Department of Economics
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Choosing the best Private Equity fund

An analysis of the influence of fund specific characteristics on future returns

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Is success spoiling private equity?

By Sharon Reier

"Fortune favors the bold," wrote Virgil, the classical poet who glorified the power of Rome. These days few are bolder or have gathered more fortune than the private equity groups that have accounted for more than 20 percent of the merger activity so far this year in the United States and a growing proportion of it overseas.

But just as a string of record-breaking private equity bids made news from Britain to Australia — and major firms like Blackstone Group prepared initial public offerings of shares to individual investors — the risks were also climbing. Experts are apprehensive that the current easy financing via low-grade, high-yield debt could become more costly and less secure, while political opposition to the swashbuckling ways of private equity is growing.

This is not the way that the elite, insiderish, secretive private equity club might have expected things to go. But the changes reflect the fact that private equity is now in the mainstream of capitalism, and will increasingly be expected to play by the rules.

"Given the size of the industry, the level of public scrutiny has reached unprecedented levels," said Javier Loizaga, chairman of the European Venture Capital Association, at a meeting of private equity investors in Geneva this month. "Not everybody likes us. Not everybody will like us."

International Herald Tribune
Saturday-Sunday, March 24-25, 2007

Abstract

By using the Private Equity Intelligence Ltd database, including more than 3300 private equity funds with IRR data and several fund characteristics, I develop a regression model based on both continuously scaled explanatory variables - vintage year, fund size and market returns - as well as three sets of dummy variables - GP location (US or Non-US), fund type (7 different types) and market conditions prior to the vintage year (positive, neutral, poor). The regression has been performed using the transformation method for simplifying the interpretation of dummy variable coefficients proposed by Sweeney and Ulveling (1972).

The results show that all explanatory variables or sets of dummy variables, except for market conditions prior to the fund vintage, significantly contribute to explaining future returns. The estimate on the vintage year variable is negative and the estimates on both the market return and fund size variable are positive. The estimates on the dummy variable coefficients are significant only in the case of a minor negative deviation for US based funds. Most of the fund type dummy coefficients, although insignificantly different from zero, affect returns in an economically intuitive way.

Acknowledgments

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1 Introduction

1.1 Background

These days, newspapers are filled with discussions on alternative investment°[1] strategies. A lot of investors have diverted from traditional stock market investments towards new investment alternatives to achieve higher returns. Among these new possibilities are hedge funds which use different speculative strategies on e.g. derivative markets as well as private equity° funds promising higher returns through investments with active ownership strategies in non-public companies.

> *"Striving to create sustainable value in partnership with superior management teams, we work with companies to formulate strategy conceptualize and implement creative financing structures, recruit talented executives and draw on best practices from the firm's portfolio° companies.*
>
> *We take a different approach to investing […]. At the heart of our approach is an emphasis on building businesses that withstand the toughest test: Time. With an average investment period of five to seven years, we take an unusually long-term perspective. Matched with our size and scope of funds under management, this approach enables the firm to provide substantial resources to our portfolio companies, a critical advantage in the face of constantly changing economic conditions and volatile financial markets."*
>
> *Warburg Pincus (Firm Brochure)*

In 2005 the global private equity branch exceeded the impressive capital raise of 136 bn USD from 2004 (Global Investor). During the first semester of 2006 this trend continued with UK-based private equity funds raising no less than 11,2 bn GBP of private capital (increase of 64% compared to the same period in 2005) and thereby for the first time outstripping public capital raises of 10,4 bn GBP (Financial Services Authority). At the same time the European Venture Capital Association (EVCA) also reported a record of total fund raising of 112,3 bn EUR for 2006, largely exceeding the 71,8 bn EUR raised in 2005.

[1] A general glossary is attached in the appendix section. Terms that are defined in that general glossary will be marked by " …° " in the continuous text sections as they are used for the first time.

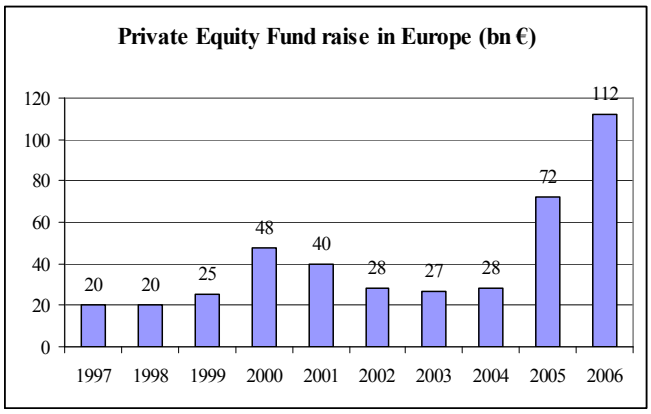

Figure 1: Private Equity Fund Raise in Europe

Source: EVCA

The main part of the discussion on alternative investments in the press has, in addition to high returns, been directed towards investment horizons and a lack of transparency. Private equity investments are obviously of great importance in financing start-up and fast growing businesses (Compaq, Intel and Starbucks are only a few examples), as well as in restructuring established companies which are in financial troubles (Gompers et al 1999). Nevertheless some critics claim that the expected life of 10 years for private equity funds, and thereby hold periods of often around 3-5 years (Financial Services Authority), leads the fund managers to emphasize too much on business strategies which neglect a long term value creation. According to these critics, the private equity branch focuses on maximizing value at the exit° date instead of maximizing long term company value.

Even though private equity as an investment strategy has existed for almost 30 years, researchers have only recently started to turn their interest towards this investment class. It is in the nature of private equity that public information is limited and this might be one of the reasons for a reduced number of studies in this field. It is only since the introduction of the American Freedom of Information Act° (FOI) in 2000 and its influence on most other well developed financial systems, that performance data has become more publicly available. This previous lack of data availability and transparency in combination with the special risk characteristics that can be associated to these funds caused the subject of investments in Private Equity to still remain a large and unexplored field, subject for further research.

1.2 Problem discussion

One of the main questions that appear when discussing investments in private equity funds is, beside the return aspect, the low correlation of these funds with traditional stock markets leading to new possibilities in diversifying investment portfolios (Woodward 2004). However, this thesis does not focus on possibilities arising from these correlation characteristics on optimal portfolio choice.

The main interest of this thesis is the promise by the private equity funds for higher returns. The private equity branch claims that through their direct influence on business strategies, the funds can outperform the passive investment strategies of traditional mutual funds in the long run. So far private equity funds have measured performance in comparison to a peer group of other private equity funds. This approach might be useful for the fund managers, as they can evaluate their performances by benchmarking themselves against the private equity industry as a whole. However, this approach does not consider whether the performance of the private equity branch, respectively its sub branches (types or strategies), are in relation with the differing risk characteristics. Another approach, the so-called PME (public market equivalence) compares cash-flow adjusted returns with the major global indexes. This approach has the advantage of taking the timing of investments into consideration but the problem of risk considerations remains.

The practical question for an investor who decided to add private equity funds to his portfolio is the choice among the multiple available funds. The database provided by Private Equity Intelligence Ltd, fundamental to this study, can be taken to be among the most extensive in this field by containing more than 3300 different funds (covering over 70% of Private Equity funds by value (Private Equity Spotlight May 2007)). Given the high number of funds started during the last years (223 funds in 2006 and 281 in 2005), a potential investor will face a large set of possible investment alternatives. This set of alternatives creates the need for an analysis of fund specific characteristics which are known prior to the investment decision. Fund specific characteristics might be influencing future returns and hence affect the investment decision and choice for the best available private equity fund.

1.3 Purpose of the thesis

The purpose of this thesis is to analyse the influence of certain characteristics, known prior to the investment decision, on future returns of private equity funds. The thesis uses a regression analysis based on characteristics of the Private Equity Intelligence Ltd database (vintage year°, fund size°, strategy, location) as well as on general market conditions prior to and during the investment period.

1.4 Limitations

Problems that arise when evaluating private equity funds are mainly the lack of time series data. This is due to the nature of these funds as they are not priced on a daily basis in public markets. This leads to a situation where published returns are very much dependant on non-realized profits which have to be estimated by the fund managers themselves (according to the international valuation guideline°). Although there is a trend towards publicly traded shares in private equity funds, their number is still limited (about 5% of the total private equity market (Private Equity Spotlight May 2007)) and this market can be characterized as illiquid. Furthermore the indexes that represent the performances of these funds (LPX®Buyout, LPX®Venture…) do not offer the same amount of fund specific information as the database provided by Private Equity Intelligence Ltd. Moreover a previous study by Huss (2005) has shown that funds with publicly traded shares do neither out- nor underperformed the non-traded funds at any point in time. Together with the results by Diller and Kaserer (2004) presented in section "2.3 Measuring private equity performance" it can be concluded that the returns based on the estimated non-realized profits can be accepted as correct on an overall level.

Another limitation of this analysis is the assumption that funds within the same investment strategy have the same risk characteristics. Therefore, for a specific fund, the model is not able to evaluate over-/underperformance against the market portfolio or other peer funds since the fund's individual characteristics are not properly taken into account. The available data does not allow for a more case specific modelling of the funds' risk-return performance. Kaplan and Schoar (2005) resolved this problem with the same assumption of considering risk characteristics to be equal among peer funds of the same strategy. This assumption is

further strengthened by the results of Ljungqvist and Richardson (2003), who reported the same standard deviation for their first and third quartile funds within the same strategy even though returns differ significantly (28,6% and 9,9%).

The suggested model in this analysis aims at detecting fund specific characteristics that influence future returns. Since the main question of the thesis is formulated on a level of purely return influencing characteristics, the negligence of an appropriate risk modelling does not constitute a drawback from the thesis's initial purpose. However the return driving fund characteristics still need to be evaluated against their different risk levels and those results should be of strong interest for any investor in private equity funds. Further characteristics might also be important in the process of choosing the right Private Equity fund. Such characteristics might concern the fund manager's previous performance record or specific information on the general partner° (GP) such as performances of previous funds. However this thesis adopts the position of reducing the set of fund specific information to the characteristics included in the database at hand, thereby simulating the investment decision of a previously ignorant investor whose decision is solely based upon market performance as well as information provided by the Private Equity Intelligence Ltd database.

1.5 Outline of the thesis

This thesis has the following outline. Chapter 2 starts by shortly presenting the private equity business. The chapter highlights the branch's history, the different investment concepts, special risk characteristics as well as methods for performance evaluation. It concludes with a discussion on the results of previous studies on the subject of private equity fund returns. Chapter 3 introduces the data which this analysis is based on before the methodology of the analysis is presented in chapter 4. The results of that analysis are presented and discussed in chapter 5 before chapter 6 concludes and summarizes the thesis.

2 Presentation of the private equity business

2.1 Historical development, legal structure and investment procedure

The investment alternative of private equity funds has developed during the late 1970's and early 1980's. Previously, private investments were mainly undertaken by corporations, wealthy families or financial institutions under the form of direct investments in issuing companies. After the introduction of the limited partnership° structure in the 1970's, the branch started to grow but it was not until the 1980's that one could talk about an explosive growth for the asset class. This explosive growth was mainly due to the evolution of the limited partnership as well as favourable tax and regulatory changes. Since these changes occurred, most investments have been undertaken by professional funds instead of the previous direct investments (Fenn et al 1995).

Organizing private equity investments as Limited Partnerships (LP) with the institutional investors as limited partners° and the investment managers as general partners (GP), has proven to be the most effective in encountering the "extreme information asymmetry and potential incentive problems that arise in the private equity market." (Fenn et al 1995). The limited partnership° (LP) (represented by the general partner), as the largest and most active shareholder in the target portfolio company°, has a significant control on the companies' management. This way the GP can ensure the management best serves shareholder interests. Moreover the GP often replaces parts of the management to gain further control. The risk due to asymmetric information and conflict of interests between the general and limited partners is being reduced through the large own participation in capital by the GP. Recent changes in the US tax code have lead to new organizational forms for private equity funds such as Limited Liability Partnerships (LLP) and Limited Liability Companies (LLC). However the Limited Partnership can still be considered by far the most widespread organizational structure and the choice between LP, LLP and LLC is purely a matter of liability, taxation issues and management responsibility (NVCA[2]).

[2] The National Venture Capital Association (NVCA) is a trade association representing the US venture capital industry (from NVCA official homepage)

The exact structuring of these vehicles depends very much on country specific legislation. As an example, the structure of an English Limited Partnership established under the "Limited Partnership Act 1907" is represented in figure 2.

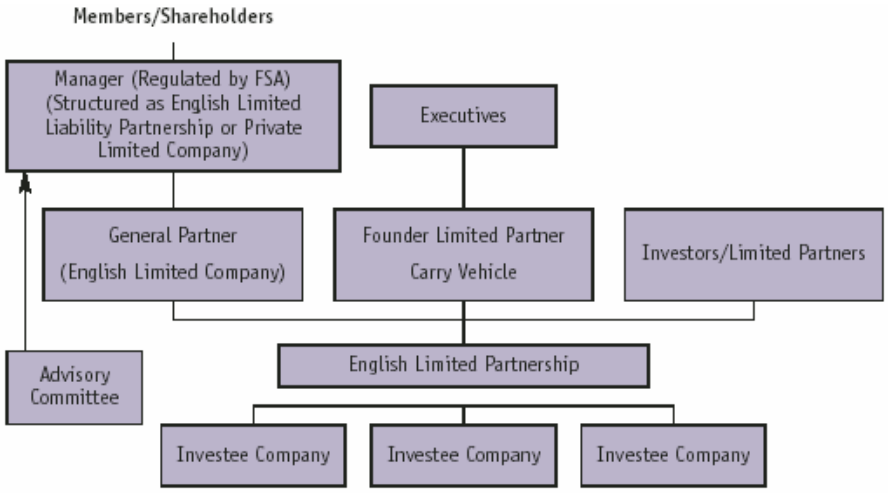

Figure 2: Structure of a typical UK-based Limited Partnership

Source: Financial Services Authority

A typical investment procedure as described by NVCA would be a private equity company setting up a limited partnership in which it serves as general partner. The pooled fund, made up of the general partner and the limited partners, has a fixed life span of usually 10 years. The limited partners provide most of the capital by capital commitments in what is known as the fund raising process. When capital commitments° have reached the target fund size, the fund is closed° to further investors or to new commitments by existing limited partners. Hence the fund manager has a defined amount of capital to draw down° (call) at any point in time in order to invest in promising portfolio companies. The fund will then, through its capital and expertise, help the portfolio companies to develop according to the strategic goals that have initially been set. After a usual operational horizon of three to five years, the fund seeks to exit the investment in the portfolio company by an initial public offering, a merger or an acquisition by other investors.

2.2 Different investment concepts within private equity

Even though private equity is often referred to as one investment class, funds within this field can be classified into different categories. The desire to take an active role in developing the businesses in which the fund is investing, reduces the possible number of individual investments (Jones and Rhodes-Kropf 2004). Investing in a reduced number of companies and thereby not taking diversification aspects into account forces the funds to specialize in very specific investment areas in order to control risks through an in-depth understanding of the target businesses. This leads the funds to develop specific investment strategies based on different focus areas. Depending on the investment strategy, fund activity can differ in the timing of the investment, the kind of assets the fund invests in as well as whether the fund directly invests in portfolio companies or chooses the indirect approach through acquiring shares in other funds.[3]

The two probably most well known strategies are venture capital (VC) and buyout (BO). The strategies differ mainly in the timing of investments at either an early stage of a company's history seeking returns mainly driven by growth figures for VC or capital restructuring and business restructuring of mature companies that operate in a suboptimal way for BO.

	Venture	Buyout
Portfolio company stage	Early	Mature
Company revenues	None	Sustaining
Number of fund investors	Many	One
Management involvement	Moderate	Heavy
Number of cash infusions by investors	4-7	1
Use of debt by investor	Never	Nearly always
Source for quarterly valuation	Funding round	Internal
Ultimate company failure rate	About 50%	Rare

Table 1: Characteristics of Venture and Buyout investments

Source: Woodward (2004)

[3] The exact definitions of the different strategies employed by Private Equity Intelligence Ltd are presented in the glossary so this short summarizing presentation is reduced to those strategies analyzed in this paper and does not claim to be completely exhaustive on all existing investment strategies.

Within these two major strategies, different characteristics allow for a further, more detailed subdivision of the funds. Furthermore most funds specialize in specific industries where they have developed specific competences and in-dept knowledge.

As already mentioned, the main target investments for VC funds are companies with a potential for high growth which are in need of further capital to finance the development of their business. The previously mentioned requirement for an in-depth understanding of business areas might lead the funds to either invest in a very early stage of companies' growth cycles, maybe even in the so-called seed stage; in expansions of businesses that already have passed the initial start-up stage or finally in a stage concluding a period of high growth leading companies into what could be considered a mature business unit. However not all funds want to restrict themselves to a specific stage in the companies life cycle and prefer to diversify to some extent by balancing the mix of portfolio companies with respect to their development stage.

Within the BO strategy, the different subcategories are not as obvious and they are therefore often not taken into account when consolidating data. Different approaches differ in whether the management of the target company is among the main investors (Management Buyout) or the investors want to take over the management positions in the acquired company (Management buyin). Buyouts by private equity houses are often said to be institutional buyouts and investments can be motivated by high cash-flow generating and value creation through restructuring companies in financial distress or restructuring of the balance sheet to reduce capital costs and increase leverage (Leverage buyout, LBO).

Another well-known and much discussed category of private equity investments are mezzanine funds. Those funds invest in non-public mezzanine debt which is a tranche of capital that can be situated between equity and bonds with a risk characteristic that places this class of capital closer to equity than to traditional corporate bonds. In a similar way distressed debt is an investment class that also invests in bonds, however increasing the risk and thereby the potential returns by purchasing debt of companies that have defaulted or are likely to do so in the near future.

As shortly mentioned a major class within private equity is composed of the so-called fund of funds. These are funds that do not actively invest into portfolio companies but rather

diversify their investment capital through investments in other private equity funds. Secondary funds adopt a similar approach but as opposed to the funds of funds which invest during the capital raising process, the secondary funds acquire fund shares on the secondary market at a later stage of the target funds life.

The last cluster of strategies is defined by the target investment industry rather than by timing or asset classes. The most predominant strategies are real estate and natural resources that have known a very strong increase in popularity lately.

2.3 Measuring private equity performance

2.3.1 Internal rate of return (IRR)

Managers of traditional open-end public market funds can not influence cash-flows patterns; therefore the traditional approach to evaluating these funds is time-weighted. Managers of closed-end° private equity funds on the other hand can influence cash-flows by calling or distributing cash. Hence the patterns of cash-flow should influence the performance by applying a value-weighted return approach, the IRR (Rouvinez 2003). Mathematically the IRR is the discount rate that makes the present value of all cash-flows (CF) equal to zero. A drawback of the IRR approach is the fact that an unbiased IRR can only be calculated for a completely liquidated fund. Hence the theoretically correct IRR(CF) reduces the number of funds that can be analyzed.

In the meantime IRR(CF) has to be replaced by an approach where large unrealized cash-flows have to be estimated as a net asset value (NAV) and can be included in the calculations of the IRR(NAV). However this approach is not applicable in the first few years of a fund as estimates of future cash-flows are too insecure. Another argument for not calculating the IRR(NAV) in an early stage of the fund is the so-called J-curve or hockey stick effect. This effect is a result of parts of the early draw downs being used to cover costs such as management fees and start-up costs without an equivalent development of the value of the portfolio companies. Hence IRR calculations are influenced in a non-appropriate, negative way during the first years (EVCA). Therefore funds do not provide any IRR performance data the first two to three years.

As the results of Diller and Kaserer (2004) show for a sample of 95 liquidated funds IRR(NAV) is overall a good approximation of the final IRR(CF) after passing the initial start-up stage.

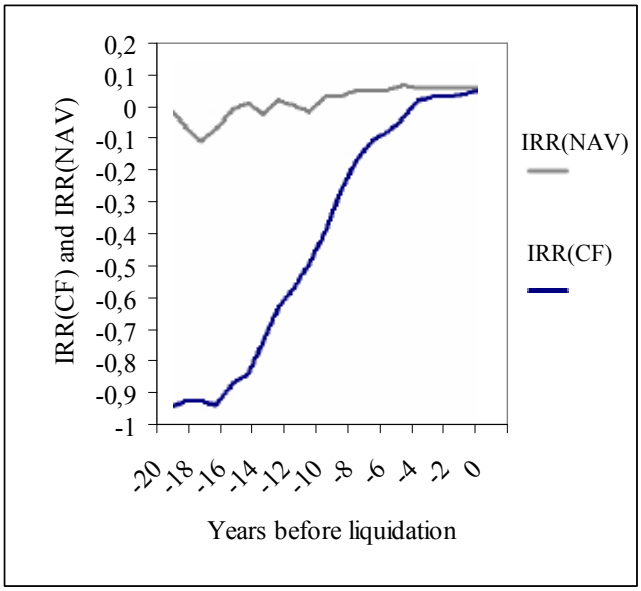

Figure 3: Development of IRR(NAV) and IRR(CF) over time

Source: Diller and Kaserer (2004)

2.3.2 Public market equivalent (PME)

To compare the investment in a private equity fund to a public market investment another approach, PME (public market equivalent), has been developed. The question that the PME answers is the following: given a 1 Euro investment in a private equity fund, how much has to be invested into a public market index to generate the same cash-flow and hence the same final wealth. In other terms PME expresses the ratio of "terminal wealth obtained when investing in a private equity fund and reinvesting intermediate cash-flows in a given public market benchmark compared to the terminal wealth obtained when investing the same amount of money in the benchmark." (Diller and Kaserer 2004).

The mathematical definition used by Diller and Kaserer definition is given by:

$$PME = \frac{\sum_{t=1}^{T} cf_t \prod_{i=t+1}^{T}(1+R_{Ii})}{\prod_{i=t+1}^{T}(1+R_{Ii})}$$

Where: *- R_{Ii} is the net return of a public market index in a period t*

- C_{ft} is the normalized positive cash flow (distribution) of the private equity fund in period t. Positive cash flows are normalized by dividing cash flow occurring in period t with the present value of all investments i.e. the present value of all negative cash flows. In this way the cash flows are normalized to an initial investment with a present value of 1 Euro.

The PME approach reveals obvious advantages over the IRR method such as a consideration of cash flow patterns in comparison to the current market situation and a simple and intuitive interpretation of private equity performance. However some problems from the IRR calculations remain (e.g. including NAV in calculations for non-liquidated funds). Furthermore PME does not consider the differences in the risk characteristics between private equity funds and the general broad benchmark index. The implicit assumption when concluding for outperformance of private equity over the benchmark index for PME ratios greater than one, is that the private equity fund has a beta equal to one and a similar return distribution to that of the public market. Moreover a PME approach requires a complete unbiased database for cash-flows that might be more difficult to acquire than IRR data.

2.4 Special risk-return characteristics

A central question when analysing private equity fund returns is whether these returns show the same characteristics as public equity returns. If that is not the case, the analytical framework used for analysing traditional public equity funds can not be applied to analysing private equity returns. Applying traditional analytical tools, based on the assumption of normally distributed returns, to private equity returns has often lead to outperforming risk-adjusted average returns which is in contradiction to economic intuition of competitive markets. Since the venture capital is a competitive business with relatively free entry (Cochrane 2004) such an explanation seems rather improbable. Cochrane therefore summarizes other, more plausible, explanations for diverting returns to the following three; liquidity, risk and diversification aspects, as well as monitoring and governance.

Firstly, the liquidity explanation is evident since private equity markets are generally highly illiquid, thereby forcing the investor to adopt a buy-and-hold investment approach. Even if capital is usually not called until the fund has detected promising investment opportunities, it is committed for a period of generally ten years and susceptible to be called at any point in time during the first years. In the meantime, the investor is forced to choose very liquid and less volatile investments promising lower returns. In the late 1980's and early 1990's a growing market for secondary investments has improved the liquidity in the market. However the due diligence process may still take up to several months and shares have often been traded at discount since buyers could expect the seller to be in need of liquidity or dedicated to selling for other reasons. This discount pricing has continuously faded away as the market grew in depth and breadth and there has even been signs of positions being traded at premium prices as investors want to diversify in funds of different maturity (Fenn et al 1995).

Secondly, the explanation about risk and diversification aspects focuses on characteristics such as a highly skewed return distribution which does not favour a mean-variance approach to quantifying risk. Cochrane goes as far as comparing VC investments to "options; they have a small chance of a huge pay-off." Risk characteristics differ from traditional mutual equity funds due to the use of "exotic and complex capital structures incorporating a variety of senior and subordinated debt tranches, together with relative small equity tranche […] and the increasingly common use of non-amortizing 'bullet' debt" (Fenn et al 1995). Private

equity funds do also diversify in a suboptimal way. The previously mentioned characteristics of the investment strategy, with an active ownership approach, give plausible explanations for this neglecting of diversification effects. A study by Jones and Rhode-Kropf suggests a proof that private equity funds, but not investors in the funds, are compensated for taking on idiosyncratic risk. In their paper from 2004 Jones and Rhodes-Kropf present a theoretical framework that, by combining the principal-agent problem to asset prices, explains why "diversifiable risk can be priced in VC deals even if the outside investor is fully diversified." Since the fund managers do not bid higher on projects than to a point where they are just indifferent to investing, prices on private equity investments are lower and gross returns are higher than suggested by the traditional CAPM (since the managers have to be compensated for their time and effort in monitoring and taking part in the development of the businesses (third explanation according to Cochrane) and the idiosyncratic risk that can not be diversified due to the characteristics of the market that have been discussed previously). However this does not mean that net of fee returns show positive alphas since competition between well-diversified investors awards the gross excess returns to the fund manager. Even if not central for the analysis in this thesis which focuses on net off fees returns, this framework can be seen as explanatory for the high, often criticized, management and performance fees that are characteristic for the private equity branch (traditionally a "2 and 20" structure referring to 2% management and 20% performance fee).

2.5 Results of previous studies on private equity returns

As already mentioned, private equity has only recently become a field of study for academic research. However the drawback of the number of studies being limited is more than compensated by the fact that all research results are recent and based on up-to-date performance data. Therefore these results can be taken to be important when deciding on forthcoming investment decisions.

One of the major studies on private equity returns was published in August 2005 by Kaplan and Schoar. Their study mainly focused on three aspects of private equity returns; performance, performance persistency and the relation between performance and capital flows, fund size and GP-survival over a period from 1980-2001. According to their results (using a PME approach), net off fees LBO (leverage buyouts) returns slightly underperformed the S&P500 general index. VC returns underperformed the S&P500 on an equally weighted portfolio level but outperformed the same index if the portfolio is capital weighted. However an acknowledged drawback in these results is the previously mentioned negligence of the risk parameters that influence returns. If the risk level of the private equity funds is higher (lower) than for the S&P500, the results will over-(under-)estimate the performance with regards to risk. The results also showed a positive relation between the performances of follow up funds started by the same GP (confirmed by Diller and Kaserer 2005). This persistency of outperforming funds being followed up by outperforming funds has not been proved for mutual funds, indicating that investment skills are determinant within the private equity branch. Considering this persistency fact for private equity funds, the positive relation between past performance and cash flow to the follow-up funds is not surprising. Another possible explanations for the positive persistency in fund returns, as suggested by Kaplan and Schoar, is a so-called “priority deal flow”, claiming that successful private equity investors have priority access to following transactions.

Diller and Kaserer had already found similar results as Kaplan and Schoars in 2004 and reported a 4,5% IRR excess return over the MSCI Europe for the time period 1980-2003. Their cash-flow based analysis results in a PME of 0,96 on an equally weighted portfolio and a PME of 1,06 for the value-weighted portfolio. Nevertheless the high standard deviations in both the IRR and PME are not analysed any further. Diller and Kaserer prefer to analyze correlation patterns between performance and the fund specific characteristics of size,

payback period and vintage year. They outline significant positive correlation with vintage year and payback period and fairly inconclusive results with regard to fund size. Similar results are provided by Rouvinez (2003).

Cochrane (2004) reports significant outperformance (arithmetic mean of 159% for a standard deviation of 107% and an arithmetic alpha of 32%) of VC funds even after compensating for selection bias. Taking the skewed return distribution into account by applying log returns, the results change dramatically and the market model reveals a slope of 1,7 and an intercept of -7,1%. However the same pattern, which can not be explained by the Fama-French 3-factor-model, also applies to the smallest Nasdaq stocks and therefore the puzzle can not be interpreted as VC specific.

Woodward (2004) shows in her study that traditional approaches of characterizing private equity funds by CAPM alpha and beta is misleading. Due to illiquidity in the private equity market, covariance calculations with the market indexes underestimate betas and therefore overestimate alphas. Woodward resolves this problem by including autoregressive terms in her model proving a massive increase in betas (e.g. beta of 2 for venture capital and 0,86 for buyout strategies against Jones and Rhodes-Kropf's estimation of 1,8 and 0,65) leading to alphas close to zero. Asness et al (2001) come to similar results of misleading beta estimates in analysing hedge funds which show the same illiquidity characteristics as private equity funds. The problem of illiquidity has also been central in the analysis of Getmansky et al (2004) on serial correlation in hedge fund returns. By using a simple econometric model, Getmansky et al argue that serial correlation can mainly be explained by illiquidity and smoothed returns. According to the authors of the paper, their econometric model and "smoothing index" may serve as a basis to embrace a more systematic approach to managing illiquid hedge funds in a portfolio perspective and could also be applied to other illiquid investment classes such as private equity.

3 Data

The set of data this study is based on is provided by Private Equity Intelligence Ltd (www.prequin.com). The database contained 3317 funds at the end of April 2007 which is the reference date for this thesis. The funds were all started after 1972 and the majority of funds have vintage years after 1980. Return data (IRR net of fees) is available for 2268 funds, the missing IRR data in the remaining funds is in 524 cases due to the previously discussed fact of meaningless IRR calculations in the first 2 years of a funds lifetime. The other 525 non return reporting funds do not display any region, industry, type or other pattern that could lead to a conclusion about a dissimulation of systematic underperformance in a special sub-branch of the private equity fund industry.

The average fund performed an annual return of 13,85% (median fund 10,60%) for a standard deviation of 36,64%. The best performing fund reported a return of 1047% in contrast to the worst performance being a reported negative return of 100% (4 funds, 2 buyout and 2 venture (general) funds). The average fund size is of 546 Million USD (median fund size 236 Million USD) with the largest fund (started in 2006) closing at no less than 16,625 bn USD. Returns are strongly skewed (12,38) and are characterized by a kurtosis of 300 implying that any traditionally model based on normally distributed returns can not be applied in a straight forward way to this set of data.

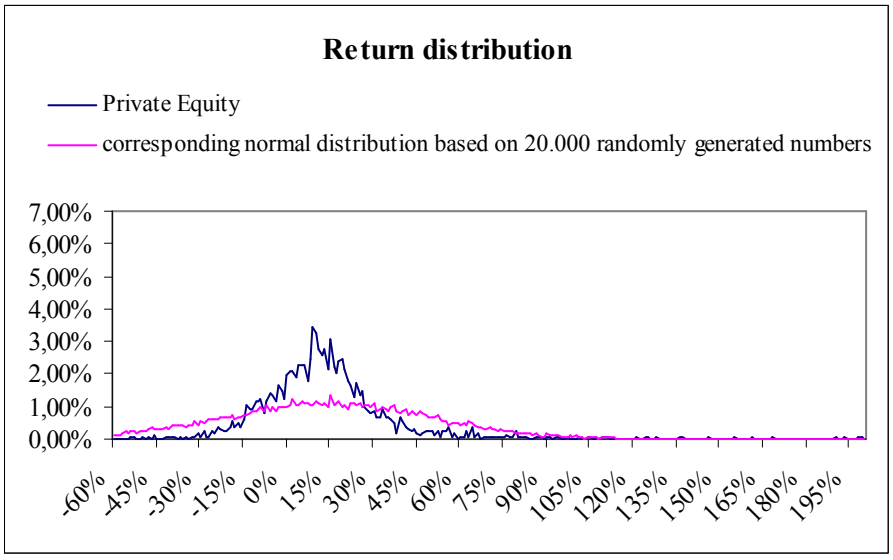

Figure 4: Return distribution of private equity funds

The database categorizes the funds into the following 22 strategies:

Strategy	Number of funds / IRR data available	Equally weighted average return (p.a.)	Strategy	Number of funds / IRR data available	Equally weighted average return (p.a.)
balanced	68/51	9,74 %	infrastructure	15/6	-0,45 %
buyout	853/611	14,37 %	late stage	59/42	10,01 %
co-investment	24/12	15,16 %	mezzanine	121/90	11,71 %
distressed debt	78/51	20,23 %	natural resources	72/50	21,19 %
early stage	271/195	15,00 %	real estate	326/201	15,84 %
early stage: seed	31/15	6,17 %	real estate fund of funds	4/2	10,65 %
early stage: start-up	34/19	2,20 %	secondaries	83/47	21,21 %
expansion	51/22	8,31 %	turnaround	5/5	18,42 %
forestry	19/15	5,08 %	unknown	2/2	-16,20 %
funds of funds	339/196	9,95 %	venture (general)	815/603	13,64 %
general special sit.	39/27	18,21 %	venture debt	7/5	26,92 %

Table 2: Strategies of the funds in the Private Equity Intelligence Ltd Performance Analyst database
For definitions of the strategies refer to the glossary in the appendix

However the analysis will not cover the entire database since some categories do not contain a large enough sample of funds to make a statistically significant conclusion. The excluded types of funds are: co-investment, forestry, general special sit., infrastructure, real estate fund of funds, turnaround, unknown and venture debt. Furthermore, the 3 classes of early stage investments are combined into 1 category. Eventually there is a dataset of 2193 funds included in this analysis. However the characteristics of the set of data are hardly influenced by this restriction; the average return raises marginally to 13,89 (median fund 10,60%) with a standard deviation of 37,12% and an average fund size of 418,5 million USD.

The target customers for the use of the Private Equity Intelligence Ltd databases are professionals working within the field of private equity investments. Therefore it can be assumed that fund specific characteristics deployed in the database are of interest for these professionals when making investment decisions.

"Private equity professionals are paying closer attention to fund performance than ever before. That's why you need access to the best and most comprehensive source of this vital information." (Private Equity Intelligence Ltd)

The database contains the following information about the funds: Fund Name, Firm (GP), Vintage, Status (liquidated, closed, raising), Fund Size, Type (Strategy), Region Focus, Distribution° (DPI %), Value (%) Residual Value to paid-in Capital° (RV/PI), Multiple° (X), Net IRR (%), Date for last IRR report, Industry Focus, Location Focus, GP Location, Called (%) (contributed capital). Furthermore different benchmark options are included in order to compare the different funds.

A problem that could occur with the database is the risk for selection bias due to the data gathering process. However Private Equity Intelligence Ltd claims that their method of gathering data from various sources (among others GPs and LPs) as well as in an early stage of the funds lifetime, eliminates the risk of survivorship bias. The private nature of the information does not allow for a control of that statement, but if there should be a selection bias it is probable to be a slightly upwards bias due to less reporting from underperforming funds.

Another characteristic of the data that has already been discussed previously is the inclusion of IRR(NAV) to enlarge the sample. The alternative to a possible biased IRR(NAV) (due to smoothened NAV estimates) would be a disregarding of funds that are not completely liquidated. This however would bias the sample of funds to only include funds with vintage years prior to the early or mid-1990's.

The market indexes that are used in this analysis are based on the region focus criterion which has 3 categories: Europe, US and ROW (rest of the world). Fund returns are therefore compared to a general well-diversified equity return index of the appropriate region. The equity indexes (adjusted for dividend payments) to cover these regions are the MSCI Europe[4]

[4] The MSCI Europe Index is a free float-adjusted market capitalization weighted index which is designed to measure the equity market performance of the developed markets in Europe. As of June 2007, the MSCI Europe Index consisted of the following 16 developed market country indices: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.
(MSCI Barra official homepage)

MSCI North America[5], and MSCI World Index[6]. The indexes have been chosen as they are among the only indexes that are calculated on such a long period and are broad indexes of the market capitalization in the covered regions.

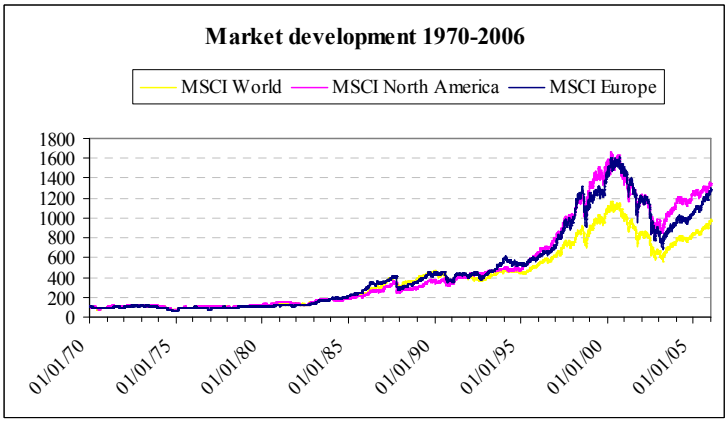

Figure 5: Market development of the benchmark indexes 1970-2006

Source: Datastream

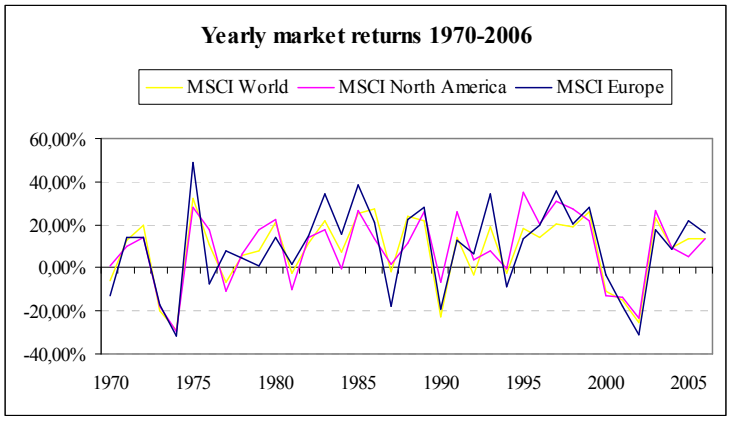

Figure 6: Returns on the benchmark market indexes 1970-2006

Source: Datastream

[5] The MSCI North America Index is a free float-adjusted market capitalization weighted index which is designed to measure the equity market performance of the markets in North America. As of June 2007 the MSCI North America Index consisted of the following 2 developed market country indices: Canada and the United States.
(MSCI BARRA official homepage)

[6] The MSCI World Index is a free float-adjusted market capitalization weighted index which is designed to measure the equity market performance of developed markets. As of June 2007 the MSCI World Index consisted of the following 23 developed market country indices: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States.
(MSCI BARRA official homepage)

4 Method

4.1 The initial model

The presented model tries to take as a many of the previously discussed fund characteristics as possible into consideration. Some of the factors in the presented model have already been shown to affect returns in previous studies. Such factors are the fund size or the effect of vintage years on later performance. Other possible influencing characteristics can be adopted from similar field of studies such as the window of opportunity effect within the IPO-market claiming that returns on newly introduced companies might depend on the market conditions at the introduction date (Shiller 2000). Similarly the suggested model in this thesis will test for a possible effect of market conditions prior to the vintage year on returns.

A factor that is presented in the Private Equity Intelligence Ltd database and hence included into the model is the location of the GP, accounting for possible competitive advantages for funds to be based in the US (77% of the funds are US based). Another characteristic that is implicitly included in this variable is the factor of superior investment regions since most of the funds (more than 90%) define their main investment area as the country or region they are based in. This can probably be explained by the closer contact to the portfolio companies and better information about possible investment opportunities in the domestic market.

The main analysis in this paper is based on the different investment strategies that are exposed in earlier parts of this paper. As already mentioned, fund specific risk characteristics are not available in the present dataset, so that the analysis will rely on Kaplan and Schoar's assumption of funds within a peer-category being equally risky. Since the return affect of focus investment industries is hard to model, mainly due to a vast number of different classifications as well as diversification, this characteristic has not been accounted for. Furthermore it can be imagined that most of those differences in returns are rather due to changes in market risk than private equity specific characteristics, with some industries traditionally being considered to have higher betas than others.

The model used to analyse the different fund characteristics is the following:

$$IRR_i = \alpha_0 + \beta_1 year_i + \beta_2 size_i + \beta_3 market_i + \pi_1 US_i + \pi_2 Non\_US_i + \sum_{m=1}^{3} \lambda_m M_{m,i} + \sum_{n=1}^{12} \rho_n D_{n,i} + \varepsilon_i$$

(Equation 1)

- *α_0 is a constant*
- *"Year" represents the fund's vintage year rescaled such that 1972 = 1.*
- *"Size" is the fund size in millions of USD*
- *"Market" is the average yearly compounded return on the corresponding market during the funds life span. Since the funds have full liberty in calling the committed capital at any point in time, no value-weighted approach is employed. To account for the fact that the vintage date is only specified on a yearly basis, market returns are starting on July 1st of the vintage year leading to an overall correct vintage date if no seasonal patterns in vintage timing are assumed.*
- *"US" and "Non_US" are dummy-variables depending on the location of the GP. The dummy is supposed to reveal country specific advantages and takes the value of 1 if the GP's location matches the dummy and 0 otherwise (US=1 if the fund is located in the US and 0 if elsewhere; Non_US=1 if the fund is located outside the US and 0 if US based)*
- *M_1 through M_3 are dummy-variables depending on the return on the corresponding market in the year prior to the vintage year. M_1 takes the value of 1 for a return being in the first third of yearly returns on market from 1972-2006 and 0 for the other years thereby representing favourable market conditions at the funds vintage. M_2 represents neutral market conditions and takes the value of 1 for a return being in the second third of returns on market from 1972-2006 and 0 for the other years. Correspondingly M_3 represent poor market conditions and takes the value of 1 if returns are in the last third of returns on market from 1972-2006.*
- *"D_1 through D_{12}" are dummy-variables depending on the fund type according to the Private Equity Intelligence Ltd classification into balanced, buyout, distressed debt, early stage (including early stage: seed as well as start-up), expansion, funds of funds, late stage, mezzanine, natural resources, real estate, secondaries and venture general.*

4.2 The transformed model

The method used to estimate the above regression follows the one suggested by Hirschberg and Lye (2001) who present a summary of the development of methods - mainly Morgan (1964), Sweeney and Ulveling (1972), Suits (1984) and Kennedy (1986) - to solve the so-called "dummy-variable trap" in working with dummy-variables[7]. The traditional solution to this problem is to either omit the intercept (if faced with only one system of dummy-variables) or to omit one class in each system of dummy variables. The drawback of these solutions is that the estimated coefficients have to be interpreted as deviations from the omitted class which can get confusing when working with a set of several systems of dummy variables. To eliminate this source of confusion, Morgan (1964) suggested a hypothetical example for a regression including a system of dummy variables with 3 classes. After estimating the regression in a traditionally way by omitting one class of the category of dummy-variables, Morgan transforms the estimated coefficients so that they can be interpreted as deviations from the mean rather than deviations from the omitted class.

The results of this hypothetical example for a set of three dummy variables can be summarized as follows:

[7] The dummy variable trap is a result of perfect (multi-)collinearity in the independent explanatory variables that results in a non-defined OLS-estimator (Westerlund 2005 pp 170 ff).

Consider the example of a set of explanatory dummy (indicator) variables for North, East, South and West. Including a constant in the matrix regression Y=X*β+Є where X is the 4x5 indicator matrix of the constant and the four indicator variables, the sum of the last four columns always equals the first column and hence the singularity in X is evident. This leads to a non-unique solution indicating that at least 1 parameter can not be estimated. For the case of one observation on every of the four indicator variables, the model takes the non-defined form:

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \end{bmatrix} \times \begin{bmatrix} c \\ \beta_1 \\ \beta_2 \\ \beta_3 \\ \beta_4 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \end{bmatrix}$$

(Rawling et al. 1998)

	Dummy variable regression coefficients	Proportion of sample	Adjusted coefficients
1. Open country	$b_1 = -10$	0,2	$B_1 = -11$
2. Town	b_0 omitted	0,5	$B_1 = -1$
3. City	$b_2 = +10$	0,3	$B_1 = +9$

Table 3: Hypothetical example of a dummy coefficient transformation

Source: Sweeney, Ulveling (1972)

The new coefficients B_i can be interpreted as deviations from the mean and the constant Q is the transformation constant defined as:

$$\sum_{i=1}^{NC} P_i(b_i + Q) = 0$$

NC = total number of classes (including the omitted class in the regression)

P_i is the corresponding proportion of the sample

In Morgan's example this yields:

$$0{,}2(-10 + Q) + 0{,}5(0 + Q) + 0{,}3(10 + Q) = 0$$
$$\Rightarrow Q = -1$$

Finally this yields the new coefficients B_i:

$$B_i = b_i + Q$$

Sweeney and Ulveling (1972) develop this method to be applicable to regressions with several dummy variable systems as well as other conventionally scaled independent variables. To account for continuously scaled variables Sweeney and Ulveling define them as the difference from their mean.

The suggested method implies that the private equity return analysing model from equation 1 (see pg. 27) has to be rewritten as the following estimation model:

$$IRR_i = \overline{IRR} + \beta_1(year_i - \overline{year}) + \beta_2(size_i - \overline{size}) + \beta_3\left(market_i - \overline{market}\right) + \pi_1 US_i + \pi_2 Non\_US_i + \sum_{m=1}^{3}\lambda_m M_{m,i} + \sum_{n=1}^{12}\rho_n D_{n,i} + \varepsilon_i$$

(Equation 2)

where:

$$\overline{IRR} = \alpha + \beta_1\overline{year}_i + \beta_2\overline{size}_i + \beta_3\overline{market} = average(IRR)$$
$$\overline{year} = average(year)$$
$$\overline{size} = average(size)$$
$$\overline{market} = average(market)$$

Imposing the following restrictions on π, λ and ρ:

$$P_{US} \times \pi_1 + P_{Non\_US} \times \pi_2 = 0$$
$$\sum_{m=1}^{3} P_{M_1}\lambda_m = 0 \qquad (P_x \text{ is the proportion of the sample})$$
$$\sum_{n=1}^{12} P_{D_n}\rho_n = 0$$

The coefficients of equation 2 can be estimated as:

$$IRR_i = \overline{IRR} + \beta_1(year_i - \overline{year}) + \beta_2(size_i - \overline{size}) + \beta_3\left(market_i - \overline{market}\right) + \pi_1\left[US_i - (\frac{P_{US}}{P_{Non\_US}})Non\_US_i\right] + \lambda_1\left[M_{1,i} - (\frac{P_{M_1}}{P_{M_3}})M_{3,i}\right] + \lambda_2\left[M_{2,i} - (\frac{P_{M_2}}{P_{M_3}})M_{3,i}\right] + \sum_{n=1}^{11}\rho_n\left[D_{n,i} - \left(\frac{p_n}{p_{12}}\right)D_{12,i}\right] + \varepsilon_i$$

The omitted coefficients can then be calculated as:

$$\pi_2 = -\left(\frac{P_{US}}{P_{Non\_US}}\right) \times \pi_1$$

$$\lambda_3 = -\left(\frac{P_{M_1}}{P_{M_3}}\right) \times \lambda_1 - \left(\frac{P_{M_2}}{P_{M_3}}\right) \times \lambda_2$$

$$\rho_{12} = -\sum_{n=1}^{11}\left(\frac{P_{D_n}}{P_{D_{12}}} \times \rho_n\right)$$

Standard deviations are calculated in the traditional way except for the standard deviation of the coefficients of the omitted classes (θ_k in the following expression for the general case of a dummy system of k classes where the k^{th} class was omitted in the estimation process). The standard deviation for the omitted class can be calculated using the following formula (Hirschberg and Lye 2001).

$$\mathrm{Var}(\theta_\kappa) = \mathrm{X} \times \left[\Omega_{k-1}\right] \times \mathrm{X}'$$

Where Ω_{k-1} is the k-1 by k-1 covariance matrix of the estimated coefficients and X is the following (1x k-1) matrix:

$$\left[\left(\frac{P_1}{P_k}\right) \quad \left(\frac{P_2}{P_k}\right) \quad \ldots \quad \left(\frac{P_{k-1}}{P_k}\right)\right]$$

4.3 Significance tests

The estimated coefficients are separately tested for significance in a t-test with the standard null-hypothesis and t-statistics (Westerlund 2005):

$$H_0 : coefficient = 0$$
$$H_1 : coefficient \neq 0$$

$$t = \frac{coefficient - 0}{stdev(coefficient)}$$

However the critical t-values are individual for the different dummy coefficients since the number of degrees of freedom depends on the number of funds that contribute to the estimation of the coefficient by taking the value of 1 for the given dummy variable.

The t-statistics for comparisons between different coefficients are calculated as (Körner, Wahlgren 2006):

$$H_0 : coefficient\,1 = coefficient\,2$$
$$H_1 : coefficient\,1 \neq coefficient\,2$$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sigma_{\overline{X_1} - \overline{X_2}}} \text{ and } \sigma_{\overline{X_1} - \overline{X_2}} = \sqrt{\frac{(n_1 - 1)\sigma_1^2 - (n_2 - 1)\sigma_{21}^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

In a second step several F-tests are performed in order to successively exclude the non-significant explanatory dummy-sets and thereby strengthen the test results. The F-tests are performed in the standard way such that (Westerlund 2005):

$$H_0 : \text{all tested coefficients equal } 0 \text{ simultaneously}$$
$$H_1 : \text{all tested coefficients do not equal } 0 \text{ simultaneously}$$

$$F = \frac{\left(SSE_R - SSE_U\right) / J}{SSE_U / (N - K)}$$

Where: SSE_R is the sum of squared errors from the restricted model

SSE_U is the sum of squared errors from the unrestricted model

J is the number of restrictions under the null-hypothesis

K is the number of estimated parameters in the unrestricted model

N is the number of observations

5 Results

The results of the analysis will be presented in 2 different sections starting with a presentation of the individual regression coefficients before outlining the results of the regression model analysis.

5.1 The regression coefficients

The results of the regression coefficients estimation are summarized in the following table.

	Coefficient	Standard deviation	T-stat	Number of funds	Prob.
constant	13,89%**	0,0078	17,6947	2193	0,0000
year_mean	-0,51%**	0,0017	-2,9384	2193	0,0033
size_mean	0,22%[(1)]*	0,0012 [(1)]	1,9217	2193	0,0559
market_mean	0,79**	0,1893	4,1796	2193	0,0000
US	-0,81%**	0,0038	-2,1153	1789	0,0345
Non_US	3,58%	0,2736	0,1307	404	0,8961
Positive	-0,63%	0,0076	-0,8273	1245	0,4082
Neutral	1,15%	0,0229	0,5020	279	0,6161
Poor	0,69%	0,0130	0,5361	669	0,5921
balanced	-3,90%	0,0511	-0,7635	51	0,4492
buyout	-0,44%	0,0133	-0,3317	611	0,7402
distressed debt	7,14%	0,0514	1,3898	51	0,1716
early stage	1,20%	0,0233	0,5150	229	0,6070
expansion	-2,35%	0,0782	-0,3004	22	0,7680
funds of funds	-2,26%	0,0253	-0,8906	196	0,3743
late stage	-6,01%	0,0565	-1,0628	42	0,2952
mezzanine	-2,32%	0,0380	-0,6104	90	0,5432
natural resources	5,68%	0,0516	1,1006	50	0,2772
real estate	3,30%	0,0249	1,3238	201	0,1871
secondaries	7,15%	0,0532	1,3442	47	0,1864
venture general	-0,83%	0,0132	-0,6278	603	0,5304

[(1)] Multiplied by a factor 100 to facilitate interpretations

* Significance at 10% level

** Significance at 5% level

Table 4: Results of the regression coefficients' estimation

5.1.1 The continuously scaled variables

The mean return on the set of private equity funds is the constant of 13,89%. Following the methodology used in the regression, the coefficients "year_mean; size_mean and market_mean" can be interpreted as return generating characteristics in case the fund characteristics differ from the sample means (Year: 26,05 corresponding to January 1997; size: 418,49; return on the market during the funds life span: 5,13%).

The effect of the vintage year

The estimated coefficient for the vintage year is -0,51%. Hence a fund looses 0,51% in return for every year that it is started later than January 1997. This coefficient is significantly different from zero on both the 5% and 10% level indicating decreasing profitability on private equity funds. This could be said to be consistent with the expectations that returns are suffering from an increasing competition among the steadily increasing number of private equity funds over the period covered by this analysis. However it is also obvious that this negative trend will have to expire in the future since returns can not be ever decreasing in a linear trend proportionally to their vintage year later than 1997.

The effect of the fund size

The coefficient for size can be interpreted in the way that for every 100 million increase in size exceeding the mean fund size of 418,49 million USD, returns increase by 0,22%. The t-statistics indicate this estimate to be significantly different from zero at the 10% but not at the 5% level. Furthermore economic intuition suggests that the relation can not be linear if the trend of exponentially increasing fund size continues; the largest fund started in 2006 closing at 16,625 billion dollars would simply by its size already generate an extra yearly return of 35,8%.

The effect of public market returns

The market-coefficient reveals that Private Equity returns are positively correlated to public market returns. However the estimated coefficient of 0,79 confirms the stated stability in private equity investments. For every percent in return deviation from the mean market return of 5,13% private equity returns deviate by 0,79% from their mean of 13,89%. However the

traditional single-index model regression (Elton et al. 2003) of the private equity returns on their corresponding market returns yield an estimated beta of 1,016 (with a considerably lower R-squared), suggesting that returns are better explained by other characteristics than the single-index model. The low mean returns on the market of 5,13% (against an arithmetic average of 7,27% on the 3 market indexes) are mostly due to the larger number of funds being started during the late 1990's and hence the corresponding market returns suffer from the stock crash of the early 21st century.

5.1.2 The dummy variables

The interpretation of the estimated dummy coefficients reveals the advantage of the used methodology. As previously mentioned the coefficients can be interpreted as deviations from the mean (the constant of 13,89%) and independently influence yearly returns by the estimated percentage.

The effect of the fund location

Considering the location dummies US and Non_US, the US located fund underperform the mean fund by 0,81% which is significant at the 5% level. On the other hand a positive influence of 3,58% for Non_US funds is estimated, however with a standard deviation of 27,6% and hence non-significant (p-value of 0,8961). It can consequently be conclude that the larger number of US funds accounting for 77,5% of the total database (in number of funds) is not based on any competitive advantage against other locations. However the large standard deviation in the Non_US dummy indicates a higher risk compared to the more consolidated US market. The previously mentioned competition among funds might be an explanation for a poorer performance on US located funds.

The effect of market conditions prior to the vintage year

Positive, neutral and poor markets are a set of explanatory variables that has been incorporated in the model to account for effects from market conditions prior to the start of the fund. The estimated coefficients, if not significant, follow an economic intuition. The estimated coefficient for positive market conditions is negative (-0,63%); hence one could

expect that in these situations private equity funds have to pay a premium price when acquiring new companies to their portfolio. The positive market conditions can be expected to affect prices on a more general level and not only for companies listed on the stock-exchange and consequently affect returns negatively. The same intuition is applicable to interpreting the positive estimate for poor market conditions of 0,69% since acquisition prices are influenced by bad market conditions. Given that private equity funds have a long-term horizon these temporary negative influences can be expected not to have a major impact on returns in the long-run. A possible explanation for the negative estimate still being lower than the neutral estimate of 1,15% could be that poor market developments are likely to be motivated by a negative fundamental economic situation that has a negative effect on the portfolio companies future value development. However as pointed out, the estimates are non-significant with p-values of 0,41, 0,62 and 0,59 respectively, so that no definite conclusions can be drawn.

The effect of the strategy

Ranking the strategies according to their influence on fund returns (non-risk adjusted) as well as according to their risk (standard deviations and estimations) yields the following order. Interesting in this context is that the 3 estimates closest to being significant - real estate, distressed debt and secondaries - with p-values < 0,2 - are all positive estimates.

Strategy	return influence	Strategy	standard deviation	Strategies ranked from the least to the most risky*
late stage	-6,01%	venture general	1,32%	mezzanine
balanced	-3,90%	buyout	1,33%	balanced [1)]
expansion	-2,35%	early stage	2,33%	distressed debt
mezzanine	-2,32%	real estate	2,49%	secondaries [1)]
funds of funds	-2,26%	funds of funds	2,53%	natural resources
venture general	-0,83%	mezzanine	3,80%	funds of funds
buyout	-0,44%	balanced	5,11%	real estate
early stage	1,20%	distressed debt	5,14%	buyout
real estate	3,30%	natural resources	5,16%	late stage
natural resources	5,68%	secondaries	5,32%	expansion
distressed debt	7,14%	late stage	5,65%	venture general [1)]
secondaries	7,15%	expansion	7,82%	early stage

* The risk estimations marked by [1)] should be considered cautiously as "the categories were not clear to me and in some respects I thought they were already covered by other categories" (Risk estimations by Pedro Aznar, Principal of Private Equity Real Estate at Warburg Pincus, London).

Table 5: The strategy dummy coefficients and their standard deviations

The estimates of the strategies' influence on returns partially follow an expected pattern. Following economic intuition about investments in different periods of the companies' lifecycle, late stage investments and expansion funds are expected to be less risky than early stage investments. In fact they do generate negative influences on returns whereas the more risky alternative of early stage generates a positive risk premium. In comparison to the late stage respectively expansion funds, the early stage investments yield significantly higher returns (p-values of 0,0000 in both cases). A similar economic intuition explains that the more diversified balanced funds and fund of funds show lower returns than average. Furthermore it is consistent with the expected results, that the more risky strategy of distressed debt yields significantly higher returns than the mezzanine investments (p-value 0,0000).

However these economically intuitive risk presumptions (confirmed by the risk estimations by Pedro Aznar) are not entirely confirmed by the standard deviations. Especially the low standard deviation for early stage funds and the high standard deviation for late stage and expansion funds are unexpected. The expected lower risk is confirmed for fund of funds and venture general strategies but not in the case of the balanced funds with the second lowest returns displaying a standard deviation well above the average of 4%. The two most well known strategies of venture (general) and buyout perform well with close to average returns (slightly negative dummy effects) while displaying the two lowest standard deviations in the sample.

Surprising is though that the similar strategies of secondary investments and fund of funds experience such a large and statistically significant difference in returns with respect to each other (p-value of 0,0000) as well as a considerable difference in standard deviation. A more in depth analyse of risk patterns within these two strategies might lead to more conclusive answers about two categories that claim to have rather similar investment approaches.

Similar comparisons are difficult to deduce for the real estate and natural resources strategies. However their return premium is considerable and in both cases significant on a 10% level if the t-test is specified as one-sided. Hence their risk pattern would have to be analysed further in order to convincingly conclude for superior investment strategies.

5.2 The regression model

The specified model aims at incorporating a maximum of the available explanatory variables from the initial data. This approach has the advantage of not disregarding from significant explanatory characteristics. However the model becomes rather extensive and hence it is of interest to test the various explanatory variables for statistical significance. The 3 continuously scaled variables (size, vintage year and market) have already shown to have significant estimation results. Hence the 3 sets of dummy variables (location, market condition and strategy) that were incorporated are still to be analysed for significance to improve the explanatory power of the model.

The estimated unrestricted model yields the following statistics:

Unrestricted model	
R-squared	0,0277
Adjusted R-squared	0,0250
S.E. of regression	0,3675
Sum squared residuals	293,7220
Mean dependent variable	0,1389
S.D. dependent variable	0,3712
Akaike info criterion	0,8339
Schwarz criterion	0,8520

Table 6: Summary statistics of the unrestricted model

It can be noticed that the R-squared and adjusted R-squared are very low, indicating a poor fitting of the model to the data at hand. Hence it could be argued that the information displayed in the database does not satisfactorily contribute to explaining future returns. However the poor fitting might be explained by the fact that a return over a period of up to 10 years can hardly be expected to be appropriately summarized down to one constant and six explanatory variables. Moreover the initial approach was to build a model from the information provided by Private Equity Intelligence Ltd. Only considering the R-squared values it can therefore be concluded that further investigations beyond the displayed characteristics are of interest before choosing which of the many funds to invest in.

The effect of the location dummy set

The estimated statistics for the restricted model that does not consider the location of the fund as an explanatory variable yields the following general statistics:

Restricted model disregarding from the location		Unrestricted model
R-squared	0,0257	0,0277
Adjusted R-squared	0,0235	0,0250
S.E. of regression	0,3678	0,3675
Sum squared residuals	294,3261	293,7220
Mean dependent variable	0,1389	0,1389
S.D. dependent variable	0,3712	0,3712
Akaike info criterion	0,8350	0,8339
Schwarz criterion	0,8506	0,8520

Table 7: Summary statistics of the restricted model without the location dummy set

The test results show a significant decline in the explanatory power of the regression model when excluding the location dummy set. The F-value of 4,496 and the corresponding p-value of 0,0341 confirm that the null-hypothesis of the location coefficients being of no improvement for the model can be rejected on both a 10% and 5% significance level. The R-squared drops from the initial 0,277 to 0,257, a fall by ample 7% if the location is not considered. A similar drop is observable for the adjusted R-squared. On the other hand the Akaike information criterion as well as the Schwartz criterion[8], which trade off a reduced

[8] The Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC) can in their most simple form be defined as (Enders 2004):

$$AIC = T \times \ln(SSR) + 2n$$
$$SBC = T \times \ln(SSR) + n \times \ln(T)$$

Where *n=number of parameters estimated*
T=number of usable observations

This definition clearly exposes the trade off of reducing the SSR (Sum Squared Residuals) against augmenting the number of estimated parameters and the model with the lowest AIC and SBC values are to be preferred.

The displayed AIC and SBC values are defined as (EViews5 software definition):

$$AIC = -2\ell/T + 2n/T$$
$$SBC = -2\ell/T + n \times \log(T)/T$$

Where *l=log likelihood given by:*

$$\ell = \frac{-T}{2}\left(1 + \log(2\pi) + \log(\hat{\varepsilon}'\varepsilon/T)\right)$$
$$\hat{\varepsilon}'\varepsilon = SSR$$

R-squared for a more parsimonious way of describing a dataset (Enders 2004), are inconclusive in deciding which of the models should be applied. Since the aim of the model is not to forecast future returns, but rather to discover return influencing characteristics, parsimoniousness is not a major goal and hence the conclusion of statistical improvement in the fitting of the data together with the Akaike information criterion prevail. To conclude, considering the location of the fund can be said to be significant in explaining future returns.

The effect of the market conditions dummy set

The following statistics summarize the restricted model which omits the market condition data.

Restricted model disregarding from market conditions		Unrestricted model
R-squared	0,0274	0,0277
Adjusted R-squared	0,0252	0,0250
S.E. of regression	0,3674	0,3675
Sum squared residuals	293,8169	293,7220
Mean dependent variable	0,1389	0,1389
S.D. dependent variable	0,3712	0,3712
Akaike info criterion	0,8333	0,8339
Schwarz criterion	0,8489	0,8520

Table 8: Summary statistics of the restricted model without the market conditions dummy set

The F-test statistic of 0,7063 with the corresponding p-value of 0,4008 suggests, since the null hypothesis of non-improvement of the model can not be rejected, that the market conditions dummy set does not significantly improve the fitting of the model to the data at hand. Even though the estimates for the individual coefficients follow a certain economic intuition it shows that, in addition to being individually insignificant, they are also insignificant as a group. The AIC and SBC values indicate consistently that market conditions should not be incorporated in the model. Both values are lower than the ones from the initial unrestricted model indicating that the additional variables in the unrestricted model do not improve the fitting in a satisfactory way. The same conclusion can be drawn from the adjusted R-squared that increases when omitting the set of market conditions dummies. Hence it can be concluded that market conditions in the year prior to the vintage of a fund do not influence long-run return in a significant way and consequently can be omitted from the model.

The effect of the strategy dummy set

The estimation of the model omitting the strategy dummies as explanatory variables yields the following statistics:

Restricted model disregarding from strategies		Unrestricted model
R-squared	0,0234	0,0277
Adjusted R-squared	0,0211	0,0250
S.E. of regression	0,3674	0,3675
Sum squared residuals	295,0299	293,7220
Mean dependent variable	0,1389	0,1389
S.D. dependent variable	0,3712	0,3712
Akaike info criterion	0,8374	0,8339
Schwarz criterion	0,8530	0,8520

Table 9: Summary statistics of the restricted model without strategy dummy set

The results from the F-test show that the null-hypothesis can not be rejected, (F-test value of 9,7339 and corresponding p-value of 0,00018) and hence the dummy set of different strategies does significantly improve the explanatory power of the model. The R-squared falls from an initial value of 0,0277 to 0,0234 which is a decrease by more than 15% and the adjusted R-squared drops by approximately the same percentage. The AIC and SBC values further confirm the F-test conclusion as they suggest that the more extensive way of describing the data by including the strategy dummy set should be preferred. It can therefore be concluded that the individually non-significant estimated coefficients should be incorporated in the model when considered as a group. These results confirm the previously discussed diverging risk levels for different strategies within private equity and their expected effect on returns.

6 Discussion

6.1 Conclusion

The purpose of this thesis was to evaluate returns on private equity funds and analyse whether certain characteristics, known prior to the investment decision, influence future returns of the funds. The study suggests a regression analysis based on several fund specific continuously scaled characteristics (vintage year and size) as well as on characteristics modelled by 2 different sets of dummy variables (GP location and fund type/strategy). In addition general market developments during the funds life time as well as market conditions prior to the start-up of the fund (modelled as a set of dummy variables) have been included in the model. A general problem of the proposed model is a low R-squared of 0,0277 indicating a rather poor fitting and explanatory power on future returns.

The results of the analysis have shown that five out of the six explanatory variables (or sets of dummy variables) significantly describe future returns. The only variable that was non-significant (p-value of 0,40) was the variable of market conditions (positive, neutral, poor) prior to the vintage year. The individual estimates within the set of market condition dummy variables follow a certain economic intuition, however none of them are significant and hence no certain conclusion can be stated.

Regarding the other five explanatory variables, they are all significant on a general level. Later vintage years had a significant (on a 5% level) negative effect on returns and fund size positively affects returns (significant on a 10% level). The set of dummy variables considering the fund location exhibits a significant (on a 5% level) negative influence of a US based location against locations outside the US. However standard deviations on non-US funds are considerably higher thereby intuitively explaining the slightly negative return effect on the more consolidated US market.

Regarding the twelve different fund types and their differing strategies none of the estimates are significant. Return influences from the different strategies mostly follow an expected pattern of intuitive risk estimations however standard deviations do not always confirm the intuitive risk perception. Possible explanations such as non-normal regression errors on the estimates or misperception in intuitive risk estimations leading to superior investment strategies would require further investigations. Finally the analysis can confirm the stated

stability in returns against public markets claimed by private equity funds with an estimated deviation from the mean in private equity returns of only 0,79% for every 1% deviation from the mean in market returns.

6.2 Proposals for further studies

An interesting follow up of this thesis could investigate the R-squared that might be increased by introducing further explanatory variables. Especially differences of industry focus within the same fund strategies have not been considered in this analysis and might be a source of further explanatory power in the above model. Furthermore the risk characteristics of the different fund types would require additional investigations which might partly solve the mentioned industry focus issue. Difficulties in the procurement of data due to the private nature of fund specific information such as the fund's portfolio companies cause risk studies on private equity to remain a large unexplored field for further studies. Moreover the modelling of risk patterns of the different strategies and a possible application in benchmarking methods such as the PME would be of great interest.

7 References

7.1 Articles

Asness, Clifford; Krail, Robert; Liew, John (2001); *Do hedge funds hedge?;* Journal of Portfolio Management, Vol 28 Issue 1 pg 6

Cochrane, John H (2004).; *The Risk and Return of Venture Capital*; Journal of Financial Economics Vol 75 pp 3-52

Diller, Christian; Kaserer Christoph (2004); *European Private Equity Funds – A Cash Flow Based Performance Analysis*; Center for Entrepreneurial and Financial Studies, Technische Universität München, Working Paper Series

Diller, Christian; Kaserer Christoph (2005); *What Drives Private Equity Returns? Fund Inflows, Skilled GP's and/or Risk?* Center for Entrepreneurial and Financial Studies, Technische Universität München, Working Paper Series

Fenn, George W.; Liang, Nellie; Prowse, Stephan (1995); *The economics of the Private Equity Market*; Board of Governors of the Federal Reserve System, Washington DC

Financial Services Authority (FSA) (2006); *Private Equity, a discussion of risk and regulatory engagement;* Financial Services Authority (FSA) November 2006

Getmansky, Mila; Lo, Andrew W.; Makarov, Igor (2004); *An econometric model of serial correlation in and illiquidity in hedge fund returns*; Journal of Financial Economics Vol 74 pp 529-609

Gompers, Paul; Lerner, Josh (1999); *An analysis of compensation in the US venture capital partnership;* Journal of Financial Economics 51 (1999) pp 3-44

Hirschberg, Joe; Lye, Jenny (2001); *The interpretation of multiple dummy variable coefficients: an application to industry effects in wage equations*; Applied Economics Letters 2001, Vol 8 Issue 11 pp 701-707

Huss, Matthias (2005); *Performance characteristics of Private Equity*; University of Basel Wirtschaftswissenschaftliches Zentrum (WWZ) October 2005

Jones, Charles M.; Rhodes-Kropf, Matthew (2004), *The Price of Diversifiable Risk in Venture Capital and Private Equity;* AFA (American Finance Association) 2003 Washington DC, Meetings

Kaplan, Steven N.; Schoar, Antoinette (2005); *Private Equity Performance: Returns, Persistance and Capital Flows*; Journal of Finance Vol 15 No 4 August 2005

Ljungqvist, Alexander; Richardson, Matthew P. (2003); *The cash flow, return and risk characteristics of private equity;* New York University Finance Working Paper No. 03-001

Private Equity Spotlight May 2007; Private Equity Intelligence Ltd

Rouvinez, Christophe (Capital Dynamics) (2003); *Private Equity Benchmarking with PME+*; Venture Capital Journal August 1, 2003 pg 1

Shiller, Robert J. (1990); *Speculative Prices and Popular Models;* The Journal of Economic Perspectives Vol. 4 N. 2 pp 55-65

Sweeney, Robert E.; Ulveling, Edwin F. (1972); *A transformation for Simplifying the Interpretation of Coefficients of Binary Variables in Regression Analysis;* The American Statistician December 1972 Vol 26 No 5

Woodward, Susan E. (2004); *Measuring Risk and Performance for Private Equity*; Sandhill Econometrics

7.2 Books

Elton, Edwin J.; Gruber, Martin J.; Brown, Stephen J., Goetzmann William N.; *Modern Portfolio Theory and Investment Analysis 6th edition 2003,* Wiley pp 130 ff

Enders, Walter; *Applied Econometric Time Series*; 2nd edition 2004 Wiley pp 69 ff

Körner, Svante; Wahlgren, Lars; *Statistisk Dataanalys;* 4e Upplaga Studentlitteratur 2006

Rawling, John O.; Pantula, Sastry G.; Dickey, David A. (1998); *Applied Regression Analysis – A research tool*, 2nd edition, Springer Texts in Statistics pp 271 ff

Westerlund, Joakim; *Introduktion till Ekonometri*; Studentlitteratur 2005 pp 170 ff

7.3 Electronic sources

EVCA - European Venture Capital Association, official homepage (www.evca.com)
http://www.evca.com/html/PE_industry/facts.asp (25/06/2007)
http://www.evca.com/html/PE_industry/glossary.asp (25/06/2007)

MSCI Barra, Index definitions from the official company homepage (www.mscibarra.com)
http://www.mscibarra.com/products/indices/equity/definitions.jsp (25/06/2007)

NVCA – National Venture Capital Association (www.nvca.org)
http://www.nvca.org/def.html (25/06/2007)
http://www.nvca.org/aboutnvca.html (25/06/2007)

Private Equity Intelligence Ltd, Performance Analyst database from the official company homepage (www.prequin.com)
http://www.prequin.com/performance_analyst.aspx

VC Experts, The Encyclopedia of Private Equity and Venture Capital from the official homepage (vcexperts.com)
http://vcexperts.com/vce/library/encyclopedia/ (25/06/2007)

Warburg Pincus, firm brochure from the official company homepage (warburgpincus.com)
http://www.warburgpincus.com/content/library/documents/brochure_english.pdf (25/06/07)

8 Appendix

8.1 List of figures and tables

8.2 General glossary[9]

Alternative investments/assets

The term describes non-traditional asset classes […which…] are generally more risky than traditional assets, but they should, in theory, generate higher returns for investors. (vcexperts.com[10]). Investments cover amongst others private equity and venture capital, hedge funds, real estate, infrastructure, commodities, or collateralised debt obligations (CDOs).

Closed-end fund

Fund with a fixed number of shares. These are offered during an initial subscription period. Unlike open-end mutual funds [that] sell as many shares as investors demand (open-end funds), closed-end funds do not stand ready to issue and redeem shares on a continuous basis.

Closing

A closing is reached when a certain amount of money has been committed to a private equity fund. Several intermediary closings can occur before the final closing of a fund is reached.

Committed / Contributed capital

Contributed capital represents the portion of capital that was initially raised (committed by investors) which has been drawn down in a private equity fund.

Distribution (DPI)

The amount disbursed to the limited partners in a private equity fund. The DPI measures the cumulative distributions returned to investors as a proportion of the cumulative paid-in capital. DPI is net of fees and carried interest. […] This is a relative measure of the fund's "realized" return on investment. The definition employed by Private Equity Intelligence Ltd in the database states: "Distributions received to date as percentage of called capital"

[9] The glossary is a partly modified sum up of the glossary provided by EVCA (European Venture Capital Association). On some occasions the EVCA glossary has been complemented by other sources that are specifically quoted.

[10] VC Experts serves the needs of the private equity and venture capital communities with its anchor product, "The Encyclopedia of Private Equity and Venture Capital" […]. The VCExperts.com site includes current industry news, weekly commentary, and the online University and 6,000 page Encyclopedia of Private Equity and Venture Capital.

Drawdown / Called capital

When investors commit themselves to back a private equity fund, all the funding may not be needed at once. Some is used as drawn down later. The amount that is drawn down is defined as contributed capital.

Exit

Liquidation (The sale of the assets of a portfolio company to one or more acquirers where venture capital investors receive some of the proceeds of the sale) of holdings by a private equity fund. Among the various methods of exiting an investment are: trade sale; sale by public offering (including IPO); write-offs; repayment of preference shares/loans; sale to another venture capitalist; sale to a financial institution.

FOI - Freedom of Information

A legislation, which provides that any individual or company has the right to request and receive information from and about public authorities, subject to certain limitations. Within the private equity/venture capital industry, FOI refers particularly to the requests for information received by public pension funds with respect to their private equity/venture capital investments, including for example the names of the underlying funds, amounts invested and their performance.

Fund size

The total amount of capital committed by the limited and general partners of a fund.

General partner

A partner in a private equity management company who has unlimited personal liability for the debts and obligations of the limited partnership and the right to participate in its management. Fund managers typically invest their personal capital right alongside their investors capital, which often works to instil a higher level of confidence in the fund. (general partner's commitment). The limited partners look for a meaningful general partner investment of 1% to 3% of the fund. See Limited Partnership.

Limited partner

An investor in a limited partnership (ie private equity fund). See Limited partnership.

Limited partnership

The legal structure used by most venture and private equity funds. The partnership is usually a fixed-life investment vehicle, and consists of a general partner (the management firm, which has unlimited liability) and limited partners (the investors, who have limited liability and are not involved with the day-to-day operations). The general partner receives a management fee and a percentage of the profits. The limited partners receive income, capital gains, and tax benefits. The general partner (management firm) manages the partnership using policy laid down in a Partnership Agreement. The agreement also covers, terms, fees, structures and other items agreed between the limited partners and the general partner.

Multiple (Realised multiple)

The ratio of total gain(/loss) to cost of realised investments. The definition employed by Private Equity Intelligence Ltd in the database states: "Distributions plus unrealized value

Portfolio company (or investee company)

The company or entity into which a private equity fund invests directly.

Private equity

Private equity provides equity capital to enterprises not quoted on a stock market. Private equity can be used to develop new products and technologies, to expand working capital, to make acquisitions, or to strengthen a company's balance sheet. It can also resolve ownership and management issues. A succession in family-owned companies, or the buyout and buyin of a business by experienced managers may be achieved using private equity funding. Venture capital is, strictly speaking, a subset of private equity and refers to equity investments made for the launch, early development, or expansion of a business.

Residual value to paid-in capital (RV/PI)

A realisation ratio which is a measure of how much of a limited partner's capital is still tied up in the equity of the fund, relative to the cumulative paid-in capital. RV/PI is net of fees and carried interest. The definition employed by Private Equity Intelligence Ltd in the database states: "Remaining Value (RVPI%): Valuation of unrealized investments as percentage of called capital"

International Valuation Guidelines

Guidelines developed by EVCA, BVCA and AFIC (the European, British and French Private Equity and Venture Capital Associations) towards investors internationally concerning valuation methodologies. Their aim is improved transparency, so that investors are better able to monitor and evaluate the performance of their investments and to make the asset class more accessible and comprehensible to new and existing investors. The guidelines have been endorsed by more than 20 European and Non-European Associations and are consistent with IFRS and US GAAP.

Vintage year

The year of fund formation and first drawdown of capital.

8.3 Fund type (strategy) glossary

Definitions of Fund Types

Balanced: Private Equity funds that invest in companies at all stages of development from early stage to buy-out.

Buyout: (also known as MBO-LBO-MBI–BIMBO) Buyout funds enable the current operating management and investors to acquire or to purchase a significant shareholding in the product line or business they manage. The financial sponsor usually gains control of a majority of a target company's equity through the use of borrowed money or debt.

Co-Investment: Co-Investments are minority investments made alongside a private equity investor in an LBO, a recapitalization or an expansion capital transaction. It is a passive, non-controlling investment, as the private equity firm involved will typically exercise control and perform monitoring functions.

Distressed Debt: Funds that buy corporate bonds of companies that have either filed for bankruptcy or appear likely to do so in the near future. As part of the company reorganizations, distressed debt firms often forgive the debt obligations of the company, in return for enough equity in the company to compensate them.

Forestry: (also known as "Timber") Private equity funds that invest in forestry and timber land and products.

Fund-of-Funds: A financial instrument that invests in a number of private equity partnerships. Investing in fund of funds can help spread the risk of investing in private equity because they invest the capital in a variety of funds.

General Special situation: Funds that invest in a broad range of unusual transactions, including, equity-linked debt, distressed debt, project finance, one-time opportunities resulting from changing industry trends or government regulations, and leasing.

Infrastructure: Funds that are pursuing opportunities for investments as equity partners in toll road, airport, car park or other large scale projects.

Mezzanine: Mezzanine debts are debts that incorporate equity-based options, such as warrants, with a lower-priority debt. Mezzanine is often used to finance acquisitions and buyouts, where it can be used to prioritize new owners ahead of existing owners in the event that a bankruptcy occurs.

Natural Resources: Private equity funds that invest in various commodities, including energy products (crude oil, natural gas, gasoline), precious metals (gold, platinum, palladium, silver) and industrial metals (aluminium, copper, nickel, zinc, lead, tin).

Real Estate: Closed-ended real estate funds that invest in property using the following strategies: value added, opportunistic and core+.

Secondaries: Private equity funds that acquire existing shares in a private equity fund from an existing limited partner. Secondary transaction may comprise a manager's entire fund of direct investments or a portfolio of interests in a number of different funds.

Turnaround: Funds that aim to revitalise companies with poor performance or experiencing trading difficulties.

Venture (General) Venture capital is a type of private equity investment that provides capital to new or growing businesses. Venture funds invest in start-up firms and small businesses with perceived, long-term growth potential.

> **Early Stage** is a type of venture investment but that invest only in the early stage of a company life. There are two main categories of early stage funds: start-up and Seed investments.
>
> > **Early Stage: Seed** allows a business concept to be developed, perhaps involving the production of a business plan, prototypes and additional research, prior to bringing a product to market and commencing large-scale manufacturing.

Early Stage: Start-up develops the company's products and fund their initial marketing. Companies may be in the process of being set up or may have been trading for a short time, but not have sold their product commercially.

Expansion (also known as "development" or "growth capital") Funds aiming to grow and expand an established company. For example: to finance increased production capacity, product development, marketing and to provide additional working capital.

Late Stage types of funds are venture capital investments in more mature companies.