Private Equity and Strategic Asset Allocation

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Ibbotson Associates opened its doors in 1977 to bridge the gap between modern financial theory and real-world investment practice. Professor Roger G. Ibbotson, the company founder, pioneered the collection of the requisite historical data used in asset allocation and quantified the benefits of diversification. Ibbotson continues to provide solutions to investment and finance problems for a diverse set of markets.

Entrusted to create asset allocation models for many of the largest companies in the finance and investment industries, Ibbotson Associates is a leading provider of retirement advice programs and investment consulting services to institutions. Ibbotson Associates is a registered investment advisor and wholly owned subsidiary of Morningstar, Inc.

Contents

Executive Summary

This paper studies the role of U.S. Private Equity and Non-U.S. Private Equity in a strategic asset allocation. There is relatively little guidance in the literature on how much investors should allocate to private equity in a strategic asset allocation setting because of 1) confusion between the private equity asset class and private equity funds and 2) considerable debate over historical returns.

Private equity is both an asset class and an investment strategy. Distinguishing between the private equity asset class and the private equity investment strategy can be confusing and creates challenges for asset allocators. Ideally, one could invest in a basket of all private corporations in which the weights of the companies in the basket are based on their true values. Such a basket would be a true representation of the private equity asset class. When investors make an allocation to private equity, it is not a passive investment in the basket of all private companies that form the private equity asset class. Rather, for most investors, the allocation to private equity is an investment in a skill-based strategy in which the two primary sub-strategies are leveraged buyouts and venture capital. The fragmented structure of the private equity market is such that private equity investors cannot fully-diversify away from private company specific risk; thus, all private equity investments are a mixture of systematic risk exposure to the private equity asset class and to private company specific risk.

Securitization is changing the private equity asset class and, over time, what was once an alpha strategy will become a traditional beta asset class. In this paper, we use two new indices to proxy the private equity asset class – the Red Rocks Listed Private Equity Index℠ (LPE Index℠) for U.S. private equity and the Red Rocks International Listed Private Equity Index℠ (International LPE Index℠) for non-U.S. private equity. The listed private equity indices may more accurately reflect the performance characteristics, especially the volatility, of the private equity asset class than appraisal-based private equity indices.

In a series of historical optimizations, we find that including U.S. Private Equity in the opportunity set would have dramatically improved the risk and return characteristics over the past 10 year period. From the beginning of 1997 to the end of 2006, U.S. Private Equity and Non-U.S. Private Equity were the best performing asset classes in our opportunity set, although the performance of the private equity proxies appears to be highly sensitive to the weighting scheme of the proxies. This sensitivity highlights that all private equity investments still contain a high level of specific risk. Over time, we think securitization will reduce the amount of specific risk associated with private equity portfolios.

In a forward-looking optimization using a set of returns based on a global implementation of the CAPM, the asset allocations with a standard deviation below 19% were only slightly improved by including private equity in the opportunity set. The benefit of including private equity in the opportunity set is most significant for higher risk, equity-centric asset allocations.

Finally, listed private equity will make it possible to apply tactical asset allocations to the asset class.

Introduction

The extraordinary performance of leading asset-allocators, like the Yale Endowment, coupled with a lower perceived risk premium for traditional equities, has created considerable interest in alternative asset classes. Over the past few years, Ibbotson Associates has completed a series of studies that demonstrate that adding additional asset classes to a typical opportunity set of investable asset classes can improve the risk-return trade-off available to investors. The free lunch of diversification remains the easiest and most cost effective method of improving the risk and return trade-off of a portfolio – diversify, diversify, diversify. To that end, we encourage all investors to look at the all-inclusive, Sharpe ratio-maximizing market portfolio of modern portfolio theory's capital asset pricing model (CAPM) and consider expanding their opportunity sets to include what some investors may view as "alternative" asset classes. All else equal, expanding one's opportunity set and allocating to each of the available asset classes should improve the risk and return trade-off.

One of the key alternative asset classes is private equity.[1] This study examines the roles of U.S. and non-U.S. private equity in a strategic asset allocation setting and finds that, similar to other asset classes that we have studied, the inclusion of additional asset classes should improve the risk and return characteristics of a model asset allocation.

Like many alternatives, the role of Private Equity in a well-diversified asset allocation is not clearly understood. While a definition of the Private Equity asset class is straight-forward, there is not a widely agreed-upon time-series of data representing the "beta" of the asset class. The illiquid nature of "private" asset classes creates performance measurement issues and significantly reduces the ability of individual investors to gain access to the asset class.[2]

The lack of widely accepted benchmarks for the private equity asset class prevent investors from understanding the risk, return, and correlation characteristics of private equity, and hence, the role of private equity in a diversified portfolio. The few private equity indices that exist face the standard problem of how to measure the performance of *private* assets. The inability to determine a true market price for private assets forces one to use appraisal-based prices that typically lead to artificial smoothing of the returns. Smoothed returns result in lower estimates of volatility, lower correlations with most other asset classes, and artificially high risk and return relationships, all of which can lead to a dramatic over-allocation in a traditional mean-variance optimization setting that attempts to maximize return per unit of risk.[3]

The same smoothed returns of most private equity investments and appraisal-based benchmarks that make private equity attractive to a mean-variance optimizer create a potential moral hazard for asset allocation policy makers. The inclusion of asset classes with smoothed returns passes through to the total portfolio understating the volatility of the total portfolio.

Private equity has been a difficult asset class for smaller investors to access due to the amount of required capital. Operationally, once a strategic asset allocation to private equity is made, it becomes challenging to maintain the target asset allocation as the value of the other asset classes evolve in relationship to the difficult-to-value private equity asset class. Differences between the amount of capital committed and the amount of capital invested blur the effective asset allocation of the total fund. With traditional private equity funds, it often takes a substantial time period for newly committed capital to be invested, often resulting in a mini-lifecycle in which the fund's investments are not diversified across the different stages associated with private equity funds.[4] In addition to pricing issues and the changing amount of capital that is actually invested, it may be difficult to move money in or out of the private equity investment in order to maintain the target asset allocation.

A new way of gaining access to the private equity asset class is emerging. It is accessible by all investors, makes it easy to maintain a target strategic asset allocation, and it results in a mark-to-market time-series that does not suffer from return smoothing. Publicly traded equities whose primary business activities are consistent with the business activities of traditional private equity firms are being bundled together. These bundles of publicly traded firms that are engaged in private-equity strategies can serve as proxies for the Private Equity asset class. These firms trade on public exchanges, so performance measurement is straightforward and investors can easily purchase the individual assets or products that are built around this new type of private equity index.

In this paper, we use two new indices to proxy the private equity asset class – the Red Rocks Listed Private Equity Index℠ (LPE Index℠) for U.S. Private Equity and the Red Rocks International Listed Private Equity Index℠ (International LPE Index℠) for Non-U.S. Private Equity. Conceptually, this is analogous to using a real estate investment trust (REIT)-based index as a proxy for the commercial real estate asset class. From an asset allocator's perspective, private commercial real estate and private equity have several similarities. Both are private segments of more general asset classes in which methods of ownership include publicly traded securities and private investments. Over a strategic horizon of twenty years or more, one would expect the private or public "legal" status to make little difference in returns of the companies after accounting for leverage and taxes.

Using these private equity asset class proxies to represent the Private Equity asset class is a relatively large assumption for which the implications are not yet fully understood. In the first section of this paper, we take a deeper look at the private equity asset class and the issues private equity creates for asset allocators. Next, we define the opportunity set of asset classes and the proxies used to represent those asset classes. This includes a detailed look at the Listed Private Equity Index℠ and the International Listed Private Equity Index℠. We then look at the historical risk and return characteristics of the asset classes, as well as their relationship to each other. Based on a set of historical capital market assumptions, we perform a series of historical optimizations to help determine what would have been optimal in the *past*. We then develop a set of forward-looking capital market assumptions that drive forward-looking optimizations to help determine what might be optimal in the *future*. Finally, we examine the future implications of listed Private Equity investments.

An Overview of Private Equity

Private equity is both an asset class and an investment strategy. Distinguishing between the private equity asset class and the private equity investment strategy can be confusing and creates challenges for the traditional approach to asset allocation. Asset allocation decisions should be based on the risk and return characteristics of the asset class, although in reality, most private equity decisions are based on the perceived risk and return characters of the available private equity vehicles.

Public companies collectively form the public equity asset class. Investors can gain exposure to the public equity asset class by purchasing shares of publicly traded companies or shares of investment vehicles, such as mutual funds, that purchase the public shares.

Private (non-public) companies collectively form the private equity asset class. Investors can gain exposure to the private equity asset class by purchasing shares of privately held companies or shares of investment vehicles, such as private equity funds, that purchase the non-public shares.

A large number of private corporations are generally assumed to be public corporations, including Dunkin Donuts, Hertz, Linens-N-Things, Neiman-Marcus, and Toys-R-Us. Common reasons for being private include family owned businesses that have always been private, leverage buyouts, and venture start-ups still waiting to go public.

From a modern portfolio perspective, ideally, one could invest in a basket of all private corporations in which the weights of the companies in the basket are based on their true values. Such a basket with real-time pricing would include thousands of constituents and would be a true representation of the private equity asset class. In such a world, all value-weighted benchmarks would lead to very similar conclusions on the performance of the asset class. Unfortunately, this is not possible and, philosophically, not how most people conceptualize a private equity investment.

When investors make an allocation to private equity, it is not a passive investment in the basket of all (or most) private companies that form the private equity asset class. Rather, for most investors, the allocation to private equity is an investment in a skill-based strategy, in which the two primary sub-strategies are leveraged buyouts and venture capital. One can carry out such strategies directly or through an investment vehicle that carries out the investments on their behalf. Two primary investment vehicles are engaged in these strategies – traditional private equity funds and publicly listed companies.[5] Traditional private equity funds are typically pure plays in the private equity strategies, while publicly listed companies offer a spectrum of private equity-like exposure. Most private equity funds are organized as limited partnerships with a finite life (e.g.10 years). The limited partners invest in (or commit capital to) the funds which are then managed by the general partners. The industry appears to be moving toward the creation of more perpetual investment vehicles.

If one assumes that traditional private equity funds and publicly listed companies engaged in private equity strategies own all of the private companies, the collective performance associated with these investments would perfectly match the performance of a basket of all private companies representing the private equity asset class. The implication is that the weighted average performance of private equity funds would be the same as the investment in the private equity asset class. On an asset weighted-basis, half of the investors will do better and half will do worse than the asset class as a whole.[6] This return relationship is straightforward, but not always recognized.

Unlike the straightforward return relationship, the risk relationship between the asset class and the investment vehicle is not straightforward. The standard deviation of private equity "asset class" returns is not the same as the standard deviation of private equity "fund" returns, as individual funds have high amounts of idiosyncratic (investment specific) risk. For example, for the universe of large cap U.S. mutual funds, the *average* standard deviation of their returns is very similar to the standard deviation of the S&P 500, which is a byproduct of the tendency of most mutual funds to create portfolios with characteristics that mimic those of the benchmark. For the universe of private equity funds, the *average* standard deviation of their returns should be considerably higher than the standard deviation of the private equity asset class due to the concentrated nature of private equity funds. This phenomenon of a wide dispersion of returns among private equity funds is documented in Lerner, Schoar, and Wongsunwai [2007].

Public equity investments often involve exposure to more than 1,000 public companies. While thousands of private companies collectively form the private equity asset class, private equity funds are more concentrated and often involve exposure to fewer than 15 private companies. The fragmented structure of the private equity market is such that private equity investors cannot fully diversify away private company specific risk; thus, all private equity investments are a mixture of systematic risk exposure to the private equity asset class and private company specific risk.

Asset allocation decisions are largely based on the expected return and standard deviation of the *asset class*. For most asset classes, it is relatively easy to invest in a passive – or beta – representation of the asset class. When it comes to the private equity asset class, a passive investment with risk and return characteristics that mimic the risk and return characteristics of the total private equity asset class does not exist! Thus, as advocates of separating the beta (asset allocation) decision from the alpha (product) decision, we face a rather large dilemma – should we base the beta decision on risk and return characteristics associated with the average private equity investment or the private equity asset class? We are forced to muddy the alpha-beta separation waters and use the risk and return characteristics that reflect the beta characteristics that an investor could obtain through a particular method of private equity exposure. Fortunately for us, the type of private equity exposure used in this study – listed private equity exposure – provides exposure to thousands of private equity companies and moving forward as more private equity investments are securitized should be more reflective of the private equity asset class.

As asset allocators contemplating the role of private equity in a strategic asset allocation, two strands of research are of particular interest: research on strategic asset allocations to private equity and research on the risk and return characteristics of private equity. Phalippou [2007a] provides an excellent literature review and thoughtful commentary on a wide range of private equity investing issues.

Relatively little guidance exists in the literature about an optimal strategic asset allocation to private equity. According to the Private Equity Council, the average allocation to private equity from the 20 largest U.S. public and private pension plans was 5.8% and 5.9% respectively. In previous Ibbotson research, Chen, Baierl, and Kaplan [2002] studies the role of venture capital in a strategic asset

allocation. Using data from Venture Economics on liquidated funds found that venture capital funds had an annual compounded return of 13.4% (compared to returns of 12.2% and 14.5% for U.S. Large and Small stocks over the same 1960 to 1999 period), an annual standard deviation of 115.6%, and a correlation with public equities of .04%, which leads to an allocation range of 2% to 9%. Swenson [2000] reports the historical (1982-1997) correlation between the Yale private equity portfolio and U.S. equity at .3. Grantier [2007] concludes that small cap stocks are a viable substitute for private equity.

Yambao, Davis, and Sebastian [2007] advocates using indices of publicly traded securities as proxies for illiquid asset classes such as private equity. Using Credit Suisse Warburg Pincus Global Post Venture Capital Index, coupled with a global CAPM approach similar to one used later in this paper, Yambao, David, and Sebastian estimates the expected return of private equity at 13.6%, a standard deviation of 30.7%, and a correlation with public equity of .9 – a correlation that is substantially higher than most other estimates, but consistent with our view that, over long time periods, returns to the public and private equity asset classes should be similar. A slightly older version of the Yambao, Davis, and Sebastian [2007] capital market assumptions was used in Ennis and Sebastian [2004]. Using mean-variance optimization, it finds that private equity only begins to enter efficient portfolios when equity allocations exceed 60%. Furthermore, it concludes, "Only moderate-size, equity-oriented funds with exceptional private equity investment skill, strong board-level support, and adequate staff resources should consider allocations of 10% or more." Finally, in an annual update on the benefits of private equity, the Center for International Securities and Derivatives Markets (CISDM) Research Department writes, "Results show that traditional private equity indices may provide diversification and return benefits when added to an existing stock and bond portfolio, as well as a stock, bond, and hedge fund portfolio."[7]

The lack of agreement regarding the historical returns of the private equity asset class is the key reason that relatively little asset allocation guidance around private equity can be found in the literature. We, too, cannot escape the uncertainty surrounding the historical returns of private equity.

The perception that the private equity asset class has significantly outperformed public equity is one of the drivers of the current interest in private equity. The National Venture Capital Association, in conjunction with Thomson, regularly report the performance of Thomson Financials' US Private Equity Performance Index (PEPI), in which the reported 10- and 20-year annualized returns approximately double those of the S&P 500. The perception that private equity has superior returns is also due to the exceptional performance of a few high profile private equity investors, such as Yale, and the stellar returns of top quartile private equity funds that are often trumpeted in the press. The Private Equity Council, an industry trade organization, proclaims that from 1980 to 2005, top-quartile private equity firms had annualized net of fee returns of 39.1% (see Private Equity Council [2007]). Unfortunately, the average private equity investor experiences average private equity returns and not top quartile returns. Overall, the literature on private equity returns vs. public equity returns is mixed.

Schmidt [2006] compares the historical performance of private equity investments against a benchmark of comparable stocks from the Russell 2000 small stock universe. From 1980 to 1990, stocks outperformed private equity, while from 1990 to 2002, private equity outperformed stocks. Over the entire period, 1980 to 2002, the compounded annual return was approximately 36.5%, nearly three times greater than the return on the comparable stock benchmark, suggesting that the returns on true private equity investments are significantly different than the custom stock benchmark.

Kaplan and Schoar [2005] finds that after fee performance of private equity funds is similar to the S&P 500. Studies by CalPERS and the Yale Endowment reach similar conclusions.[8]

In contrast with the above findings, Moskowitz and Vissing-Jorgensen [2002] finds that the risk and return trade-off is superior for public equities. Phalippou and Gottschalg [2006] claims that Kaplan and Schoar [2005] and others overstate the performance of private equity funds. After correcting for potential biases, it estimates that private equity funds underperformed the S&P 500 by 383 basis points.[9] Phalippou [2007a] states, "An interesting area for further research is to understand why investors allocate large amounts to this asset class, given such low past performance."[10] After surveying the literature on private vs. public equity returns, Grantier [2007] concludes that, on average, private equities do not outperform public equities, although top private equity firms have outperformed public equities.

Unlike most other asset classes where past performance is viewed as a historical fact and the focus is on forecasting future returns, further research is necessary to accurately determine both historical and future expected returns of private equity.

Of particular interest, given the new private equity asset class proxies used in our study, Zimmermann *et al.* studies the risk, returns, and biases of listed private equity portfolios. Between 1986 and 2003, it estimates the annual return and standard deviation of three portfolios of listed equities. The value weighted buy-and-hold portfolio had a return of 5.4% and standard deviation of 43.2%. The equally-weighted rebalanced portfolio had a return of 16.0% and standard deviation of 19.3%. The equally-weighted buy-and-hold portfolio had a return of 5.9% and standard deviation of 26.9%. Clearly, the weighting and rebalancing schemes have a significant effect on performance. After adjusting for serial correlation, the standard deviations of the two equally weighted portfolios increase substantially, to 33.7% and 37.1%, respectively. For comparison purposes, over the same period, the S&P 500 had a compounded annual return of 11.1% and a standard deviation of 18.0%.

Private Equity Index Proxies

Representing the U.S. private equity asset class, the Listed Private Equity Index℠ is a new index introduced on September 30, 2006, with an available backfilled history that begins on September 29, 1995. The LPE Index℠ is a collection of publicly traded companies listed on the NYSE, AMEX and/or NASDAQ that are deemed to be predominately "Private Equity Holding Companies." As a general rule, the Index Committee looks for companies from which the majority of the revenue stream comes from investing, lending, or providing services to privately held businesses. The Index uses a modified market capitalization approach. A desire to diversify amongst different private equity phases (e.g. early stage financing, late stage, etc.), a maximum constituent weight of 10%, and concentration issues drive the Index Committee tilts away from market capitalization weights.

The backfilled histories were created using the constituent weights at the time of inception. Such an approach is susceptible to survivorship bias, as all of the companies selected by the Index Committee on the true index inception dates obviously survived to that point. It is unclear if, had the Index Committee existed in 1995, which companies would have been in the Index.

The 32 constituents as of September 30, 2007, are listed in Table 1. An investment in the LPE Index℠ is reported to represent an investment in over 1000 private companies. Conceptually, each of the constituents is like an investment in an evergreen private equity fund providing exposure to multiple individual private equity transactions. Packaging the constituents together results in an investment that is conceptually similar to a fund of private equity funds.

Table 1: Listed Private Equity Index℠ Constituents as of September 30, 2007

Company Name	Ticker	Weighting
Leucadia Natl Cp	LUK	9.75%
Fortress Investment Group	FIG	9.25%
American Capital Strategies	ACAS	8.50%
Blackstone Group L.P.	BX	8.00%
Allied Cap Corp	ALD	7.00%
Capitalsource Inc	CSE	6.00%
Apollo Investments	AINV	5.00%
KKR Financial Corp	KFN	4.00%
Macquarie Infrastructure	MIC	4.00%
SVB Financial Corp	SIVB	4.00%
Ares Capital Corp	ARCC	3.50%
Affiliated Managers Group Inc	AMG	3.00%
MCG Capital Corp	MCGC	3.00%
BlackRock Kelso Capital Corp.	BKCC	2.50%
CMGI Inc	CMGI	2.50%
Capital Southwest	CSWC	2.00%
Compass Diversifi	CODI	1.50%
Hercules Technology Growth Capital	HTGC	1.50%
Internet Cap Grp	ICGE	1.50%
MVC Capital Inc	MVC	1.50%
Prospect Energy Corp	PSEC	1.25%
Evercore Partners	EVR	1.00%
Gladstone Capital Corp	GLAD	1.00%
Gladstone Investment Corp	GAIN	1.00%
Harris & Harris	TINY	1.00%
Kohlberg Capital Corp	KCAP	1.00%
NGP Capital Resources	NGPC	1.00%
Patriot Capital	PCAP	1.00%
PennantPark Investment Corp.	PNNT	1.00%
Safeguard Scientific	SFE	1.00%
Technology Investments	TICC	1.00%
UTEK Corp	UTK	0.75%

Source: Red Rocks Capital

A sister index, the International Listed Private Equity Index℠ represents the non-U.S. private equity asset class. The International LPE Index℠ applies the same methodology to non-U.S. domiciled companies. The International LPE Index℠ started on December 31, 2006 with an available backfilled history that begins on September 29, 1995. The 39 constituents representing a reported investment in more than 1,000 private companies are listed in Table 2.

These two indices benefit from two relatively recent trends. First, a worldwide trend toward securitizing previously illiquid investments is evolving. One stand out example is emerging in the Netherlands, where common shares are being issued in a new company, Conversus Capital, which will own a direct interest in a large number of private equity funds. Second, top private equity firms, such as Kohlberg Kravis

Roberts (KKR) and Blackstone, have issued or are in the process of issuing publicly-listed shares. The listing of private equity firms is not without controversy. In mid-2007, CalSTRS (a large pension plan and private equity investor) voiced its public concern on this new trend.[11]

Table 2: International Listed Private Equity Index℠ Constituents as of September 30, 2007

Company Name	Weighting
Wendel Investment	9.25%
Eurazeo	8.75%
3i Group	7.75%
Jafco	6.75%
Ratos AB B	5.50%
ONEX	5.25%
Macquarie Global Infrastructure Total Return Fund	4.75%
KKR Private Equity	4.50%
Macquarie Airports	4.50%
Babcock & Brown Infrastructure Group	3.25%
Intermediate Capital	3.25%
SVG Capital	3.25%
GP Investments	2.75%
Macquarie Communications Infrastructure Group	2.50%
NIF SMBC	2.25%
GIMV	2.25%
RHJ Industrial	2.25%
Japan Asia	2.00%
Electra	2.00%
Candover Investments	1.50%
Arques Industries AG	1.50%
IP Group	1.25%
Graphite Enterprise Trust	1.25%
Deutsche Beteiligungs AG	1.25%
Macquarie Capital Alliance Group	1.25%
CDB Web Tech / DeA Capital S.A.	1.00%
Macquarie Media Group	1.00%
Bure Equity	1.00%
Brait S.A.	1.00%
Dinamia	0.75%
HgCapital Trust plc	0.75%
JZ Equity	0.75%
CapMan Oyj	0.75%
Growth Value Opportunities S.A.	0.75%
AdCapital AG	0.50%
Dunedin Enterprise Investment Trust plc	0.50%
Traction	0.50%

Source: Red Rocks Capital

Historical Analysis

The Opportunity Set

In order to shed light on the role of private equity within a strategic asset allocation setting, we must define an opportunity set of available asset classes that is indicative of the type of opportunity set that an investor who is contemplating an investment in private equity might have. After defining the opportunity set, we calculate a number of historical performance statistics. The historical arithmetic returns, standard deviations, and correlations for the asset classes form a set of historical capital market assumptions that drive the Markowitz–de Finite mean-variance optimization framework, which enables us to determine the mixtures of asset classes that maximized return for a given level of risk.

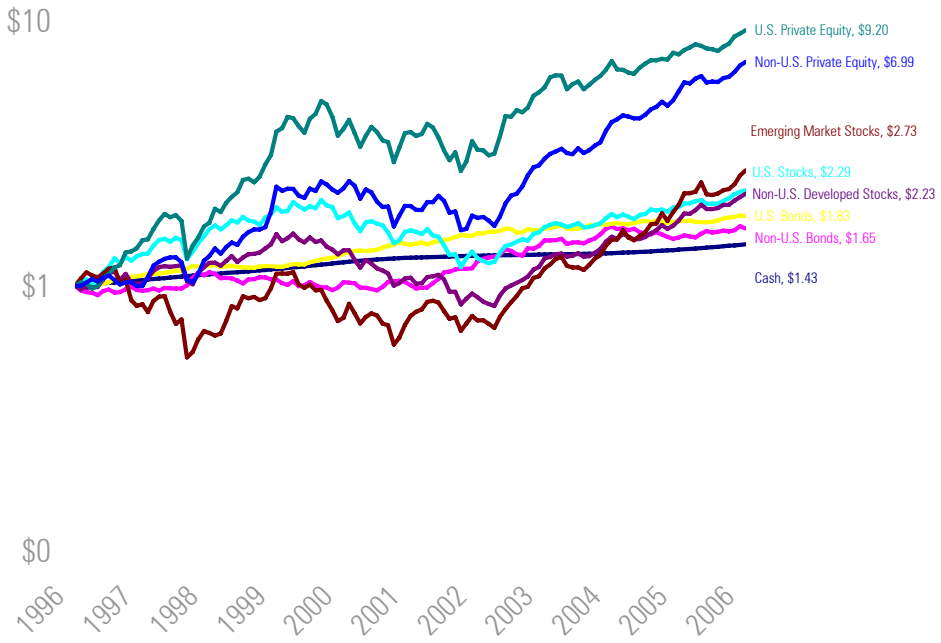
The asset classes and the asset class proxies used in this study are listed in Table 3.

Table 3: Opportunity Set

Asset Classes	Asset Class Proxies
Cash	Citigroup U.S. Domestic 3-Month T-Bill
U.S. Bonds	Lehman Brothers U.S. Aggregate Bond
Non-U.S. Bonds	IA International Bond Composite
U.S. Stocks	Russell 3000
Non-U.S. Developed Stocks	MSCI World Ex. US
Emerging Market Stocks	IA Emerging Market Composite
U.S. Private Equity	Red Rocks Listed Private Equity Index℠
Non-U.S. Private Equity	Red Rocks International Listed Private Equity Index℠

Figure 1 displays the growth of $1 investment made on January 1, 1997 ending on December 31, 2006. Over the relatively short 10-year time period from the beginning of 1997 to the end of 2006, the two private equity asset classes significantly outperformed the other six asset classes. Given that the two private equity asset class proxies were not available until 2006, one must exercise considerable caution in the interpretation of these results. Shortly, we explore different methods of creating backfilled histories for the LPE Index℠ and the International LPE Index℠ to test the sensitivity of these results to other plausible histories.

Figure 1: Growth of $1 Investment



The annual arithmetic returns, compounded returns, standard deviations, and Sharpe Ratios for the eight asset classes are presented in Table 4. In contrast with most 10 year periods in which the annualized statistics for one or more of the asset classes is significantly different from long-term statistics, the order and magnitude of the returns for the six traditional assets classes in this study are relatively consistent with longer-term returns. Unlike most of the literature which finds that private equity and public equity asset class returns are somewhat similar, this is certainly not the case over this ten year period.

Table 4: Asset Class Historical Return Statistics (Jan. 1997 to Dec. 2006)

Asset Class	Arithmetic Annual Return	Compounded Annual Return	Standard Deviation	Sharpe Ratio
Cash	3.69%	3.67%	1.80%	0
U.S. Bonds	6.31%	6.24%	4.00%	0.654
Non-U.S. Bonds	5.72%	5.11%	12.05%	0.169
U.S. Stocks	10.12%	8.64%	18.40%	0.350
Non-U.S. Developed Stocks	10.22%	8.33%	20.91%	0.312
Emerging Market Stocks	15.20%	10.55%	34.08%	0.338
U.S. Private Equity	29.78%	24.85%	40.73%	0.641
Non-U.S. Private Equity	25.11%	21.46%	32.37%	0.662

In Table 5, we compare the performance of the two private equity proxies – the LPE Index℠ and International LPE Index℠ – to the Morningstar U.S. Sector and Style Indices, as well as the two most commonly used appraisal-based private equity benchmarks – the Cambridge Associates LLC U.S. Private Equity Index and the Thomson Financials' US Private Equity Performance Index (PEPI).[12]

Table 5: Sector / Style Historical Return Analysis (Jan.1998 to Dec. 2006)

Asset Class	Arithmetic Annual Return	Compounded Annual Return	Standard Deviation	Sharpe Ratio
U.S. Private Equity	27.9%	24.1%	33.0%	0.739
Non-U.S. Private Equity	27.7%	22.4%	42.6%	0.567
Cambridge Private Equity	14.7%	13.6%	16.3%	0.688
Thomson PEPI	16.3%	13.9%	25.9%	0.496
M* Business Services	5.7%	4.6%	15.8%	0.141
M* Consumer Goods	6.3%	5.9%	10.2%	0.274
M* Consumer Services	10.7%	9.0%	20.3%	0.353
M* Energy	14.3%	12.8%	18.9%	0.570
M* Financial Services	10.4%	9.4%	15.0%	0.457
M* Hardware	12.6%	4.1%	46.7%	0.195
M* Healthcare	8.6%	6.8%	21.0%	0.243
M* Information Super	8.9%	2.8%	37.9%	0.141
M* Media	7.9%	3.5%	32.1%	0.136
M* Services Super	9.0%	8.1%	14.3%	0.383
M* Software	13.0%	5.0%	45.8%	0.208
M* Telecommunication	4.0%	-0.5%	31.2%	0.015
M* Utilities	11.2%	8.4%	26.0%	0.296
M* Mid Value	12.1%	11.2%	15.2%	0.567
M* Small Value	13.1%	11.9%	18.2%	0.529
M* Large Value	8.8%	8.0%	13.7%	0.383
M* Small Core	14.1%	12.9%	17.2%	0.613
M* Mid Core	10.6%	9.8%	14.1%	0.506
M* Large Core	7.2%	6.0%	16.7%	0.223
M* Small Growth	6.7%	3.3%	28.7%	0.111
M* Mid Growth	8.7%	5.5%	27.4%	0.188
M* Large Growth	4.2%	-0.3%	32.3%	0.022

The stellar performance of the two private equity asset class proxies seems too good to be true and raises concerns about the reasonableness of the weights used to create the backfilled history. In order to get a better understanding, we take a detailed look at the individual index constituents of the Listed Private Equity Index℠.

For each of the 34 LPE Index℠ constituents at inception, Table 6 contains the "modified market capitalization" weights on September 30, 2006, used to create the backfilled history; the actual market capitalization weights on September 30, 2006; the "modified market capitalization" weights on September 29, 1995; and the actual market capitalization weights on September 29, 1995.

Table 6: Weight Analysis

Component		Index Weights on 9/30/2006	Market Cap. Weights on 9/30/06	Index Weights on 9/29/95	Market Cap. Weights on 9/29/95
Leucadia Natl Corp	LUK	8.50%	10.13%	24.29%	21.08%
American Capital Strategies	ACAS	8.00%	10.16%	0.00%	0.00%
SVB Financial Corp	SIVB	7.50%	2.74%	21.43%	4.49%
Allied Cap Corp	ALD	6.50%	7.88%	18.57%	9.94%
Capitalsource Inc	CSE	6.50%	8.20%	0.00%	0.00%
Cit Group Inc	CIT	6.00%	17.27%	0.00%	0.00%
KKR Financial Corp	KFN	6.00%	3.53%	0.00%	0.00%
Macquarie Infrastructure	MIC	5.50%	1.52%	0.00%	0.00%
Affiliated Managers Group Inc	AMG	4.00%	5.41%	0.00%	0.00%
Apollo Investments	AINV	4.00%	3.01%	0.00%	0.00%
Millennium Pharmaceiticals	MLNM	4.00%	5.62%	0.00%	6.16%
Triarc Cos Cl B	TRY.B	3.50%	2.41%	0.00%	0.00%
CMGI Inc	CMGI	3.00%	0.92%	8.57%	2.15%
Pinnacle West Capital	PNW	3.00%	8.05%	8.57%	36.78%
Ares Capital Corp	ARCC	2.50%	1.53%	0.00%	0.00%
Internet Cap Grp	ICGE	2.50%	0.66%	0.00%	0.00%
MCG Capital Corp	MCGC	2.50%	1.56%	0.00%	0.00%
Compass Diversifi	CODI	2.00%	0.56%	0.00%	0.00%
Safeguard Scientific	SFE	2.00%	0.42%	5.71%	11.98%
Capital Southwest	CSWC	1.50%	0.83%	4.29%	3.48%
Boston Private Financial Holdings	BPFH	1.00%	1.82%	2.86%	0.69%
Gladstone Capital Corp	GLAD	1.00%	0.48%	0.00%	0.00%
Gladstone Investment Corp	GAIN	1.00%	0.43%	0.00%	0.00%
Jupitermedia	JUPM	1.00%	0.55%	0.00%	0.00%
Technology Investments	TICC	1.00%	0.51%	0.00%	0.00%
Harris & Harris	TINY	0.75%	0.46%	2.14%	0.54%
Hercules Technology Growth Capital	HTGC	0.75%	0.31%	0.00%	0.00%
HQ Healthcare Sb	HQH	0.75%	0.67%	2.14%	1.45%
MVC Capital Inc	MVC	0.75%	0.44%	0.00%	0.00%
NGP Capital Resources	NGPC	0.75%	0.45%	0.00%	0.00%
UTEK Corp	UTK	0.75%	0.32%	0.00%	0.00%
HQ Life Sciences	HQL	0.50%	0.46%	1.43%	1.26%
Jamba/Service Acquisition Corp	JMBA	0.50%	0.33%	0.00%	0.00%
Prospect Energy Corp	PSEC	0.50%	0.36%	0.00%	0.00%
		100.00%	**100.00%**	**100.00%**	**100.00%**

Next, we create two alternative histories for U.S. private equity, both of which are rebalanced to the target weights monthly.

- Alterative 1 – Equally weighted portfolio of the 34 original constituents in existence
- Alternative 2 – Time varying market capitalization weights of the 34 original constituents in existence

Table 7 contains the performance statistics for the LPE Index[SM] and the two alternative histories. The equally weighted (Alternative 1) portfolio produced similar arithmetic returns and at higher standard deviation. The market capitalization (Alternative 2) portfolio had a much lower return and much higher risk. Had an investor been contemplating an investment in listed private equity back in 1997, the somewhat arbitrary decision of which weighting scheme to follow would have made a profound impact on their subsequent 10 year investment experience. We should point out that a relatively large number of LPE Index[SM] constituents do not have a 10 year history and, as a result, the market capitalization (Alternative 2) portfolio becomes highly concentrated in just a few names. This high concentration that results in the high standard deviation is not something we would expect to see moving forward.

Table 7: Performance Statistics – LPE Index[SM] Back History vs. Alternative Back Histories

	Arithmetic Annual Return	**Compounded Annual Return**	**Standard Deviation**
Listed Private Equity Index[SM]	29.78%	24.85%	40.73%
Equally Weighted (Alternative 1)	34.80%	23.10%	70.19%
Market Cap. Weighted (Alternative 2)	39.33%	4.49%	129.91%

We repeated this analysis, creating two alternative histories for the International Listed Private Equity Index[SM]. The results are presented in Table 8.

Table 8: Performance Statistics – International LPE Index[SM] Back History vs. Alternative Back Histories

	Arithmetic Annual Return	**Compounded Annual Return**	**Standard Deviation**
International Listed Private Equity Index[SM]	25.11%	21.46%	32.37%
Equally Weighted (Alternative 1)	21.07%	18.48%	26.31%
Market Cap. Weighted (Alternative 2)	17.99%	10.81%	46.25%

Again, we see that alternative methods for constructing back histories for the two private equities led to substantially different results.

Figure 2 displays the evolution of the market capitalization of the original constituents of the two indices using the historical market capitalization data.

Figure 2: Historical Market Capitalization of Listed Private Equity Companies (in billions)

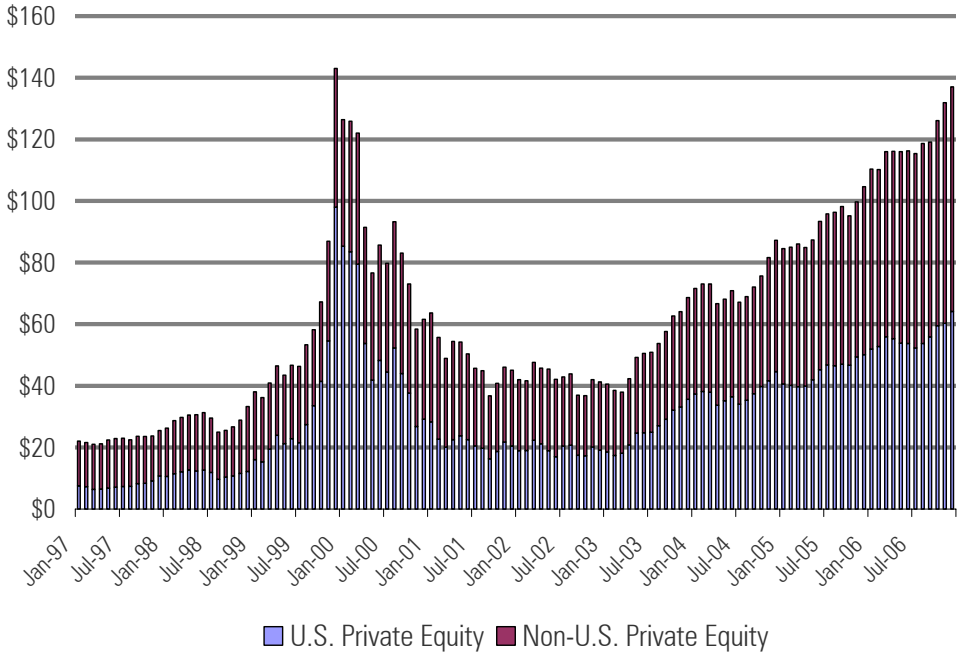


Table 9 presents the historical correlations between the eight asset classes as well as the alternative private equity asset class proxies based on the alternative backfilled histories that we created.

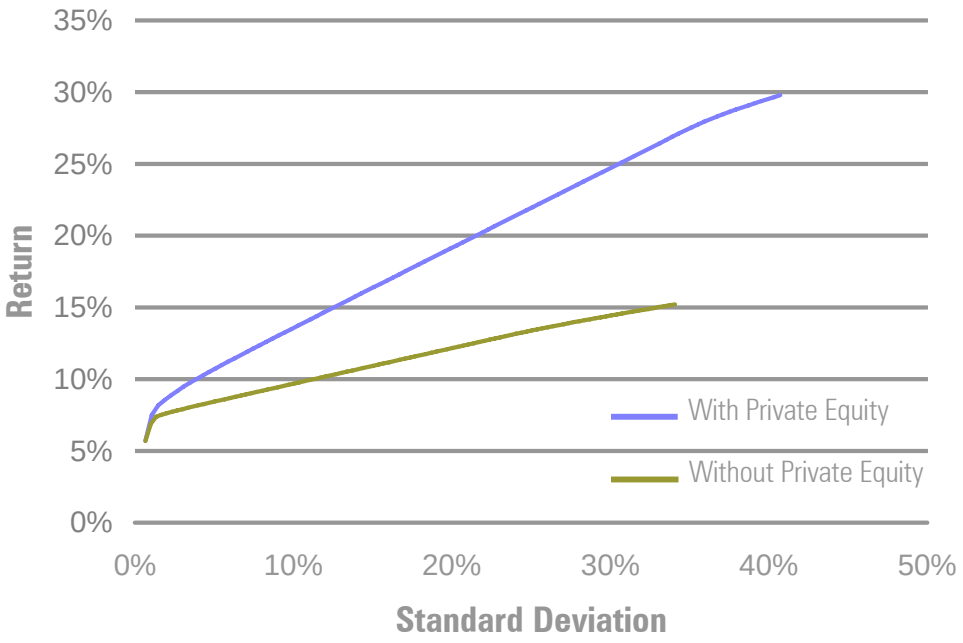
The differences in the backfilled histories create uncertainty around the true performance that an investor in private equity might have realized. Due to this uncertainty, we performed two sets of historical optimizations. In the first set, we used the backfilled LPE Index[SM] and International LPE Index[SM] histories to calculate historical capital market assumptions. In the second set, we replaced the backfilled histories with the Alternative 2 histories.

Table 9: Historical Correlations

	Cash	U.S. Bonds	Non-U.S. Bonds	U.S. Stocks	Non-U.S. Developed Stocks	Emerging Market Stocks	U.S. Private Equity	LPE Index℠ Equally Weighted (Alt.1)	LPE Index℠ Market Cap. Weighted (Alt. 2)	Non-U.S. Private Equity	Int. LPE Index Equally Weighted (Alt.1)	Int. LPE Index Market Cap. Weighted Alt. 2)
Cash	1.00	0.27	-0.56	0.09	-0.25	-0.46	0.04	0.00	0.08	-0.23	-0.33	-0.13
U.S. Bonds	0.27	1.00	0.22	-0.42	-0.75	-0.94	-0.67	-0.75	-0.75	-0.85	-0.84	-0.89
Non-U.S. Bonds	-0.56	0.22	1.00	-0.01	0.19	-0.05	-0.18	-0.17	-0.25	0.05	0.08	-0.06
U.S. Stocks	0.09	-0.42	-0.01	1.00	0.80	0.36	0.70	0.53	0.45	0.65	0.64	0.56
Non-U.S. Developed Stocks	-0.25	-0.75	0.19	0.80	1.00	0.72	0.67	0.61	0.54	0.90	0.92	0.79
Emerging Market Stocks	-0.46	-0.94	-0.05	0.36	0.72	1.00	0.67	0.72	0.68	0.82	0.83	0.83
U.S. Private Equity	0.04	-0.67	-0.18	0.70	0.67	0.67	1.00	0.95	0.90	0.83	0.76	0.87
LPE Index℠ Equally Weighted (Alternative 1)	0.00	-0.75	-0.17	0.53	0.61	0.72	0.95	1.00	0.98	0.83	0.72	0.94
LPE index℠ Market Cap. Weighted (Alternative 2)	0.08	-0.75	-0.25	0.45	0.54	0.68	0.90	0.98	1.00	0.78	0.66	0.92
Non-U.S. Private Equity	-0.23	-0.85	0.05	0.65	0.90	0.82	0.83	0.83	0.78	1.00	0.96	0.94
Int. LPE Index Equally Weighted (Alternative 1)	-0.33	-0.84	0.08	0.64	0.92	0.83	0.76	0.72	0.66	0.96	1.00	0.86
Int. LPE Index Market Cap. Weighted (Alternative 2)	-0.13	-0.89	-0.06	0.56	0.79	0.83	0.87	0.94	0.92	0.94	0.86	1.00

The results of the first set of optimizations are displayed in Figures 3, 4, and 5. Figure 3 presents two historical efficient frontiers based on the LPE Index℠ and International LPE Index℠ backfilled histories. Including U.S. Private Equity and Non-U.S. Private Equity dramatically improved the risk and return characteristics of the efficient frontier. Over the common standard deviation range from approximately 0.67% to 34.1%, the average improvement in returns from including the two private equity asset classes in the optimization is an impressive 633 basis points.

Figure 3: Historical Efficient Frontiers (Using LPE Index℠ and International LPE Index℠ histories)



The allocations that led to these two efficient frontiers are displayed in Figures 4 and 5, respectively. In Figures 4 and 5, the vertical cross-section at the far left displays the asset allocation of the minimum variance asset allocation while the vertical cross-section at the far right displays the asset allocation of maximum return asset allocation. Over this particular historical time period, the two private equity asset classes played extremely large roles in the efficient asset allocations.

Figure 4: Asset Allocation Area Graph with Private Equity

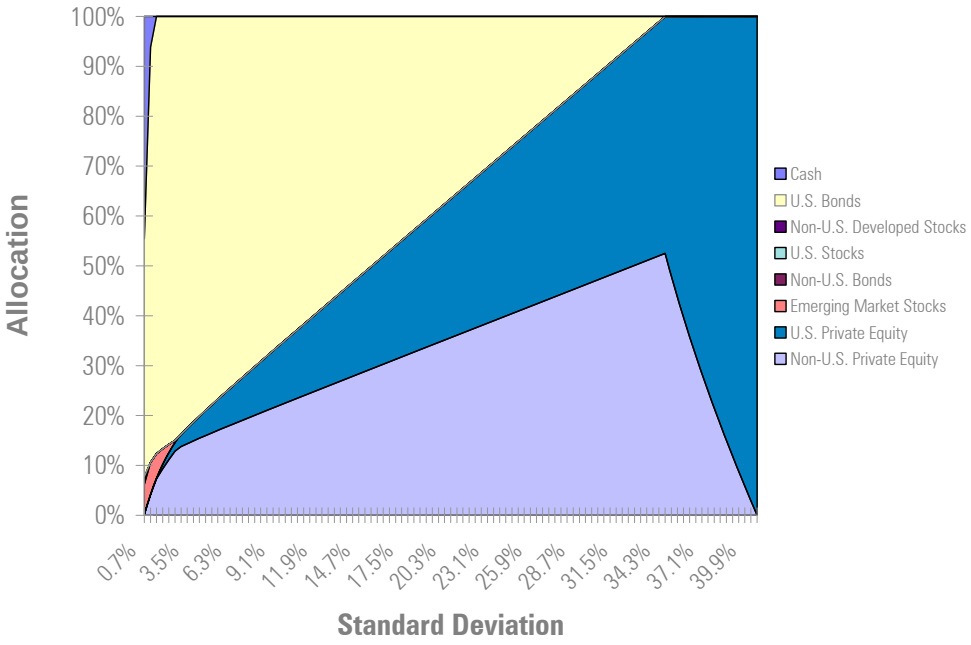
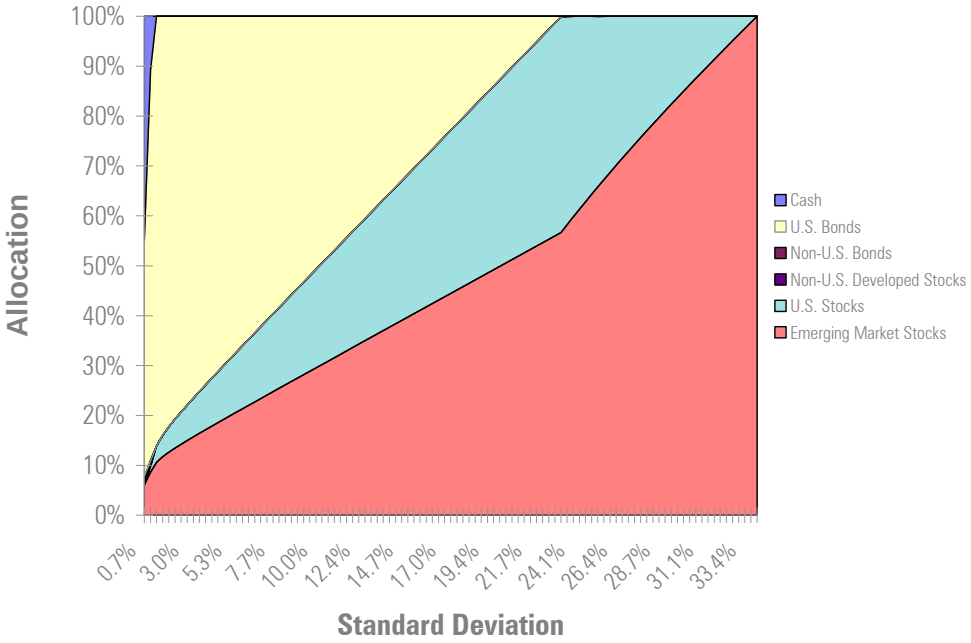


Figure 5: Asset Allocation Area Graph without Private Equity



In our second set of historical optimizations, we replaced the backfilled LPE Index[SM] and International LPE Index[SM] histories with more pessimistic market capitalization weighted alternative histories. The results are reported in Figures 6 and 7. As one would expect, the difference between the two efficient frontiers (over the common risk range) is far less when the pessimistic alternative histories are used to form the capital market assumptions. Over the common standard deviation range from approximately .67% to 34.2%, the average improvement in returns from including the two private equity asset classes in the optimization was more subdued 46 basis points..

Figure 6: Historical Efficient Frontiers (Using alternative histories)

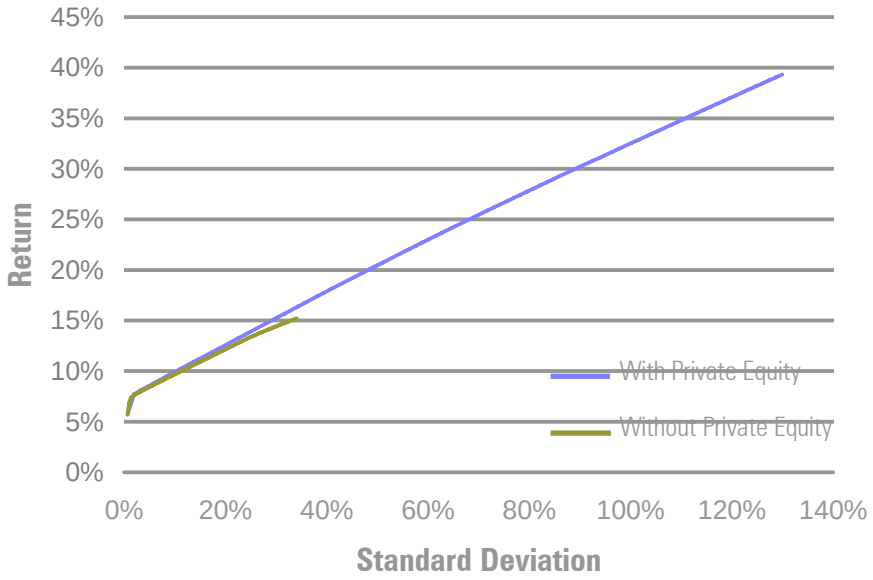
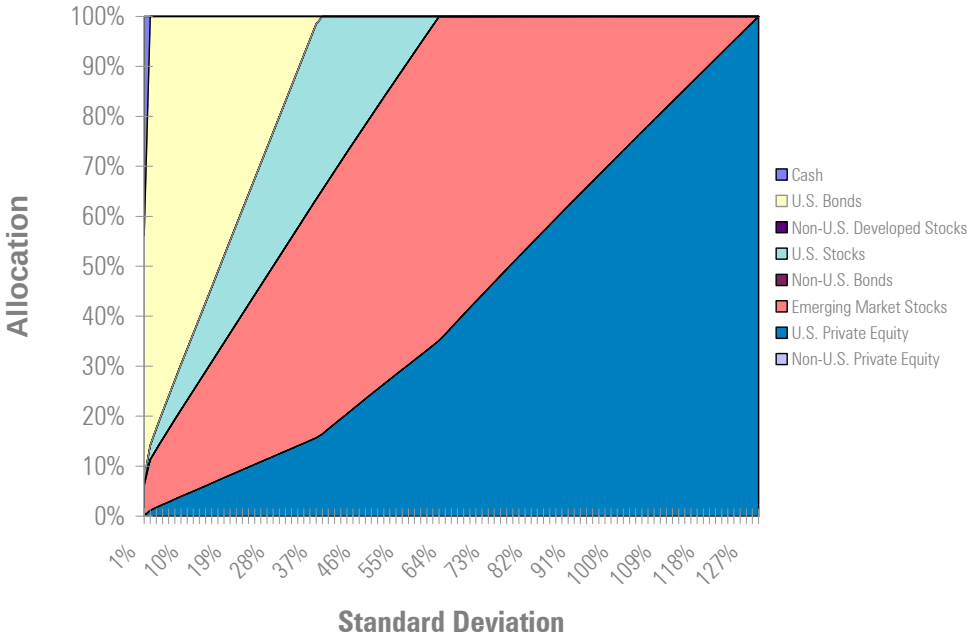


Figure 7: Historical Asset Allocation Area Graph with Private Equity (Using alternative histories)



At reasonable standard deviation levels of 20% or below for a diversified asset allocation portfolio, the optimal level of exposure to private equity in the *past* has been between 0% and 7%.

The asset allocations from the two historical optimizations that included private equity in the opportunity set are dramatically different. In this case, the important comparison is between the allocations to private equity in Figure 4 relative to the allocations in Figure 7. Uncertainty over the historical returns of the asset class creates uncertainty around asset allocations that would have been optimal in the past. Nevertheless, when the returns of private equity are estimated using the pessimistic market capitalization weighted alternative histories with extraordinarily high standard deviations, allocations to private equity still improved the risk and return characteristics of the portfolio.

Moving forward, we believe the volatility of the private equity asset classes will be lower than that of the pessimistic market capitalization weighted alternative histories and more in line with the historical volatility of the official histories of the Listed Private Equity Index℠ and International Listed Private Equity Index℠, respectively. However, we also believe that over longer time periods, the compounded return of private equity will be similar to that of public. In the next section, we perform a forward-looking optimization that incorporates these beliefs on the future performance of the asset class.

Forward-Looking Asset Allocations

It is well known that the highly concentrated asset allocations that result from optimizations based on relatively short-term capital market assumptions are often among the worst performing asset allocations in a forward-looking context. In an effort to create more reasonable forward-looking asset allocation ranges, we develop a set of forward-looking capital market assumptions.

In addition to using forward-looking capital market assumptions, we use an enhanced optimization technique known as resampled mean-variance optimization.[13] Traditional mean-variance optimization treats the capital market assumptions as if they were known with 100% certainty. Resampled mean-variance optimization recognizes that the capital market assumptions are forecasts and are not known with 100% certainty. Conceptually, resampled mean-variance optimization combines Monte Carlo simulation with the traditional Markowitz mean-variance optimization approach. The resulting asset allocations are those that, on average, are predicted to perform best over the range of potential outcomes implied by the forward-looking capital market assumptions. Research has shown that asset allocations selected from a resampled efficient frontier may outperform those from a traditional efficient frontier.[14]

Asset Allocations based on the CAPM

Our forward-looking capital market assumptions are based on the Sharpe-Lintner-Mossin-Treynor Capital Asset Pricing Model.[15] The CAPM is the most famous of the asset pricing models and at the heart of modern portfolio theory. According to the CAPM, the expected return of an asset is directly related the asset's sensitivity to the return premium of the unobservable, all-inclusive market portfolio return plus the expected return on the applicable risk-free asset. When developing a set of expected returns using the CAPM, we use the reverse optimization method proposed in Sharpe [1974], which requires us to develop a working version of the market portfolio based on our opportunity set of available asset classes.[16] The relative market capitalization weights of the assets in the opportunity set are then coupled with the historical covariance matrix and the risk-free rate to impute the expected returns of the assets. Rather than estimating the expected premium of the total market portfolio above the risk-free rate of return, we calibrate our model so that the expected return to U.S. Equities matches Ibbotson's current expectation.[17]

We begin by estimating the market value of each of the eight asset classes in our opportunity set. For the most part, this is a straightforward procedure in which we use the free-float market value associated with the asset class proxy or a very similar asset class proxy. While the market capitalizations of the LPE Index[SM] and International LPE Index[SM] are readily available, these values represent only part of the broader private equity asset class. Ennis and Sebastian [2005] estimates the value of private equity at the end of 2003 at approximately $500 billion. Phalippou [2007a] states that the value of private equity exceeds $1 trillion. According to data from Thomson Financial, there are more than 3,000 private equity

funds with asset under management of $1.5 trillion. And most recently, a July 2007 *InvestmentNews* article cited a figure of $1.7 trillion based on information from Tiburon Strategic Advisors. Arguably these estimates are for the total value invested in private equity funds, which is a subset of the broader private equity asset class.

A somewhat inventive approach is needed to approximate the size of the true private equity asset class. In late 2006, *Forbes* identified all U.S. private companies with sales of $1 billion or more. The 394 companies had total sales of $1.4 trillion.[18] With average sales of $3.55 billion, these companies are somewhat similar to the average sales of a mid-cap company. Averaging the trailing price-to-sales ratios of several mid-cap indices leads to a price-to-sales ratio for mid-cap stocks of 1.22. Applying the price-to-sales ratio of 1.22 to the total sales of the largest U.S. private companies leads to an estimated market value of U.S. private companies of $1.7 trillion. Next, assuming that the ratio of U.S. private companies to total U.S. equity (both private and public) applies outside of the U.S., we infer the market value of non-U.S. private companies at $2.2 trillion. Thus, the total value of the private equity asset class is estimated at $3.9 trillion. As this number ignores firms with sales of less than $1 billion it is probably a conservative estimate of the size of the private equity asset class. Conceptually, one might interpret the $3.9 trillion as the value of the private asset class and the $1.7 trillion estimate of the current value of all private equity funds as the part of the asset class that is available for purchase.

Moving forward, we make the assumptions that the free-float (or available for purchase) worldwide value of private equity is $1.7 trillion. Furthermore, we divide $1.7 among U.S. Private Equity and Non-U.S. Private Equity based on the ratio of U.S. equity to all non-U.S. equity. This assumption implies that private equity represents approximately 2.6% of the working version of the market portfolio based on our opportunity set. In the absence of additional information, 2.6% could be a market neutral allocation to private equity. In a more diverse opportunity set, this number would decrease and in a less diverse opportunity set, this number would increase. As we noted earlier, the market capitalization of listed private equities at the end of 2006 was nearly $140 billion, representing around 8% of the $1.7 trillion invested in private equity funds. Over time, we expect this 8% to dramatically increase as more private equity funds are securitized in some manner.

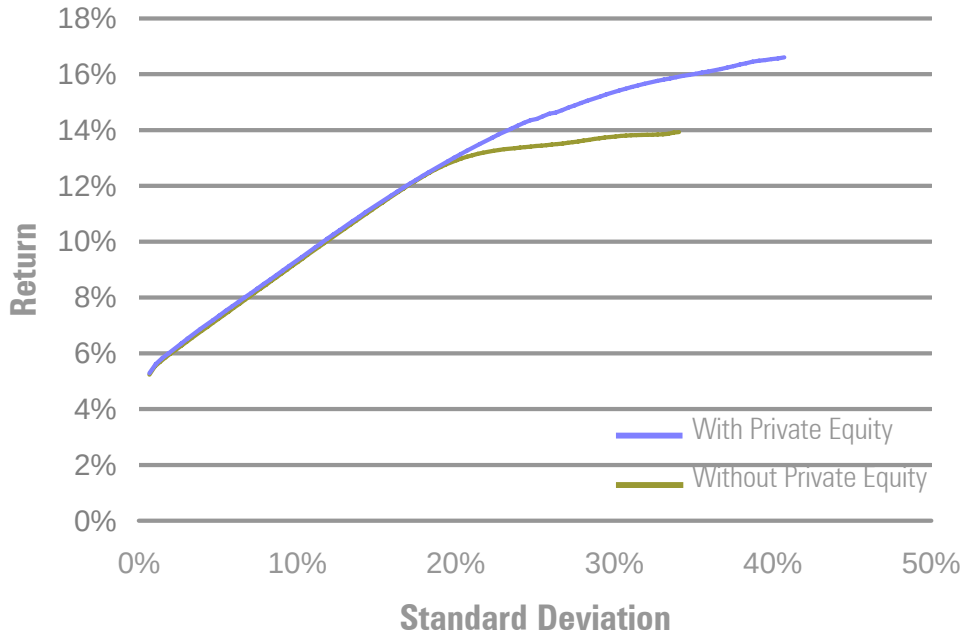
Table 10 presents the market value estimates, the weights of the market portfolio, and the imputed total returns based on the CAPM. The return of U.S. Bonds relative to Cash is somewhat unusual; however, given the dip in the intermediate range of the U.S. yield curve at the time of this writing, perhaps this is not entirely unreasonable.[19] Under this global CAPM model of expected returns, private equity is expected to produce significantly higher arithmetic returns than public equity, although the dispersion among these two types of equity is not nearly as great when the returns are converted into expected compounded returns. All else equal, volatility increases the difference between arithmetic and compounded returns. Based on our literature review, we think that it is reasonable to assume that the compounded returns of private equity will be similar to those of public equities, albeit at a higher standard deviation, as all current private equity investments are bundles of systematic (beta) risk and investment specific risk.

Table 10: Market Capitalizations and CAPM Returns

Asset Class	Estimated Market Value	Weight in Market Portfolio	CAPM Expected Return
Cash	$500	0.8%	5.0%
U.S. Bonds	$10,935	16.6%	4.2%
Non-U.S. Bonds	$14,199	21.6%	6.7%
U.S. Stocks	$16,623	25.2%	11.7%
Non-U.S. Developed Stocks	$18,882	28.7%	13.4%
Emerging Market Stocks	$3,004	4.6%	13.9%
U.S. Private Equity	$734	1.1%	16.6%
Non-U.S. Private Equity	$966	1.5%	16.3%
Total	$65,844	100.0%	

We can now couple the forward-looking CAPM expected returns with the historical standard deviations and correlations reported earlier to produce a complete set of capital market assumptions. Using resampled mean-variance optimization, Figure 8 contains two efficient frontiers. As before, the lower efficient frontier does not include the two private equity asset classes in the opportunity set.

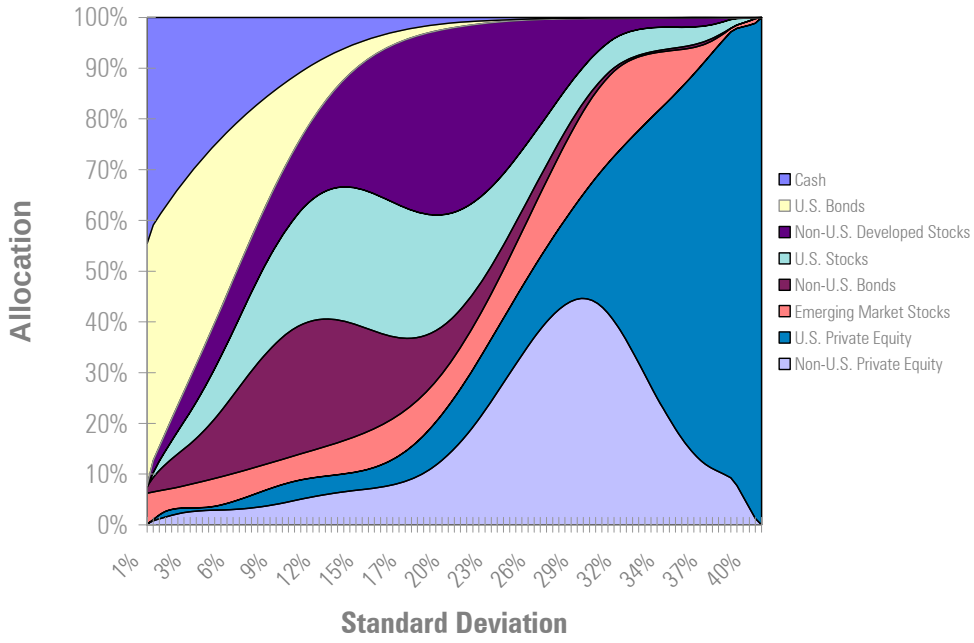
Figure 8: Forward-Looking Efficient Frontiers



Intuitively, including U.S. Private Equity and Non-U.S. Private Equity in the opportunity improves the risk and return possibilities. In a finding that is qualitatively similar to that of Ennis and Sebastian [2004], the benefit of including private equity in the opportunity set is most significant for higher risk, equity-centric asset allocations. The benefits are most pronounced in asset allocations with a standard deviation above 19%, which in our analysis, corresponds to asset allocations with approximately 85% or more in equities.[20]

In Figure 8, the asset allocations with a standard deviation below 19% were only slightly improved by including private equity in the opportunity set. Despite the small improvement in the risk and return trade-off, the allocations to private equity at these lower risk points were surprisingly large. Figure 9 displays the asset allocations that lead to the efficient frontier in Figure 8. From the applicable part of the efficient frontier from which most asset allocations are selected (i.e. asset allocation with a standard deviation below 20%), the allocations to private equity range from near 0% for conservative asset allocations and approximately 20% for more aggressive allocations.

Figure 9: Forward-Looking Asset Allocation Area Graph with Private Equity



The forward-looking optimizations suggest that strategic asset allocations ranging from 0% to 10% that split between U.S. Private Equity and Non-U.S. Private Equity are reasonable. Using CAPM-based return assumptions suggests that allocations to private equity will provide relatively small improvements in the available risk and return characteristics at lower risk levels and potentially large benefits at very high risk levels.

Given the relatively small market size of private equity in the market portfolio, asset allocation above 10% should be entered into with great caution. Two primary scenarios would lead one to an *effective* asset allocation greater than 10%.[21] First, for investors who truly believe that the performance of the asset class as a whole will surpass the performance of public equity, larger strategic asset allocations are warranted. Second, for investors with access to managers (e.g. top quartile managers) that they believe will produce positive alpha, private equity will play a larger role in their portfolios. Under this second scenario, an alpha-beta separator would not increase their strategic asset allocation to private equity, rather they would accept active risk relative to the strategic asset allocation in the pursuit of alpha.

The introduction of listed private equity indices that enable us to more accurately measure the performance of the asset class, especially the volatility, also create new challenges. A new choice for implementing a strategic asset allocation is now available. In general, institutional investors, especially

those with access to top quartile private equity managers, should continue to implement strategic asset allocations through traditional private equity managers. For investors who do not have access to top quartile private equity managers, listed private equities provide a new, liquid way of implementing a target private equity allocation.

A word of caution is warranted when it comes to implementing a strategic asset allocation to the private equity asset class with listed private equity. This is a macro-inconsistent investment policy. All listed private equity companies are part of the broad equity benchmarks. As a result, listed private equities would be purchased to implement two areas of the asset allocation – both the public and private equity sections. Should a relatively large number of investors include a strategic asset allocation to private equity that is implemented with listed private equity, this could result in a long-run supply and demand imbalance. We believe a supply and demand imbalance resulting from strategic asset allocations to real estate that are implemented with REITs has contributed to the outstanding historical performance of REITs.[22]

Future Implications

While the focus of our research has been on the role of private equity in strategic asset allocations, one of the most exciting implications of the development of listed private equity indices is the ability to make tactical asset allocations to the private equity asset class. The illiquid nature of traditional private equity funds prevents tactical asset allocators from quickly increasing or decreasing allocations to the asset class. Listed private equity indices and the introduction of products based on them enable investors to quickly and to easily make tactical shifts.

Fund specific risk cannot be hedged and the degree to which listed private equity proxies reflect the true beta characteristics of the private equity asset class is somewhat limited. We believe that the securitization of private equity investments is just beginning. This will have two significant impacts. First, moving forward, listed private equity proxies will more accurately reflect the beta characteristics of the private equity asset class as more private equity investments are securitized. Second, while most current investments in private equity funds are dominated by fund specific risk, securitization will generally lead to more diversified private equity investments. As this happens, typical private equity portfolios will be characterized less by investment specific risk and more by the beta characteristics of the true private equity asset class.

The diversification of private equity portfolios and the diversification of listed private equity indices will enable investors to hedge unwanted private equity asset class beta and begin to practice portable alpha / portable beta strategies with private equity portfolios. Due to securitization, we believe that what was once considered a pure alpha strategy is becoming exotic beta and will relatively quickly become standard beta. Additionally, what was once an institutional-only asset class will begin to appear in the strategic asset allocation of individual investors – something that was unheard of 10 years ago.

Conclusions

Private equity is a perplexing asset class that is rapidly changing.

There is considerable confusion on 1) the distinction between the private equity asset class and private equity strategies / investments / funds, 2) the historical performance of private equity, and 3) the role of private equity in a strategic asset allocation.

Listed private equity enables all investors to participate in the asset class, an asset class that we expect to produce similar returns to public equities over time. Private equity investments are bundles of systematic asset class risk and investment specific risk. Securitization is just beginning within the private equity space. In the future, typical private equity portfolios will be characterized less by investment specific risk and more by the beta characteristics of the true private equity asset class.

The development of listed private equity proxies overcomes the primary disadvantage of appraisal-based benchmarks, artificially smoothed returns. The past performance of listed private equity indices is extremely sensitive to the weight of the constituents. Over time, we believe listed private equity proxies will become the best representation of the beta of the private equity asset class. As a result, listed private equity indices are well suited for asset allocation studies.

In both historical and future-looking optimizations, including U.S. Private Equity and Non-U.S. Private Equity in the opportunity set improved the available risk and return characteristics of the asset allocations. The portion of the private equity asset class that is available for purchase represents approximately 2.6% of the world-wide investable universe. A range around this 2.6% market neutral allocation varying from 0% to 10% seems to be an appropriate allocation range supported by the optimizations. For investors with average risk tolerances, an allocation below 2.6% could be regarded as underweight in private equity. Allocations to private equity above 10% should be entered into with great caution and are only appropriate for very aggressive, knowledgeable investors with access to top quartile managers. Finally, given the large flows in recent years into the private equity asset class, it is reasonable to assume that the number of dollars invested in private equity strategies will increase in the future, in which case the market neutral allocation of the future should exceed 2.6%.

Institutional investors with access to top quartile managers should primarily use traditional private equity funds to implement a target private equity allocation. For investors who do not have access to top quartile managers and want to include an allocation to private equity, investing in listed private equity is a viable and exciting alternative that, over time, should more accurately reflect the private equity asset class.

Finally, one of the most exciting implications of the development of listed private equity is that it enables tactical asset allocators to make tactical private equity shifts.

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Endnotes

[1] In general we are not a fan of the "alternative" label as it is often used as a "catch-all" or "other" bucket for more esoteric asset classes as well as newer investment strategies, which immediately prevents a clear separation of alpha and beta. Strategic asset allocation is the beta decision and the implementation of that strategic asset allocation is the alpha decision (i.e. product implementation decision).

[2] Even for investors that have access to private equity funds, they should proceed with caution. Fee structures can be extremely complex (see Phalippou [2007b]).

[3] Marcato and Key [2007] discusses the implications of the artificially smooth returns series that result from appraisal-based indices in an asset allocation and evaluates the prominent approaches to de-smoothing appraisal-based return series.

[4] The returns of private equity funds often follow what is referred to as a J-curve in which initial returns are negative, stabilize, and then are sharply positive as the fund moves through a typically lifecycle.

[5] Wealthy investors, family offices, and large institutional investors can carry out private equity investments directly, which distinguishes them from investment vehicles.

[6] Just like traditional equity investing, active management remains a zero-sum game. However, as the typical private equity fund is extremely concentrated when compared to a typical mutual fund, it easy to see that the dispersion of returns among private equity funds will be substantially higher.

[7] See CISDM Research Department [2006].

[8] See Private Edge Group [2006] and Swenson [2000].

[9] Phalippou and Gottschalg [2006] consistently makes aggressive assumptions that ultimately lead to the substantial underperformance of private equity relative to public equity and as such should be treated as a lower bound on the performance of private equity.

[10] Phalippou [2007a] provides an overview of the different rationales for investing in private equity given the low realized returns found.

[11] See for example, Guerrera [2007].

[12] As appraisal-based indices, both the Cambridge Associates LLC U.S. Private Equity Index and the Thomson Financials' US Private Equity Performance Index (PEPI) are likely to have artificially smoothed returns; thus, the standard deviations reported in Table 5 may be understated. The returns of these indices may also be biased upward (see Kaplan and Schoar [2005] and Phalippou and Gottschalg [2006] for more in-depth discussions).

[13] Ibbotson's proprietary version of resampled MVO grew out of the pioneering work of Jobson and Korkie [1980, 1981], Jorion [1992], DiBartolomeo [1993], and Michaud [1998].

[14] See Markowitz and Usmen [2003].

[15] See Sharpe [1964], Lintner [1965], Mossin [1965], and Treynor [1961, 1962]

[16] Reverse optimized returns are also the starting point for the Black-Litterman asset allocation model (see Black and Litterman [1992]; therefore, they are sometime also referred to as Black-Litterman returns.

[17] The U.S. Equity return premium is estimated using the Ibbotson building blocks methodology (see Ibbotson and Sinquefield [1976a, 1976b] coupled with a "supply-side adjustment" (see Ibbotson and Chen [2003]).

[18] From Forbes.com, one can access Forbes' list of largest private companies in the U.S. The list includes statistics on the largest U.S. private companies (http://www.forbes.com/lists/2006/21/biz_06privates_The-Largest-Private-Companies_Revenue.html).

[19] Two other causes for the low expected return on U.S. Bonds are 1) the correlations are based on a relatively short time period, and 2) our opportunity set is somewhat equity-centric resulting in a negative beta relative to the market portfolio defined by our opportunity set.

[20] Including a riskier, higher returning fixed income asset class, such as high yield or emerging market bonds, would likely decrease the 85%.

[21] Here we use the word "effective" as it is commonly used in a returns-based style analysis framework to describe the beta exposures of the aggregate portfolio which are often different from the target beta exposures of the strategic policy benchmark.

[22] See Idzorek, Barad, and Meier [2007].