View metadata, citation and similar papers at core.ac.uk

brought to you by CORE

provided by ScholarlyCommons@Penn

University of Pennsylvania
ScholarlyCommons

Joseph Wharton Scholars

Wharton Undergraduate Research

2018

An Investigation of Private Equity Buyout Performance During the 2007-2009 Financial Crisis

Frederick W. R. Jordaan
University of Pennsylvania

Follow this and additional works at: https://repository.upenn.edu/joseph_wharton_scholars

Part of the Finance and Financial Management Commons

Recommended Citation

Jordaan, F. W. (2018). "An Investigation of Private Equity Buyout Performance During the 2007-2009 Financial Crisis," *Joseph Wharton Scholars.* Available at https://repository.upenn.edu/joseph_wharton_scholars/55

This paper is posted at ScholarlyCommons. https://repository.upenn.edu/joseph_wharton_scholars/55
For more information, please contact repository@pobox.upenn.edu.

An Investigation of Private Equity Buyout Performance During the 2007-2009 Financial Crisis

Abstract
This paper investigates the net-of-fees performance of North American and European Private Equity Buyout Funds (vintages 2002 – 2007) that invested in the 2007-2009 financial crisis. To evaluate performance this study looks at both absolute return metrics such as Internal Rate of Return (IRR) and Total Value to Paid-In (TVPI) and the relative public market equivalent (PME) method conceived by Kaplan and Schoar (2005). This research builds on a 2015 Gianfrate and Loewenthal study by utilizing an updated March 31st, 2018 Preqin Private Equity Cash Flow database to gather date-specific fund-level cash flow data on 249 buyout funds as well as Bloomberg historical return data on ten public equity indices. The present study found a mean buyout IRR of 12% and a TVPI of 1.68, slightly lower than that observed in prior research. However, overall 2002-2007 buyout funds did substantially and consistently outperform their respective public market benchmarks with an average PME, calculated using relevant public benchmarks, of 1.11 for North American buyout funds and 1.10 for European buyout funds. The study also observed a significant downward PME trend on the vintage level between 2002 and 2007 as well as a positive relationship between fund size and performance.

Keywords
Private Equity, Buyout, Performance, Financial Crisis

Disciplines
Business | Finance and Financial Management

This thesis or dissertation is available at ScholarlyCommons: https://repository.upenn.edu/joseph_wharton_scholars/55

AN INVESTIGATION OF PRIVATE EQUITY BUYOUT PERFORMANCE DURING THE 2007 – 2009 FINANCIAL CRISIS

By

Frederick W. R. Jordaan

An Undergraduate Thesis submitted in partial fulfillment of the requirements for

the

JOSEPH WHARTON SCHOLARS PROGRAM

Faculty Advisor:

Burcu Esmer, Ph.D.

Department of Finance

THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA

MAY 2018

TABLE OF CONTENTS

I. ABSTRACT

This paper investigates the net-of-fees performance of North American and European Private Equity Buyout Funds (vintages 2002 – 2007) that invested in the 2007-2009 financial crisis. To evaluate performance this study looks at both absolute return metrics such as *Internal Rate of Return* (IRR) and *Total Value to Paid-In* (TVPI) and the relative public market equivalent (PME) method conceived by Kaplan and Schoar (2005). This research builds on a 2015 Gianfrate and Loewenthal study by utilizing an updated March 31st, 2018 Preqin Private Equity Cash Flow database to gather date-specific fund-level cash flow data on 249 buyout funds as well as Bloomberg historical return data on ten public equity indices. The present study found a mean buyout IRR of 12% and a TVPI of 1.68, slightly lower than that observed in prior research. However, overall 2002-2007 buyout funds did substantially and consistently outperform their respective public market benchmarks with an average PME, calculated using relevant public benchmarks, of 1.11 for North American buyout funds and 1.10 for European buyout funds. The study also observed a significant downward PME trend on the vintage level between 2002 and 2007 as well as a positive relationship between fund size and performance.

Keywords:
Private Equity, Buyout, Performance, Financial Crisis

Discipline:
Finance

II. INTRODUCTION

Private Equity (PE) is often broadly defined as the investment of risk capital[1] into non-publicly[2] held companies. PE firms acquire businesses or take stakes in them (often also taking public companies private by purchasing most of their publicly traded shares) in order to reshape their businesses, streamline operations and apply financial engineering tactics to harvest and eventually sell these holdings for a profit. Further, PE can be seen on a spectrum with two main forms focusing on each end of the business cycle: venture capital (VC) which aims to help young firms grow; and leveraged buyouts (BO), which is used to improve mature, established businesses.

The inception of PE can be traced back to the earliest days of commercial activity. In fact, the Spanish monarchy who financed the expeditions of Christopher Columbus was, in some sense, a PE investor[3]. Starting in the industrial revolution PE activity quickly picked up with investors becoming more comfortable acquiring businesses and making minority investments, however, the domain of PE financing remained in the hands of ultra-wealthy individuals and families such as the Rockefellers, Vanderbilts and Warburgs. Towards the beginning of the 1900s J.P. Morgan would frequently engage in large-scale financing of industrial companies

[1] Risk-Capital: Capital that, in contrast to debt, which might be more secure, is invested in equity in return for ownership positions

[2] Non-Publicly: Private companies and non-publicly held; illiquid securities

[3] Leleux, Benoit, Hans Van Swaay, and Esmeralda Megally. *Private equity 4.0: reinventing value creation*. Chichester, West Sussex: Wiley, 2015.

and railroads with its acquisition of Andrew Carnegie's steel company in 1901 often considered the first true modern buyout[4].

It was only until the latter half of the 20th century when PE turned into a professional, large-scale industry and established itself as an important and attractive asset class to institutional investors across the globe. Today, PE firms are managing and raising capital at record levels with over $2.6 trillion in global assets under management (AUM) and a record $963 billion of dry powder ready to be deployed. In 2017 alone, global buyout value grew 19% to $440bn with global deal count standing at 3,077 deals[5]. Apollo Global Management was able to raise a record $25 billion IX fund[6] and Softbank's technology-focused Vision Fund raised over $93 billion[7] both reflecting the popularity of committing capital to PE funds. PE, as an alternative asset class and organization form, can now be found throughout most of the world; however, activity remains concentrated in the Americas and Western Europe. Kaplan and Stromberg (2009) tallied more than 21,000 PE BOs worldwide between 1970 and 2007 with the total value of firms acquired, counting both equity and debt, surpassing $3.6 trillion. Today, Bain & Company reports that there are

[4] "Andrew Carnegie." Biography.com. November 22, 2016. Accessed December 16, 2017. https://www.biography.com/people/andrew-carnegie-9238756.
[5] "Global Private Equity Report 2017 - Bain & Company." Accessed December 16, 2017. goo.gl/cLmQMt
[6] Louch, William. "Apollo Breaks Record as Investors Flock to Buyout Funds." The Wall Street Journal. June 27, 2017. Accessed December 16, 2017. https://www.wsj.com/articles/apollo-breaks-record-as-investors-flock-to-buyout-funds-1498588118.
[7] Russell, Jon. "SoftBank's massive Vision Fund raises $93 billion in its first close." TechCrunch. May 20, 2017. Accessed December 16, 2017. https://techcrunch.com/2017/05/20/softbank-vision-fund-first-close/.

over 7,500 active PE firms worldwide including around 1,250 buyout firms actively looking to complete deals, a number that has only risen steadily[8].

When evaluating PE the first question that arises is ultimately that of performance. The importance of estimating the performance of PE funds is quintessential for a wide variety of reasons including portfolio theory, making investment decisions, allocating capital across asset classes and the value creation of the industry as a whole. The debate around PE performance also fits into the larger academic discourse revolving around the performance of professional investment managers including that of asset managers, mutual funds, hedge funds, etc. as well as with respect to answering questions around market efficiency and investor sophistication.

Since there is no transparent accessible public market for private equity and Limited Partners (LPs) are not required to report performance or cash flow data of their funds, researchers, particularly before the early 2000s, found it difficult to measure returns in the industry reliably. Among the limited databases that were available, data were often missing, anonymized and summarized making it hard to validate and analyze.

The seminal study in this field is that of Kaplan and Schoar (2005) in which they analyzed the performance of 746 PE funds between 1980 and 1995 and found that US buyout returns were very close to but slightly below that of the S&P 500 Index on

[8] "Global Private Equity Report 2017 - Bain & Company." Accessed December 16, 2017. goo.gl/cLmQMt

a net-of-fees basis[9]. Since PE is assumed by the investment community to have less attractive liquidity and risk properties to the public markets, this initial result indicated performance was low.

Phalippou and Gottschalg (2006), taking a critical look at Kaplan and Schoar's work, found that their performance findings were inflated[10]. This was a result of firstly sampling bias of the selected funds in the study, which were shown to be better performers than non-selected funds, and secondly the inflation of so-called Residual Value (RV) or Net-Asset-Value (NA) of non-exited investments on the PE firms' books when in turn they were worthless investments. After both these adjustments, Phalippou and Gottschalg found that PE funds actually underperformed the S&P 500 by 3 percent annually. However, in a later 2012 study, Phalippou, as well as Stucke in his 2012 paper, noted that there was evidence of substantial missing cash flow data that could have resulted in a negative bias for measured performance.

Within PE strategies more specifically Hwang, Quigley, and Woodward (2005)[11] and Cochane (2005)[12] studied individual VC investments and also found a net-of-fees performance below that of the S&P 500. However, for BOs, David Swensen, chief investment officer at Yale University, found that after examining data on 542

[9] Kaplan, Steven N., and Antoinette Schoar. "Private Equity Performance: Returns, Persistence, and Capital Flows." *The Journal of Finance*60, no. 4 (2005): 1791-823. doi:10.1111/j.1540-6261.2005.00780.x.
[10] Phalippou, Ludovic, and Oliver Gottschalg. "Performance of Private Equity Funds." *SSRN Electronic Journal*, 2006. doi:10.2139/ssrn.473221.
[11] Hwang, Min, John M. Quigley, and Susan E. Woodward. "An Index For Venture Capital, 1987-2003." *Contributions in Economic Analysis & Policy*4, no. 1 (2005). doi:10.2202/1538-0645.1180.
[12] Cochrane, John. "The Risk and Return of Venture Capital." 2005. doi:10.3386/w8066.

buyout deals that BO performance outperformed that of the S&P 500[13]. However, he did note that if one had invested in the S&P 500 with a similar leverage profile to PE investments of around a 60% net debt-to-enterprise value ratio, then the results would not have been as positive[14].

Further, a 2014 study by Harris, Jenkinson & Kaplan found markedly more positive results than earlier studies by showing that an investor would have seen a 3 percent outperformance annually for buyout funds relative to the S&P 500 over the life of the fund[15]. These results are consistent with the 3 percent outperformance observed by Robinson and Sensoy (2011)[16] and the 6 to 8 percent annually reported by Ljungqvist and Richardson (2003)[17], who both used data from one of the largest institutional limited partners (LP) who, they argue, invested and diversified much like an index fund, particularly for buyout funds. The largest ever study conducted was by Stucke and Higson in 2012 which looked at 1,169 funds with total committed capital of more than $1 trillion and found US buyout fund outperformance of 500 basis points annually over the S&P 500 for vintage years 1980-2008[18].

[13] Swensen, David F. *Pioneering portfolio management: an unconventional approach to institutional investment*. New York: Free Press, 2009.
[14] Private Equity Replication with Leveraged Small-Cap Value Stocks -. (2017, October 03). Retrieved from https://alphaarchitect.com/2015/08/06/private-equity-replication-with-leveraged-small-cap-value-stocks/
[15] Harris, Robert, Tim Jenkinson, and Steven Kaplan. "Private Equity Performance: What Do We Know?" 2014. doi:10.3386/w17874.
[16] Robinson, David, and Berk Sensoy. "Cyclicality, Performance Measurement, and Cash Flow Liquidity in Private Equity." 2011. doi:10.3386/w17428.
[17] Ljungqvist, Alexander, and Matthew Richardson. "The cash flow, return and risk characteristics of private equity." 2003. doi:10.3386/w9454.
[18] Higson, C., & Stucke, R. (2012). The Performance of Private Equity. *SSRN Electronic Journal*. doi:10.2139/ssrn.2009067

As seen above, even with the immense increase in PE activity, fundraising and the number of funds and the subsequent academic and practitioner scrutiny, the historical performance of PE still today remains uncertain and hotly contested, particularly with the more recently raised post-millennial funds. One can frequently come across news headlines one day stating "Private Equity underperforms market" (Financial Times, November 22, 2014) and the next day "Private Equity Returns Still Outperform Public Markets" (Forbes, March 14, 2014), clearly iterating that there is no consensus both in a public and academic context.

More recently, Gianfrate and Loewenthal released in 2015 the first landmark paper looking into the performance of private equity funds throughout the 2008 financial crisis using September 2014 data sourced from Preqin. They found substantial annual outperformance of buyout funds of 1,158 bps versus the S&P 500 given an average hold period of 4.0 years as well as a US buyout mean IRR of 12 percent and a TVPI of 1.56[19]. Gianfrate and Loewenthal's study specifically focused on both BO and VC PE strategies and their performances compared against each other and relative to public benchmarks through the PME method.

[19] Gianfrate, Gianfranco, and Simone Loewenthal. "Private Equity throughout the Financial Crisis." *The Journal of Private Equity*, 2015. doi:10.3905/jpe.2015.2015.1.048.

III. OBJECTIVE AND RESEARCH QUESTION

As such the objective of this paper is to mainly update the findings in Gianfrate and Loewenthal's paper, which used September 2014 data. While Gianfrate and Loewenthal were able to get a first glimpse into the performance metrics of private equity funds investing in the lead up to and during the financial crisis using 2014 data, 2007 vintage funds were in 2014 still only halfway through the median fund life span of just over 13 years[20]. The returns of private equity funds can only be properly measured accurately once the fund is completely liquidated.

This study therefore contributes to the current academic literature on private equity performance by conducting an investigation into specifically North American and European private equity buyout performance during the financial crisis by looking at commonly used industry absolute metrics *Internal Rate of Return (IRR)* and *Multiple on Invested Capital (MOIC)* (referred to as *Total Value to Paid In (TVPI)* in academic contexts) as well as the academic rooted relative *Public Market Equivalent (PME)* metric first introduced by Kaplan and Schoar in their 2005 paper and subsequently used by Gianfrate and Loewenthal in their study. In addition, the roles of factors including fund size (≥$1bn vs <$1bn) and fund geographic focus (North American vs European) are investigated as well as absolute and relative performance of individual vintages over time. Finally, the results are compared with existing literature and other publicly available performance results.

[20] Bollen, J. (2015, March 30). Average Private Equity Fund Life Span Exceeds 13 Years. Retrieved from https://blogs.wsj.com/privateequity/2015/03/31/average-private-equity-fund-life-span-exceeds-13-years/

IV. SIGNIFICANCE

An investigation into the performance of private equity during the financial crisis and its subsequent recovery is significant for a variety of reasons. Firstly, the 2007 – 2009 financial crisis is noted by economists as being one of, if not the worst, financial crisis since the Great Depression of the 1930s, a time period during which the PE industry was practically non-existent. In the words of Ben Bernanke, the former head of the Federal Reserve, the 2007 – 2009 financial crisis "was the worst financial crisis in global history, including the Great Depression"[21]. Further, the recovery from this recession has also been unique both in terms of its length but also weakness, being cited as the slowest US recovery since WWII[22].

Secondly, timing constraints have prevented this time period from being studied by others before as PE funds, as mentioned earlier, have generally fixed term life's of 10-15 years . This means that only now, with August 2017 being the 10-year anniversary of the start of the recession, do we have the complete capital call and distribution data to analyze performance accurately and reliably. This issue is only accentuated by the J-Curve effect seen with PE investments where PE funds often deliver negative returns and cash flows in the early years as capital is called and positive cash flows later in the investment fund's life as the portfolio companies

[21] His statement is raising eyebrows. While the "Great Recession" was scary. "2008 crisis: Worse than the Great Depression?" CNNMoney. Accessed December 16, 2017. goo.gl/i5SVGV

[22] He blames President Obama for the sluggish economy, and Claims He Can Do Far Better. "Yes, this is the slowest U.S. recovery since WWII." CNNMoney. Accessed December 16, 2017. goo.gl/HEtFN2

mature and distributions are paid out[23] as seen in *Exhibit 7* with our own results. This combination of uniqueness and timing constraints coupled with the J-Curve effect means only now is it possible and appropriate to conduct said investigation.

In terms of this paper's hypothesis, theoretically, because PE investments are illiquid, it should not be surprising that investors see some premium relative to investing in public markets no matter where in the business cycle the economy is. In addition to the illiquid nature of PE investments, there is also a larger uncertainty with PE investments with regards to the uncertain timing of capital calls and realizations. This so called "commitment risk" therefore exists in contrast to investing in public equities where there is no distinction between committed and invested capital and there is continuous trading and a liquid market. Concerning the financial crisis, the fact that private equity investments are privately held means that they should be able to better withstand the cyclicality of market cycles and thus perform better during an economic downturn such as the 2007-2009 financial crisis.

[23] Why and How to Invest in Private Equity - learn the basics on investing in private equity. Accessed December 16, 2017. http://www.venturechoice.com/articles/why_n_how_to_inv_in_priv_equity.htm.

V. METHODOLOGY AND DATA

The methodology for this study is primarily derived from that of Kaplan and Schoar who in their 2005 paper *Private Equity Performance: Returns, Persistence and Capital Flows* first introduced the *Kaplan Schoar Public Market Equivalent (PME)* metric which aims to benchmark private investments against the performane of public equity, the largest investment asset class, with US Equity's alone accounting for 18% of total global invested capital[24].

The PME metric is the most significant for this study as it allows one to compare the performance of PE funds with those that could have been obtained by Limited Partners investing in public equities over the same time period. The PME formula, seen below in F*igure 6*, requires for the discounting of all distributions (D_t) and capital calls (C_t) back to the start of the fund at the total return of a benchmark index ($\frac{I_T}{I_t}$) during the same time frame. The discounted distributions are then divided by the discounted capital calls to get a multiple which if greater than 1 points to PE outperformance and if less than 1 reflects underperformance relative to the public benchmark at which the cash flows are discounted.

Figure 6-

***KS Public Market Equivalent* (*PME*)**

$$PME = \frac{FV_D}{FV_C}$$

$$FV_D = \sum_{t=0}^{T} \frac{I_T}{I_t} \times D_t$$

[24]Global Invested Capital Market - Health | Aon. (2014, June). http://www.aon.com/attachments/human-capital-consulting/2014_HEK_whitepaper_Global_Invested_Capital_Market.pdf

$$FV_C = \sum_{t=0}^{T} \frac{I_T}{I_t} \times C_t$$

$$where\ t = fiscal\ quarter$$

In addition to the PME metric, the industry standard *Internal Rate of Return* (IRR) and *Total Value to Paid-In* (TVPI) were also calculated as seen in *Figure 7* where the Residual Value, the remaining equity or value of investments that a limited partner owns in the fund (otherwise referred to as NAV or Ending Market Value (EMV)), was taken as of the latest quarterly data available (March 31st, 2018 for most cases).

Figure 7-

$$\boldsymbol{Total\ Value\ to\ Paid-In\ (TVPI)}$$

$$= \frac{\sum_{t=0}^{T} D_t\ + RV_T}{\sum_{t=0}^{T} C_t}$$

$$\boldsymbol{Internal\ Rate\ of\ Return\ (IRR)}:$$

$$0 = \sum_{t=0}^{T} \frac{NCF_t}{(1 + IRR)^t}$$

$$where$$

$$Net\ Cash\ Flow\ _t(NCF_t) = D_t - C_t \text{ and } NCF_T = D_T - C_T + RV_T$$

In terms of cash flow data, the March 31st, 2018 updated Preqin Private Equity Cash Flow database was used comprising 249 North American and European buyout funds (192 North American and 57 European) with vintage years 2002 to 2007. Like with Gianfrate and Loewenthal, the 2002-2007 time-period was chosen as they are all vintage years in which the respective fund managers had to make investment decisions at some point during the 2007-2009 financial crisis. Vintage years 2008 and 2009 were not included as a vast majority of these funds have not yet been liquidated and are still investing today, see *Exhibit 4 & 5*, while funds prior to

2002 would have been affected by the dot-com bubble, a time-period outside the scope of this study.

The Preqin Private Equity Cash Flow database contains date-specific amounts and transaction dates of individual capital calls, distributions and residual values on the fund level. For the purpose of this study all values were pooled into their respective fiscal quarter which is much more granular than past studies which pooled cash flows annually. The Preqin database is able to source its data by using the Freedom of Information Act legislation in North American and European countries to gather performance data mainly from public institutions (pension plans, sovereign wealth funds, etc.), public filings and self-reporting. As such selection and survivorship bias is limited relative to prior studies which have relied solely on voluntary self-reported data from funds.

The data was limited and vetted to only include North American and European BO funds and therefore all VC, growth equity and distressed funds were excluded in the sample. For further analysis the data was also later sorted by fund size (≥$1bn and <$1bn) and by geographic focus (North American and European funds) for comparison across individual vintage years. All capital calls and distributions reported in the Preqin database are based on a LP with a $10mm commitment in each fund and therefore our results are equal-weighted and not skewed by the performance of larger funds. This is generally in line with how a LP would diversify its allocations generally equally across PE BO funds. Further since we are analyzing

cash flow data from the LP's perspective all the results are net of both carry and management fees generally charged by the buyout fund's General Partner (GP). This therefore means our results are more reflective of true PE performance from the perspective of someone allocating capital to PE rather than the overall gross absolute performance, which GP's use to advertise when fundraising.

For the Kaplan and Schoar study, the discount rate used in their PME calculation, which is a public market benchmark, was the S&P 500. More recently, however, researchers have been trying to find more applicable benchmarks to compare funds' performance by using various small-cap indexes which more accurately reflect the recent PE activity in smaller, middle-market companies, with the S&P SmallCap 600 seeing the most popularity and also being used by Gianfrate and Loewenthal. Seeing that the average fund size in this study's sample is $ 1,010mm and one assumes an average of 5 deals per fund that leaves an average equity investment of $202mm. With an average leveraged 4x Debt-to-Equity multiple implying an enterprise value (EV) of $1,010mm that falls just above the Russell 2000 Index median market capitalization of $ 692mm (with an average Debt-to-Equity ratio of 0.97 implying a median EV of $1,363mm) and just below the median market capitalization of $1,100mm for the S&P SmallCap 600 (with an average Debt-to-Equity ratio of 1.1 implying a median EV of $2,310mm)[25]. This study uses five North American indices (S&P 500, S&P SmallCap 600, S&P Composite 1500, Russell 2000 and the Russell

[25] Russell 2000. (n.d.). Retrieved from http://www.ftse.com/products/indices/russell-us; S&P SmallCap 600. (n.d.). Retrieved from https://us.spindices.com/indices/equity/sp-600

3000), four European indices (FTSE All-Share, FTSE Europe ex UK, MSCI Europe Small Cap and the STOXX Europe 600) and the international benchmark MSCI ACWI. Historical performance data was collected for all 10 indices on a quarterly basis between 3/29/2002 and 3/30/2018 from Bloomberg. Lastly, all indices were calculated on a total return basis where dividends are assumed to be re-invested. See below more information on the selected public equity benchmarks:

Index-	**Description[26]-**	**5yr TR pa-**	**5yr Vol-**
S&P 500	US stock market index based on the market capitalizations of 500 large companies listed on the NYSE or NASDAQ	13%	10%
S&P SmallCap 600	Covers the small-cap range of US stocks with market cap ranging from $400mm to $1.8bn covering roughly 3% of the total US stock market	14%	13%
S&P Composite 1500	Covers all stocks in the S&P 500 (large-cap), S&P 400 (mid-cap), and S&P 600 (small-cap) covering 90% of the total US stock market	13%	10%
Russell 2000	US small-cap stock market index of the bottom 2,000 stocks in the Russell 3000 Index	12%	14%
Russell 3000	Measures the performance of the 3,000 largest publicly held companies incorporated in the US as measured by total market capitalization	13%	10%
FTSE All-Share	Represents 98-99% of UK market capitalization and is the aggregation of the FTSE 100, FTSE 250 and FTSE Small Cap Indexes.	8%	10%
FTSE Europe ex UK	Provides coverage of all Developed and Emerging markets in Europe, excluding the UK	9%	12%
MSCI Europe Small Cap	Captures small cap representation across the 15 Developed Markets[27] countries in Europe with 994 constituents equal to roughly 14% of the market capitalization in Europe	13%	14%
STOXX Europe 600	With a fixed number of 600 components, the STOXX Europe 600 Index represents large, mid and small capitalization companies across 17 countries in Europe	8%	16%
MSCI All Country World Index (ACWI)	The MSCI ACWI captures large and mid cap representation across 23 Developed Markets and 24 Emerging Markets. With 2,495 constituents, the index covers approximately 85% of the global investable equity	9%	10%

[26] Descriptions and market data taken from official index factsheets

[27] Developed European Markets: Austria, Belgium/Luxembourg, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden and Switzerland

VI. RESULTS

As seen in *Exhibit 1*, 2002-2007 vintage buyout funds, whose cash flow profile can be seen in *Exhibit 7,* saw a mean IRR of 12% and a median IRR of 11%. The study observed a very high standard deviation of 13% pointing to a very high degree of variance among buyout fund performance. For example, the highest performing fund in the data is the GCP California Fund managed by Leonard Green and Partners with an IRR of 93.1% and a TVPI of 8.47 while the lowest performer was Reliant Equity Partners with an IRR of -49.9% and a TVPI of 0.02. Both of these funds are numerous standard deviations from the mean. From the results, we find that the return distribution is slightly right-skewed indicating that right-tail outliers exist which push up the mean. Interestingly, the 25th percentile IRR is still positive at 5%, indicating that even though these funds invested throughout the financial crisis the vast majority of funds still posted positive IRRs, with the 75th percentile IRR at 16%. This indicated that buyout funds serve as a strong preserver of capital even through downturns like the financial crisis.

On a TVPI basis we see that 2002-2007 vintages had a median TVPI of 1.55 and a mean of 1.68. Again we see the same right skewness and large variability. Overall on a TVPI basis our results are almost identical to those found by Gianfrate and Loewenthal, however, we do observe slightly lower IRRs possibly indicating that these funds have held on to their residual values for longer than initially measured. Our IRR results are identical to the 12% average that Kaplan and Schoar observed.

Again on a TVPI basis we see that PE was a strong conserver of capital with the 25th percentile at 1.32, significantly above 1.00.

Now looking between North American and European BO performance on an absolute basis we observe almost identical IRR performance, although on a TVPI basis we see stronger mean North American performance of 1.71 versus a 1.56 mean in Europe, however this difference is not significant at the 0.05 level. The standard deviation of North American TVPI performance is 76%, higher than that of European funds at 57%, pointing to the higher variability from both substantially higher and lower performing BO funds in North America. This re-iterates the value and importance of LPs being able to select and invest in the high-performing GPs as they are able to substantially outperform the worst-performing funds.

Overall, from the LP perspective we can observe the true relative performance of PE buyout funds during the financial crisis by looking at the PME values in *Exhibit 2*. This study observes a PME of 1.10 against the S&P 500 which is lower than the average of 1.15 observed by Gianfrate and Loewenthal mainly because of the strong public equity bull run seen since 2014. However, even with the recent strong performance of public equities, 2002-2007 vintage buyout funds were still able to show strong outperformance versus public equity markets throughout their fund lifecycle against every single index benchmark used. The highest overall PME observed was 1.41 against the Euro Stoxx 50 and the lowest was 1.03 against the S&P SmallCap 600. Not a single overall PME value is below 1.00 pointing to PE's

outperformance and that even with lower IRRs the drawdown in public equities during the financial crisis must have been much greater and not proportionate to that of PE. This could be in line with our earlier hypothesis that since private equity investments are privately held they should, as a result, be better suited to tackle market and economic cyclicality due to the GPs strong incentive to cost control, implement operational improvements and create systematic "performance oriented cultures" in their portfolio companies.

Most interesting is that when North American BO PME's using North American public benchmarks are compared against European BO PME's using European public benchmarks the average PME's of 1.11 and 1.10 respectively are almost identical. Thus, while North American BO performance has shown to outperform European BO performance, when compared to their respective public benchmarks we see almost identical outperformance. This is consistent with North American LPs generally considering US equities as a direct substitute to North American BOs while European LPs will likely have more exposure and allocation towards European public equities. The only PMEs we find that are less than 1.00 are European BO performance against the S&P SmallCap 600 and MSCI Europe SC which are two of the closest comparable public benchmarks in terms of enterprise value, possibly raising some concern amongst LPs investing in European BO funds. Nonetheless against a global benchmark European BO funds still greatly outperformed with a PME of 1.18 using MSCI ACWI.

Looking at *Exhibit 3*, which breaks down private equity returns by vintage years, we observe some interesting developments. Firstly, we see a substantial drop in PME values from 2002 through 2007 with peak values being reached in 2003 and most PME values ultimately dropping below 1.00 in 2006 and 2007. While this data still points to early superior consistent performance of buyout funds, we do observe a fairly consistent decline in relative performance as can be observed in *Exhibit 6*. While this fall in the absolute performance of BO funds can be rooted in the fact that substantially more capital is being allocated to the space driving down returns as more and more BO funds are competing with record amounts of capital chasing limited targets at lofty prices. On the flipside we have also witnessed a supercharged 10-year bull run with public equity markets experiencing its second strongest streak since World War II starting from the trough of the financial crisis in 2008. Our BO vintage results are inconsistent with those found by Gianfrate and Loewenthal who observed consistent above unit PMEs and substantial outperformance versus the public markets year in and year out.

Now by comparing the results for buyout funds with committed capital greater than and equal to $1bn against those with less than $1bn we see that larger funds in every year apart from 2004, where both the absolute and PME results were practically equal, outperformed smaller funds. This hints towards some form of positive relationship between size and performance which should be further investigated.

When controlling for geographic focus and comparing the results of North American focused funds versus European focused funds we observe mixed results. On an absolute basis North American funds perform better in 2004, 2005 and 2007 while European funds do better in 2002, 2003 and 2006. It is important to note that our sample data is heavily weighted towards North American funds mainly as the European buyout industry was still nascent in the early 2000s and thus there are substantially fewer observations. On a PME basis, where we compare each respective geographic focus to their respective benchmarks we see that European funds generally outperform North American funds between 2002 and 2006, likely because of the lesser competition and relative assets under management (AUM) in the region. In 2007 however, we see a strong reversal of this trend with North American funds performing much better with most PMEs still greater than 1.00 while in Europe every PME dropped below 1.00. This likely tells us that European BO performance had a relatively larger impact from the financial crisis against public equities than that of North American funds.

Exhibits 4 & 5 reveal an analysis conducted on the drawdown profiles of different vintages to observe the timing of investments made and capital calls conducted by funds. In *Exhibit 4* we see that easily over 90% of funds in vintages between 2002 and 2011 have called more than 70% of their committed capital. However, and more interestingly, we start seeing a fast drop below 80% of funds who have invested 90% or more of their committed capital starting with the 2008 vintage. This reiterates that

the financial crisis probably had a direct impact on GPs making investments and their dealflow during the financial crisis, likely due to the large uncertainty and difficulty in receiving financing, which BO funds rely heavily on. *Exhibit 5* shows us the fraction of capital calls made by funds in that respective year over the total capital calls made by that vintage year throughout its lifecycle. We observe that vintages 2004-2007 had the largest concentration of investments made between 2007 and 2009 ranging from 30% in 2004 to a high of 55% in 2006.

Exhibit 1 - Private Equity Returns during the Financial Crisis (vintages 2002-2007)

	Equal Weighted[1]		
Sample	**All BO Funds**	**North American BO**	**European BO**
IRR			
Median	0.11	0.11	0.09
Mean	0.12	0.12	0.12
St. Deviation	0.13	0.13	0.13
25th Percentile	0.05	0.05	0.05
75th Percentile	0.16	0.16	0.16
TVPI			
Median	1.55	1.59	1.43
Mean	1.68	1.71	1.56
St. Deviation	0.72	0.76	0.57
25th Percentile	1.32	1.33	1.23
75th Percentile	1.96	1.97	1.88
No. of Obs.	249	192	57

Exhibit 2 - Public Market Equivalent Returns (vintages 2002-2007)

	Kaplan Schoar Public Market Equivalent (PME)		
US Indexes	**All BO Funds**	**North American BO**	**European BO**
S&P 500	1.10	1.13	1.01
S&P 600	1.03	1.05	0.99
S&P 1500	1.09	1.12	1.05
Russell 2000	1.08	1.11	1.04
Russell 3000	1.09	1.12	1.05
Average	1.08	1.11	1.03
European Indexes			
FTSE All Shares	1.14	1.17	1.06
FTSE Europe	1.16	1.19	1.09
MSCI Europe SC	1.07	1.09	0.98
Euro Stoxx 50	1.41	1.44	1.29
Average	1.20	1.22	1.10
Global Indexes			
MSCI ACWI	1.20	1.23	1.18

Exhibit 3- Private Equity Returns by Vintage Year and Geography

All Buyout Funds (≥1bn)

				Kaplan Schoar Public Market Equivalent (PME)					
Sample	**Obs.**	**IRR**	**TVPI**	**S&P 500**	**S&P 600**	**Russell 2000**	**FTSE Europe**	**Euro Stoxx 50**	**MSCI ACWI**
2002	7	0.27	2.05	1.57	1.44	1.48	1.40	1.73	1.51
2003	8	0.21	2.14	1.65	1.53	1.59	1.48	1.96	1.64
2004	10	0.12	1.63	1.28	1.21	1.25	1.22	1.61	1.31
2005	24	0.10	1.55	1.17	1.09	1.14	1.23	1.56	1.28
2006	36	0.08	1.47	1.02	0.95	1.01	1.17	1.42	1.19
2007	30	0.08	1.41	0.87	0.82	0.87	1.04	1.17	1.03

All Buyout Funds (<1bn)

				Kaplan Schoar Public Market Equivalent (PME)					
Sample	**Obs.**	**IRR**	**TVPI**	**S&P 500**	**S&P 600**	**Russell 2000**	**FTSE Europe**	**Euro Stoxx 50**	**MSCI ACWI**
2002	17	0.15	1.59	1.23	1.11	1.14	1.06	1.33	1.16
2003	10	0.16	1.61	1.31	1.22	1.26	1.15	1.42	1.26
2004	16	0.12	1.65	1.28	1.20	1.25	1.22	1.60	1.32
2005	24	0.08	1.47	1.04	0.97	1.02	1.13	1.39	1.16
2006	28	0.06	1.39	0.89	0.83	0.89	1.05	1.25	1.05
2007	30	0.10	1.57	0.97	0.90	0.96	1.16	1.32	1.14

North American Focus Buyout Funds

				Kaplan Schoar Public Market Equivalent (PME)					
Sample	**Obs.**	**IRR**	**TVPI**	**S&P 500**	**S&P 600**	**S&P 1500**	**Russell 2000**	**Russell 3000**	**MSCI ACWI**
2002	18	0.15	1.61	1.25	1.14	1.24	1.17	1.23	1.19
2003	16	0.20	1.82	1.45	1.35	1.44	1.39	1.43	1.41
2004	22	0.13	1.76	1.36	1.27	1.34	1.33	1.34	1.40
2005	38	0.09	1.54	1.11	1.04	1.10	1.09	1.10	1.24
2006	46	0.07	1.40	0.94	0.87	0.93	0.93	0.93	1.10
2007	43	0.11	1.61	1.00	0.94	1.00	1.00	1.00	1.18

European Focus Buyout Funds

				Kaplan Schoar Public Market Equivalent (PME)				
Sample	**Obs.**	**IRR**	**TVPI**	**FTSE All Shares**	**FTSE Europe**	**MSCI Europe SC**	**Euro Stoxx 50**	**MSCI ACWI**
2002	6	0.30	2.11	1.47	1.37	1.27	1.67	1.47
2003	2	0.14	2.11	1.44	1.46	1.49	2.06	1.60
2004	4	0.06	1.23	1.02	0.98	1.06	1.22	1.04
2005	13	0.08	1.41	1.09	1.13	1.07	1.38	1.16
2006	18	0.08	1.52	1.13	1.20	1.08	1.44	1.22
2007	17	0.04	1.20	0.83	0.87	0.70	0.99	0.86

Exhibit 4- Committed Capital and Fraction Called by Vintage Year

Vintage	Number of Obs.	Committed Capital ($ mm)	Fraction 70% Called	Fraction 90% Called
2002	50	32,992	0.94	0.76
2003	56	50,564	0.98	0.84
2004	54	47,574	0.94	0.85
2005	98	115,902	0.94	0.85
2006	121	234,158	0.96	0.83
2007	116	173,211	0.97	0.81
2008	93	167,984	0.99	0.78
2009	44	42,702	0.91	0.66
2010	49	32,661	0.96	0.80
2011	63	94,035	0.98	0.63
2012	71	94,217	0.85	0.49
2013	71	80,413	0.59	0.24
2014	82	139,850	0.50	0.16
2015	86	120,945	0.19	0.05
2016	84	121,372	0.05	0.02
2017	39	88,992	0.03	0.00
Total	1,177	1,637,570	0.74	0.55

Exhibit 5 - Fraction of Fund Invested during Financial Crisis

Vintage	Fraction Invested 2007-2009
2002	12.5%
2003	20.3%
2004	29.9%
2005	45.8%
2006	55.2%
2007	46.9%
2008	26.8%
2009	11.9%
2010	0.0%

Exhibit 6-

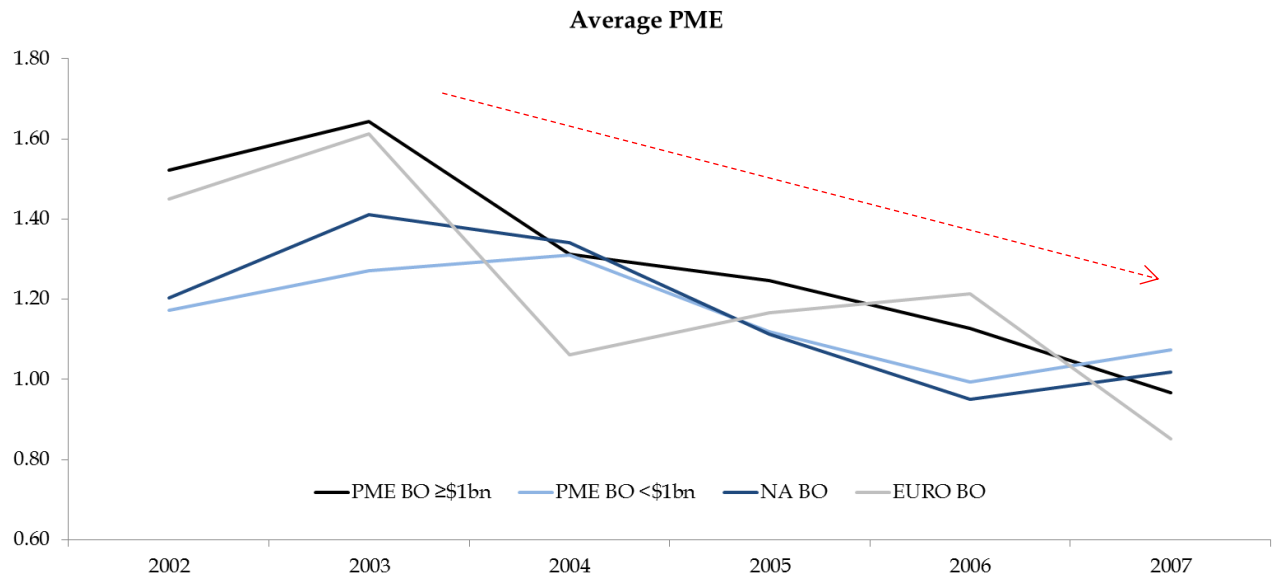
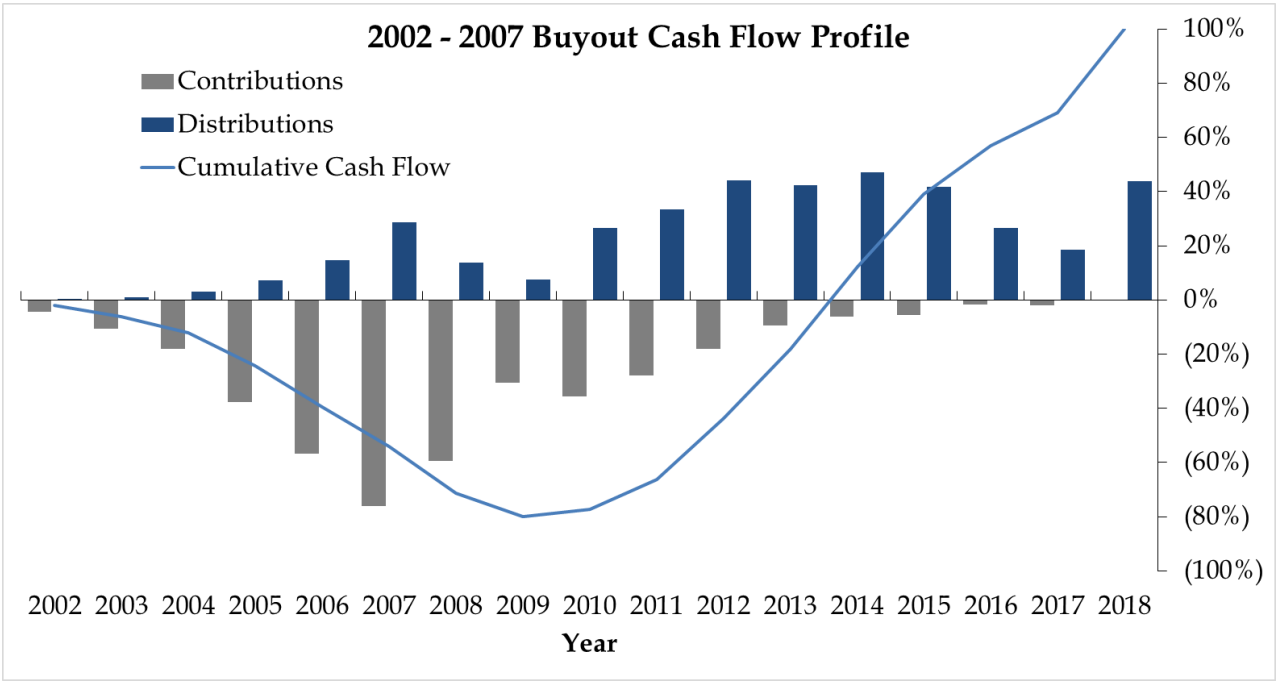


Exhibit 7-



VII. CONCLUSION, CHALLENGES AND KEY TAKEAWAYS

From our findings North American and European buyout funds have proven to show strong performance both in absolute terms seen through IRR and TVPI metrics and in relative terms through the PME for vintages 2002-2007. We also saw outperformance of North American funds versus European funds but on a more granular vintage-by-vintage level the results were less clear. If we compare funds by geographic focus to their respective public equity benchmarks then we see almost an identical PME of 1.11 for North American funds and 1.10 for European funds. Across vintages we see a trend of declining IRRs, TVPIs and PME's mainly because of increased competition in the PE space negatively affecting performance and a strong public equity rally since the financial crisis increasing the PME discount rate. We also observed that funds greater than or equal to $1bn showed outperformance versus those smaller than $1bn. This is not surprising seeing that funds with strong track records and proven past performance likely found it easier to raise larger funds. This also then raises the question as to whether this proves that past performance is a strong predictor of future success. Larger funds, however, should be able to make better use of more extensive resources and expertise as well as enjoy greater economies of scale with regards to fees.

Certain challenges arose when dealing with the data that are important to bring up. Firstly, the way that the residual values of funds are handled is still debated amongst researchers. For this study we included the last reported residual value in the IRR, TVPI and PME calculation, however, critics and scholars have criticized this

approach including Phalippou and Gottschalg as PE firms have a tendency to either overvalue the residual value through on-paper accounting valuation or continue to report a residual value even though the NAV is actually worthless or negligible and investments are just being held on the books for PE firms to continue to collect management fees. Other challenges include the fact that our public equity indices' returns were collected on a gross basis and therefore normal brokerage and expense fees, while minor, were not taken in account unlike the net-of-fees basis of our private equity cash flow data.

Potential future research on this topic could include updating and further analyzing the performance of other forms of PE strategies such as VC funds and distressed funds during the same 2002-2007 time period. VC cash flow data reporting is known to be more inconsistent, harder to classify and generally less reliable as VC can include anything from seed, early stage expansion to growth equity. Distressed funds, on the other hand, invest in debt as well as equity positions, making it hard to complete a similar analysis that solely focuses on equity investing.

Ultimately, buyout funds have proven to be a resilient investment asset class that has shown strong performance against public equities during the financial crisis. Buyout funds seem to have a case as being strong capital preservers with lower volatility relative to the large swings public markets experienced during the financial crisis. This ultimately goes in line with the continued interest and record-

breaking fundraising and dry powder accumulation we are seeing in private equity and buyouts today. Institutional investors including sovereign wealth funds and pension funds are continuing to allocate larger portfolio percentages towards the asset class.

While private equity suffered from losses just like most other asset classes during the financial crisis, the fact that PE firms had long-term time horizons and lock-up periods compared to public equity investors meant that they suffered from marginally smaller losses and had quicker recovery periods. This greater protection is therefore rewarded with a return premium that is observed in our results.

Once data becomes available it will be interesting to analyze the performance of private equity and buyout funds after the financial crisis. With investors allocating record-setting amounts of capital to PE since the financial crisis and especially in the last five years it will be interesting to observe whether the industry will overheat. With valuation multiples now at all-time highs, intense competition and an uncertain economic outlook it is causing PE firms to remain vigilant and cautious even under immense pressure to put capital to work and to generate outsized returns.

VIII. REFERENCES

Bernstein, Shai, Josh Lerner, and Filippo Mezzanotti. "Private Equity and Financial Fragility during the Crisis." 2017. doi:10.3386/w23626.

Gianfrate, Gianfranco, and Simone Loewenthal. "Private Equity throughout the Financial Crisis." *The Journal of Private Equity*, 2015. doi:10.3905/jpe.2015.2015.1.048.

Gompers, Paul, Steven Kaplan, and Vladimir Mukharlyamov. "What Do Private Equity Firms Say They Do?" 2015. doi:10.3386/w21133.

Harris, Robert S., Tim Jenkinson, Steven N. Kaplan, and Rüdiger Stucke. "Has Persistence Persisted in Private Equity? Evidence from Buyout and Venture Capital Funds." *SSRN Electronic Journal*, 2013. doi:10.2139/ssrn.2304808.

Higson, C., & Stucke, R. (2012). The Performance of Private Equity. *SSRN Electronic Journal*. doi:10.2139/ssrn.2009067

Kaplan, Steven, and Per Strömberg. "Leveraged Buyouts and Private Equity." 2008. doi:10.3386/w14207.

Kaplan, Steven, Frederic Martel, and Per Stromberg. "How Do Legal Differences and Learning Affect Financial Contracts?" 2003. doi:10.3386/w10097.

Kaplan, Steven N., and Antoinette Schoar. "Private Equity Performance: Returns, Persistence, and Capital Flows." *The Journal of Finance*60, no. 4 (2005): 1791-823. doi:10.1111/j.1540-6261.2005.00780.x.

Phalippou, Ludovic. "Investing in Private Equity Funds: A Survey." *SSRN Electronic Journal*, 2007. doi:10.2139/ssrn.980243.