

1) A share of the residual net asset value will be paid to the limited partners until the total amount of investments is returned;
2) A further share of the residual net asset value will be paid to the limited partners until they achieve a “Preferred Return” of 10% p.a.;
3) A share of the residual net asset value will be paid to the general partners until their share of the profit equals 25% of the profit already distributed to the limited partners; This means that the 80/20 share of proceeds is re-established ('20' being 25% of '80').
4) The remaining residual net asset value will then be split accoring to the 80/20 rule.

An interim IRR is a “snapshot” of performance to date. In calculating an interim IRR, the assumption used is that the fund is wound up at the Net Asset Value date (i.e. 31/12/96) and that the residual value is distributed according to the above. As the fund is not fully drawn down, one of two assumptions can be made, each of which has the same effect on the IRR calculation. Either the £3 million not yet drawn down is cancelled and commitments correspondingly drop to £17 million, or the £3 million is drawn down on 31/12/96 and distributed simultaneously.

Calculation of the IRR

In order to calculate the fund's IRR the remaining net asset value of £15,000,000 has to be split as follows between the investor and the VC manager:

Step 1:
In accordance with priority 1), the invested amount has to be returned to the investors. Given that £12,250,000 has already been been distributed, a further £4,750,000 will therefore automatically be allocated to the investors.

Step 2:
In order to realise the preferred return of 10% compound p.a., a net asset value of £10,101,810 is required (This amount would lead to an IRR of 10% based on the above cashflow characteristics). Stated differently, the minimum returns to the investors should amount to £10,101,810. The next allocation priority therefore has to be £5,351,810 (=10,101,810-4,750,000) to the investors.

Step 3:
As a next step, the remaining share of the net asset value will be distributed to the VC manager until the amount reaches 25% of the sum allocated to the limited partners in step 2 to achieve the preferred return (priority 3). This amounts to 1,337,953 (= 25% of 5,351,810).

Note that the profit of the partnership is to be shared according to the 80/20 rule. Therefore, a 25% "catch-up" provision ("20" being 25% of "80") is actually required in order to get to an 80/20 split of profits.

Step 4:

Finally, the remaining net asset value of £3,560,240 (= 15,000,000-4,750,000-5,351,810-1,337,950) will be divided according to the 80/20 carried interest provision. Thus, the VC manager and the investors will receive £712,050 and 2,848,190 respectively.

Overall, the net asset value of £15,000,000 is allocated as follows:

- The investors receive £12,950,000 (4,750,000 + 5,351,810 + 2,848,190).
- The VC managers receive £2,050,000 (1,337,953 + 712,047).

The example given above produces an interim IRR *before* carried interest of 17.1% p.a
Taking into account the split of the asset value between limited and general partners, the fund generated an IRR net of carried interest and fees of 14.3%.

Note: All figures have been calculated using Microsoft Excel and the IRRs, using the XIRR function in the same program.

Appendix 3: Alternative Criteria to Define Fund Maturity

There is a certain debate whether to use fund age or a set of alternative criteria as defining criteria for maturity. The proponents of fund age argue that large IRR fluctuations are unlikely after four to six years because the IRR formula tends to be mathematically dominated by the time effect the older a fund gets. On the other hand, one could argue that age is too deterministic since some funds, especially buy-out funds, can produce attractive returns over periods as short as two years. The following alternative criteria for maturity could be considered:

1) the residual value to paid-in ratio
2) the paid-in funds to capital raised ratio
3) the distributions to paid-in capital.

We could look at those funds whose net asset value represents less than a certain percentage of the total sum of draw-downs (the so-called residual to paid-in ratio). Since low asset valuations are unlikely to result in substantial IRR fluctuations when the fund is finally wound up, it could be assumed that the choice of an appropriate cut-off will cause the interim IRR to be a reasonable approximation of the final IRR. However, there is a problem with this method. A low residual to paid-in ratio can in fact indicate two very different situations. In the first case, it could mean that a fund has made several realisations thus leading to a lower residual asset value. This fund would be correctly classified as a mature fund. In the second case, it could merely indicate that the investments have not been successful and that the valuations had to be adjusted downwards in order to reflect a conservative valuation practice. We thus have little information on the maturity of this type of fund. We therefore need an additional indicator to assess the maturity of a fund, such as a ratio of paid-in funds to capital raised or a ratio of distributions to paid-in capital.

We compared the effect of choosing an age cut-off of four years with the combined effect of several thresholds for the above ratios. Our simulations revealed that conservative cut-offs will have nearly the identical effect as choosing a cut-off of four years. We would therefore recommend that the simpler measure of age should be maintained as main criterion to define maturity. The residual to paid-in, distributions to paid-in and paid-in to capital raised ratios represent additional pieces of information that gives an indication of the expected range of the final IRR of *individual* funds. In their regular reports to investors, they should be provided by venture capitalists as an additional piece of information in conjunction with a description of the investment history. However, for the purpose of an *industry-level* assessment, we prefer "fund age" as the main criterion for maturity.

Appendix 4: A Method for Comparing Private Equity Returns to the Returns of other Asset Classes

From the perspective of an institutional investor, the IRR method can be seen as an incomplete decision yardstick, since its results are close - but not identical to the time-weighted return method applied to other asset classes. As mentioned in the methodology section (section 5.1.8), the TWR does not represent a true rate of return but a measure to compare fund managers with their peers. We also noted that TWRs *cannot not be applied to private equity funds unless valuations are carried out every time a fund records a cash-flow*. A further method is increasingly used to address this issue. In essence, this method consists of comparing the returns of the private equity industry to the returns obtained from investments in other asset classes based on identical cash-flows. We can thus assess the returns of private equity while taking into account the opportunity costs of investing in other asset classes. Put simply, this means that IRRs for investments in other asset classes are calculated since it is not possible to apply the time-weighted method to private equity. To this end, we will construct a comparator which can be thought of as a "virtual benchmark tracking fund." This method involves the following steps:

1) The pooled fund values of the private equity industry at the chosen starting point of the exercise are treated as one initial draw-down to this tracking fund.
2) The subsequent cash-flows are then discounted by the index return realised over the period under observation.

Assume that we have a fund with one draw-down of £100,000 occurring on January 1st 1987 and one distribution of £400,000 on February 2nd 1996. The terminal value of the private equity fund is £350,000 on December 31st 1998. This would produce an IRR of 21.7%. In order to calculate the equivalent of the returns if our virtual index-tracking fund, the cash-flows have to be adjusted to account for the value changes of the index. Our chosen index has a value of 15 on January 1st 1987, 80 on February 2nd 1996 and 120 on December 31st 1998. Thus, the adjusted draw-down amounts to £800,000 (=120/15 x 800,000) and the distribution to £600,000. (=120/80 x 400,000). These cash-flows are then summed up. The inverse of this sum constitutes the terminal value of the tracker fund (£200,000). In the next step, we can calculate the IRR based on the original cash-flows (draw-down of £100,000; distribution of £400,000) but substituting the private equity fund value with the terminal value of the index-tracker. The latter is the equivalent of the value had the cash-flows been invested in and divested from the tracker fund instead of the private equity fund. This results in an IRR of 19.8%. This result makes intuitive sense since the terminal value of the private equity fund (£350,000) is higher than the sum of cash-flows of the tracker fund (£200,000).

Date	Private Equity Cash-Flow	Index Value	Discount Factor	Discounted Tracker Cash-Flow	Actual Tracker Cash-Flow
01/01/87	-100'000	15	120/15 =8	-800,000	-100,000
02/02/96	400,000	80	120/80 =1.5	600,000	400,000
31/12/98	350,000	120		200,000	200,000
IRR	**21.7%**				**19.8%**

This method has two minor drawbacks. The tracker-fund returns are gross (i.e. management costs have not been deducted) whereas private equity returns are net of fees and carried interest. The tracker returns for other asset classes therefore overstate the returns to investors by a small margin. Second, there are some small differences between the TWRs shown by performance measurement companies such as CAPS and WM and our virtual tracker fund which are due to the timing of the cash-flows. For example, an index such as the FTSE All-Share may increase substantially during the first half of a particular year and stay flat during the second half. If venture capitalists make the majority of their investments during the second half of the year, the index-tracker returns based on the equivalent cash-flows will automatically be lower than the TWRs for the same year. In our case, the positive and negative annual differences were within a margin of 200 basis points. In the long run, however, these differences should not matter and the cumulative IRRs of the respective index-tracking funds over a longer period should be very close to the TWRs for the various asset classes.

Nonetheless, this method appears to be the most appropriate method developed to date to compare the returns of private equity to the returns of other asset classes. It thus compares the value created by venture capitalists with the value created by identical investments in other asset classes. Interested readers will find a more exhaustive discussion of this method in the methodology section of the 1998 Venture Capital Investment Benchmark Report published by Venture Economics.