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School of Business and Management
Strategic Finance and Business Analytics

Private Equity Buyout Funds Performance Comparison to Publicly Quoted Indices

2020

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Tiivistelmä

Tekijä:	Mikko Metsäranta
Otsikko:	Pääomasijoitusrahastojen suorituskyvyn vertailu julkisesti noteerattuihin indekseihin
Akateeminen yksikkö:	LUT School of Business and Management
Maisteriohjelma:	Strategic Finance and Business Analytics
Vuosi:	2020
Pro Gradu:	67 sivua, 9 yhtälöä, 6 taulukkoa, 6 kuviota
Tarkastajat:	Professori, Mikael Collan Tutkijaopettaja, Sheraz Ahmed
Hakusanat:	Pääomasijoittaminen, buyout-rahastot, julkisesti noteeratut indeksit, suorituskyky

Yleisesti ottaen yksityiset pääomamarkkinat tuottavat paremmin kuin julkiset pääomamarkkinat, mutta ensimmäistä kertaa viimeisen kymmenen vuoden aikana julkisten markkinoiden tuotot ovat olleet tasavertaisia yksityisten markkinoiden kanssa. Tämä julkisen ja yksityisen sektorin tuottojen konvergenssi ilmiö on ollut havaittavissa pääosin Yhdysvaltain markkinoilla, mikä herättää kysymyksen siitä, voidaanko samanlainen ilmiö havaita myös Euroopassa. Pääomasijoitustoiminnan suorituskyvyn mittaaminen on ollut tutkijoiden mielenkiinnon kohteena viime vuosina ja se on yksi laajimmin tutkittuja aiheita pääomasijoitus toimialalla. Tämän työn tarkoituksena on vertailla pääomasijoitusrahastojen tuottoja julkisesti noteerattuihin indekseihin. Tutkimusotos koostuu pääomasijoitusrahastojen tuotoista vuosina 2010-2016, jotka sijaitsevat maantieteellisesti Euroopassa. Jotta yksityisiä ja julkisesti noteerattuja sijoituksia voidaan vertailla keskenään, tutkimuksessa käytetään julkisten markkinoiden vastaavien (PME) suorituskyvyn mittaamenetelmiä. Mahdollisten mittaamenetelmien erojen tunnistamiseksi on tutkimuksessa käytetty kolmea erilaista mittaamenetelmää. Aikaisempi empiirinen tutkimus osoittaa, että pääomasijoitukset ovat tuottaneet paremmin kuin julkisesti noteeratut indeksit. Tämän tutkimuksen tulokset ovat yhtenäisiä aiempien tutkimusten havaintojen kanssa, pääomasijoitusrahastojen tuotot ovat Euroopassa keskimäärin suuremmat kuin julkisesti noteerattujen indeksien. Lisäksi havaittiin myös, että varsinkin suurien buyout-rahastojen tuotot olivat suuremmat pienemmällä volatilitteetilla kuin julkisesti noteerattujen indeksien.

Abstract

Author:	Mikko Metsäranta
Title:	Private Equity Buyout Funds Performance Comparison to Publicly Quoted Indices
Faculty:	LUT School of Business and Management
Master's program:	Strategic Finance and Business Analytics
Year:	2020
Master's Thesis:	67 Pages. 9 equations, 6 Tables, 6 Figures
Examiners:	Professor, Mikael Collan Associate Professor, Sheraz Ahmed
Keywords:	Private Equity, Buyout Funds, Publicly Quoted Indices, Performance

Generally speaking, private equities outperform public equities. However, for the first time, the past 10 years of public market returns have matched those for private equity. This public-private convergence phenomenon in returns has occurred chiefly in the U.S. market, raising the question of whether a similar phenomenon can be observed in Europe. The measurement of private equity performance has been a leading interest for scholars in recent years, and it is one of the most widely studied topics in this field. This thesis examines the performance of private equity buyout funds compared to publicly quoted indices. The research sample consists of private equity buyout fund returns from 2010 to 2016 that are geographically focused in Europe. To enable comparisons between private and publicly traded investments, the research uses public market equivalent (PME) performance measurement methodologies. Three different methods have been used to identify possible methodological differences. Previous empirical research indicates that private equity investments perform better than publicly quoted indices. The results of this research are consistent with previous findings. On average, in Europe private equity buyout funds' returns are higher than those of publicly quoted indices. Moreover, there is evidence that large buyout funds perform better and with lower volatility than publicly quoted indices.

Acknowledgements

A few thanks are deserving of mention. First, I would like to thank my employer for allowing me to access the Preqin database and my colleagues for providing an encouraging atmosphere during this study. Furthermore, I am especially grateful to my supervisor Mikael Collan for offering supportive feedback.

Helsinki, 22.4.2020

Mikko Metsäranta

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1. INTRODUCTION

1.1 Background

The last few years in the private equity industry have been a period of remarkable success. During this time, more money has been raised, invested, and returned to investors than in any other period in the industry's history. The private equity industry seems to be expanding progressively globally, so the end of this prosperous era is not yet in sight. Returns in private equity asset classes are still strongly related to other asset classes, but there are signs that the growth trend is slowly declining towards the public market averages at present. At the same time, global uncertainties such as volatile capital markets, USA-China trade disputes, an unbridled Brexit, and the threat of recession are causing dark clouds above the dealmakers. Almost every industry is under pressure to respond to the rapidly increasing power of technological innovations, and it is becoming even harder to predict winners and losers (Bain & Company 2019).

2018 was a remarkably strong year for private equity markets. Consequently, greater and greater numbers of investors now believe that private markets are maturing and will provide adequately for diversified global growth. Globally, private equity net asset value grew by 18% in 2018, and it has already increased 7.5-fold this century. This growth has been twice as fast as for public market capitalization. The balance in the industry is stable, despite the slowdown in 2018. While the rapid pace of fundraising appears to be decreasing, 2018 was still the third-highest fundraising year in history. Private equity markets continue to add flexibility, depth, and sophistication. Thus, according to people in the industry, whenever the next downturn occurs, the lessons learned from the previous financial crisis, deeper markets, and more experienced managers will help both limited partners (LPs) and general partners (GPs) to weather the storm (McKinsey 2019).

When we delve into the European private equity industry, it may be asked, are there any signs that private equity could evolve into the most significant alternative asset class in Europe? There are indications that private equity fundraising could increase much further because European-focused investors are targeting private equity rather than hedge funds. Moreover, we should keep in mind that 60% of investors in Europe are not based in Europe; half of these investors come from North America. Despite all the macroeconomic headwinds that Europe has encountered, the global assets under management are currently valued at

\$10.7 trillion, and this level is expected to reach \$14 trillion by 2023. It is possible that private equity could exceed the hedge fund as the principal alternative asset class in Europe (Preqin 2019a).

According to Kaplan and Schoar (2005), within the private equity industry generally, venture capital (VC), and leveraged buyout (LBO) investments have grown remarkably over the past decade. In 1990, investors committed less than \$10 billion to private equity partnership, but by 2017, this amount had increased to \$5 trillion (Mckinsey 2018). Even though the private equity industry is currently more attractive than ever, many investors have a limited understanding of private equity returns, capital flows, and their interrelationship. To measure the performance of the private equity fund and compare it to the public index, we need to make private equity fund returns comparable to the returns of the public index (Kaplan & Schoar 2005).

In this thesis, we concentrate on measuring the performance of private equity buyout funds that are geographically focused in Europe. Regarding performance, we are interested in the returns of buyout funds and the volatility of these returns. Thus, to measure the performance, we need to quote indices to benchmark our funds publicly. To make private equity returns comparable to the public indices, we need to employ specific methodologies. In this thesis, we will use different methodologies to determine if there is any variability among them.

1.2 Problem discussion, objectives, and limitations

The primary focus of this thesis is to analyze the performance of private equity buyout funds. More specifically, these buyout funds' returns are evaluated by using three different methodologies to generate returns that can be compared. These returns are then compared with the chosen publicly quoted indices, with the purpose of comparing private equity funds' performance against public market indices and identifying any performance differences.

Private equity investments are not publicly traded and are commonly illiquid investments. Consequently, there may be a need for some form of liquidity premium because returns should be higher than for liquid indices. Thus, it is important to keep in mind that private equity cash flows vary over the investment cycle. Therefore, the cash flows of private equity companies are only valued quarterly, which is a noticeable difference to public markets. Accordingly, it is not reasonable to compare private equity directly to public equity. For investors, a wide range of different benchmarking methodologies and indices are available.

Each methodology has its advantages and limitations, so investors should be careful when deciding which methodology to use. Every private equity investor should be mindful that there is no such thing as a perfect benchmark. In all cases, the most appropriate choice depends on the characteristics of the private equity investments under consideration – such as geographic focus, strategy, sector, and life cycle stage (J.P. Morgan 2018).

The objective of this master's thesis is to examine private equity buyout fund performance and compare it to public market performance, considering the extent to which private equity investments outperform or underperform compared to publicly quoted indices. To address this objective, the following research question is formulated:

Do performance differences exist between private equity funds and publicly quoted indices?

The main research question is supplemented by the following sub-questions:

What does the previous literature state about private equity performance?

How do the results obtained by the public market equivalent (PME) measure of private equity returns differ among the three selected methodologies?

By answering all these research questions, the ambition of this research is to provide robust evidence of private equity buyout funds' performance and to compare private equity funds' performance against public market indices, with the aim of identifying crucial performance differences. Since this subject has been extensively studied, it is justified to compare the results of this research to those obtained in the previous literature. In addition, the results of the different methodologies present this study's results from different angles, adding depth to this research. Overall, this research could help to identify possible benchmarks in public market indices for private equity investments. The theoretical framework of the research is presented in figure 1.

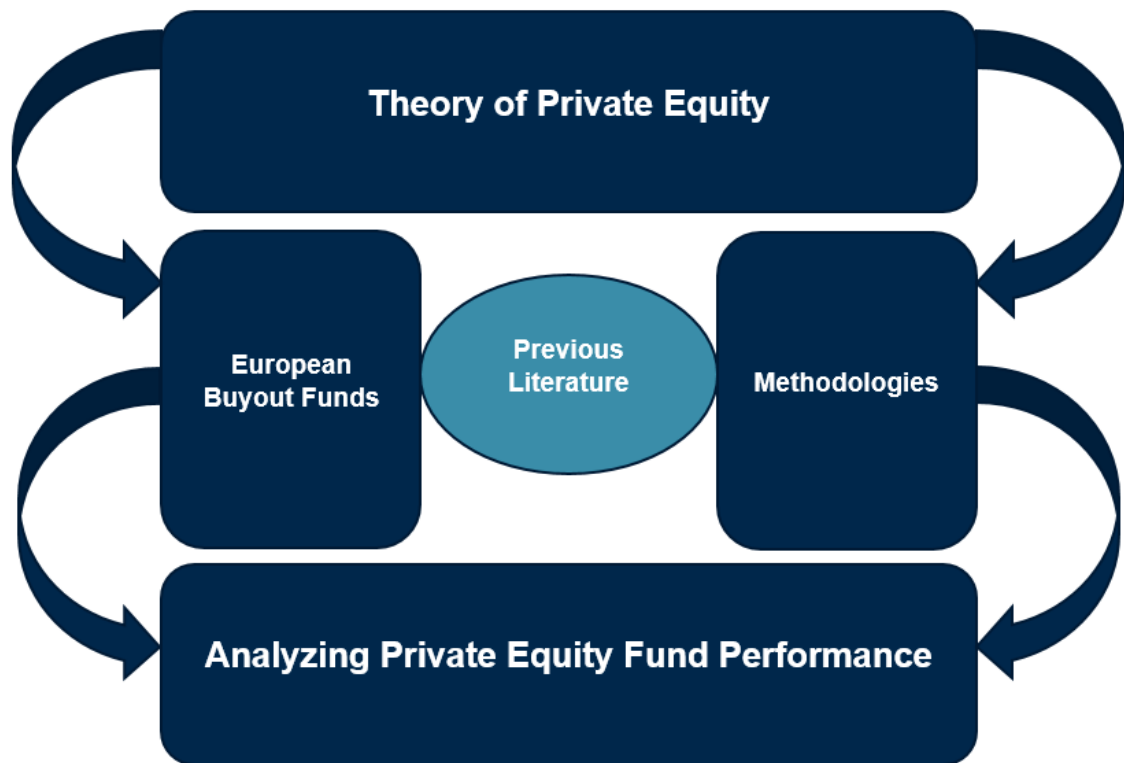


Figure 1. Theoretical framework of the research

The limitations of this thesis are essentially related to the data collection, methodologies, and indices. All the research data is collected from the period 2010–2016. All the related funds are buyout-type investments and geographically focused in Europe. The selected methodologies are three public market equivalent (PME) approaches: Kaplan-Schoar PME (KS-PME), Long-Nickels PME (LN-PME), and public market equivalent plus (PME+). These mathematical models are employed in the literature and previous studies. The indices used in this research are the S&P 500, Russell 3000, and MSCI Europe Standard.

1.3 Methodology

This research uses three different methodologies that are intended to find results indicating the performance differences between private equity funds and public market equities. In addition, the results of previous literature are examined, and the results obtained by different methodologies are compared. Furthermore, typical quantitative research methods are used in this thesis to illustrate the results of the study. Quantitative research usually involves both

experiments and additional systematic methods that highlight controlled and quantified measures of performance (Proctor et al. 2006). The central focus of quantitative research is measurement and statistics because these tools are relevant to the analysis of the mathematical relations considered in empirical research. Thus, quantitative researchers are interested in understanding and exploring new ideas and analyzing patterns of behavior (Hoy 2010). In this thesis, the main goal is to analyze the performance of private equity funds and to understand and exploit the patterns of their behavior with reference to the results of previous literature.

According to Singh (2007), systematic quantitative research can be broadly defined as including the following steps. The first step is to identify the research problem and define the alternatives that are available to solve the problem. The next step is the selection of research design. The primary object in quantitative research is to determine the connection between an independent variable and another set of dependent or outcome variables. The third step is the finalization of the research instruments. At this point, the focus is on analyzing the available information, finalizing the sampling, and reviewing the secondary literature. The next step is data collection. In this phase, all the necessary data is suitably collected. This step is followed by data processing and analysis. During this stage, the data is systematically and thoroughly analyzed, and the findings of the research are gathered. The final step is the preparation of the report, which should contain all the significant information regarding the background of the research, the research methodologies, and the relevant findings to enable the reader to gain a comprehensive understanding of the fundamentals of the research.

The research data was collected from the Preqin database and it is secondary data. Byrne (2002) describes secondary data analysis as containing data that has already been collected: this method uses the “raw materials” for the interpretation, takes the original data files, and works with this data for a specific research purpose. The Preqin database provides real-time updated data to facilitate accurate decision-making. It includes hundreds of reliable data points for analyzing alternative investments (Preqin 2020a). Anttila (2000) states that the quantitative research method entails that the phenomenon under analysis can, and should, be described in terms of amounts, quantities, and numbers. The research results provide information on the context to which the feature is comparable. Ordinarily, quantitative research has a consistent and linear structure, where the hypothesis takes the form of expectations about the anticipated causal links between essential concepts identified in the hypotheses. This method relies on the measurement and analysis of

statistical data. In essence, it determines the relationships between one set of data and another (Eldabi et al. 2002).

1.4 Structure of the research

The structure of this thesis is divided into six chapters. The first chapter introduces the background of the topic, the problem discussion, the objectives of the research, and the limitations. It also presents the methodology of the research and the principal definitions for the most essential concepts of the topic and the structure of the research.

The second chapter presents the theory underlying private equity investment, providing a brief overview of the theory and essential terms of private equity. Different types of private equity investments are also introduced. In addition, this chapter takes a closer look at buyout types of investments and different structures of private equity investments. It concludes with a closer examination of the methods for measuring private equity performance and the risk-return characteristics of private equity.

The third chapter presents a literature review, surveying previous academic literature about the risks, returns, and performance of private equity investments. In particular, this chapter examines the literature from the last decade up to the latest research. The measurement of private equity performance has been a leading interest for scholars in recent years, and it is one of the most widely studied topics in this field. Furthermore, private equity markets constitute a considerable part of the alternative investment environment and are expected to expand in the future.

The fourth chapter presents the empirical part of the research and includes two components: data and methodologies. More specifically, it outlines the data processing and analyzing methods, including the descriptive statistics of the data. This research used three different methodologies, each of which is presented in detail in this chapter. The fifth chapter, which also concerns the empirical part of the research, presents the results of the thesis' analysis of private equity performance. It outlines the results of the private equity funds' performance and compares these results with previous academic literature.

Chapter six consists of a summary and conclusion. The summary outlines the main findings of the previous chapters and sets out the answers to the research questions. The conclusion summarizes the main findings, discusses the topic, and proposes future research questions.

1.5 Definitions

Due to the varied terminology in the literature on private equity, this section outlines some important definitions for the reader to facilitate their understanding of the material and ensure the consistency of the research.

Private Equity – Private equity helps unquoted companies to grow and succeed by providing long-term and committed share capital. Private equity differs considerably from traditional bank loans. Typically, loan lenders such as banks have the right to interest on the loan and repayment of the capital, even if the loan recipient's business collapses. In contrast, in private equity, the investor's returns are dependent on the growth and profitability of the business, because in exchange for the money invested the investor receives a stake in the company and becomes a shareholder (BVCA 2010).

Private Equity Firm – A private equity firm is a company with expert knowledge of buyout, venture, or growth investment strategies. A private equity firm raises and advises a fund. If the fund succeeds, the private equity firm is the family of funds, through two other associated legal entities: the general partner (GP) and the investment manager. Generally, the private equity firm members hold all the directorship keys and other authoritative positions of both the GP and the investment manager for each fundraising initiative by the firm (Zeisberger et al. 2017).

Limited Partner - Limited partners (LPs) are the investors that provide the largest share of capital to any private equity fund raised. LPs are passive investors, and their liability is limited only to the capital committed to the private equity fund. In general, LPs are mainly financial investors, so they cannot be involved in the daily operation or management of the funds without losing their limited liability rights (Zeisberger et al. 2017). LPs are generally institutional investors, including most insurance companies, banks, corporations, family offices, and funds of funds (BVCA 2019). LPs have legal rights to receive distributions of capital, in other words retaining a share of profits when at the time of successful exit of the fund's investments (Zeisberger et al. 2017).

General Partner – General partners (GPs) are responsible for managing the funds, and they have the trustee's responsibility to protect the interests of the fund's investors (BVCA 2019). Following the mandate of the Limited Partnership Agreement (LPA), GPs deal with capital calls to LPs and make all the investment decisions of the funds. GPs can delegate some of these duties to the investment managers or a private equity firm's investment

committee. However, GPs still retain complete responsibility for all the debts and liabilities of the fund (Zeisberger et al. 2017).

Investment Manager – The investment manager chiefly handles the mundane activities of the private equity fund. Their main tasks are evaluating potential investment opportunities, offering advisory services to the fund's portfolio companies, and being responsible for auditing and reporting processes. The investment manager is compensated with a management fee that is usually equivalent to about 1.5–2% of committed capital during the whole investment period (Zeisberger et al. 2017).

Portfolio Company – Over its lifecycle, a private equity fund will be invested in a defined number of companies, typically around 10–15, and these represent its investment portfolio (Zeisberger et al. 2017). Through vehicles called funds, investors invest in portfolio companies. Typically, funds are raised from large institutional investors, and the purpose is to make a profit by exiting the investments after the fund's lifecycle (Pääomasijoittajat 2019).

Leveraged Buyout – In a leveraged buyout (LBO), a specialized investment firm acquires a company by using a relatively small share of equity and a relatively large share of outside debt financing. Typically, in the LBO transaction, the private equity firm acquires majority control of the company (Kaplan and Strömberg 2009).

Venture Capital – Venture capital is a subset of private equity, and it involves equity investments for the launch, early stage, or expansion of a business. In this class, the focus is on entrepreneurial commitment rather than on the mature business (EVCA 2007).

2. BACKGROUND OF PRIVATE EQUITY

This chapter defines the background of private equity theory. First, the sub-chapters explain the nature of the private equity assets class, including key terms and a brief overview. Next, there is an exploration of different types of private equity investments, a closer examination of these investments' structures, and an in-depth consideration of the buyout types of private equity investments. Second, the sub-chapters elucidate the measurement of private equity performance and further explore the internal rate of returns (IRR), money multiples, and the comparison of private equity funds' performance against public market equities. Third, the sub-chapters explain the risk and return characteristics of private equity investments.

2.1 What is private equity?

While several definitions of private equity exist, the simplest explanation is that private equity makes a medium- or long-term equity investment into small, medium, and large companies with the intention of making these companies larger, stronger, and more profitable (Invest Europe 2019). Furthermore, private equity investments could be illustrated as any non-public equity investment in private or public firms (Fenn et al. 1995). Private equity consists of many types of investments, such as venture capital, buyout transactions, hedge funds, funds of funds, private investment in public equity, distressed debt funds, and other securities. It also includes investments in very early-stage companies. The previous definition of private equity holds generally, but there are some exceptions: private equity investments consisting of structured transactions with changeable debt, the acquisition of publicly traded companies that are afterwards taken private and delisted from an exchange, and illiquid investments in publicly traded companies. Although the business itself could be publicly traded, a private equity fund's investment is not typically not traded (Centrowski et al. 2008).

Typically, private equity investments are generated by funds, which are closed-end vehicles where investors provide a specific amount of capital for investments (Kaplan & Strömberg 2009). Private equity investments can be divided into two different categories, fund investing and direct investing or companies under direct ownership of an entity. For instance, pension companies seldom invest capital directly in portfolio companies; instead, they usually focus their efforts on fund investing. Thus, private equity funds use their capital to arrange direct

investments in portfolio companies (Centrowski et al. 2008). As a result of the differences between private equity and public equity ownership, private equity-backed firms' management teams take better advantage of free cash flow than public equities, and overall, such firms make preferable managerial decisions. Moreover, companies under a private equity firm's control have greater growth rates, more significant margins, and preferable capital expenditure management (Jensen 1989).

2.1.1 Terms and brief overview

To be capable of understanding the private equity field, it is essential to understand all the details that the industry keeps hidden. Many of these details are secret, and often companies are unwilling to reveal any details of their funds to outsiders (Centrowski et al. 2008).

For the most part, private equity funds are arranged by limited partnerships. They are built up and managed by management companies, and institutional investors serve as the LPs (Fenn et al. 1995). Usually, private equity investments allow investors to invest their capital for investment in portfolio companies, allowing investors to grow their diversification, range, and acquiring power. There is also the chance that the private equity organization will allow investors to invest in multiple private equity funds (Centrowski et al. 2008).

The limited partnership structure provides several advantages for private equity funds, such as taxation benefits. For example, the earnings achieved by such an organization are taxed only once, as they then flow to the partners. Another point that can be raised is regulation and reporting policies. In contrast to publicly traded securities, private equity regulation is an evolutionary process, and there are changes expected in the near future that will influence the larger private equity funds (Centrowski et al. 2008). There are also some disadvantages of this structure: poor liquidity, managing commitments, less diversification, minimum commitments, and higher fees (Brown & Kraeussi 2010).

GPs are also known as managers of private equity funds, and LPs are known as investors. LPs can lose, at most, their total sum of capital contributions (Centrowski et al. 2008). Most of the private equity capital comes from numerous LPs, for instance, institutional investors such as insurance companies, pension funds, and banks that have the possibility to achieve stable returns in the long run (EVCA 2019). Private equity investors leave their capital to the GPs' dominance, while LPs do not have authority over the daily operations of the fund. LPs receive quarterly statements regarding the private equity fund's performance, such as

capital deployed to date, investment returns, and many other facts. LPs have the right to express their beliefs, but they cannot participate in daily decision making (Centrowski et al. 2008). When LPs delegate the responsibility of selecting, structuring, and managing private equity investments to the GPs, they must be concerned with how efficiently the GPs take care of the interests. There are many ways in which GPs can demolish this partnership: they can favor their own interests at the expense of the LPs, for example, by providing insufficient effort in monitoring and advising portfolio companies. In addition, GPs can charge excessive management fees, take unnecessary risks, and keep information about the most promising investment opportunities for themselves (Fenn et al. 1995).

Unlike many other investments, private equity investments are limited-life entities: they have a limited lifetime (Centrowski et al. 2008). Typically, a private equity fund's lifetime is fixed and usually lasts from 10 to 12 years, although it is not uncommon that a fund's lifespan is no more than five years if the potential deals are scouted beforehand (Kaplan & Strömberg 2009). Ordinarily, a private equity fund's lifetime involves four phases: fundraising, investment, management, and harvest. Figure 2 illustrates these phases.



Figure 2. Typical phases of a private equity fund

The first phase is called fundraising. In this phase, a private equity fund selects investors and specifies its strategy and focus. This step includes marketing for the potential investors. This phase may be short-term if the private equity firm is already established and the economy is healthy enough, typically taking around three to six months (Wheater 2014). The next phase is called investment. All the investments are gathered together during this stage. The GPs negotiate deals and make the final arrangements. Generally, this phase takes one to four years. In the third phase, management, a private equity fund focuses on managing investments in portfolio companies. There could be different managing styles: sometimes GPs will replace the management team with professionals from inside the company, while in other instances the original management team may remain (Centrowski et al. 2008). The last phase is called harvest. Basically, it involves the private equity fund

investors receiving distributions. Typically, although private equity funds distribute low or negative returns in the early years, over time the investment gains as the portfolio companies mature and increase in value, and this is known as the J-curve effect (Caceis 2010).

2.1.2 Different types of private equity

According to Zeisberger et al. (2017), private equity funds can be divided into four different classes. These investment classes can all be categorized by the life cycle stage of the target company and the majority or minority stake of the target company. The first class is venture capital. This class typically includes early-stage companies and start-ups, which offer high risk/return investment opportunities. The second class is growth equity. This class consists of fast-growing companies – investors in this class belong to minority equity, and they do not have a control position. The third class is LBOs, and it is the most significant private equity fund type. Buyout investors acquire controlling equity in companies that are more mature and often employ an abundant amount of debt in LBOs. The fourth and final class is alternative strategies. This class consists of distressed business, real assets, debt, infrastructure, and natural resources.



Figure 3. Private equity types

This research paper primarily focuses on buyout-type private equity investments. Later in this chapter, we will discuss other buyout-type of investments and explore the theory behind them.

2.2 Structure of private equity

There are many different structure possibilities for private equity funds, although such funds are comparable to other collective investment vehicles. The differences are mainly due to regulatory and tax issues in the differing juridical situations that impact the operation of the fund (Gilligan & Wright 2008). The limited partnership structure has been the most popular choice for the past thirty years for fund managers in both private equity and venture capital. In addition to this type, other private equity capital classes such as real estate, infrastructure, and debit/credit funds use a similar limited partnership structure form (BVCA 2019). Figure 4 illustrates a simplified limited partnership private equity structure, which raises capital and makes investments. Commonly, private equity investments are committed mostly by institutional investors. They invest capital in private equity funds, and professional managers are responsible for managing these funds. Institutional investors are known as LPs, while professional investors that manage the funds are called GPs (Fang et al. 2013). GPs provide a small amount of capital in the fund, too, but it is typically only a small percentage points.

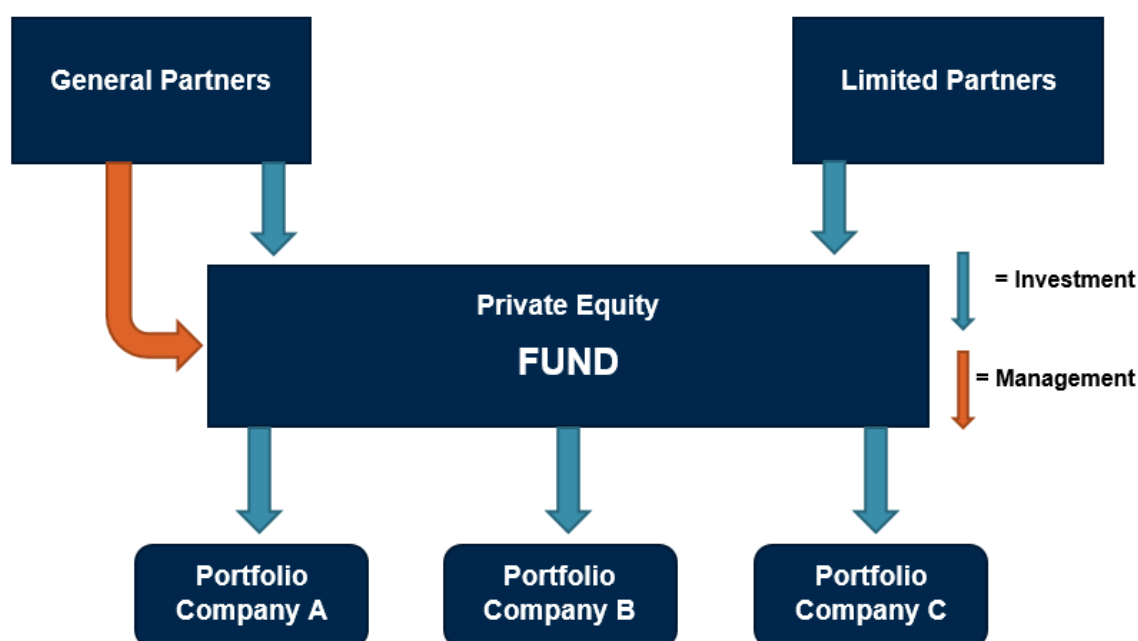


Figure 4. Limited partnership structure in private equity

GPs perform an essential role throughout the investing process, involving deal selection, execution, monitoring, and exiting. The LPs' role is more passive, and they mainly provide capital to maintain their limited liability status. Typically, GPs are compensated for an annual management fee, which is usually 1.5–2% of committed capital (Fang et al. 2013). Another fee earned by GPs is called “carried interest,” which is a share of the profits of the fund and typically amounts to 20%. From the cumulative investments cost point of view, the annual costs of this compensation structure are around 5–7% (Gombers & Lerner 1999; Metrick & Yasuda 2010). Although this 20% compensation fee is spread extensively across the fund, the carried interest calculation has recently evolved in favor of the LPs. Before, agreements were based on the returns on individual investments, but presently, such fees are commonly based on the returns of the partnership's whole portfolio (Fenn et al. 1995).

2.2.1 Leveraged buyouts

The buyout type of private equity investments are the most familiar publicized uses of private equity alongside venture capital. In the 1970s, only a few insurance companies invested in small-scale LBOs. However, LBOs became familiar in the 1980s, and the transaction sizes and the amount of leverage employed increased significantly. Typically, companies that have undergone public buyouts are characterized by steady growth rates, stable cash flows, and management that is misusing the discretionary cash flows for negative present value acquisitions or other actions (Fenn et al. 1995). Kaplan and Störmborg (2009) state that in an LBO, a specialized investment firm acquires a company by using a relatively small share of equity and a relatively high share of outside debt financing. Usually, the private equity firm acquires majority control of the company in an LBO transaction. Guo et al. (2007) explain that when the deal is financed with a more significant proportion of bank financing, or if the deal includes more than one private equity investor, the returns to post-buyout capital are higher. In addition, higher pre-buyout leverage leads to greater gains in operating cash flows for firms, along with an enormous growth in leverage as a result of the buyout.

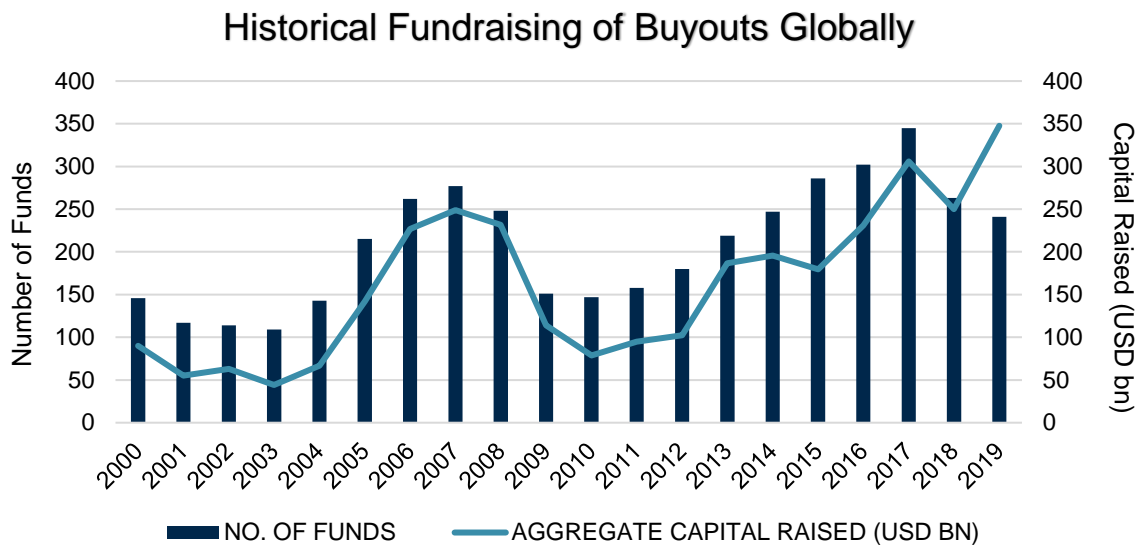


Figure 5. Historical fundraising of buyouts globally (Preqin 2019)

According to the Preqin database, in 2019, GPs raised \$348 billion from investors in the buyout strategy, and the total number of funds was 241, while the average size of the funds was \$1,545 million. The chart above illustrates the historical evolution of fundraising in the buyout investment strategy.

2.3 Measuring private equity performance

Reputation has a critical role in the private equity markets. Consequently, a reliable method for measuring the performance of partnerships is necessary. Different methods can be used to measure performance, both quantitative and qualitative (Fenn et al. 1995). Commonly, previous studies have compared how private equity funds perform against some benchmark such as the S&P 500 (Kaplan & Schoar 2005). The IRR is the most widely used method for measuring performance, and it can be calculated at any point in a stage of the partnership’s life. Nevertheless, investors have only partial confidence in the IRR, not only because of the difficulty in verifying the accounting returns of younger partnerships but also due to the variable returns of partnership. Remarkable returns on an individual investment can considerably increase the performance of the whole fund. Typically, potential investors conduct a specific empirical analysis of the partnership returns. In this way, investors can examine the distribution of individual investment returns and identify both stellar and poor investments. It is also essential to scrutinize the relationships between investment returns and investment characteristics, for example, the industry, size of the portfolio, and location

of the portfolio companies (Fenn et al. 1995). However, the IRR provides just one insight into private equity performance. Moreover, other metrics offer more detailed information on the funds' performance compared to public equity markets and other liquid assets classes (Albers-Schoenberg 2019).

2.3.1 Internal rate of return

The IRR calculates the returns by examining all of the cash flows from the investment over a specified period, taking into consideration drawdowns, distributions such as capital gains and dividends, and the residual value of the fund if it exists (BVCA 2015a). Typically, IRR is the performance metric of choice in the private equity industry because it is easy to use, but it does exhibit some weaknesses. One significant weakness is "reinvestment assumption." On this assumption, the capital that is distributed to limited partners at the early stage will be reinvested throughout the life of the fund at the same IRR as generated at the first exit. A high IRR generated by a profitable exit at the early stage in a private equity fund's life is thus expected to exaggerate its actual economic performance, so the probability of discovering an investment with a relatively high IRR over the remaining (short) term is low. The nature of private equity funds constrains investors from reinvesting capital in other funds during the divestments period. This limitation encourages GPs to aggressively exit portfolio companies in an early stage in a fund's lifecycle to deliberately lock-in high IRR (Albers-Schoenberg 2019).

2.3.2 Money multiples

Money multiples are regularly used metrics in the private equity industry; thus, they offer a straightforward way to demonstrate the scale of the returns of investment. Money multiples measure returns from an investment and illustrate how much investors are acquiring cash-on-cash. Generally, three different metrics are presented: distribution to paid-in capital (DPI), residual value to paid-in (RVPI), and total value paid-in capital (TVPI) (BVCA 2015a). The DPI metric measures the cumulative investment returned to the investors relative to invested capital; in other words, it is formed by the capital and income of the investment minus expenses and liabilities. RVPI represents the amount of unrealized value of the fund, namely how much investors' capital is still tied up in the fund (Preqin 2019b). TVPI evaluates

the total value to the paid-in ratio of the fund, and it consists of DPI and RVPI; thus, it measures the overall performance of the private equity fund (Albers-Schoenberg 2019).

2.3.3 Comparing private equity funds with public equity portfolios

Often, many LPs' investment committees wish to compare private equity funds' performance against some traditional asset class, which is not a straightforward process. Most private equity performance reporting depends on temporary valuations of unlisted and illiquid investments, thus making a determination of the exact market value impossible. In addition, the standard performance measures are not directly comparable to liquid asset classes, where valuations and returns are calculated daily (Albers-Schoenberg 2019). The LN-PME method introduced by Long and Nickels (1996) tends to compare a private equity fund's performance with a benchmark by creating a theoretical investment in the chosen index using the fund's cash flows. Kaplan and Schoar (2005) propose a different method to compare private equity portfolio returns against a reference benchmark. Their KS-PME method seeks to answer how much wealthier an investor would become over a specific period by investing in the private equity portfolio instead of the reference benchmark. Rouvinez's (2003) PME+ method offers another approach to measuring the performance of private equity funds. This method employs similar principles to LN-PME, and the main idea is to produce the same residual value in the reference portfolio as the private equity portfolio has at a certain time and ultimately to liquidate just as the private equity portfolio does. All the above methods are used in this research paper and described in further detail in a later data and methodology section (4.1)

2.4 Risk-return characteristics of private equity

One especially crucial issue is the measurement of the risk and returns characteristics of private equity investments. Given the timing of the cash flow, it can be difficult to compare private equity funds' performance of LPs with stock market indices. As previously noted, one standard metric for measuring the performance of the LP is the IRR, but it cannot be directly compared with the return of an index (Brown & Kraeussi 2010). According to Ljungvist and Richardson (2003), private equity generates excess returns that are 5–8% higher per annum than the relative aggregate public equity market. In addition, Kaplan and Schoar (2005) state that private equity investment would have outperformed the S&P 500. While Ljungvist and Richardson (2003) estimate that private equity funds portfolios' betas are greater than one, they point out that on a risk-adjusted basis, the excess value of the typical private equity fund is on the order of 23.8% relative to the present value of the invested capital.

2.4.1 Risk of private equity funds

The importance of the private equity asset class keeps growing, and investors are exploring its diversification benefits compared to the common stock and bond holdings. The proportion of the private equity investments of the overall investment portfolio is increasing, especially among large institutional investors such as insurance, endowment, and pension companies (Buchner 2017). The characteristics of private equity investments cause specific risks that investors should be aware of. The most significant risks are market risk, funding risk, liquidity risk, and capital risk. The unique structure, long-term time horizon and illiquidity of private equity investments generates a set of specific risks. These kinds of risks differ from those in public markets, and for this reason, such risks might be challenging to understand or even capture. Thus, standard risk measures cannot be used in the private equity industry (BVCA 2015b). Although the field of financial modeling risk management has been well studied for many years, current understanding of how to quantify the risks of private equity investments correctly and manage them effectively remains limited (Buchner 2017).

Market risk refers to holding the asset that can be traded on the market and whose value changes over time. This risk is often attached to equity in listed companies through the purchase of stocks. Due to the lack of real continuous market prices for private equity investments, the quarterly net asset values are frequently used as a substitute for market prices (BVCA 2015b).

Funding risk, which is also known as default risk in the private equity industry, is the risk that an investor cannot pay their capital commitments to a private equity fund. If this risk realized, an investor might lose their full investment, counting all paid-in capital; for this reason, it is essential for investors to manage their cash flows to fulfill the financial commitments of the fund (BVCA 2015b).

Liquidity risk means that investors cannot redeem their investment at the specific time of their choosing. Due to the structure of private equity funds, investors stay in the fund for the whole period without an opportunity to cash out their commitment. Nonetheless, a secondary market for LP commitments has evolved, and there could be the liquidity risk that an investor wants to sell their private equity investment on the secondary market, but there is not enough volume or efficiency for a fair deal (BVCA 2015b).

Capital risk means that there is a probability of losing invested capital with a private equity portfolio over its whole lifetime. Capital risk is closely related to the market risk for the investor. In capital risk, investors would have realized loss in their portfolio, but at the same time, market risk is based on unrealized values. Internal and external factors drive both of these risks (BVCA 2015b).

According to Buchner (2017), one can use a value-at-risk (VaR) approach to capture market risk. This approach has become a standard measure in financial analysis to quantify market risk. The basic idea behind VaR is that it is determined as the maximum potential loss in the value of a portfolio of financial instruments over a specific horizon with a given probability. This is because the private equity funds are highly illiquid, while funds can be sold only at some discount on the secondary private equity markets. To facilitate taking this factor into account in the VaR calculations, there is an extended approach known as liquidity-adjusted value-at-risk (L-VaR). This approach adds in secondary market discounts as an exogenous liquidity cost in the VaR calculations. The main idea is to capture the unpredictable nature of secondary market discount dynamics by employing a mean-reverting Ornstein-Uhlenbeck process for the discounts, which are supposed to be correlated with cumulative stock market returns. In addition, to capture the funding risk, there is an approach called cash-flow-at-risk (CFaR). The basic idea of this approach is to

specify the change loss in the investor's cash position. Typically, it is only exceeded with some probability over a specific time horizon.

Generally, the private equity asset class is often taken to be one of the riskiest investment classes. Thus, one might think that, for example, a financial crisis would affect this class more severely than the public sector. However, in the 2007–2008 global financial crisis, while private equity markets suffered from losses just as public equity markets did, the losses were significantly lower, and the recovery time required was considerably shorter than for the public market (Pfister & Jost 2017). Bernstein et al. (2017) find that private equity-backed companies operating in the UK during the 2007–2008 global financial crisis decreased investments less and were able to continue investing more quickly compared to non-private equity-backed companies. This outcome was a consequence of private equity companies being able to take advantage of the resources and relationships of their financial sponsor to raise equity and debt funding during the challenging time and reduce the interest expenses, thereby lowering their cost of capital. Furthermore, accumulative investing during the financial crisis led to increased asset growth, greater market shares, and eventually a higher probability to be acquired. Private equity funds have mostly outperformed public equities regardless of the phase of the economic cycle they were raised in. Considering the risk point of view, private equity can increase the diversification of the investor's equity allocation, while the extensive universe of private equity companies provides far more investment opportunities than quoted companies (Ott & Pfister 2017).

2.4.2 The cash flow dynamics and risk-return characteristics

Cochrane (2003) examines the expected return, standard deviation, alpha, and beta of venture capital investments. The core question of his research concerns whether venture capital investments perform in the same way as publicly traded securities. He detects that the venture capital investment standard deviation of log return is 89%, whereas the S&P 500 standard deviation of log return was 14.9% over the same period. It should be taken into account, though, that these individual firms are quite volatile compared to a diversified portfolio such as the S&P 500. For example, this annual 89% standard deviation might be better to digest as $89/\sqrt{365} = 4.7\%$ daily standard deviation. However, it can be said that venture capital investments are riskier than the S&P 500 index. The base case results prove that the mean log returns for the whole sample are 15%, just about the same as the 15.9% mean log S&P 500 return. Kaplan and Schoar (2005) examine the set of individual funds' performance against the S&P 500. First, they notice that LBO fund returns net of fees are

slightly lower than the returns of the S&P 500. On the other hand, the equal-weighted returns of venture capital funds are lower than the returns of the S&P 500, while capital-weighted returns are higher than the S&P 500. Ljungqvist, Richardson, and Wolfenzon (2008) explore the determinants of buyout funds' investment decisions. They find that established funds speed up their investment flows and earn higher returns when their investment opportunities proceed. Moreover, the competition for deal flows becomes more comfortable, and the credit market conditions loosen up. This makes first-time funds less sensitive to market fluctuations. Therefore, younger funds invest in riskier buyouts to achieve returns on established funds. Finally, after a successful period, funds become more conservative, and this is especially true for younger funds.

Phalippou and Gottschalg (2003) examine the performance of private equity funds, both net of fees and gross of fees. They state that performance should be evaluated with suitably weighted profitability indices. Moreover, the researchers note that using average IRRs can bias performance upward. They find that private equity funds' performance was 3% lower annually than S&P 500 by looking at the average net of fees. Conversely, the gross-of-fees performance examined was 3% higher annually. After adjusting for risk, this performance decreased around 3% annually, bringing the alpha net of fees to -6% annually. It should be noted that these performance estimates are reliable only for mature funds. Korteweg and Sorensen (2010) discuss the risk and return characteristics of venture capital-backed entrepreneurial companies. They extend a standard dynamic asset-pricing model in their empirical research on risk and return in venture capital investments. To correct for the endogenous selection of the observed returns, they added a selection process. Their model specifies the total unobserved valuation and returns the path between the observed valuations, including the probability of observing a valuation at every point in time. To further understand private equity investments' cash flows and performance, we need to explore the implications of cyclicity for them.

Robinson and Sensoy (2011) state that the relationship between beta and relative performance is very convex. It is essential to understand this convexity to identify the implications of leverage for evaluating private equity performance. Performance assessment is sensitive to changes in beta when the beta is near to zero. A beta value from 0 to 1 cut the estimate of the excess performance of buyout funds from 57% over the life of the fund to 18%. In contrast, beta from 1 to 1.5 only lowers the excess performance assessment to 12%. If a private equity fund is likely to call capital at economic troughs and expected returns are high, then the conclusion for liquidity is different than if such calls appear when expected returns are low. In this situation, private equity should require a high

premium in equilibrium. Robinson and Sensoy state that the private equity investors' liquidity risk is probably modest, and the observed discount in secondary markets for private equity investments is driven by the situation of individual investors rather than by a systematic determinant. They also note that most variations in cash flows are predictable and related to the age of the fund. Young funds call capital to acquire investments, whereas older funds concentrate on exiting the investment they have made.

3. LITERATURE REVIEW

The literature review occupies a significant position in this research. In simple terms, the literature review analyzes, documents, and draws conclusions regarding the previous knowledge of the topic. The purpose is to produce the same statement of the knowledge that the thesis presents (Machi & McEvoy 2016). According to Webster and Watson (2002), a successful literature review advantageously informs the reader of what has been learned. For the reader, the literature review should reveal the patterns that are seen in literature, not offer specific critical reviews of individual papers. This section presents the essential findings of the previous academic literature on private equity returns, risks, and performance.

Most of the studies have been conducted in the USA due to the size of this country's private equity markets. Some studies have also been conducted in Europe, especially in the UK. The academic literature on private equity has increased considerably in recent decades, especially research on measuring the performance of private equity funds. Long and Nickels (1996), Gompers and Lerner (1999), Rouvinez (2003), Kaplan and Schoar (2005), and Kaplan and Strömberg (2009) were the first authors to research the performance of private equity funds. They developed different methodologies for comparing private equity funds' returns to the public index. Private equity has been the preferred choice of investment for the past decade and thus has received much attention over this period. Despite the growth of private equity markets, the academic literature on this subject has developed slowly due to information about the private equity sector being kept secret. The present-day research encompasses risk-returns characteristics and private equity performance, the economics of private equity markets, and an increasing range of regulatory aspects (Tripathi 2010).

3.1 Risk and return in private equity

Private equity markets are a considerable part of the alternative investment environment, and this asset class is now well-established: according to Preqin, in 2019, the aggregated amount of capital raised globally was \$618 billion. There have been high annual commitments in the private equity universe over the past three years, and more large fund contributions are expected, which indicates the remarkable amount of total funds looking for capital. The risk and returns characteristics in the private equity industry are particularly interesting given that private equity returns have been outperformed by public equities.

Political and macroeconomic anxiety is leading to volatile markets; consequently, investors are becoming more attracted to private markets.

Leeds and Sunderland (2003) describe private equity funds as an investment in early and later-stage private companies from third-party investors chasing a high return based on the risks of the companies and the illiquidity form of these investments. Private equity investments are usually less liquid than publicly exchanged stocks, and for that reason, they are long-term investments. Low transaction costs, simplified financial management responsibilities, and reduced financial reporting requirements are common features of the private equity industry. For private equity investors to achieve profitable returns, it is required that they find a buyer or a public offering allowing the investor to exit (Tripathi, 2010). Metrick and Yasuda (2010) examine the private equity industry by using a novel model and dataset. Their research sample was collected between 1993 and 2006, and it contained 238 private equity funds. Typically, fund managers make their profit from different fees and profit-sharing rules. The authors estimate expected revenue to managers as a function of these fees and profit-sharing rules, finding sharp differences between venture capital and buyouts funds. In particular, buyout fund managers acquire lower revenue per managed dollar than managers of venture capital. However, buyout fund managers mostly have higher present value for revenue per partner than venture capital fund managers. Hence, buyout managers form their earlier experience by increasing the size of the funds more rapidly than venture managers do, which drives considerably higher revenue in buyouts funds per partner, even if these funds have lower revenue per dollar. Conversely, although the previous experience of venture capital managers leads to higher revenue per partner, it does not result in notably higher revenue per professional. Consequently, the buyout business can be seen as more scalable than the venture capital business.

According to Fenn et al. (1995), private equity investments are the most expensive structure of finance. Hence, companies that raise private equity usually cannot raise funds in other markets. Most of these companies are considered too risky to be capable of getting debt. In addition, potential investors need to examine precisely the background of the investment, given that the lack of publicly available information and the unique risks of the private equity field lead to higher potential risks. Fenn et al. (1995) also discuss the returns on private equity investments and look forward to future returns, including forecasts on possible future returns. According to these authors, the reason for the explosive growth of the private equity markets in the 1980s has been the substantially higher returns than in other markets; however, the private equity markets remain riskier and more illiquid than other assets. Fenn et al. observe that expected returns on co-investments and partnership investments are not

equal with direct investments. Although direct investors avoid the cost of carried interest and management fees, they still carry the investment costs that GPs usually incur. Consequently, the returns on direct investments are reliant upon the skill and capability of the investment crew.

Robinson and Sensoy (2011) examine how the determinants of manager compensation and ownership are related to the fund's cash flow performance. They find that management fees and carried interest are typically not related to net-of-fee cash flow performance, which indicates that private equity GPs that receive higher compensation earn it in the form of higher gross returns. In addition, the authors find that there is no proof that low GP ownership is related to lower returns; for buyouts funds, though, the opposite is true. They also analyze the liquidity properties of private equity cash flows and how these properties behave during a financial crisis. Typically, when market conditions decline, private equity tends to be a modest liquidity sink, although such equity serves as a source of liquidity when market conditions improve. Two completing forces reflect the overall sensitivity of capital calls to market conditions. First, as market conditions improve, any fund is probable to call capital. Second, these brightening market conditions create a new fund, and funds consequently call more capital in the years that follow. This finding emphasizes the sensitivity of the entire private equity markets.

Kend and Katselas (2013) discuss how private equity companies are motivated to make a profit on their investment, similarly to any public company. According to the authors' findings, private equity companies offer a more sensible time horizon that enables them to make more accurate and timely managerial decisions. Consequently, such companies can make faster decisions while new growth opportunities are available. Buyout funds exhibit lower sensitivity to changes in market conditions than venture capital funds. Private equity companies also have the advantage of requiring less paperwork and other documentation compared to publicly listed companies. Therefore, new owners can work with management and achieve their expected returns. Typically, public companies aim to satisfy the wide range of investors by distracting activities, whereas private equity companies do not encounter the same kinds of distractions. Private equity companies can therefore focus their resources on wealth creation and achieve the desired returns that publicly listed companies dream of.

According to Fenn et al. (1995), most institutional investors are firmly in favor of private equity because they expect higher risk-adjusted returns on private equity investments than other risk-adjusted investments due to the benefits of diversification. The authors note that private equity returns have considerably exceeded returns on the public market. Their study

shows that the capitalization-weighted median IRR of venture capital partnerships was 11.2% in the early 1990s, indicating significantly higher returns than during the 1980s. The capitalization-weighted average IRRs for funds in the mid-1980s surpassed the compounded average of 14.4%, and funds after 1986 were below the average. The reason for the decline in rates of return was the underperformance of LBOs in the late 1980s. As a result of lower returns, later deals became connected to meltdowns in both pricing and structure. Chapple et al. (2010) demonstrate that private equity target companies are more massive, use their assets more efficiently and profitably, and have greater cash flows. Moreover, such companies are more highly leveraged. In addition, the authors' multivariate analysis indicates that private equity targets have relatively higher financial indolence, better financial stability, higher free cash flow, and lower measurable growth possibilities.

According to PWC (2018), private equity has developed to become less leverage-dependent and more operationally minded since the most recent financial crisis. Investors pay attention to how fund managers build value and try to search for the most skilled managers who can adequately deliver profits. MacArthur et al. (2019) have recently discussed the returns of the private equity industry. They state that while private equity returns remain strong compared to other asset classes, such returns are clearly falling towards to the public market average. Private equity company managers are preparing for the possible downturn by evaluating macro-economic uncertainties and planning carefully how they could make a profit from this downturn. With the previous financial crisis still fresh in their memory, companies are giving more attention to downside scenarios. It has been learned from the last crisis what types of industries successfully negotiate – or not – such unfavorable conditions and adapt in suitable ways, such as the healthcare sector, which is widely known as a recession-proof industry. Jordaan (2018) examines the net-of-fees performance of private equity buyout funds during the 2007–2009 financial crisis. The author shows that North American and European buyout funds have continued to perform strongly despite the recession. Furthermore, North American buyout funds also outperformed European funds during 2002–2007. In addition to this finding, Jordaan notes that IRRs, TVPIs, and PME have declined, primarily because of increasing competition in the private equity field, which has negatively affected performance levels, and also due to the intense public equity rally since the financial crisis causing further growth in PME discount rates. Overall, buyout funds appear to be a flexible asset class that has shown robust performance against public market equities throughout the financial crisis. Thus, it seems that buyout funds are strong capital preservers with lower volatility.

3.2 Performance of private equity funds

Measuring the performance of private equity funds has been a leading interest for scholars. For many years it has been one of the most researched topics in this field. Most studies are based on the empirical frameworks developed in Kaplan and Schoar's (2005) research on measuring private equity performance, along with Kaplan and Strömberg's (2009) empirical research on the operating performance of private equity companies. There are also multiple studies from the 2000s that examine the performance of private equity funds, while other more recent studies such as Harris et al. (2017) concentrate on analyzing the funds of funds performance against a public market index. Sorensen and Jagannathan (2013) examine the historical performance of private equity funds, and Lahmann et al. (2016) analyze the value creation in small and mid-size private equity deals with specific leverage. Extensive research has been conducted on the topic, and this section presents the main findings of this previous academic literature on the performance of private equity funds.

Kaplan and Strömberg (2009) present empirical evidence that the operating performance of companies that have been acquired through LBOs is mostly positive. Kaplan (1989) shows that the operating ratio of income to sales increased by 10 to 20% in U.S. public-to-private deals in the 1980s, while the cash flow ratio to sales increased by approximately 40%. Lichtenberg and Siegel (1990) find that LBOs are an essential determinant of the long-range productivity growth after the acquisition. According to Kaplan and Strömberg (2009), there has been just one exception to the mostly consistent operating results reported in recent public-to-private buyouts research. Guo et al. (2007) demonstrate that LBO deals between 1990 and 2006 are more conservatively valued and lower leveraged than the comparable buyouts from the 1980s.

Harris et al. (2017) analyze both private equity funds of funds and benchmark funds of funds (FoFs) performance against a public market index. Their research sample covers funds that were raised between 1987 and 2007. The authors find that private equity funds of funds provide returns corresponding to or even higher than those of the public market index. This outcome indicates that private equity generally outperforms public equities. More strictly, buyout funds outperformed public equities throughout the period considered by the study, while venture capital funds performed similarly over this period, except for during the dot-com bust. These researchers also note that FoFs had lower returns than portfolios of direct funds. According to Harris et al., this previously mentioned lower performance is necessarily different from zero to FoFs that allocated on buyouts. In the case of venture capital, the FoFs performed approximately similarly to portfolios formed by direct fund investing after

fees. The authors suggest that for non-funds of funds, both the fees charged by investors and the amount of money committed to FoF managers might be under pressure. FoFs represented only 5% of the total amount of commitments to buyout and venture capital funds from 2013 to 2016 compared to 2000 to 2007, when this figure was over 10%. Clearly, it is difficult for FoF managers to obtain profit, and the trend appears to have followed a downward trajectory in recent years. The results of this study are consistent with the findings of Harris et al. (2012), which indicate that the performance of direct venture funds has been consistent since 2007, whereas the performance of direct buyout funds has decreased in recent years. To conclude, Harris et al. (2017) state that since FoFs are unable to choose direct funds that will outperform public equities, they should focus on buyout FoFs as a group.

According to Kaplan and Strömberg (2009), their empirical research shows that LBOs create value for private equity firms. They also note that the evidence does not undoubtedly prove that private equity funds acquire exceptional returns for their LP's investors, primarily because private equity companies generally purchase firms in auctions or pay a premium to public shareholders. In addition, the limited partners pay the necessary fees in private equity funds. Kaplan and Schoar (2005) have investigated the returns of private and venture capital funds between 1980 and 1997. In this research, they compare LPs' returns in private equity funds against the public market index S&P 500. The authors discovered that private equity fund investors gained less than the S&P 500 index net of fees. At the same time, however, these results indicate that private equity investors outperformed the S&P 500 index gross of fees. According to Phalippou and Gottschalg (2003), private equity funds performance is comparable to public market performance during the period from 1980 to 2002. They find that the average net-of-fees fund performance was 3% per year under the compared index S&P 500, although average gross performance per year was 3% above the S&P 500 over the same period. This demonstrates how crucial the fees are when measuring the performance of the funds. Gresch and Wyss (2010) have examined a dataset consisting of 1641 private equity funds between 1979 and 2005. They researched the performance of these funds by vintage years, finding that the funds between 2002–2003 performed well, while the number of funds whose performance resulted in a negative final IRR. Conversely, the vintage years between 1997 and 1999 yielded the lowest returns, which may have been a consequence of the bubble.

Harris et al. (2012) examine the buyout and venture capital funds' performance in the U.S markets. The authors determine that buyout funds outperformed public markets in the 1980s, 1990s, and 2000s. In addition, they note that investment multiples, in most cases,

provided better measures of performance than IRRs. Robinson and Sensoy (2011) arrive at almost identical conclusions in their study. They analyze detailed data for a large sample of venture capital and buyout private equity funds from the vintage between 1984 and 2010. They find that, on average, private equity buyouts funds outperformed the S&P 500 around 18% over the life of a fund, while considering on a net of fees. The authors also establish that broad market fluctuations are correlated with fluctuations in private equity performance, which has an effect on relative versus absolute performance measurements. In other words, even if the absolute performance of private equity is low, it does not underperform compared to public equity. The co-movement between public and private capital markets is crucial for understanding the returns that investors are waiting for.

Robinson and Sensoy (2011) analyze private equity funds' performance between 1984 and 2010, providing new evidence concerning crucial factors of private equity performance and cash flow behavior. Their principal findings are as follows: on average, private equity funds outperformed public market equities by around 15% over the life of the fund. Exceptionally, in the buyout sector funds performed strongly, and funds in the venture capital sector slightly outperformed the S&P 500. Even though this performance is measured relative to a levered position in the public index equal estimates of portfolio company betas from previous work, the buyout funds outperformed public equities. The authors also demonstrate the sensitivity of relative performance deduction to beta estimates, determining that the relationship is an exceptionally relatively constant in a range of betas around 1.5 to 2.5.

Braun et al. (2016) consider the adverse selection and the performance of private equity co-investments. According to these authors, investors searching for private equity funds for co-investing outside the fund structure appear to be seeking saving opportunities on fees and carried interest payments. The authors do not find any evidence of adverse selection and demonstrate that the gross returns distributions of co-investments are similar to other deals. Moreover, they find that the similarity of gross returns over the whole sample indicated higher average net returns to investors in co-investments due to lower fees and carried interest. Hence, 35% of buyout deals beat the overall fund return, suggesting that investing in private equity funds offered a diversified portfolio for those returns. In contrast, Fang et al. (2014) show that direct deals outperform public market benchmarks, most clearly when private equity fund PME's are compared, although this outperformance seems to be evident only in buyout funds. In addition to this finding, the authors observe that the performance of co-investments was weaker than the funds they invested directly, while direct investments performed well compared to the benchmarks.

Korteweg and Sorensen (2017) investigate private equity performance with a new variance decomposition model to isolate three factors of persistence. The authors find that all types of private equity companies have long-term persistence. Expected returns spread between the top and the bottom quartile in private equity companies are around 7 to 8% per year. Furthermore, their research detects a low investible persistence and shows that the prior performance is noisy with a low signal-to-noise ratio: LPs need to notice an enormous amount of previous funds to identify private equity firms with higher expected future returns with even rational reliability. The authors also note that smaller funds have greater long-term persistence than larger funds. Another fascinating observation is that funds located in the USA have the least long-term persistence, followed by funds located in Europe, while the largest persistence is for companies located in the rest of the world. Additionally, Kaplan and Schoar (2005) present robust evidence for permanence performance. Put another way, performance in one private equity fund predicts performance by the firm in consecutive funds. These results are expected to underrate permanence since the weakest performing funds are unlikely to raise a consecutive fund.

Sensoy et al. (2014) examine the performance of LPs and private equity investments over time. Their sample consists of 14,380 investments by 1,852 LPs in 1,250 buyouts and is concentrated on venture capital funds that began between 1991 and 2006. In this research, they focus on the relationship between LPs and GPs by giving close attention to access to funds and the way it has changed in recent years. First, they determine that from 1991–1998, the performance of the private equity funds was superior, whereas from 1999–2006, the performance of these funds was very similar to other investor classes. The exceptional performance was restricted to venture capital funds that benefited from the technology boom of the 1990s. Thus, buyout funds' performance was nearly identical to other asset classes. Sensoy et al. also explain that in the period 1991–1998, endowments did not beat the other investor classes in their investments of first-time funds, an admission that is probably not restricted and therefore illustrates a real test of selection skill. Additionally, this research suggests that the abnormal growth of fund assets was more likely to be achieved by invest in venture funds with limited access during 1991–1998, noting that under such circumstances, these funds performed remarkably. Finally, the authors state that the maturing has had significant implications for the relationship between GPs and LPs. Supposedly, a considerable amount of capital inflows and commoditization of the industry has lowered the rents to GPs. If, in the future, limited access were to decrease as well, these rents should decrease over time.

Sorensen and Jagannathan (2013) examine the historical performance of private equity funds. They provide a systematical and accurate argument for the Kaplan and Schoar (2005) PME measure of private equity performance. The PME is an accurate economic performance measure when LPs have log-utility preferences and the total returns of LPs are equal to the market return. It is important to note here that PME is usable, aside from the risk of private equity investments. PME is exceptionally sensitive to variations in the timing and systematic risks of the underlying cash flows. Kaplan and Schoar (2005) state that the PME is a realistic measure for LPs because it provides a return to private equity investments that is comparable to public market equities. They find that the prior performance measured both as PME and IRR is solidly related to GPs' capability to raise funds in the future. Additionally, the number of those funds is reasonable, given the authors' hypothesis that the consistency of PMEs and IRRs measures consistency in performance instead of dissimilarity of risk.

Sorensen and Jagannathan (2013) have sought to clarify the strengths and disadvantages of PME while measuring private equity fund performance. They find that the PME is adept at measuring performance despite the underlying risks. The advantages are that this method does not need another kind of processing of cash flows combined with capital calls and distributions, regardless of their different properties. This means that an investor does not need to follow any specific trading strategy, such as reinvesting distributions into the market portfolio. Although their research offers an explicit basis for the PME measure, the authors have also identified some avenues for improvement. They propose a change to improve the statistical precision of the PME measure by using standard methods for GMM estimators and selecting optimally weighted individual observations for a subset. If the LPs coefficient of relative risk aversion deviates from another coefficient, the PME might require some adaptation to illustrate these preferences. In the case that the returns of the LPs' total wealth are different from the market returns, it might be adequate to use discount rates derived from the return on the LPs' total wealth.

Lahmann et al. (2016) analyze the value creation in small and mid-size private equity deals with specific leverage, discussing how private equity companies attempt to increase value in different ways to achieve exceptional returns. They mention that most of the deals belong to the small or mid-sized segments, although the previous literature primarily analyzes large private equity buyouts. The authors find that operational and governance improvements are general value creation measures in all classes of buyouts. Additionally, they observe that in smaller private equity deals, financial engineering is less critical, which means that lower

leverage is required. Moreover, growth is the principal strategic focus in small and mid-sized deals, whereas in large buyouts downsizing and refocusing are prioritized.

European private equity LBOs have been studied by Maeseneire and Brinkhuis (2012), who gathered a sample of 126 European private equity-sponsored buyouts between 2000 and 2007. They indicate that LBOs are typically highly used for debt financing. According to standard view, debt involves many disadvantages, such as decreased financial flexibility and increased bankruptcy costs. However, debt financing also provides many other financial services, for example, tax shields and disciplinary effects. In their sample, an average of 71% of buyout funds financing consisted of debt. The authors found that a new type of junior debt, second-lien debt, entered the European market from 2004. They also note that classical capital structure theories do not explain leverage in LBOs, whereas such theories do so in public companies. The existing conditions of the debt market densely influence the choice of capital structure in LBOs. Thus, when the credit environment loosens, LBOs use more debt because the financial flexibility is higher in the market. Moreover, the authors found that buyout funds with a good reputation had higher leverage levels, allowing them to provide their portfolio firms greater values and more financial flexibility, which enabled these funds to take on more debt.

Marquez et al. (2015) have examined the anomalous patterns of private equity fund returns. They state that private equity funds are fundamentally different from mutual funds, providing two prominent reasons for this claim: first, private equity funds are ambitious to match with healthy companies, while the companies seek to match with talented managers; second, there is greater asymmetric information on private equity fund managers' capability to create value. For this reason, fund managers are entirely motivated to manipulate the expectations of companies regarding the capability to create value; that is to say, to engage in the "signal jamming" of entrepreneurs' expectations. When there is an equilibrium, companies are not tricked, and they create unbiased expectations. Thus, managers cannot benefit from their signal jamming. Marquez et al. (2015) also draw fascinating conclusions concerning the role of asymmetric information in positive assortative matching. In their model, asymmetric information causes too much effort; after all, this might be socially advantageous given that a more thorough examination effort is more likely to conclude with better matching between higher-quality companies and managers. Moreover, the researchers Marques et al. strongly believe that policies that demand additional statements by financial service providers may not be unquestionably socially advisable if they cause lower selection effort or worthless matching.

3.3 Summary of previous literature

Considering the previous literature on private equity, it can be said that research in this field has grown year by year. Risks and returns in the private equity industry have been studied for over 20 years. Fenn et al. (1995) examined the private equity investment returns and risks. More recent studies such as Leeds and Sunderland (2003), Metrick and Yasuda (2010), Robinson and Sensoy (2011), Chapple et al. (2010), and Kend and Katselas (2013) have discussed in more specific detail the private equity returns and risks based on recent results. Jordaan (2018) and MacArthur et al. (2019) have investigated the macro-economic uncertainties due to private equity returns and those financial problems caused by the crisis related to private equity investments.

The previous literature on private equity performance is indicative of the increased interest from scholars in recent years. Most of the studies are based on Kaplan and Schoar's (2005) research on private equity performance. There are also many relevant studies that examine the performance of private equity investments, such as Kaplan and Strömberg's (2009) empirical research on the operating performance of private equity companies. Philippou and Gottschalg (2003) have compared the returns of private equity investments against a public market index. Gresch and Wyss (2010) have examined the performance of large datasets of private equity investments. Harris et al. (2012) have analyzed the performance of buyout and venture capital investments in the U.S. markets. Sorensen and Jagannathan (2013) have studied the historical performance of private equity funds, and they have furnished systematic and accurate arguments for Kaplan and Schoar's (2005) PME measure of private equity performance. Lastly, Braun et al. (2016) have examined the adverse selection and the performance of co-investments.

4. DATA AND METHODOLOGY

This chapter presents the research data and methodology. The results of this research are based on the data and methodology outlined below in Sections 4.1 and 4.2. First, Section 4.1 describes the data more precisely and illustrates how the collected data was utilized in this research. Second, Section 4.2 specifies the primary methodologies used in this research and also clarifies the differences between these different methodologies to make it easier to interpret the results.

4.1 Data

For this research, the vintage year performance data for European buyout funds were taken from the commercial source Preqin. The results consist of the aggregate performance for funds in a specific fundraising vintage year as determined by the data provider. Preqin has gathered performance data from institutional investors, which are acquired using a Freedom of Information Act (FOIA) request. In addition to this, the data is collected directly from the fund managers. All the performance data figures are provided to GPs and FOIA sources, to ensure that all performance calculations are consistent with different methodologies. After this step, Preqin verifies the data to ensure the validity and consistency of this performance data. Hence the data collected from Preqin is mostly accurate and trustworthy information about the private equity markets (Preqin 2018a). Preqin aggregates figures for the private equity industry as well as performance data, and subscribers can use their data to drill down to the fund level. The data from Preqin is unique, timely, accurate, and insightful. Multilingual researchers worldwide collect information in direct cooperation with key decision-makers to ensure the most relevant information for alternative assets is obtained. There is extensive coverage of the data encompassing over 35,000 firms, 65,000 funds, and 18,000 investors globally. Quality is one of the top priorities for Preqin, and the data consequently undergoes a multi-layer verification process that uses cutting-edge technology to ensure the high quality of this data (Preqin 2020).

The sample of this research covers the years 2010–2016, partly because the private equity industry is growing rapidly and the early 2000s contain relatively few fund observations, and partly because the results for recent years are not yet available. This research focuses on private equity buyout funds, giving close attention to three distinct benchmark groups: large, mid, and small. All funds in the sample are geographically focused on Europe. Besides, this

research includes the quarterly performance measures of these funds. These measures are the internal rate of return (IRR), standard deviation, net multiple, residual value to paid-in (RVPI), distributions to paid-in capital (DPI), and called percentage. IRR calculations are presented as median and average values, and all of the performance metrics are shown net of fees. Public market equivalent (PME) methodologies measure the performance of a fund or group of funds. In this research, three different PME methodologies have been utilized: Kaplan-Schoar PME (KS-PME), Long-Nickels PME (LN-PME), and PME+, and to make sure that the values are meaningful, the latest PME values are limited to a six-month lag (the next section provides more detailed information on these methodologies). For the comparison between private equity funds and public market index, the S&P 500, Russell 3000, and MSCI Europe Standard have been selected.

4.2 Methodology

For many decades, modern portfolio theory (MPT) has been appropriate for investors. MPT provides an intellectual framework and the tools for measuring different variables such as performance, risk, and build up portfolios. For private equity investments, however, MPT is not a convenient approach. The main problem for this kind of illiquid asset is that some of the crucial statistics used in MPT are difficult to measure for private equity, especially in the case of alpha, the rate of return from outside the market system. In recent years, various methods have been proposed for estimating alpha in private equity. More precisely, these methods are collectively called PME, and the idea behind such methods is to interpret alpha indirectly by comparing it with the return that could have been invested in some public market benchmark. Moreover, the various PME methods produce quite different results (Oleg et al. 2014). This research employs three different PME methods: KS-PME, LN-PME, and PME+. The Preqin data source provides a PME tool for more meaningful comparison of private equity returns against public market indices. All of the three abovementioned methods use cash flow data from the Preqin database and calculate the comparable returns of the private equity funds. A more detailed description of the methodologies used in this research is offered below.

4.2.1 Kaplan-Schoar PME

Kaplan and Schoar (2005) present an alternative method to compare the returns of private equity portfolios against a public market benchmark. The goal of this method is not to identify an annualized rate of excess return, but instead to explore how much wealthier an investor would have become at a specified time by investing in a private equity portfolio instead of the chosen public market index benchmark.

$$KS-PME = \frac{\sum FV(D) + NAV_{PE}}{\sum FV(C)} \quad (1)$$

Equation (1) above indicates that the private equity portfolio has outperformed the reference public market index. Equation (2) below indicates the opposite. The KS-PME method adequately discounts the private equity fund cash flow by the public market index value. The calculation describes how the discounted distribution plus the current remaining value are divided by the discounted contributions to acquire the ratio (Preqin 2015).

$$KS-PME = TVPI(FV(C), FV(D), NAV_{PE}) \quad (2)$$

KS-PME represents the returns of a strategy that finances the contributions into the private equity portfolio by short sales of the reference public benchmark and reinvesting all the distributions back into the benchmark until time n . The advantage of this method is that it always produces an accurate and reliable solution. The disadvantage of this method is that it does not provide any information on the per-period rate at which the excess wealth has accumulated (Oleg et al. 2014).

4.2.2 Long-Nickels PME

Long and Nickels' (1996) approach integrates a private equity portfolio's cash flows with the returns from the reference public market benchmark to determine the IRR that would have been achieved had the private equity cash flows been made instead in the benchmark. This method assumes that an equal investment matches all the capital calls of the private equity portfolio in the reference benchmark at the time. Thus, all the capital distribution from the portfolio equates it to an identical sale from the reference benchmark. LN-PME calculates the IRR of the private equity portfolio and then calculates the spread against the IRR of the reference portfolio. Equation (3) below describes the residual value of the reference portfolio at time n .

$$NAV_{ICM} = \sum FV(C) - \sum FV(D) \quad (3)$$

Equation (4) shows the IRR of the reference portfolio:

$$IRR_{ICM} = IRR(C, D, NAV_{ICM}) \quad (4)$$

Equation (5) demonstrates the IRR spread of the private equity portfolio by the difference between both IRRs:

$$\Delta IRR = IRR_{PE} - IRR_{ICM} \quad (5)$$

The Long-Nickels approach provides excellent early counseling for institutional investors seeking to adjust annualized returns from private equity investments for general market movements. The main difficulty with this method is that the hypothetical reference portfolio usually does not liquidate as the private equity portfolio does. For example, if the private equity portfolio outperforms the reference portfolio, then the reference portfolio carries a large short (long) position in a later year. When the private equity portfolio is arriving through the liquidation, fluctuation in the benchmark may have approximately no impact on the value of its unrealized investments, although the effect could be seen on the residual value of the

reference portfolio. In these kinds of situations, the LN-PME approach may be unreliable in terms of relative performance (Oleg et al. 2014).

4.2.3 PME+

The PME+ method introduced by Rouvinez (2003) attempts to respond to the shortcomings of the LN-PME approach noted above. The main idea of the PME+ approach is to produce the same residual value in the reference portfolio as in the private equity portfolio at a specific time n , and then to liquidate the reference portfolio in the same way as the private equity portfolio. In this method, we must use a fixed scaling factor to determine identical residual values for the portfolios. Equation (6) below shows the distribution sequence, with the s representing a scaling factor.

$$NAV_{PE} = \sum FV(C) - s \cdot \sum FV(D) \quad (6)$$

$$\Leftrightarrow s = \frac{\sum FV(C) - NAV_{PE}}{\sum FV(D)} \quad (7)$$

Thus, the IRR of the reference portfolio is

$$IRR_{PME+} = IRR(C, sD, NAV_{PE}) \quad (8)$$

The private equity portfolio's IRR spread is defined as

$$\Delta IRR = IRR_{PE} - IRR_{PME+} \quad (9)$$

As mentioned previously, the PME+ method efficiently avoids the difficulties of the LN-PME approach. However, there is also a related problem with the PME+ approach. The sensitivity of the IRR measure to early distributions causes a downscaling or upscaling of distributions in case of outperforming or underperforming by the private equity portfolio. This causes an expanding effect on positive or negative Δ IRR. This well-noted issue with PME+ cannot be calculated. If there are no distributions by the younger private equity portfolios, and if there are only a few distributions that have appeared, the scaling factor s may be negative and change distributions into additional contributions. Unlike the Long-Nickels method, PME+ does not create an investible portfolio, because the distribution scaling factor s adapts all distributions based on the NAVPE at the time of the analysis. For this reason, the real investor cannot follow the non-causal processes of the PME+ approach (Oleg et al. 2014).

4.3 Descriptive statistics

In this section, we restrict the sample of the research to funds for which the vintage was between 2010 and 2016. The funds are divided into three different groups – large, mid, and small – and the geographical focus for all the funds is in Europe. The size of small buyout funds is less than \$500 million, mid buyouts funds are between \$501 million and \$1.5 billion, and large buyouts are between \$1.5 billion and \$4.5 billion. Table 1 represents the descriptive statistics for the subsample of 757 individual buyout funds collected from Preqin. Of the subsample, 4% are large buyout funds, 38% mid buyout funds, and 58% small buyout funds. The constituent size of all the funds is \$418 billion. Of that amount, the large buyouts share is 17%, with 61% for mid funds and 23% for small funds. The average fund sizes in this sample are as follows: \$2.33 billion for large buyouts, \$880 million for mid buyouts, and \$220 million for small buyouts. The average size of all the funds is \$550 million.

The first cell in the table is mean fund size; the amount of capital that is committed to a fund is measured as the dollar. The second row represents the median net IRR (%), the third row mean net IRR (%), the fourth row weighted net IRR (%), while the fifth shows the standard deviation, and the last row indicates the number of observations. The first column presents the full sample of all the funds of this research; the second column indicates large funds, the third mid funds, and the fourth small funds. The median net IRR for all funds is 14.42% and the mean 15.01%. Large funds returns are slightly lower, with a median of 12.76% and a mean of 12.94%. However, still lower returns appear for mid funds: the median net IRR is 10.59% and the mean 8.9%. Small funds show the highest returns, with

a median return of 17.19% and a mean of 19.38%. The standard deviation is smallest for large funds (7.93%), greater for mid funds (13.41%), and highest for small funds (15.33%).

Table 1. Descriptive Statistics

Sample	All Funds	Large Funds	Mid Funds	Small Funds
Size (Mn)	550	2 330	880	220
Median Net IRR (%)	14.42	12.76	10.59	17.19
Mean Net IRR (%)	15.01	12.94	8.90	19.38
Standard Deviation	14.19	7.93	13.41	15.33
No. of Observations	757	30	287	440

Table 2 below presents the private equity funds' performance more specifically. Net multiple shows how many times investors have or likely would have got their money back and made a profit for their investments. For all the funds this value is more than 1. All the funds are making a profit, and the small funds seem to be the most profitable type. RVPI-% presents the value of a fund's unrealized value. It is higher in the beginning, and over time it will fall when most of the fund value resides in active portfolio companies. RVPI is more than 90% of all the funds, and it indicates that most of the invested capital is still tied up in the equity of the funds. DPI-% indicates how much capital was returned to the investors at the valuation date. Half the capital (50%) is returned to the investors in the small funds, while in the large funds only 1.2% is returned. Called-% measures the cumulative LPs' capital invested relative to the total capital committed by the LPs; all the funds are relatively close to each other.

Table 2. Measuring private equity performance

Sample	All Funds	Large Funds	Mid Funds	Small Funds
Net Multiple (x) Median	1.4	1.3	1.3	1.5
RVPI (%) Median	94	122.1	94.7	90.8
DPI (%) Median	37.7	1.2	28	47.9
CALLED (%) Median	78.7	75.4	74.2	82.2

5. ANALYZING PRIVATE EQUITY PERFORMANCE

This section defines private equity performance and compares it to the performance of the S&P 500, Russell 3000, and MSCI Europe Standard. In these primary analyses, the attempt is not to adjust for differences in systematic risk. The performance of the funds is reported in two different ways: 1) The IRR of the funds calculated by Preqin, and 2) the public market equivalent (PME). The PME compares investments in a private equity fund to investments in the S&P 500, the Russell 3000, and the MSCI Europe Standard. All the PME calculations are aggregated from Preqin.

5.1 Performance of private equity funds

PMEs are metrics for measuring the performance of a fund or group of funds against an appropriate public market total return index, while accounting for the timing of the fund cash flows. To ensure that values are meaningful and based on a significant dataset, the latest PME values are restricted to a six-month lag. KS-PME discounts fund cash flows by the public market index value. The discounted distributions plus the current remaining value are divided by the discounted contributions to acquire the ratio. If the ratio is greater than one, it indicates that a private equity fund or group of funds outperforms the selected public index.

Table 3. KS-PME performance

Sample	All Funds	Large Funds	Mid Funds	Small Funds
S&P 500 KS-PME	1.09	1.03	1.07	1.11
RUSSELL 3000 KS-PME	1.10	1.04	1.08	1.12
MSCI EUROPE STANDARD KS-PME	1.30	1.13	1.26	1.34

Table 3 above indicates that all private equity funds outperformed the selected public market indices. In the large funds, the S&P 500 index seems to be closest to a private equity fund return, but the Russell 3000 performed to a similar level. The MSCI Europe Standard is the least effective in this class. In the mid private equity fund class, the results look very similar to those in the large funds class. Mid private equity funds outperform public market indices better than large funds. The most significant differences are in the small funds class, where the returns are better in every index than for the average of all the funds. Kaplan and

Schoar (2005) have obtained a quite similar result in their research. Their value-weighted performance result for the PME was an average of 1.05, which indicates that private equity investments slightly outperformed the S&P 500 on average. The equal-weighted average returns net of fees of 0.96 is lower than this study's average of all funds of 1.09. Large funds are closest to S&P 500 returns and also closer to the same results than reported by Kaplan and Schoar. As expected, mid and small funds perform better than large funds due to more volatile companies. However, there is a striking difference between MSCI Europe's performance and the other indices in every fund class. Harris et al. (2012) have examined private equity buyout PMEs from 1984 to 2008. They determine that the average of the weighted average PME is 1.27, the average of average is 1.22, and the average of the medians is 1.16. The authors used the average returns for PMEs for U.S. buyout funds, and their benchmark index was the S&P 500. Their average median PME of 1.16 is slightly higher than my result of 1.09 for all funds compared to the S&P 500.

Table 4 below represents private equity funds' performance against public market indices, as measured by the LN-PME methodology. For the large private equity funds, the median net IRR is higher than any of the three public index IRRs. The S&P 500 and Russell 3000 yielded almost the same return, with 11.48% and 11.23% respectively, but the MSCI Europe Standard only managed 5.51%. This finding suggests the S&P 500 is closest to the large fund's return, while the MSCI Europe Standard is far behind. Large funds outperformed the S&P 500 by 1.28%, the Russell 3000 by 1.53%, and the MSCI Europe Standard by 7.25%. For the mid private equity funds, the results are different. The median net IRR for these private equity funds is 10.59%, and the comparison public indices' return is 12.93% for the S&P 500, with 12.61% for the Russell 3000. These results indicate that investors would make more profit from investing in public market indices. Once again, the return of the MSCI Europe Standard index is the worst, at only 5.06%. The S&P 500 outperformed mid funds by 2.34%, and the Russell 3000 outperformed such funds by 2.02%. In contrast, the MSCI Europe Standard underperformed mid funds by 5.53%. In the small private equity funds, the differences are the most significant. The median IRR of small private equity funds is 17.19%, while the benchmark indices' returns are 12.26%, 12.02%, and 4.76% respectively for the S&P 500, the Russell 3000, and the MSCI Europe Standard. In this class, the private equity funds' performance was outstanding compared to the selected public market indices: small private equity funds' median return IRR is 4.93% better than the S&P 500, 5.17% better than the Russell 3000, and 12.43% better than the MSCI Europe Standard.

However, Long and Nickels (1996) found that if the cash flows cash is invested into or withdrawn from the S&P 500 in the same way as private equity investment cash flows, the

total IRR is 2,09%, which indicates that private equity investment outperforms the S&P 500. Harris et al. (2012) obtained similar results to Long and Nickels (1996): they calculated that the average return of private equity buyout funds was 6.6% greater than if the same amount of money had been invested in the S&P 500, while the median was 3.4%. Overall, the outperformance of their results compared to the S&P 500 annually is 3.70%, whereas this figure is 1.94% in this research and 2.09% in Long and Nickels (2006). Higson and Stucke (2012) examined U.S. buyout funds from the Cambridge Associates' private equity fund database. The authors' sample consisted of 556 funds for the vintage year from 1986 to 2008. According to their research, U.S. buyout funds have outperformed the S&P 500 almost every year since 1980. The capital-weighted average IRR for 1980 to 2008 vintage year is 5.44% higher than for equivalent investments in the S&P 500. Taken together, these studies all indicate similar results: private equity funds outperformed relative to the public market equities in almost every fund class.

Table 4. LN-PME performance

Sample	All Funds	Large Funds	Mid Funds	Small Funds
Median Net IRR (%)	14.42	12.76	10.59	17.19
Mean Net IRR (%)	15.01	12.94	8.90	19.38
Standard Deviation	14.19	7.93	13.41	15.33
S&P 500 LN-PME (%)	12.48	11.48	12.93	12.26
RUSSELL 3000 LN-PME (%)	12.21	11.23	12.61	12.02
MSCI EUROPE STANDARD LN-PME (%)	4.92	5.51	5.06	4.76

Table 5 below represents PME+, the last methodology used to compare private equity funds to public market indices. These results are also similar to those obtained using the LN-PME methodology. In the large funds class, the returns are 12.01% for the S&P 500, 11.59% for the Russell 3000, and 5.19% for the MSCI Europe Standard. In this sample, the first two indices produce a better return than with the previous method, but the MSCI Europe Standard return is weaker compared to the LN-PME results. The large funds' median IRR outperformed the S&P 500 by 0.75%, the Russell 3000 by 1.17%, and the MSCI Europe Standard by 7.57%. In the mid funds, the class results are similar to those obtained with the prior methodology. The S&P 500 return is 13.21%, with 12.89% for the Russell 3000, and these two indices outperformed the mid private equity funds, whose median IRR is 10.59%.

The MSCI Europe Standard decreased further, with a return of 4.91%, which is much lower than the median IRR of mid funds (10.59%). In this class, the private equity mid funds underperformed the S&P 500 by -2.62% and the Russell 3000 by -2.30%, but outperformed the MSCI Europe Standard by 5.68%. In the small funds class, the return is 12.53% for the S&P500, 12.24% for the Russell 3000, and 4.63% for the MSCI Europe Standard. Small funds outperformed the S&P 500 by 4.66%, the Russell 3000 by 4.95%, and the MSCI Europe Standard by 12.56%.

Table 5. PME+ performance

Sample	All Funds	Large Funds	Mid Funds	Small Funds
Median Net IRR (%)	14.42	12.76	10.59	17.19
Mean Net IRR (%)	15.01	12.94	8.90	19.38
Standard Deviation	14.19	7.93	13.41	15.33
S&P 500 PME+ (%)	12.77	12.01	13.21	12.53
RUSSELL 3000 PME+ (%)	12.46	11.59	12.89	12.24
MSCI EUROPE STANDARD PME+ (%)	4.77	5.19	4.91	4.63

Rouvinez and Capital Dynamics (2003) investigated whether private equity outperforms public market equities. They compared private equity IRR and the S&P 500 total return using PME+. In their analysis, the total pooled private equity returns from 1980 to 2000 yielded 14.4% IRR, and during the same period, the S&P 500 total return for PME+ was 9.2%. This result indicates an over 5% premium for illiquidity. In my research, the large funds median IRR outperformed the S&P 500 by 0.75%, the Russell 3000 by 1.17%, and the MSCI Europe Standard by 7.57%. Results in the mid funds class are variable: mid funds underperformed against the S&P 500 by -2,62% and the Russell 3000 by -2,30%, but outperformed relative to the MSCI Europe Standard by 5.68%. The most considerable differences are in small funds, which outperformed the S&P 500 by 4.66%, the Russell 3000 by 4.95%, and the MSCI Europe Standard by 12.56%.

Table 6 below represents all private equity funds' returns by vintage year. The time horizon is from 2010–2016, and the total amount of observations is 757. In 2010, there are 50 funds in this sample; the median net IRR is 7.52%, the mean net IRR is 6,61%, and the standard deviation is 12.71. This year's returns are lower than in the following years. In 2011 and 2012, there are considerably more observations: 249 and 205. The returns are better than

in 2010, while the median net IRRs are 13.89% and 13.88%. 2013 has 75 observations, and the median net IRR is 12.79%, and the standard deviation is notably lower than in any other year in this sample (7.10). In 2014, returns are significantly higher than in any other year. The median net IRR is 26.22%, the mean net IRR is 23.24%, and the standard deviation is 24.56. In 2015 and 2016, the returns are similar: the median net IRRs are 15.19% and 15.60%, while the standard deviations are 10.30 and 12.92, respectively. It can be said that there are two apparent exceptions in the sample: the unquestionably poor returns in 2010, with a median net IRR of only 7.52% and a mean of 6.61%, along with the strong returns in 2014, when the median net IRR was significantly high at 26.22%, while the mean net IRR was 23.24%.

Table 6. Private equity returns by vintage year.

Sample		All Funds		
Year	Obs	Median Net IRR (%)	Mean Net IRR (%)	Standard Deviation
2010	50	7.52	6.61	12.71
2011	249	13.89	16.85	16.71
2012	205	13.88	12.86	13.24
2013	75	12.79	12.88	7.10
2014	41	26.22	23.24	24.56
2015	95	15.19	16.69	10.30
2016	42	15.60	16.49	12.92

5.2 Risk and return of private equity funds

Figure 6 exhibits the risk and return of private equity funds against public market indices. The risk of buyout funds is measured by the standard deviation of net IRR and public market indices; the standard deviation is the average for the last ten years. The return of private equity funds is median net IRR, while for the public market indices, it is the median net IRR of the LN-PME methodology. The vintage for the whole sample is between 2010 and 2016.

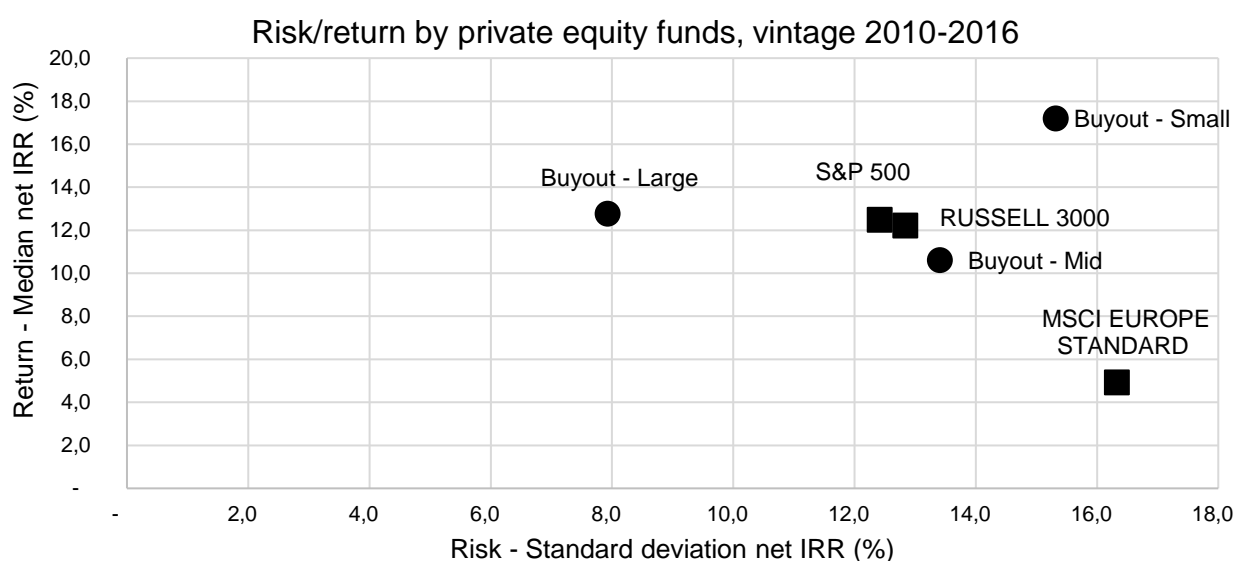


Figure 6. Risk and return of private equity funds against public market indices vintage 2010–2016

The chart above illustrates that across the vintage year, small buyouts provide the highest median net IRR at 17.2% with a corresponding standard deviation of 15.3%. Mid buyouts provide a median IRR at 10.6% with a standard deviation of 13.4%. Large buyouts provide a median net IRR at 12.8% with a standard deviation of 7.9%. Small buyouts present the highest risk level but also the highest returns, whereas the smallest risk level is for the large buyouts, which offer fairly modest returns. Among the public market indices, the S&P 500 provides the highest median net IRR at 12.5%, with a corresponding standard deviation of 12.4. The Russell 3000 median net IRR is 12.2%, with a standard deviation of 12.8%. These two publicly quoted indices are especially close to each other here, while the MSCI Europe Standard is far behind, with a median net IRR of 4.9% and the highest standard deviation of 16.3%. Surprisingly, large buyouts provide better returns than any of the public market indices, and the risk is significantly lower. Large buyouts offer the best selection of risk-return performance, and the MSCI Europe Standard Index provides the worst result.

Phillips (2018) has closely examined risk and variation in returns in private equity investments. His research focuses on private equity and growth equity, excluding early-stage venture funds. He also proposes a new method to take account of risk and variation in returns in private equity investments. It is relevant to note here that using standard deviation across individual investments differs from the usual Sharpe ratio that is commonly used in public markets. In private equity, Sharpe's ratio is not useable due to the challenge of individual investments that are not "market-to-market" every month or quarter because there is no publicly traded market price and the cash flows are seldom realized over time. In Phillips (2018) research, the top-quartile performance of the portfolio median return ranges from 23.57% to 60.74%. In addition, the variation of the standard deviation of returns is quite large: for the private equity investment, it ranges from 31.5% to 228%. This indicates the limitation of this method; thus, it is necessary to develop a method that considers both central tendency and the standard deviation. Phillips' research results are significantly different from mine. In my research, the net IRR figures are simply plugged into the regular standard deviation formula. Considering all the funds together, the median return range is from 7.52% to 26.22%, and the variation of the standard deviation ranges from 7.10% to 24.56%. This standard deviation range is considerably smaller than in Phillips' research.

6. SUMMARY AND CONCLUSIONS

In this research, I examine the performance of private equity buyout funds by using data from the Preqin database. The sample consists of three different sized buyout fund classes from the period 2010 to 2016. The performance of the funds is compared to publicly quoted indices, and all the returns are expressed as net of fees. The core purpose of this research is to analyze the performance of different sizes of private equity funds' returns and compare those returns to the benchmark indices using different methodologies. This topic has been studied for decades, with a focus on investigating the performance of private equity funds and comparing the returns with publicly traded indices. There are various approaches to this research problem, and most of these studies are based on the empirical findings of Kaplan and Schoar (2005), Long and Nickels (1996), and Rouvinez (2006).

Before answering the main research question on whether there are performance differences between private equity buyout funds and publicly quoted indices, the sub-question results are summarized. The first sub-question concerns the previous literature on private equity performance, while the second considers how the performance of different methodologies varies among these approaches.

What does the previous literature state about private equity performance?

When discussing the economics of private equity investments, the previous literature mainly considers aggregated trends in the private equity industry or the relationship between GPs and entrepreneurs. The challenge of obtaining information on the performance of private equity investments has limited the amount of previous literature in this field. Nevertheless, there are confirmed findings that private equity investments have outperformed against other investment classes over many decades, while the returns of private equities are higher than publicly traded equities. In most of the previous literature, the performance calculations are measured using PME or IRR. There is a relationship between fund size and GPs' experience with performance, and larger funds have higher PMEs, though when funds have grown too large, the performance declines. In addition, the relationship with fund size is concave, which indicates declining returns to scale, and the GPs' record of performance is positively related to the capability to attract capital into new funds. Moreover, private equity funds that invest during periods of high public market performance, favorable financial

situation, and declining corporate bond yields, show higher IRRs. This outcome indicates that private equity funds achieve pro-cyclical returns.

More recently, most articles examine the risk and returns characteristics alongside the performance drivers of private equity investments. Previous studies have provided analyses of private equity returns based on actual cash flows by looking at returns of large institutional investors. Increasingly, LPs need to monitor the excessive amount of previous funds to recognize private equity firms with higher expected future returns with equitable certainty. Financial engineering plays an essential role in elevating the performance of private equity investments. There are a few opportunities to take advantage of debt in private equity deals: for instance, the tax-deductibility of interest payments. In addition, it is empirically supported that debt in the portfolio companies of private equity firms has a robust positive influence in equity IRR, but it also has its downsides. Nonetheless the conclusion of previous literature about the performance of private equity buyout funds is robust, and the outperformance of such funds compared to public indices is significant. Even if the absolute performance of private equity is low, it does not underperform relative to public equity. Therefore, parallel movement between public and private capital markets is crucial for understanding the returns that investors experience.

The review of previous literature in this thesis investigates the performance of private equity and what kinds of factors affect it. By examining different methodologies to measure the performance of private equity investments and enabling their comparison with public indices, the following research sub-question is answered:

How do the results obtained by the public market equivalent (PME) measure of private equity returns differ among the three selected methodologies?

Three different methodologies have been used in this thesis to measure the performance of private equity funds and compare these funds to public equities. The main idea behind these PME methods is to interpret alpha directly by comparing it with the return that could have been invested in some public market indices. The first method, KS-PME, is the market-adjusted equivalent of the traditional TVPI. The two other methods, LN-PME and PME+, are the market-adjusted equivalents of the traditional IRR.

In KS-PME, the main idea is to discount fund cash flows by the public market index value. The discounted cash flows added with the current remaining value are divided by the

discounted contributions to acquire the ratio. In this research, the ratio was over 1 in every buyout fund class, which indicates that the KS-PME statistics generated represent the outperformance of the private equity fund. Both the LN-PME and PME+ methods represent the results as the annualized rate of return. In these methods, private equity outperforms if the estimated private equity fund IRR is higher than the PME IRR. In LN-PME, contributions to private equity funds are transformed into an equal acquisition of shares in the public index, and distributions present the liquidation of shares in the public index. In contrast, PME+ uses a definite scaling factor to convert each distribution to ensure the PME final period's remaining values are the same as the private equity fund remaining value. The IRR calculations in LN-PME utilize the identical contributions and distributions as a private equity fund, but with a different final period remaining value, whereas PME+ utilizes modified contributions and distributions but with an identical final period remaining value. When considering the performance results of this research, it is self-evident that the results obtained by the LN-PME and PME+ methods are highly comparable. The PME+ method provides a higher rate of returns in all buyout classes when compared to the S&P 500 or Russell 3000, but in the case of the MSCI Europe Standard, LN-PME provides a higher rate of returns. However, as noted, the differences between these two methods are minimal. Ultimately, all three of these methodologies indicate that private equity buyout funds outperformed publicly quoted indices over the sample period.

Having addressed the above sub-questions about the previous literature on private equity performance and the differences between performance measurement methodologies, the main research question of the thesis can now be answered.

Do performance differences exist between private equity funds and publicly quoted indices?

When looking at the performance results of the KS-PME method, clearly, every size class including small, mid, and large private equity funds, outperforms compared to the S&P 500, Russell 3000, and MSCI Europe Standard. The most significant performance differences with publicly quoted indices are with small funds and the closest with large funds. The S&P 500 performance is closest to the private equity buyout funds' performance. Moreover, the performance of the Russell 3000 is very close to the S&P 500 performance. The MSCI Europe Standard performance is the weakest and farthest from the returns of private equity funds, and it is therefore the worst benchmark. Kaplan and Schoar (2005) investigated the

private equity buyout investments average returns net of fees 1.05 value-weighted, and they suggest that the average returns to private equity exceeded the returns of the S&P 500. In this research, the results were similar, but the performance differences were clearly more significant, and the average returns to all private equity funds net of fees 1.09.

The LN-PME method provides a quite similar result to the KS-PME method. The average median net IRR of large buyout funds is higher than the S&P 500 by 1.28%, and it exceeds the Russell 3000 by 1.53% and the MSCI Europe Standard by 7.25%. However, in the mid buyout funds class, the average median net IRR is lower than the S&P 500 by 2.34% and the Russell 3000 by 2.02%. This finding indicates that in the period from 2010 to 2016, the investor would have earned more by investing in the S&P 500 or Russell 3000 than in mid buyout funds. Nonetheless, mid buyout funds still outperformed the MSCI Europe Standard by over 5.53%. Once again, the largest performance differences are found in the smallest funds. The small buyout funds median net IRR is higher than the S&P 500 by 4.93%, the Russell 3000 by 5.17%, and the MSCI Europe Standard by 12.43%. The S&P 500 index seems to be closest to the performance of large and small private equity buyout funds, while the Russell 3000 is closest to the performance of the mid buyout class. Somewhat unexpectedly, mid buyout funds underperformed compared to the S&P 500 and Russell 3000, whereas the KS-PME results were completely different in that class. Long and Nickels (1996) obtained quite similar results to this research. In their study, the S&P 500 total return with the same timing of fund cash flow as private equity investments would underperform private equity investments by 1.09%, whereas in this research, the average performance would exceed the S&P 500 by 1.94%, when considering all buyout funds.

Looking at the PME+ method, the results are very close to those for the LN-PME method. The average median net IRR of large buyout funds is higher than the S&P 500 by 0.75%, and it exceeds the Russell 3000 by 0.42% and the MSCI Europe Standard by 7.57%. In the mid buyout funds class, the average median net IRR is lower than the S&P 500 by 2.62%, the Russell 3000 by 2.30%, and the MSCI Europe Standard by 5.68%. In the small buyout fund class, the average median net IRR of funds is higher than the S&P 500 by 4.66%, the Russell 3000 by 4.95%, and the MSCI Europe Standard by 12.56%. The performance of these funds is hand-in-hand with the KS-PME method, and the performance of the S&P 500 still appears to be closest to the private equity buyout fund classes, although the Russell 3000 performance is also at a similar level. Conspicuously, the MSCI Europe Standard index performance is far below the performance of private equity buyout funds. Rouvinez (2003) has shown that private equity investments from 1980 to 2000 yielded 14.4%, while the S&P 500 yielded 9.2% over this period; thus, private equity investment outperformed

publicly quoted equity by 5.2%. In this research, all buyout funds on average outperformed the S&P 500 by 1.65%, and only the small buyout funds achieved almost as good a performance as Rouvinez reports in his study.

Overall, all of these three methods provide a unique result for private equity performance. Since the KS-PME method indicates that private equity buyout funds outperformed publicly quoted indices in every class, its results imply that larger and more stable buyout funds' performance is closer to the performance of public indices, while volatility in small funds' performance is much higher. Looking at the performance of public indices, the S&P 500 performed best, followed by the Russell 3000, and lastly, the MSCI Europe Standard. The results of the LN-PME and PME+ methods were very close to each other and differed slightly from the KS-PME method. Large and small buyout funds beat out all the indices and strongly outperformed the MSCI Europe Standard index. Nevertheless, mid buyout funds underperformed compared to the S&P 500 and Russell 3000, which is somewhat unexpected. In the end, the S&P 500 return was closest to private equity buyout funds' return, while the Russell 3000 performance was slightly weaker than the S&P 500. The performance of the MSCI Europe Standard index, however, was far behind the private equity buyouts funds, especially when compared to small buyout funds. According to this research, the best public benchmark for large private equity buyout funds is the S&P 500, while the MSCI Europe is the worst. For mid private equity buyout funds, the most suitable benchmark is the Russell 3000. When considering the results of the small private equity buyout fund, the Russell 3000 was the best suited benchmark, even if there was a significant difference in performance.

One especially intriguing avenue of future research on private equity performance concerns the performance of global economy under a public health-related financial crisis. The recent coronavirus pandemic that has shaken the whole world and impacted the global economy arrived abruptly and spread rapidly. The sense of panic is spreading everywhere, and the stock market is diving without the probable outcome of these losses being clear. Above all, it would be interesting to examine how private equity buyout funds survive during these kinds of shocks, while also comparing the performance of publicly quoted indices and private equity funds. In addition, it would be fascinating to observe how quickly the private equity industry is able to recover after such global economic gloom. Following the last global downturn, many private equity firms recognized that the global financial crisis represented some of the best buying circumstances of all time, and private equity firms have now gathered a record-breaking stack of dry powder for future deals. However, when the dust settles, we will see a declining amount of leverage on balance sheets and slackening

economic growth that will head off falling private equity returns. At the same time, the coronavirus pandemic has infected the whole stock market and is putting the investors' psychology to the test, while the stock market is crashing harder than ever before in history. It is challenging to anticipate whether the private or public market recovery will be faster under these circumstances, but one thing is certain: the current financial market conditions are undoubtedly unsteady and black swans exist. Thus, investors should carefully evaluate a wider range of disturbing scenarios when considering new investments.

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