Policy Benchmark Selection

Volume I: Approaches to Setting Policy Benchmarks

Volume II: Approaches to Selecting a Risk Premium

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Foreword

A universal requirement for sophisticated investors is to continually measure the success of its investment strategy. However, the unique nature of private investments can complicate an LP's selection of an appropriate high-level performance goal, or Policy Benchmark, for the asset class. This report is not a recommendation for a specific Policy Benchmark methodology, as LPs' allocation strategies, risk tolerances, and liquidity requirements (among other characteristics) can vary widely. Rather, the report's goal is to provide a comprehensive overview of all considerations to support each LP's selection of a Policy Benchmark for its private investment portfolio.

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- The ILPA Research & Benchmarking Committee
- Cambridge Associates
- ILPA members who provided details on their Policy Benchmark approach

ILPA welcomes questions and comments on this report, as well as recommendations for future research topics. Please contact content@ilpa.org.

About the Author

With over 25 years of experience as an investor, advisor, and analyst, Eric Johnson has extensive knowledge of the institutional market, including a particular expertise in strategic asset allocation, emerging markets, and private equity performance and benchmarking issues. Prior to forming TVPI Advisors (www.tvpiadvisors.com), Eric was a Managing Director at Cambridge Associates (CA), where he worked closely with board members and investment committees of endowments, foundations, sovereign wealth funds, healthcare organizations, and other institutional investors. He has advised Limited Partners on issues ranging from spending policy and asset allocation strategy to manager structure and selection, performance monitoring and benchmarking, investment policy, mission-related investing, and portfolio implementation. Eric has direct experience leading due diligence of private investment partnerships globally including venture capital, buyout, growth equity, impact investment funds, and funds of funds. He was instrumental in the development and expansion of CA's emerging markets private equity and venture capital benchmarks. Eric also was the primary creator of the firm's proprietary Modified Public Market Equivalent (mPME) methodology for comparing private equity returns to public market returns, and was a strong advocate for including other PME approaches such as K&S PME and Direct Alpha in the firm's benchmarking toolkit.

Eric began his investment management career with Small Enterprise Assistance Funds, managing a private equity fund backed by the European Bank for Reconstruction and Development (EBRD). Earlier, he served on the National Security Council staff in the White House Situation Room, and previously was an Analyst for the U.S. Department of Defense. Eric has a Bachelor of Arts in History, a Master of Arts in Russian and East European Studies and an MBA, all from Stanford University. He is fluent in Russian.

Table of Contents

DISCLAIMER: This installment of the ILPA White Paper Series (Paper) reflects the views of the participants on how a Limited Partner might evaluate the performance of its portfolio. No Limited Partner should utilize this Paper as a substitute for its own determination as to what information such Limited Partner will need or desire with respect to any particular investment or portfolio of investments.

Executive Summary (Volumes I & II)

This report provides guidelines for Limited Partners to use in establishing Policy Benchmarks for their allocations to Private Equity and Venture Capital investments ("PE/VC") within the context of their overall long-term investment portfolios. It is intended primarily for LPs at the level of the Board, Investment Committee, Chief Investment Officer, and Asset Allocation Director/Team, as well as private investment specialists.

The report discusses various purposes of Policy Benchmarks in light of different LPs' investment objectives, asset allocation strategies, and portfolio construction methodologies. It highlights current practices most commonly used by LPs, drawing upon ILPA's most recent member surveys and other industry data.

The report is comprised of two volumes, examining the:

1. Approaches to setting Policy Benchmarks, merits of using public and private indices, and survey data on current LP practices (Volume I)
2. Approaches to selecting a risk premium (Volume II)

To help LPs determine the appropriate premiums for their programs, the report provides analyses and guidance for interpreting the latest historical PE/VC returns.

A Policy Benchmark should help an LP understand whether its PE/VC program is fulfilling its designated role within the LP's broader investment program. For most LPs, this role is to achieve higher potential long-term returns than may be available in the other asset classes in their portfolio. The two most common benchmarking approaches--public-market indices and private investment peer-group indices--can help an LP address two key questions:

1. "Have we been adequately rewarded for allocating capital to PE/VC in comparison to other potential uses for our capital?"
2. "How well have we done in implementing our PE/VC allocation?"

Policy Benchmarks based on public-market indices have the advantage of measuring the net effects of the full range of an LP's active management decisions versus a simpler, investable portfolio, consisting solely of public securities. Importantly, this includes measuring the combined effects of the LP's decision to invest in PE/VC itself and the LP's overall implementation of the PE/VC portfolio. However, because an LP's performance versus a public-market index consists of both these elements, it is difficult for a public-market index alone to provide sufficient answers to address the second effect of how well the PE/VC portfolio has been implemented.

Policy Benchmarks based on peer-group indices of private investments, on the other hand, have the advantage of a much more direct comparison of the results of an LP's implementation decisions (e.g., strategy, geography, manager, and timing choices) with the performance of the most representative indices of actual private investments that the LP can identify. This can help answer the second question above, but does not provide a clear answer to the first one.

Some LPs already calculate two different overall portfolio Policy Benchmarks, one using private indices and the other using only public indices. This is a reasonable practice, even if only one of the calculations is designated as the "primary" Policy Benchmark that is reported on a quarterly

basis using time-weighted returns. Other LPs may simply choose one approach for their ongoing quarterly Policy Benchmarks, and then conduct more detailed periodic reviews of their PE/VC programs that use both approaches and other analyses. These can include since-inception dollar-weighted returns (e.g., Internal Rates of Return) and comparisons to public-market indices using Public Market Equivalent ("PME") calculations (which weight the public market returns according to the cash flow pattern of the PE/VC investments) that provide a more comprehensive view of the answer to the second question.

Whether using public-markets or private investment peer-groups, LPs should choose indices that reflect the geographies, strategies, and potentially even the company sizes that are relevant to the private investment strategies in their programs. The specific mix of indices should be changed over time, as needed, to reflect the evolution of the LP's private investment program (for example, by adding new geographies in the case of a North-America-focused program that decides to make ongoing commitments in Europe and Asia). LPs should consider, however, whether any large changes may create unintended incentives for the institution either to speed up or slow down allocations to particular strategies or geographies. Weightings can be adjusted based on the expected/targeted amount of annual commitments to each strategy/geography. Very large investors can also consider customized private investment peer-group indices that exclude smaller funds, which are not investable for them because of their required commitment sizes. Lastly, LPs may wish to add a time lag (e.g., three months) when using a public benchmark, given that reported private market valuations can take longer to adjust than the stock markets.

LPs using public-market indices should choose a premium above the returns of public stocks that reflects the additional compensation that their institution both requires and expects to be able to achieve when taking on the illiquidity and other risks of PE/VC. This level can vary among institutions, but should be based on:

1. The LP's required premium for illiquidity and the other risks of PE/VC
2. Reasonable expectations of forward-looking premiums that reflect an understanding of the:
    a. Industry's historical returns
    b. Current/expected market environment
    c. LP's own capabilities

In deciding on the return premium to include in a public-market approach, LPs need to ensure that the expected return premium for their PE/VC allocation is greater than or equal to the return premium that is required for their PE/VC assets to fulfill their role in the LP's portfolio.

Different LPs can be expected to have different required premiums for illiquidity and other private investment risks. These required premiums can vary based on LP-specific factors, including the overall level of illiquidity in the LP's portfolio and the LP's level of expected future spending requirements. LPs with small allocations to illiquid assets and low near- and medium-term spending requirements, for example, may have lower required premiums than LPs with large allocations to illiquid investments and high near-term spending requirements.

The most common premium according to survey data in this report is currently in the range of 300 to 399 basis points above public stocks, with many other LPs setting their premiums at 400 or 500 basis points.

The aggregated results for $2 trillion in US-focused PE/VC funds over the last 20 years have often failed to meet 300 to 500 basis points of outperformance, as measured using Direct Alpha, a leading PME methodology. This is especially true when US PE/VC is evaluated versus small-cap stocks. Although US PE/VC funds of the 1995 to 2016 vintages beat the S&P 500 Index by 443 basis points, that same group of funds fell far short of a 300- to 500-basis-point objective versus small-cap stocks, beating the S&P 600 Small Cap Index by just 111 basis points. This latter result came despite including the strong results of the 1995 to 1997 US venture capital vintages. Without those bubble-driven VC results, the $1.7 trillion of US PE/VC commitments in the 1998 to 2014 vintages underperformed the S&P 600 Small Cap Index by 26 basis points (and thereby failed to meet any 300- to 500-basis-point objectives by very wide margins).

As they seek to determine an expected forward-looking premium for inclusion in their Policy Benchmarks, LPs should review the academic and industry literature on the performance history of PE/VC, as well as the new analyses and considerations presented in Volume II. Unfortunately, one of the industry's most popular performance measures--a methodology for aggregating the returns of many different PE/VC funds between two specific points in time, called the "horizon return"--is highly flawed, as shown in this report, and cannot be used reliably for determining an appropriate premium. LPs can instead use analyses based on PME methodologies such as Direct Alpha, Cambridge Associates mPME, and/or K&S PME to inform their decisions on an expected returns premium (along with forward-looking assessments of the market environment and a candid understanding of their institutions' strengths and limitations as LPs).

LPs commonly use a broad market index such as the Russell 3000 Index or even the S&P 500 Index as the base index for their Policy Benchmarks. LPs should consider, though, if part of what they currently consider as a "premium" or "spread" versus such a broad market index could essentially be replicated by more targeted public-market allocations. For example, an index of small-cap stocks (or even active management in small-cap stocks) might better represent the opportunity costs for many LPs allocating to PE/VC, and could be considered as the base index for the Policy Benchmark, above which a premium would be added. Whichever index is selected should be calculated on a "total return" basis, including reinvestment of dividends (rather than on a price-only basis).

On the other hand, for LPs wishing to continue using a broad market index such as the Russell 3000 Index (or even the S&P 500 Index) for consistency with their public equity benchmark, the historical outperformance of small-cap stocks over various extended time periods shown in this paper (as well as leverage and sector effects highlighted in recent research by a group of authors from CPPIB/ADIA) may suggest the value of setting a premium well above the typical 300 basis points when using the Russell 3000 or S&P 500 indices.

LPs considering the use of a small-cap index should also be careful about analyses based on the Russell 2000 Index, a common policy benchmark for small-cap stocks. Much of what appears to be "outperformance" by PE/VC investments when using the Russell 2000 Index for benchmarking

or in academic studies disappears when the S&P 600 Small Cap Index or another non-Russell small-cap index is used instead. LPs may wish to review additional public-market analyses if they are currently using the Russell 2000 (and perhaps by extension also the Russell 3000) Indices for their PE/VC Policy Benchmarks.

PE/VC outperformance has been quite concentrated, with the top 5%, 10%, and 25% of funds accounting for a disproportionate share of the positive results. LPs using "pooled" average historical results for setting their Policy Benchmark premiums should consider whether they are likely to be able to identify and access their proportionate share of the future top funds. Without those winners, their results are likely to be below the pooled averages, and so those pooled figures may not be a good basis for setting their premium. For example, LPs investing only in funds within the second and third quartiles (25th to 75th percentile) from 1998 to 2014 had annualized results that were 150 to 200 basis points worse than the broad pool of all four quartiles. Alternatively, missing out on just the top 5% of US VC funds and US Buyout funds caused outperformance to drop by approximately 230 basis points and 100 basis points, respectively. These various declines represent a large percentage of a 300-basis point premium that an LP might otherwise consider to be achievable.

The analyses in Volume II of this report would generally suggest that LPs should set lower Policy Benchmark premiums overall, rather than higher ones, based on: 1) the modest premiums that the industry has generated overall on a total pooled returns basis, especially versus small-cap stocks; and 2) the even lower premiums that have been generated by the "average" funds or by the industry (i.e., minus the top 5% or 10% of its funds). The differentials in relative performance of PE/VC versus broad-market indices and small-cap indices would suggest that for any given level of overall expectations of private investment returns, investors using a broad-market index may wish to use a higher premium relative to the premium they might use for a small-cap index that incorporates some of the additional risks associated with PE/VC investments.

Finally, LPs should compare their revised expected return premiums with the premium requirement that they determined was necessary based on the role of PE/VC in their portfolios and their tolerances for illiquidity and the other risks associated with PE/VC. If the expected return is greater than the required return, the Policy Benchmark premium can be set at the level of the premium requirement. If it is not, the LP should either reconsider its portfolio and asset allocation return requirements, or consider whether changes to its implementation approach could improve the expected return premium of its PE/VC allocation.

Volume I - Approaches to Setting Policy Benchmarks

a. Introduction

This report addresses key issues in selecting the appropriate "Policy Benchmark(s)" for asset owners with allocations to private investments such as buyout, venture capital, growth equity, and distressed securities funds ("Private Equity and Venture Capital" or "PE/VC").[1] The report is organized in two Volumes, which focus on key decisions facing LPs at the level of the Board, Investment Committee, Chief Investment Officer, and Asset Allocation Director/Team. These decisions include whether to use public and/or private investment performance indices, which specific indices to use (e.g., broad market-cap-based indices or narrower small-cap and/or sector indices), and what premium or "spread" (e.g., 200 to 500 basis points) of outperformance to target above the return of the index (if any). In addition to covering the theory and policy issues related to establishing a benchmark at the total portfolio level, the report highlights current practices most commonly used by LPs, drawing upon ILPA's most recent member surveys and other industry sources. Volume I provides an overview of Policy Benchmark approaches and current LP practices. Volume II provides details on approaches to selecting a risk premium for inclusion in an LP's Policy Benchmark.

The focus of this report is on long-term Policy Benchmarks and return targets for broad PE/VC allocations set by an institution, rather than benchmarks for individual fund managers or specific investment strategies or geographies.[2]

b. Overview of Policy Benchmark Approaches

Policy Benchmarks are set at the asset owner's overall "Policy Portfolio" level, which includes the set of asset classes, factor exposures, or types of investments used by that investor, along with their relevant weightings. These Policy Benchmarks should be set by the Board and/or Investment Committee following input from the Chief Investment Officer, other members of the investment team, and the LP's consultant(s), if any. The Policy Benchmarks should be consistent with the assumptions used in the LP's asset allocation modeling, and should reflect the long-term returns that each asset class or type of investment is expected to provide the institution on a true "net" returns basis. For PE/VC, these net returns would include the effect not only of fees and carried interest paid to the GPs, but also an allocation of the LP's incremental costs of managing and overseeing its private investment program (whether those costs are paid to internal staff and service providers/consultants, or paid to a fund-of-funds manager).

Policy Benchmarks for most marketable asset classes typically assume an LP can achieve the returns for the asset class without manager selection skill by investing in an index that includes most or all of the securities in that asset class. PE/VC Policy Benchmarks, on the other hand,

[1] The paper targets Policy Benchmarks that would be appropriate for programs investing for high returns in some combination of buyout, venture capital, growth equity, and distressed securities funds. Other types of private investment programs, such as private real estate, oil & gas partnerships, timberland, agriculture, and direct company investments, are not covered by this paper.

[2] For further coverage of benchmarking issues, including the types of (primarily peer-group-based) benchmarks that LPs might use for evaluating their skills in manager selection and/or in allocating between different private investment strategies over time, see, for example: A Framework for Benchmarking Private Investments, Cambridge Associates (2014); Private Equity Benchmarking: Where Should I Start?, Towers Watson (2012); Benchmarking Private Equity: Getting through the Maze, Russell Investments (2012).

cannot be based on that assumption, since no single LP can invest in the entire universe of private funds.

The most common Policy Benchmark approaches for PE/VC programs are:

- Public-market stock indices, plus a premium
- Peer-group indices of similar private investment funds formed during relevant time periods
- Absolute return targets, either in nominal or real terms (e.g., "10%," or "CPI plus 8%")

Other less-common approaches include:

- Using a leveraged equity index (e.g., combining returns that are "long" 130% times an equity index and "short" 30% times a fixed income index), reflecting the higher leverage associated with buyout funds and the potential for larger declines than public markets during down periods
- Not designating explicit Policy Benchmark targets for PE/VC, but rather, treating such assets just as another form of (very) active management within a broader equity allocation that itself has a public-market benchmark and some level of expected outperformance
- Simply including the institution's actual PE/VC return in the overall Policy Benchmark, eliminating the impact that these private investments have on the calculation of over- or underperformance of the remainder of the portfolio

Examples of Commonly-Used Benchmarks

Example 1: Public Index Benchmark

An LP that defines its asset classes as US Stocks, US Bonds, Non-US Stocks, and PE/VC might set a Policy Portfolio benchmark for the PE/VC allocation based upon a single public market index such as the U.S. stock market's Russell 3000 Index. To incorporate an element of additional expected or required outperformance, the LP might add a premium to the annual returns of the index. The LP would select that premium (e.g., 300 basis points) to reflect its assessment of the additional returns it would require as compensation for the illiquidity and various additional risks it was incurring with its PE/VC allocation.

Example 2: Peer Index Benchmark

Peer-group indices are based on aggregating the returns data reported by other private investment funds that are investing in similar geographies, strategies, and time periods. These indices are typically prepared by third-party providers, such as Cambridge Associates and Burgiss, which have access to confidential returns data for a range of funds, or by firms such as Preqin that obtain returns data from public sources.

Example 3: Absolute Return Benchmark

Some LPs continue to use "absolute return" benchmarks that are based on achieving a fixed target return. The level of return can be specified as a nominal return of "X," or a real (after-inflation) return of "X." The level of "X" can be based upon the long-term expected compounded real return assumptions for PE/VC that the LP uses in its asset allocation modeling, or can be based upon the LP's bottoms-up modeling of the expected returns for private investments.

NO SINGLE APPROACH IS IDEAL

Unfortunately, industry participants generally agree that all these approaches fail to meet most of the important characteristics for a good benchmark, such as those outlined by the CFA Institute and other institutional investing experts. Ideally, a benchmark would be investable, transparent, specified in advance, and broadly representative of the characteristics of the full set of investments an LP could consider (even if the benchmark does not provide comprehensive coverage).

While these traits may be desirable, they are likely to remain out of reach for PE/VC. Public indices, while investable, transparent, and specified in advance, are composed of fundamentally different investments than PE/VC funds. Peer-group indices of PE/VC funds, on the other hand, will never provide "comprehensive" coverage of the private markets. LPs (and even the index's compilers to some degree) do not really know the full extent to which a given index is "representative" of the market it is attempting to cover, nor how serious the index's potential tilts or biases may be.

As long as the private investments industry remains private and lacks enforceable reporting requirements, there will remain an inherent conflict between the interests of transparency and the interests of benchmarks being more representative and inclusive. Make an index more transparent, and it may become less representative as certain firms decline to participate. Absent regulation or broad adoption of industry standards by LPs that refuse to invest with GPs that do not provide their fund returns to leading aggregators like Cambridge Associates and Burgiss, there will likely continue to be GPs that will not participate in benchmarks if their fund-specific information would be shared beyond their own LPs. And even if all GPs did somehow agree to participate in the future, the uncertainties of fundraising would still make it impossible to specify the constituents of the benchmark in advance.

CONSIDERATIONS FOR PUBLIC INDEX

LPs should consider using public-markets benchmarks for longer-term representation of the "opportunity cost" of PE/VC. Although a "public-markets plus X basis points" benchmark does not represent any of the actual direct attributes of the private markets themselves, it can represent the simpler, completely liquid portfolio that an LP would otherwise have used if it wasn't investing in alternative assets such as PE/VC.

While, in theory, any liquid public index could be considered, most LPs should use a public equity index that is calculated on a "total return" basis, including reinvestment of dividends. Most PE/VC investments are best categorized broadly as "equity" investments, making a comparison to a public equity index typically more appropriate than to an index of fixed income or other securities. Public and private investments are being made in corporations operating in the same economies (and often competing directly against each other). Even many "distressed" securities funds often have substantial equity risk. Furthermore, private investment exits are directly affected by the state of the public capital markets.

The primary strength of a public-markets-based benchmark is that it can allow an LP to measure over the long term whether it has been sufficiently rewarded for allocating to PE/VC rather than deploying its assets elsewhere in liquid securities. This is a very attractive feature for long-term benchmarking, since most LPs have no inherent reason to invest in "alternative" assets unless

they believe such investments will enhance the return and risk characteristics of their total portfolios. Public-markets-based benchmarks can help LPs measure whether they could have achieved similar returns using widely-available liquid, investable assets.

While many US-based LPs may have started their programs using the S&P 500 Index as the market index in their Policy Benchmarks (because their initial investments were largely in funds investing in the United States), public-market-based benchmarks can also be based on other total-return indices, either alone or in combination. LPs that have diversified their PE/VC programs with substantial commitments to funds investing in Europe, Asia, or more globally, should consider a weighted mix of US and ex-US stock indices. The weights can either be in-line with their broader equity allocations or use a different weighting that reflects their actual or expected mix of private investment commitments.

Other LPs that are moving toward a more global approach to their stock allocations and their private investment programs may choose simply to use a single global stock index such as the MSCI World or MSCI All-Country World Index, rather than having a mix of country and/or regional indices.

While LPs may find the simplicity of using broad market indices aligned with the geographic mix of their public-market exposures to be attractive, LPs should also consider whether using one or more specifically targeted indices is a better choice. For example, large venture capital exposures may be better matched by a sector index focused on information technology, and buyout exposures by an index of small-cap stocks. A mix of such targeted indices may more accurately reflect the types of exposures and capitalization weightings that are represented in many private investment programs.

An important consideration when choosing the public-market index(s) is that the selection should represent a neutral exposure to the markets and strategies that the LP is targeting. An LP that only allows private investments in US funds should not use the MSCI World Index of all developed-markets stocks (including Europe and Asia/Pacific) as a benchmark. In such a case, the differential performance between the U.S. and ex-U.S. stock markets could easily overwhelm any value that the private investments may have actually added, obscuring the attribution of performance.

Conversely, LPs that have begun making substantial allocations overseas, but are still using the S&P 500 or the Russell 3000 Index, should consider phasing-in an ex-US or global index for at least a part of the allocation. In revising the underlying index or mix of indices, though, LPs should consider timing effects, and whether any large changes may create unintended incentives for the institution either to speed-up or slow-down allocations to particular strategies or geographies to more closely "match" the composition of the index(s) (regardless of the LP's views on the availability of high-quality managers).

Using a public-markets benchmark can also allow LPs to tie their Policy Benchmarks more closely to their asset allocation modeling assumptions, which often are expressed in terms of the long-term expected returns, volatilities (standard deviations), and correlations of the asset classes in which the LP invests. Regardless of the precise methodology used to determine these assumptions, the resulting inter-

relationships between the expected compound returns for public stock markets and private investments (e.g., a differential performance premium of 250 basis points for a particular LP) can be mirrored directly in the Policy Benchmarks.

Of course, such a premium itself is not "investable," even though the underlying public stock index is. While there are many advantages to incorporating the premium directly into the Policy Benchmarks, LPs should be aware that including the constant value represented by the premium can also affect the total policy portfolio's Sharpe Ratio and other calculations that look at performance in relation to volatility.

LPs should use public-market benchmarks for medium- and long-term comparisons only once their program is relatively mature. Over long time-periods, LPs can gain valuable information about the overall success of their private investments allocation from comparisons to a public-markets benchmark. Importantly, this information includes not only whether the LP has invested its PE/VC allocation successfully, but also whether the Board/IC decision to approve that particular PE/VC allocation has been successful.

Public benchmarks can provide confusing, and even misleading, signals over shorter time periods because there are vast compositional differences between an LP's private investments portfolio and a public-market index. There are also important differences in the way that public and private returns are generated and reported.

For example, the "J-curve" of negative and low initial returns can skew initial private investment returns downward, even in a period when public stocks have strong positive returns, leading to relatively meaningless comparisons. Private investments' imprecise interim valuations, when coinciding with the beginning and ending points of a benchmarking period, can also have the effect of "shifting" returns that in economic terms were generated in one period into another period (complicating comparisons to public-market returns, which are clearly defined for each period).

LPs may wish to add a time lag (e.g., three months) when using a public benchmark to compensate partially for some of the delay that occurs before private investment funds update their valuations (although a lag only addresses part of the timing problem).

LPs can supplement the Policy Benchmark calculations, which are prepared on a quarterly time-weighted returns basis, with additional PME-based analyses that review since-inception returns by vintage year using appropriate public-market indices.

CONSIDERATIONS FOR PEER INDEX

Peer-group indices have the primary advantage of comparing an LP's PE/VC investments to other private investments that were available to the LP during a given period, rather than to an index of public stocks. The latter, of course, are not directly representative of the investments that the LP made or considered for its private portfolio.

While the comparison is much better than for public stocks, it is not, however, perfect. Most LPs are not able to access or consider investing in all the funds that are raised for a particular strategy in a given year. Not all the funds that an LP considers will necessarily even succeed in raising capital. Nor do all those that succeed in fundraising wind up in the peer benchmarks against which the LP ultimately will be measured.

Peer-group benchmarks are much better than public-market benchmarks at providing information about an LP's overall skills. These include skills in selecting managers as well as allocating commitments across strategies. For LPs that use their overall Policy Benchmarks as a component of incentive compensation for in-house PE/VC staff, peer-group benchmarks provide a much more relevant comparison than public-market benchmarks, since they better represent the universe of potential investments that the staff could consider.

Peer-group benchmarks can be highly customized. LPs can select different peer groups based on the mix of strategies (e.g., buyouts, venture capital, and/or growth equity), geographies (e.g., North America, Developed Europe, Emerging Markets), vintage years, and even the size of the funds included in the LP's portfolio. LPs with large minimum commitment sizes, for example, can consider whether to exclude funds below a certain size threshold that they cannot realistically consider as part of their opportunity set (without incurring additional costs, such as using a fund-of-funds manager, to aggregate a number of smaller commitments).

Another big advantage of peer-group benchmarks is that LPs can use them at all stages of their investment program, including with young programs. Because an LP's new commitments can be compared to a benchmark of peer funds that closed in the same time-period (vintage year), the effects of the J-curve are similar for both the LP's program and the benchmark. When the pace of capital deployment or exits is accelerated or delayed for a particular type of funds, the benchmark and the LP's private investments are likely to react in broadly similar fashion.

Peer-group benchmarks, however, are not good at helping an LP assess over the longer term whether its capital may have been better-off being deployed in other asset classes, such as public stocks. There can be time-periods when even top-quartile manager performance lags the returns that an LP could have gained through an investment in a public-market index. In other time periods, managers in the third or fourth quartile may outperform a public index.

LPs should use peer-group benchmarks for dollar-weighted returns (e.g., IRRs and multiples), based upon the vintages in which they make commitments. For the purposes of calculating trailing returns over various time periods for the LP's entire portfolio versus its Policy Benchmarks, peer-group benchmarks can be converted to time-weighted returns and weighted by vintage year, geography, and strategy.

Peer-group benchmarks of private investment fund returns are usually reported without any adjustment for the manager selection and oversight costs paid by LPs to manage their programs. LPs using peer-group benchmarks should consider whether they are assuming that their program will outperform the peer-group benchmark by a sufficient margin to cover their internal management and oversight costs, or whether the expected return from the peer-group benchmarks should potentially be adjusted downwards by an amount sufficient to cover those costs.

CONSIDERATIONS FOR ABSOLUTE RETURN BENCHMARKS

One of the primary advantages for absolute return benchmarks is that they can be tied directly to the return assumptions an LP uses for its allocations to PE/VC, as well as for its other asset classes.

These assumptions can either be built from the bottom up in absolute terms, or can be based on a set of risk premiums above a "risk-free" asset. LPs with fixed future liabilities can also set benchmarks based on their expected spending needs. These absolute benchmarks can either be in nominal terms or real, after-inflation terms. Absolute return benchmarks such as "CPI plus 8%," however, are obviously even less investable than public or private peer benchmarks. They also convey no particular information about the performance of the private investment markets under various conditions. Furthermore, because they incorporate a constant return that does not vary from quarter to quarter, calculations of the total Policy Portfolio's volatility and outperformance (e.g., Sharpe Ratio) may be misleading because of the absence of a realistic representation of the PE/VC allocation's volatility.

While it may be reasonable to consider an absolute return benchmark over a very long time period (e.g., 15 or 20 years), most LPs would benefit from the additional, more-timely information that public-market and peer-group benchmarks can convey in their ongoing Policy Benchmarks.

Pros & Cons of Index Types

	Pros	Cons
Public Index	• Index is investable • Index is transparent • Can customize by sector, geography, size • Can represent opportunity cost of capital	• Not representative of actual private investments • Short-term comparisons not meaningful (making them less useful for younger LPs) • Premium (if any) is not itself investable
Peer Index	• More representative of investments • Can customize by strategy, geography, size, vintage year • Better match of timing (J-curve), allowing for more useful shorter-term comparisons	• Lack of transparency • Not specified in advance • May or may not be representative • Not investable (size, access)
Absolute	• Can tie directly to cost of capital, asset allocation modeling assumptions, and/or spending requirements	• Not investable • Lack of information related to market conditions • Short-term comparisons not meaningful • Large impact on total fund policy benchmark volatility measures

c. Review of Current Limited Partner Approaches

Survey data on the policy benchmarking approaches currently used by LPs provides insights into the current state of industry practices. While the following figures can provide LPs comfort that their current or planned approach is either widely used by peers or is at least within the range of

"reasonableness," LPs should also consider the discussion and analyses in the remainder of this report as they decide whether to revise their approach to setting Policy Benchmarks.

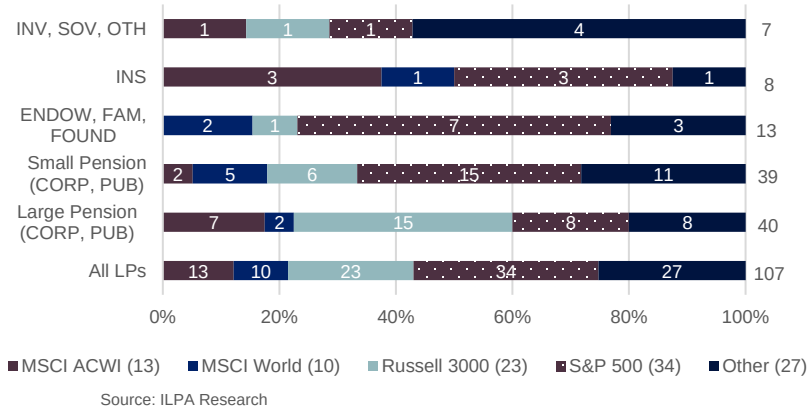
Most institutional investors surveyed use one of two major approaches to setting their Policy Benchmark for private investments:

- Public-market index(s), plus a premium
- Private-market (peer-group) index prepared by a firm such as Cambridge Associates, Burgiss, State Street, or Preqin

ILPA MEMBER SURVEY DATA

Based upon recent surveys, ILPA member institutions most commonly used a US-focused public-markets index for their private investments Policy Benchmark. As Exhibit 1 shows, the two most common indices were the S&P 500 Index and the Russell 3000 Index, which were used by more than half of respondents. More than 20% of the LPs were using global indices, either the MSCI All-Country World Index (MSCI ACWI) or the MSCI World Index. Only one institution used a US index focused on small-cap stocks (Russell 2000 Index).

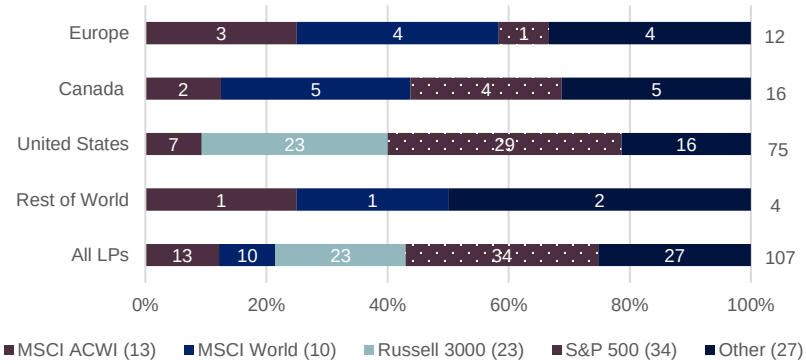
Exhibit 1 - ILPA Members: Public Indices Used by LP Type



Source: ILPA Research

ILPA members based outside the United States were much more likely to use a global equity index than LPs based in the US, as Exhibit 2 shows. Among the "Other" indices used by LPs outside the US were public stock indices for local stock markets (e.g., TSX 60, KOSPI).

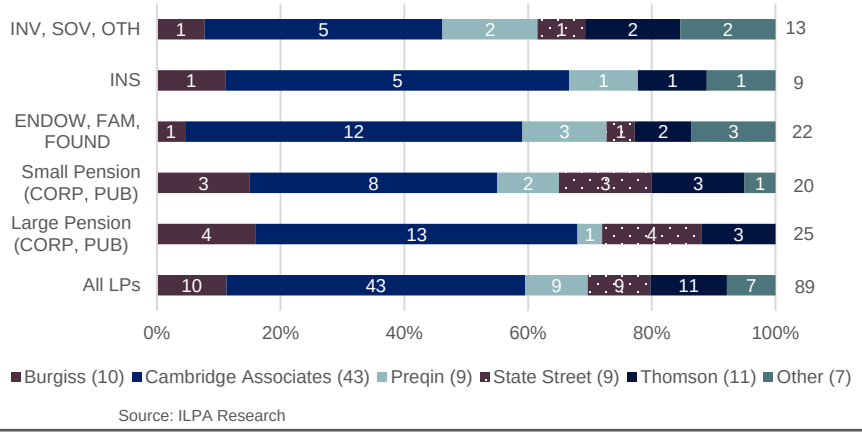
Exhibit 2 - ILPA Members: Public Indices Used by LP Geography



Source: ILPA Research

ILPA members using peer-group benchmarks most commonly relied on Cambridge Associates, either directly or via Thomson Reuters, as shown in Exhibit 3.[3] Additionally, at least three ILPA members use the ILPA Private Markets Benchmark (produced in partnership with Cambridge Associates) in their Policy Benchmark. Other firms such as Burgiss, Preqin, and State Street each provided benchmarks to a smaller group of LPs than Cambridge Associates.

Exhibit 3 - ILPA Members: Peer Indices Used by LP Type



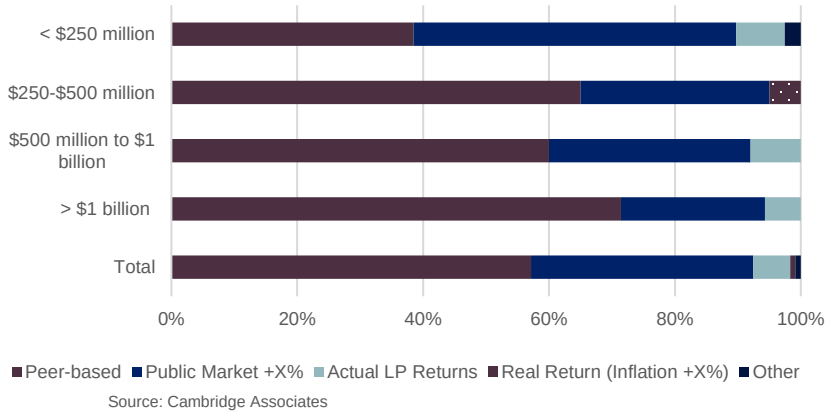
Source: ILPA Research

CAMBRIDGE ASSOCIATES' DATA ON ENDOWMENTS

To supplement the information from the ILPA surveys, Cambridge Associates provided data on the private investments benchmarks used by 119 endowments that responded to their most recent annual survey. As shown in Exhibit 4, this group reported a general preference for peer-group benchmarks (51% of respondents) versus public-market benchmarks (35%). The largest institutions (those with assets over $1 billion) had the highest usage of peer-group benchmarks (71% of institutions).

By contrast, the smaller endowments (with total assets under $250 million) were the only group with a preference for using public-market benchmarks (51%). Six percent of endowments reported using their own program's actual private investment returns.

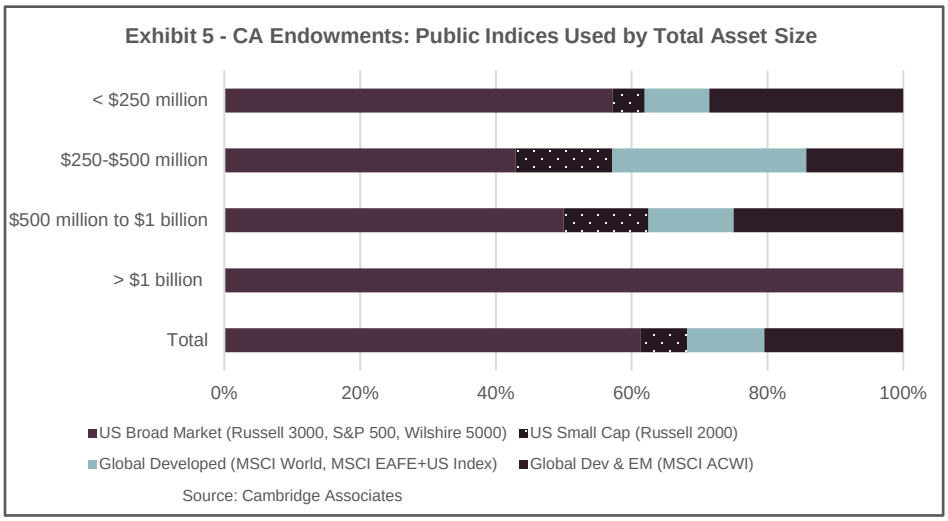
Exhibit 4 - CA Endowments: Benchmark Type by Total Asset Size



Source: Cambridge Associates

[3] Cambridge Associates became the provider of the underlying private investments benchmarking data for Thomson Reuters in 2014, replacing Venture Economics. LPs responding to recent surveys likely continued to view Thomson as the benchmark "provider" and/or reported the wording from their policy statements, which may not yet have been updated to reflect the underlying source of the peer group data.

A large portion of the endowments in the Cambridge Associates' dataset still uses only a US-based public-market index for their Policy Benchmark. As shown in Exhibit 5, most of these institutions use a broad market-cap weighted index such as the S&P 500 or the Russell 3000 Index that is heavily weighted to mega- and large-cap stocks. A smaller group uses the Russell 2000 Index of small-cap stocks. Those endowments using global stock indices favored the MSCI ACWI, which includes both developed and emerging markets. A smaller number of endowments use the MSCI World Index or a mix of US and MSCI EAFE indices to remain focused on developed markets, excluding emerging markets from their benchmark.



FUND OF FUNDS, DIRECT FUNDS, & INTERNAL COSTS

Most of the peer-group indices used by endowments in the Cambridge Associates dataset were indices of direct funds. Only a small number of institutions used an index of funds of funds. Returns from such fund-of-funds peer groups are expected to be lower than indices based solely on direct funds, since there is another layer of fees involved. For LPs that invest primarily via funds of funds, this second layer of fees can be thought of as being analogous to the increased internal staffing costs that LPs with direct programs must pay to manage their PE/VC allocations.

Yale University Case Study: Using Both Peer-Group and Public Market Approaches

Yale's annual Endowment Reports provide a case study of how one institution's approach to its private investment Policy Benchmarks has evolved over time to include both peer-group composite indices specific to its private investment strategies, as well as blended mixes of public market indices that are targeted to include small-cap, technology, and specific ex-U.S. country exposures.

In its 2003 report, Yale began including a set of "Active Benchmarks" and a set of "Passive Benchmarks" for each of the endowment's asset classes. At that point, Yale's private investments were shown as a single category: "Private Equity." The passive benchmark was "University Inflation plus 10%" and the active benchmark was based upon a composite of peer-group returns from Cambridge Associates.*

These benchmarks were in place through Yale's 2012 report, at which time the passive benchmark for "Private Equity" was switched to a diversified mix of public market indices that included the Russell 2000 Index, the Russell 2000 Technology Index, and the MSCI ACWI ex-US Small-Cap Index. For its active benchmark, Yale continued to use a composite of Cambridge Associates' peer-group indices.

Then, in its 2015 report, Yale reported separate asset class categories for "Leveraged Buyouts" and "Venture Capital" (investment strategies that had both been present within the previous asset class category of "Private Equity" since well before the first 2003 report discussed here). For its passive benchmarks in 2015, Yale used a blend of Russell 2000 and the MSCI ACWI ex-US Small-Cap Indices for the Leveraged Buyouts allocation, and a mix of the Russell 2000 Technology, MSCI China Small-Cap, and the MSCI India Small-Cap Indices for the Venture Capital allocation. For its active benchmarks, Yale continued to use peer-group indices, but specified the use of the Cambridge Associates Leveraged Buyouts Composite and the Cambridge Associates Global Venture Capital index.

Yale's most recent set of active and passive benchmarks provides a good example of how both the peer-group-based approach and the public market-based approach can be used in a way that is customized to the types of private investments included in an LP's private investment program.

* There was also an allocation to "Real Assets" in the 2003 report, which was reported to consist primarily of illiquid assets in real estate, energy, and timberland. The benchmark of "University Inflation plus 10%" appears to have been reduced from an absolute return target of 12% real (above University Inflation) that had been in place through the previous year.

d. Summary and Conclusions – Volume I

- Policy Benchmarks should:
  - Be consistent with assumptions in an LP's asset allocation modeling, reflecting long-term expected return assumptions
  - Assess program performance on true "net" returns basis, including oversight costs
- Most common approaches:
  - Public-market stock indices, plus premium
  - Peer-group indices of private investment funds
  - Absolute return (nominal or real, such as "10%" or "CPI plus 8%")
- Other approaches:
  - Leveraged equity index (130% long equity index/30% short a fixed income index)
  - No designated Policy Benchmark for Private Equity and Venture Capital ("PE/VC"), but consider those assets just a form of (very) active management in a broader "equity" allocation
  - Include the institution's actual PE/VC return in the overall Policy Benchmark
- No single benchmarking approach is ideal, due to issues related to investability, transparency, representativeness, and specification
- There is an inherent conflict between the transparency of peer-group index constituents and being representative, as many GPs will refuse to participate in a transparent index
- Public-market indices, usually based on stocks, and reflective of reinvested dividend income ("total return" basis), allow a long-term answer to whether allocating to private investments was worth it versus other liquid uses of an LP's capital
  - Typically require a premium versus stocks (e.g., 200 to 500 basis points)
  - Major downside is that they do not include the actual investments made by PE/VC funds; performance can be very different, especially over short-/medium-term and during early years of "J-curve"; time lags of private reporting
- Peer-group indices have advantages of including similar private investments, going through similar stages of private investment life-cycle, allowing for more relevant comparisons even over shorter and medium periods
  - Better for assessing LP's overall skills and success in selecting managers, as well as allocating across time and various private investment strategies/geographies
  - Very large investors can customize peer-group indices to exclude smaller funds that are not investable because of their required commitment sizes
- Absolute-return approaches have advantages of tying expected returns directly to asset allocation or portfolio construction assumptions
  - But don't convey useful information about market conditions as either public-market or peer-group approaches do
  - They complicate comparisons of the volatility of an LP's portfolio with that of the policy benchmark
- Most ILPA members surveyed use a broad market US index as the base for their public-markets approach; only one used small-cap index

Volume II – Approaches to Selecting a Risk Premium

a. Introduction

This volume examines the level of premium(s) over a public index that LPs may wish to include in their Policy Benchmarks from two perspectives. First, what are the levels of outperformance versus liquid public markets that LPs require for Private Equity and Venture Capital investments ("PE/VC")? Second, what levels of outperformance versus public equity markets have such private investments delivered, and what elements of the industry's performance record should LPs consider before setting the target premium for investments going forward? This section examines the latest returns data from the Cambridge Associates' database and public markets, and provides guidance for LPs assessing such historical performance as they determine what premium(s) to include in their Policy Benchmarks.

b. What Outperformance is Needed to Meet our Objectives?

Board Members/Trustees, Chief Investment Officers, asset allocators, and others deciding whether to allocate to PE/VC versus other investments must determine what level of return these investments should be expected to achieve. What are the LP's objectives in allocating to PE/VC? What level of extra returns would the LP require above the returns of other investments (e.g., public stocks or other investable liquid assets) to be compensated for the illiquidity and other risks associated with private investments?[4]

For LPs with returns-based allocations to PE/VC, a central issue is the question of "opportunity cost": "Where else would the capital have likely been deployed if it were not invested in private strategies?" For most LPs in PE/VC, the answer is likely some sort of equity strategy, rather than fixed income or cash. Such LPs can consider whether there are other, more liquid, investments that may be available, which could provide them much of the exposure to underlying "factors" such as broad equity market returns, the small-cap "premium," and/or leverage that are inherent in PE/VC.

For LPs that invest in actively-managed public stock accounts, what are their expectations for adding value from active management (including their history of success or failure at manager selection)? Are there variations in the LP's level of expected value-add from active stock managers across the different geographies in which it invests in stocks and private investments? How valuable is "liquidity" itself to the LP, and how does that change at various levels of the LP's overall portfolio illiquidity?

The concept of the "illiquidity risk premium" is a central issue for LPs and others in the industry.[5] Unfortunately, some LPs, GPs, and members of the general financial press use this term to refer to the overall broad premium that LPs are targeting with their private investments. It is helpful, though, to think of the "illiquidity risk" premium separately from many of the other "risk premiums" associated with private investments.

[4] For this report, the focus is on LPs that are seeking to optimize the return and risk parameters of their portfolios, rather than on those who may make private equity investments for "strategic" or "impact investing" purposes (such as a healthcare foundation investing in biotech venture capital to further the foundation's mission).
[5] Or the "liquidity risk premium", as it can also be called.

ILLIQUIDITY RISK PREMIUMS

As Andrew Ang of Columbia University notes, "[i]lliquidity risk premiums compensate investors for the inability to access capital immediately. They also compensate investors for the withdrawal of liquidity during illiquidity crises."[6] Robeco Institutional Asset Management reviewed the academic and industry literature on illiquidity premiums in 2015, noting that such premiums represent "compensation for not being able to trade at a fair price at any given time." Robeco noted that the total illiquidity premium can be considered to have two parts: compensation for the "liquidity level" (or average illiquidity) of an asset and also "compensation for holding assets that perform poorly when there is a systematic liquidity shock" (risk of illiquidity). The two effects can be positively correlated, making it hard to isolate one or the other, but they can also play out differently over time as liquidity conditions in the market change.[7]

ADDITIONAL RISKS

As noted above, illiquidity is not the only additional risk for which LPs in PE/VC should seek adequate compensation. LPs should also consider what additional premium they require for risks such as the:

- Generally smaller size and lower "quality" of typical private companies versus larger listed companies[8]
- Uncertainty about expected returns, because of limited transparency and attribution of historical performance
- LPs' need to select GP management firms to invest blind pools of capital in which LPs have limited legal rights, and in which GPs have wide latitude to decide which transactions to pursue, how to structure them, and when (and at what price) to sell
- LP-challenge of reinvesting distributions at the same rate of return in new investments
- Relatively high costs (vs. public equity), including transaction costs, fees, expenses, and carried interest paid to GPs, as well as the LP's own incremental increases in internal and oversight expenses
- Increased demands for the limited time and attention of Board members and senior executives (especially if periods of poor performance or unexpected problems arise)

A SIMPLE EXPERIMENT

With these clearer concepts of illiquidity risk and other private investment risks in mind, an LP can conduct a simple experiment: "How great a premium would the LP require to lock-up a significant portion of its capital in a hypothetical index fund with a five- or seven-year lockup, instead of holding an otherwise identical index fund with daily (or even quarterly) liquidity?" In the former case, the LP would be unable to benefit from portfolio rebalancing between asset classes —one of the primary benefits of multi-asset class investing— and would not be able to draw upon the assets for an emergency.

An LP's answer may depend on the nature of the index, current market valuation levels, the LP's overall level of illiquidity across its portfolio, and other LP-specific factors. While

[6] Ang, Andrew, 2014, *Asset Management: A Systematic Approach to Factor Investing* (New York: Oxford University Press), p. 426.
[7] The Ins and Outs of Investing in Illiquid Assets, Robeco, 2015, which cited research on marketable securities published in 2011 by A. Khandani and A.W. Lo.
[8] "Quality" in this sense refers to characteristics such as the level and sustainability of a company's profitability, its debt ratios, etc., rather than a judgment about the merits of the investment theses of PE/VC transactions.

this exercise is highly-subject to the unique characteristics of individual LPs, it's easy to imagine how some LPs' annual required illiquidity premium could exceed 100 to 200 basis points. Even LPs who might think that as "long-term" investors they could accept a smaller illiquidity premium should consider the benefits of rebalancing and/or active redeployment of capital to more attractive opportunities in an environment where there is increased risk of a large systematic shock. For example, LPs should consider such a hypothetical illiquid position in an index of highly-overvalued stocks, like the NASDAQ Index in early 2000, versus being able to sell some or all of an identical, but liquid portfolio at the start of that year.

An LP incurring the illiquidity risk of this hypothetical indexed allocation would still be in a much better position than an LP in a typical private investment portfolio. This LP would at least be assured that: 1) it does actually have ownership of a transparent pool of securities in a broadly-diversified group of functioning companies; 2) it would not be taking on manager selection risks nor security selection risks; 3) it would (essentially) be assured of being able to fully exit its position on the pre-specified exit date; and 4) its investments would not perform more poorly than the liquid index fund if the exit date happened to coincide with a systematic liquidity shock that depressed the valuations of less-liquid assets. These points suggest that each LP should consider what additional premium, above the illiquidity premium, it requires.

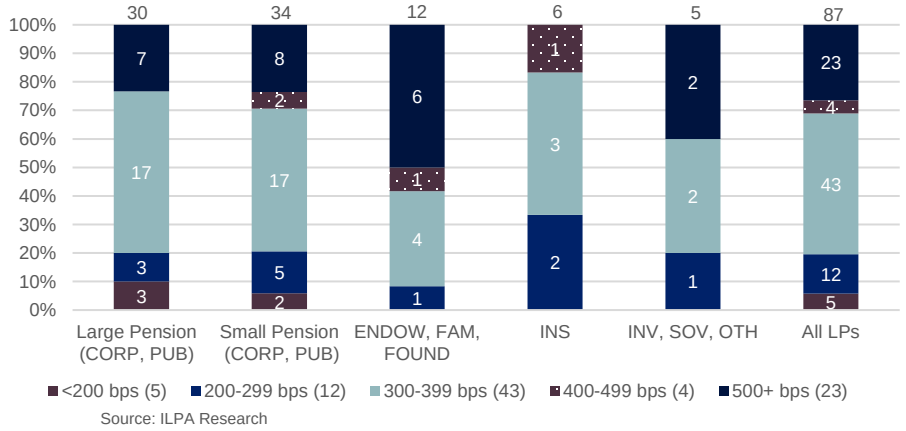
If an LP's preferred level of illiquidity premium is X%, what additional level of premiums should an LP consider for the many other risks specific to a PE/VC program? How might those premiums differ across LPs? How should LPs think about the level of "X" itself, separately from the other risk premiums that may be required? What insights can be drawn from the levels of illiquidity risk premiums that may be available within asset classes (for example, among various U.S. stocks or Treasury bonds), versus those that may or may not be available across asset classes (such as between U.S. stocks and U.S. private equity)?

WHAT PREMIUM DOES AN LP NEED?

There is a wide range of opinions on the overall required level of illiquidity and other risk premiums for which LPs should seek to be compensated. On the one hand, large amounts of capital have been deployed in programs using a premium of approximately 300 basis points (based on separate surveys by ILPA and Cambridge Associates, as shown in Exhibits 6 and 7), providing strong market-based evidence that many LPs believe such levels to be sufficient and attainable.

As shown in Exhibit 6, the most common public index return premium among ILPA respondents was 300 to 399 basis points. LPs in the Endowments, Foundations, and Family Offices ("ENDOW, FAM, FOUND") category had the highest premiums versus public indices, as roughly 60% targeted outperformance of 400+ basis points. More than 80 percent of pension plans targeted 300+ basis points.

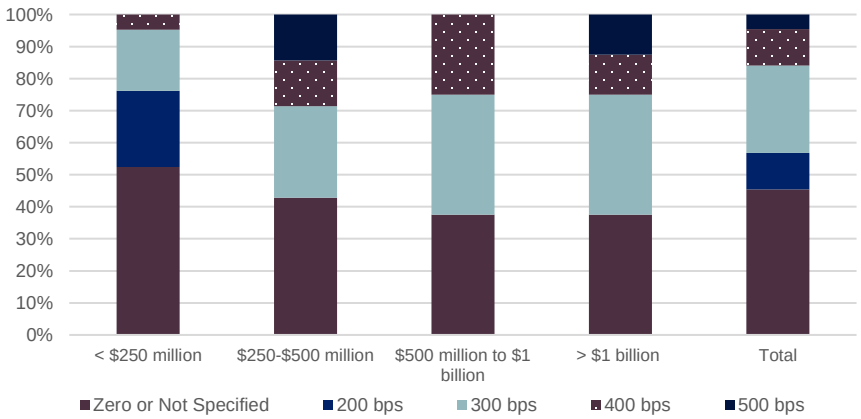
Exhibit 6 - ILPA Members: Public Index Premiums by LP Type



Source: ILPA Research

Exhibit 7 shows the premiums reported by the Cambridge endowment group above public-market returns. Institutions reported discrete margins of either 200, 300, 400, or 500 basis points (without any intermediate values). A large group of endowments, however, simply reported the index or indices they used, but did not indicate what, if any, premium they use. It is possible that some of these institutions expect to receive a premium, but do not incorporate that figure directly into the Policy Benchmark calculations in order to maintain a clearer sense of the total Policy Portfolio's volatility and performance in terms of metrics such as the Sharpe Ratio (which can be affected through the inclusion of a component in the benchmark--the premium--that has a constant positive value without any additional volatility).

Exhibit 7 - CA Endowments: Spread over Public Index



Source: Cambridge Associates

As these surveys show, there are also a substantial number of LPs that use premiums of 400 or 500 basis points, suggesting they believe those somewhat higher levels are necessary and can be reached. On the other hand, some academics and industry participants question whether LPs would be adequately compensated for private investment risk even at levels higher than 500 basis points above public stocks. For example, Dr. Ang of Columbia has calculated the premium that would be necessary for an investor holding an illiquid asset over various periods of time when the asset could not be traded.

In the model that he developed with Dimitris Papanikolaou, and Mark Winterfield, an LP with a 5-year required holding period would require an additional 4.3% per year. Even over a relatively short, 2-year period, the required premium would be 2.0%. For a 10-year holding period (i.e., longer than the average dollar-weighted holding period of a private equity fund, though less than the average time-period for full liquidation) the required return premium would be 6.0% per year. Ang notes that the "true illiquidity hurdle rate" is likely even higher, since his simplified model doesn't cover other important issues (such as "agency conflicts of interest…cash flow management issues…and asset liability mismatches.")[9]. Operating from this framework, an LP trying to develop an overall premium for illiquidity and the range of other private investment risks (which aren't considered in Ang's study) would likely come up with a very high number.

AVERAGE REQUIRED PREMIUM LIKELY IS BELOW THE MARGINAL REQUIRED PREMIUM

For the premium component of their Policy Benchmark calculation, LPs should think about the premium they require for a marginal increase in illiquidity, while using an average premium across their entire PE/VC allocation.

An LP's required marginal and average illiquidity premiums can be considered in relation to not only a specific asset or asset class, but also to both the LP's overall level of liquidity and the LP's specific liquidity requirements. After all, an LP with only one illiquid investment that accounts for less than 5% of its portfolio is in quite a different position than an LP with 65% of its assets in illiquid holdings. Additionally, an LP facing large near-term payout requirements may find even modest illiquid holdings problematic, whereas an LP without any spending requirements over the next ten years and large expected inflows could find its required illiquidity premium to be relatively low.

Mark Hayes, James Primbs, and Ben Chiquoine developed a model for deriving "illiquidity-adjusted expected returns" for each asset class as well as what they denoted as an "illiquidity surplus." The latter occurs because the marginal cost for an extra unit of liquidity above, say, an overall 25% allocation to private investments is higher than the cost for a unit of liquidity at each of the preceding lower levels of the allocation.[10]

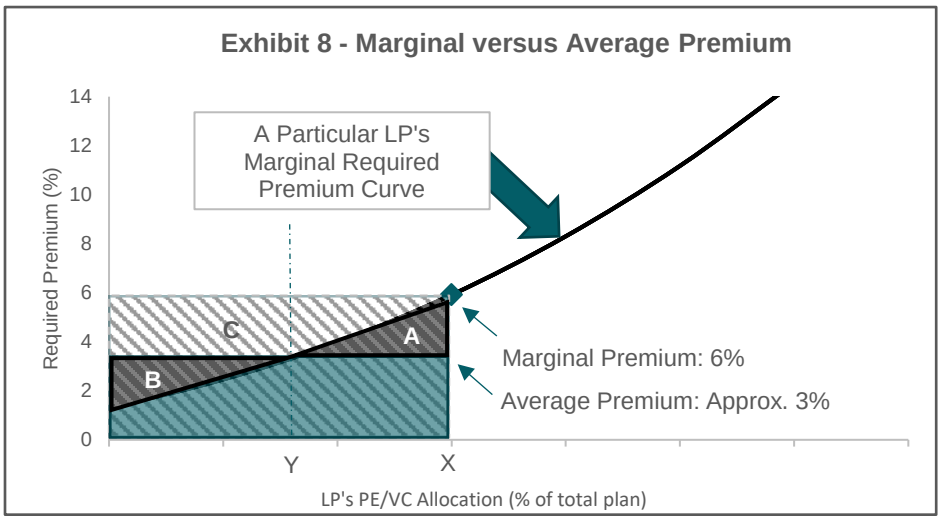
Exhibit 8 shows a stylized example for a hypothetical LP with an illiquid PE/VC allocation of level "X." (For purposes of this example, we'll assume the LP only has this one illiquid allocation.) This particular LP has determined an upward sloping curve for the marginal premium it would require at each level of allocation. In this example, the curve starts near 1% for an allocation of zero, is at 6% for the allocation level of "X," and continues to increase for potential allocation levels greater than "X." In this case, the LP may determine that its average required premium across the entire PE/VC allocation (which is usually a single figure for policy benchmarking purposes) might come out closer to 3%, even if the marginal premium at the maximum allocation was at the higher level of 6%.

[9] Ang, p. 438.

[10] Mark Hayes, James Primbs, Ben Chiquoine, A Penalty Cost Approach to Strategic Asset Allocation with Illiquid Asset Classes, *Journal of Portfolio Management*, Winter 2015.

The area within the lower-rectangle (below the required premium of 3%) represents the product of the LP's allocation level "X" and the premium level of 3%. The area within the upper rectangle represents the product of the allocation level "X" and the full marginal premium level of 6%. With a policy benchmark premium at 3%, the LP would essentially be treating a portion of its allocation between zero and "Y" as having a higher benchmark premium than actually needed. This is shown by the area "B" that is above the marginal premium curve, but below the 3% horizontal line. In contrast, the portion of the LP's allocation between levels "Y" and "X" would be benchmarked with a premium (3%) that did not fully capture the higher marginal premium the LP needed. This is shown by area "A," the area below the marginal premium line and above the horizontal 3% line. By roughly balancing the area of "A" with that of "B," the overall allocation can use an "average" premium that reduces what would otherwise be a much larger "surplus" that would result from using a premium of 6%. That surplus area is the sum of the unshaded area "C" above the marginal premium line and the shaded area "B" above the marginal premium line.

Exhibit 8 - Marginal versus Average Premium



Actual premium values would depend on the LP's assumptions, including the size of the allocation and the steepness of the marginal required premium curve. While it may be difficult for many LPs to come up with precise assumptions, this general insight can still be helpful for LPs that have determined that they have a fairly high marginal required premium (e.g., because they have a high allocation to illiquid assets). Such LPs can still use a more modest overall average premium for benchmarking their entire PE/VC allocation that reflects the fact that a substantial portion of their allocation would not necessarily require the full marginal premium.

Considerations for Selecting a Premium

- What are our objectives for allocating to PE/VC?
- What is our "opportunity cost" (where else would capital have been deployed?)
- Are there other, more liquid, investments that could provide similar exposure to "factors" such as broad equity market, small-cap "premium", and/or leverage?
- What are our expectations for any value-added from active stock managers?
- How successful have we been at selecting active stock managers?
- What is the nature of our future spending requirements (large, modest, none)?
- How valuable is "liquidity" to us?
- How does that value change at different levels of overall portfolio liquidity?
- How large a premium do we need for "illiquidity risk"?
    1) For average illiquidity level of these assets?
    2) As extra compensation for poor results in a liquidity shock
- How much additional premium do we need for various other risks of PE/VC (besides illiquidity)?
    1) Smaller size and lower quality of companies (versus broad public markets)
    2) Blind-pool risk
    3) Manager-selection risk
    4) Reduced legal rights
    5) Agency risks
    6) Relatively high direct costs and increased oversight costs
    7) Distraction and reputation risks for our board and institution
- How large is our allocation to PE/VC, as well as other "illiquid" assets (as proportion of total assets)?

c. Using Historical Performance to Illustrate the Challenges of Premium Selection

Whereas the previous section focused on what level of return premiums LPs may need or desire to achieve, the related and central question for LPs' setting a Policy Benchmark based on public-markets is what levels of premiums may actually be available going forward. After all, it would be fine for an LP to decide that it requires an 800 basis point premium to take on the illiquidity and other risks of PE/VC. Setting a Policy Benchmark target at that level, however, without a clear understanding of historical returns and the prospect for success in beating such a high bench-mark, is likely to lead to disillusionment and failure.

The premium needs to be both sufficient and attainable. LPs should also understand that, even when their program is on target to beat its long-term benchmark, there can be periods of pro-longed underperformance along the way.

CHALLENGES TO DETERMINING EXPECTED RETURN PREMIUMS

What are reasonable expected return premiums for PE/VC investments versus public stocks (and by extension, versus cash and/or bonds)? Central to the difficulties that LPs, GPs, investment

consultants, and academics face in answering this question is the fact that the performance (and the promised outperformance) of these strategies relies heavily upon active management skills by the GPs. This is quite different than the broad market "equity premiums" versus cash and bonds of the type usually used by academics and asset allocators to determine relative expected asset class returns. For such asset classes, the Policy Benchmark typically includes a public-market index in which the LP can invest and receive the return of the asset class (minus a small fee) without any active management skill.

In addition, active portfolio management skills by the LPs themselves in overweighting and underweighting certain strategies and/or geographies may also play a substantial role in certain investors' private investment programs. Together, these factors make it hard to determine for PE/VC investments just what is an "average" asset class expected return (i.e., the return an LP without any above-average skills might receive) and what is the component of the expected return that is dependent upon the LP's specific skills and resources.

A number of other factors contribute to making it difficult for LPs to determine an appropriate policy benchmark target return. A key issue is the relatively short historical performance track record of PE/VC investments. Even several decades of returns for such funds in the US—the country with the longest and most robust private investment track records—is a brief history in asset allocation terms, especially compared to the long return series for US stocks and bonds.[11]

Furthermore, the private investment return histories that are the longest are arguably now the least relevant, given the dramatic changes that the industry has undergone since its earlier days (and is still experiencing). In addition, there are long time lags before returns are generated, which makes the data for recent vintages also less relevant (for now). Data access and transparency issues, though improved, continue to hinder determining just how "representative" the reported returns are of the full universe of funds that were raised. Newer benchmarking approaches that focus on aggregating the returns of the underlying investments of PE/VC funds on a gross-of-fees basis can provide additional insights, but are subject to even greater potential selection biases than fund-based benchmarks, given the wide range of other private transactions that are not included.

Finally, there remains a range of performance measurement ("math") issues that continue to complicate the interpretation of returns even well after they have been generated (e.g., the reinvestment assumptions that are inherent in IRR calculations, various competing Public Market Equivalent metrics).

Fortunately, despite these issues, there are lessons that can be drawn from the returns data on what now amounts to trillions of dollars of private investment commitments. To help LPs address some of the challenges they face in establishing reasonable return expectations for inclusion in their Policy Benchmarks, this section provides a review of key historical evidence supporting the potential for PE/VC to generate sustained outperformance versus listed public equities. It also addresses issues for consideration in assessing private investment peer indices. As with all investments, past performance is not necessarily a predictor of future results. Individual LPs

[11] The only other region with a reasonably robust performance record of funds covering the last 20 years is Developed Europe.

should recognize that there can be as much "art" as there is "science" in interpreting the historical results and blending those with their current assessments of the PE/VC industry to determine the level of premium they believe is attainable in the future. In doing so, LPs should attempt to come to their current best assessment, using all information available, about the premium level that may be obtainable over the long term (e.g., the next 20 years), recognizing that the Policy Benchmark premium levels are not expected to change much from year to year, but can be adjusted periodically as new information and insights become available.

The analyses in this section focus primarily on US private equity, venture capital, and distressed funds, given the large size, long history, and importance of the US private investments industry.[12] They were prepared by TVPI Advisors using the Cambridge Associates private investments performance database, accessed via Thomson Eikon, with returns data as of December 31, 2016, unless otherwise noted.

CONSIDERATION #1: PREMIUMS SHOULD BE DERIVED FROM PMEs RATHER THAN LONG-TERM "HORIZON" RETURNS

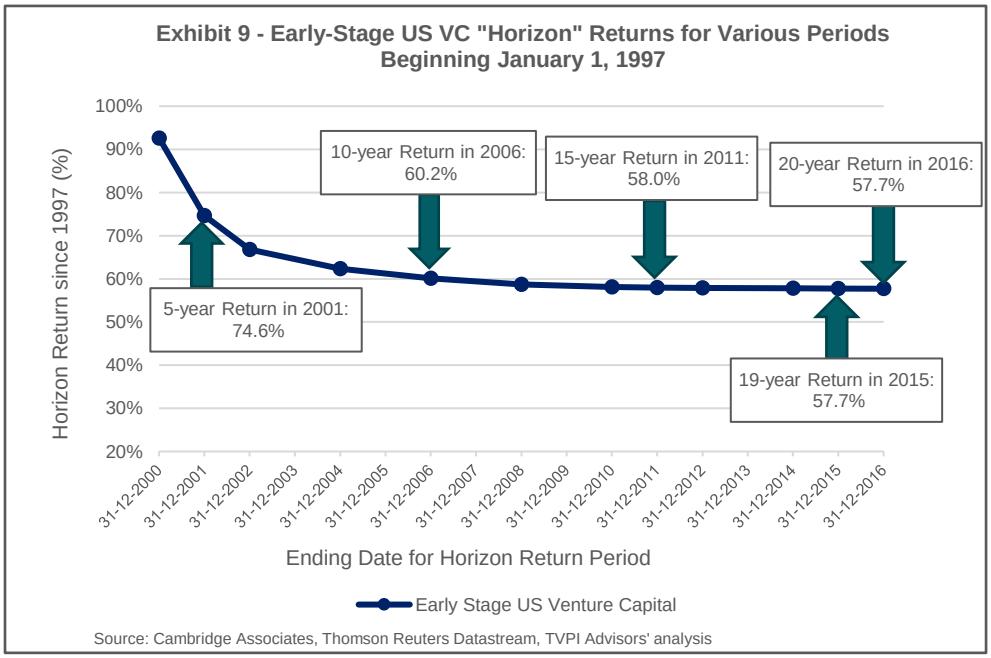
For many asset classes such as stocks and bonds, long-term historical return series represent the best starting point for evaluating an asset class's return and risk characteristics. However, private investments are different. LPs should not use the longest available "horizon returns" (also known as "end-to-end returns"), prepared by many firms in the industry, as their basis for making asset allocation assumptions for private investments and establishing Policy Benchmark premiums for those assets versus public stocks. Other approaches, such as Public Market Equivalent (PME) analyses, can provide better insights.

Horizon returns can be highly unreliable as a measure of the long-term return characteristics of private investments. Horizon returns have distortions that can worsen over time (unlike time-weighted return series for most marketable asset classes, where extreme results often eventually revert back to long-term averages). In the case of the history of US venture capital returns, anecdotal evidence suggests the possibility that these distortions have contributed to overly high assessments of the historical premiums that venture capital has achieved (especially by the media and the broader investment community). Even relatively sophisticated LPs may have grown accustomed to industry performance figures at their quarterly and annual meetings over the last decade that suggest something like "recent returns for VC have been modest/disappointing, but the long-term returns remain very strong."

The primary reason for this unreliability is the Internal Rate of Return (IRR) calculation that is used to generate horizon returns. The reinvestment assumption that is inherent within the IRR can have the unfortunate effect of "locking-in" high long-term returns that, in some cases, will not change at all regardless of subsequent performance. Consider the following examples for US venture capital, using horizon returns over the last 20 and 25 years, and quarterly cash-flow data from the Cambridge Associates benchmarking tools on the Thomson Eikon platform.

[12] This includes the US industry's role as the basis for academic and industry studies on the nature of venture capital, buyout, and other private investment performance that are used to support the industry's expansion globally in markets with more limited or absent track records. For the purpose of the following analyses, "private equity" is assumed to include buyouts, growth equity, mezzanine and private equity energy funds, as defined by Cambridge Associates.

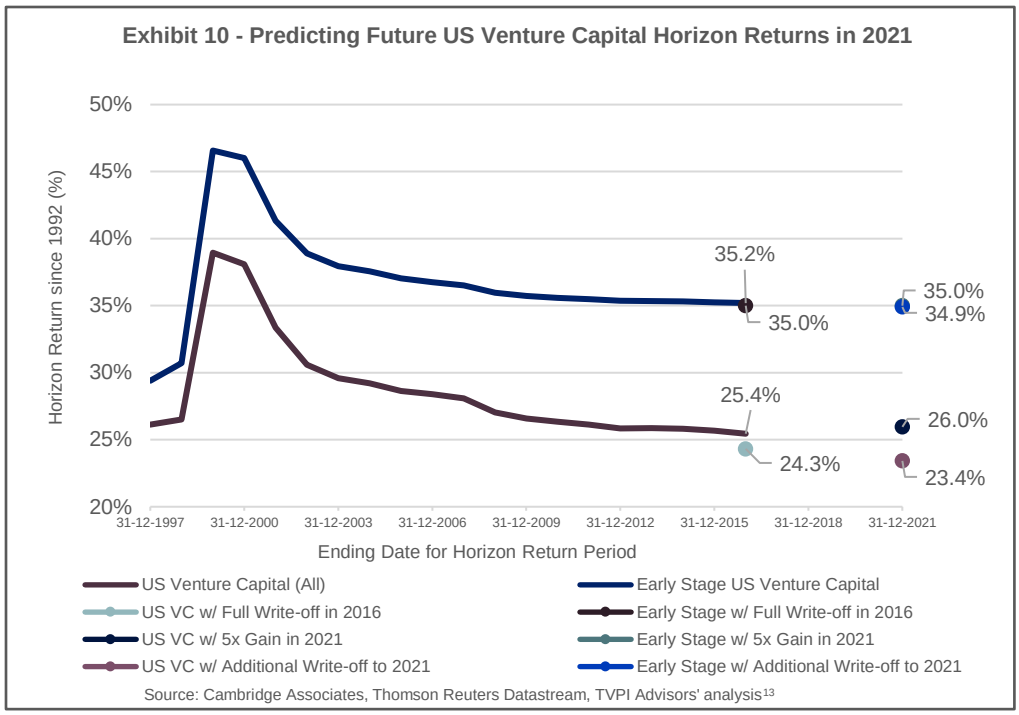
In Exhibit 9, the 20-year return for US early-stage VC through December 31, 2016 is 57.7%. LPs may not realize that the 19-year returns from the same starting date, but through December 31, 2015, were also 57.7%. Even the 15-year returns from that same starting date, but through December 31, 2011 were essentially identical: 58.0%. Because horizon returns are usually reported in 5-year increments as of a common ending date, LPs are used to seeing changes from quarter to quarter in the trailing "X-Years" horizon returns. However, these quarterly changes often do not represent the results of recent investment activity so much as they represent a progression through a series of inception dates that start 5/10/15/20/etc. years before the current quarter, with earlier returns already "baked in." In many cases, even extreme results at the end of the horizon period have little or no effect on the overall returns.



The impact of these problems is evident in the 25-year horizon returns for the entire US VC industry and the early-stage US VC segment. For the broad US VC industry, the 25-year horizon return since January 1, 1992 is 25.4%. If one were to write off the entire current NAV of $160 billion as of December 31, 2016, the reported horizon return would drop only to 24.3%, as shown in Exhibit 10.

Deploying an additional hypothetical $160 billion over the next five years and completely writing it off as well would barely affect the horizon return at the end of 2021, which would still be 23.4%. On the other hand, even if the current $160 billion NAV grew to 5 times its current value over the next 5 years, the horizon return at the end of 2021 would inch up only to 26.0%. For early stage US VC, the various similar horizon returns since January 1, 1992 are even more constrained, sticking very close to 35% regardless of the assumptions of write-offs or gains.[13]

[13] Source: Cambridge Associates, Thomson Reuters Datastream, TVPI Advisors' analysis. Pooled returns are in US Dollars net to Limited Partners for horizon return periods beginning January 1, 1992 and ending on December 31 of each year shown. Data through December 31, 2016. Pro-forma calculations assume additional annual investments evenly spread over the next five years that are equal in magnitude to the December 31, 2016 NAV for US venture capital (all) and US early-stage venture capital.



How could this possibly be? Surely the performance of the VC industry's current unrealized and future investments should matter to the long-term returns that will be reported later in 2017, 2021, and beyond. Unfortunately, in terms of horizon returns for early-stage VC for any time periods starting in January 1992, January 1997, or many similar dates, that is not the case at all. The assumed reinvestment rate in the IRR function, when applied to the VC distributions in the late 1990s, means that subsequent returns have little or no effect on future horizon returns based on those starting dates. This problem can be especially true over longer time periods, as the terminal valuation date becomes further away from the early period of strong cash flows, and the intervening period cash flows of contributions and distributions partially balance each other out, leaving net annual flows that are relatively modest and have limited impact on the IRR calculation. As a result of these issues, horizon returns reported in the future for the broader VC industry over the longer time periods beginning in 1992 will still be well above 20%, even in the unrealistic situation where there are dramatic write-offs and no realizations.[14]

Another way to look at this problem is to note that the actual distributions for early-stage venture for the first 5 years of the 20-year period were $82.3 billion. For an IRR of 57.8% over the 20-year period, the mathematics of the IRR function essentially assume that those early distributions (and all others) were reinvested and then grew at 57.8% annually. There are a couple obvious problems with this assumption. First, with a 6.1% reported horizon return for the subsequent 15-year period, it's hard to imagine where that $82.3 billion could have been reinvested to get a 57.8% return beginning in 2002. Second, if the $82.3 billion had been reinvested at a 57.8% annual compounding rate, it would need to have grown to $76.8 trillion by the end of 2016 just for the IRR assumptions to make sense. This (absurd) figure would be 250 times the $302 billion in total distributions and current NAV for the entire history of the early-stage US VC industry.[15]

[14] Cambridge Associates provided a detailed example of how strong early performance for an individual fund could "lock-in" such a high IRR that the entire remaining portfolio could be written off with almost no effect in their 2014 paper "A Framework for Benchmarking Private Investments", page 7.

[15] Source for cash flows and returns in this paragraph: Cambridge Associates, Thomson Reuters Datastream, TVPI Advisors' analysis. Data as of December 31, 2016.

A second problem that undermines the general usefulness of horizon returns is more subtle, but can also have dramatic effects. This problem is the assumption that an entire private investment strategy or group of strategies can be purchased at NAV on the initial date of the measurement period.[16] LPs analyzing the premiums associated with PE/VC should be wary of industry analyses that show horizon returns over the trailing "X-Years" and then compare the returns with those of public markets. This problem includes not only comparisons of IRR-based horizon returns to time-weighted public market returns (of course, since they are fundamentally different calculations that should not be compared to each other), but also such comparisons as the Cambridge Associates Modified PME (mPME), when it is employed as a direct benchmark for a horizon return over a fixed time period.[17]

What do horizon returns tell LPs about the performance of venture capital over the last 5 and 10 years ending December 31, 2016? The reported horizon returns for the two periods are 14.0% and 9.4%, respectively. But just what is included in venture capital? In both cases, two-thirds of the initial NAV that an investor is assumed to be "buying" at the start of 2007 and 2012 consists of positions in funds of vintages that are already five or more years old, which would not be available to LPs making new commitments in 2007 or 2012. Looking at the returns for venture capital funds of only the 2005 and later vintages brings the 10-year return to 13.3%. For venture capital funds of 2010 and later vintages, the 5-year return through December 31, 2016 jumps to 22.5%.[18]

Which is the "right" return for the last 5 and 10 years? It depends on what an LP is trying to measure:

- The theoretical "return" that includes a set of assets, most of which the LP could not purchase at the beginning of the period; or
- The "return" on new capital that could be deployed either into public markets or private investments beginning 5 and 10 years ago.

LPs with mature PE/VC programs that have vintage year and strategy commitment exposures broadly in-line with those of a peer-group benchmark may find some use in comparing this theoretical horizon return of a benchmark with a similar calculation for the assets in their program over discrete time periods. LPs should not, however, think that these horizon return figures represent a good comparison to the returns of public markets, even when using a methodology such as the Cambridge mPME, since stock indices can be purchased at their actual market values on the initial data of the horizon-return period, whereas the private assets cannot.[19]

[16] LPs are likely more familiar with the analogous problem of assessing the fairness of the valuations for unrealized assets on the ending date of the measurement period.
[17] This concern does not affect the use of the mPME for vintage year or "since inception" analyses that begin essentially with net asset values of zero.
[18] Source for cash flows, returns, and composition of the VC index as of 2007 and 2012 in this paragraph: Cambridge Associates, Thomson Reuters Datastream, TVPI Advisors' analysis. Data as of December 31, 2016.
[19] The second problem noted for horizon returns unfortunately also arises for LPs making comparisons of their PE/VC program returns on a time-weighted returns basis over the last trailing "X" years to public benchmarks and the returns of other portions of their portfolios, including public stocks. These calculations also start with a large group of assets held at NAV that could not be purchased at that time for those prices, making comparisons to public stock returns over discrete time periods less reliable.

While in both of the cases above, the horizon returns increased when older vintages were excluded, the effect can go in either direction: removing older vintages can also cause horizon returns to decline. Furthermore, the direction and magnitude of the differences can be difficult to predict, even for LPs with a detailed knowledge of the relative weightings and returns of the vintage years within the benchmark. This problem adds to the difficulty of making accurate interpretations of longer-term horizon returns for determining a Policy Benchmark premium. (Short-term horizon returns can be even more dramatically affected, calling into question their overall usefulness. But that is beyond the scope of this paper.)

Rather than using horizon returns as a basis for setting the return premiums in their Policy Benchmarks, LPs should consider other approaches, including PME approaches such as Direct Alpha (which is used in the analysis found in this volume), Cambridge Associates mPME, and/or K&S PME, calculated over various groups of vintage years.[20] Such PME results, when calculated from inception, can provide LPs with more reliable insights into the expected returns of PE/VC investments relative to public stocks. LPs can then use averages and estimates of the relative returns (i.e., premiums) along with the longer-term return histories for public-market investments as inputs when determining their return expectations and Policy Benchmark premiums.[21]

CONSIDERATION #2: INCORPORATING SMALL-CAP STOCKS

In determining whether US PE/VC investments have generated a long-term return premium versus US stocks that LPs could expect to see repeated in the future, LPs should review the relative performance of PE/VC investments versus small-cap stock indices, in addition to the popular indices dominated by mega- and large-cap stocks, such as the S&P 500 Index (or the Russell 3000 Index).[22]

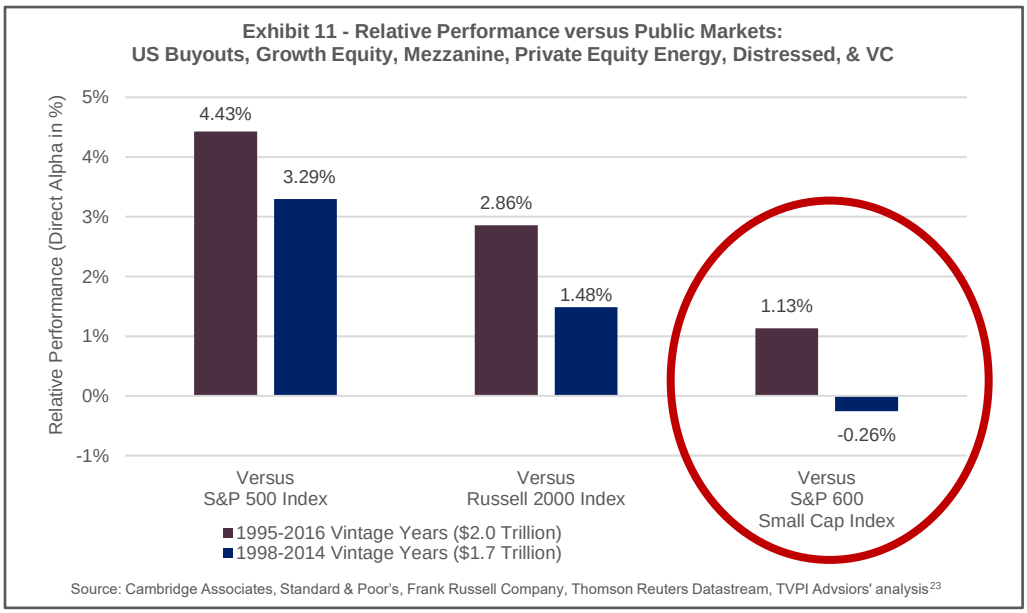
As noted in in Volume I, most US LPs using a public-market approach choose a broad market index such as the S&P 500, Russell 3000, or Wilshire 5000 as the base index for their Policy Benchmark. The rationale for using such indices is that private investments would otherwise have been invested in the US equity allocation, so the default position would be to measure their performance versus the benchmark for that entire allocation. Many investors also do not make a distinction for asset allocation purposes between the expected long-term returns for small-cap stocks and the mega-/large-cap stocks that dominate the performance of the broad market indices, since the returns are highly correlated with each other.

[20] The Direct Alpha methodology is described by Oleg Gredil, Barry Griffiths, and Rüdiger Stucke in Benchmarking Private Equity: The Direct Alpha Method, 2014.

[21] Time-weighted returns (or linked quarterly IRRs) of private investments are also problematic for determining long-term premiums versus public stocks, for many of the same reasons that LPs typically use IRRs to measure individual fund returns, including the implied equal weighting of returns for different periods where substantially different amounts of capital were invested.

[22] Although this example is written from a US perspective, global or ex-US investors should similarly review the performance of relevant small-cap indices.

Exhibit 11 shows such a comparison for $2.0 trillion of commitments to private investment strategies that might typically be included in a US-centric program targeting an "equities plus 300 to 500 basis points" return objective: buy-outs, venture capital, growth equity, private equity energy, mezzanine, and distressed investments. Relative performance for two overlapping groups of vintage years are shown versus the S&P 500 Index, as well as the Russell 2000 and S&P 600 Indices of small-capitalization stocks: 1995 to 2016 (purple) and 1998 to 2014 (blue).[23]



In this analysis, the broad set of US-focused private investment strategies has beaten the S&P 500 Index (on the left) by reasonable margins for the two groups of vintage years shown (4.43% and 3.29% per year). These results are generally in-line with other studies concluding that US buyout funds have outperformed the S&P 500 Index by sufficiently large margins to meet at least some LPs' objectives. The analysis here, though, is extended to include the aggregated results for a much broader range of strategies, including most notably venture capital, rather than focusing on a single strategy such as buyouts or venture capital, as many other papers do.

The story is not as positive, though, when the comparison is made versus small-cap stocks, especially when using the S&P 600 Small Cap Index. In the latter case, even with the highly-successful 1995 to 1997 venture capital vintages that exited during the internet bubble, the overall outperformance versus stocks was only 113 basis points, well below most LPs' targets. Without those three vintages (1995 to 1997), outperformance for the $1.7 trillion in commitments for the 1998 to 2014 vintages versus the S&P 600 Small Cap Index vanished, falling to negative 26 basis points. While LPs nearly received a public-market return, they received no premium for the additional risks and illiquidity they incurred (and a large portion of their capital remains unrealized).

[23] Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, TVPI Advisors' analysis. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016. Performance shown for 2770 US-focused direct private investment funds using Direct Alpha comparison to public markets stock indices. Vintage years based on first cash flow.

For Developed Europe, the one other geography where there is a sufficiently robust returns history to assess the 20-year track record of PE/VC, the industry's outperformance versus the MSCI Europe Small/Mid-cap Index is around 300 basis points less than the outperformance versus the broad MSCI Europe Index: 509 versus 804 basis points for the 1995 to 2016 vintages, and 447 versus 754 basis points for the 1998 to 2014 vintages.[24]

Since small-cap stocks have many of the same embedded risks as PE/VC, including higher volatility of returns and lower-quality companies than mega-cap and large-cap stocks, LPs setting a return premium versus small-cap stocks may wish to consider using a smaller premium than versus a broad market index. The similar risk profiles may partially explain the lower level of historical outperformance of PE/VC versus the S&P 600, as shown in Exhibit 11. LPs considering the use of a small-cap benchmark for a Policy Benchmark should also be aware that there can be times when small-cap stocks are very expensive versus mega- and large-cap stocks, such that subsequently outperforming the low returns of a small-cap index will be little consolation if much higher investment returns may have been available through indexed exposure to much larger and higher-quality public stocks.

CONSIDERATION #3: VINTAGE-YEAR PREMIUMS

LPs should also consider the relative performance of private investment strategies versus stocks on a vintage-year-by-vintage-year basis. Such a review can help identify whether relative performance has been consistent over time, highlight vintage years with especially strong and weak performance for additional review, and show patterns that may not be evident from aggregated data, such as trailing 1-year, 5-year, and 10-year returns all through a common date.

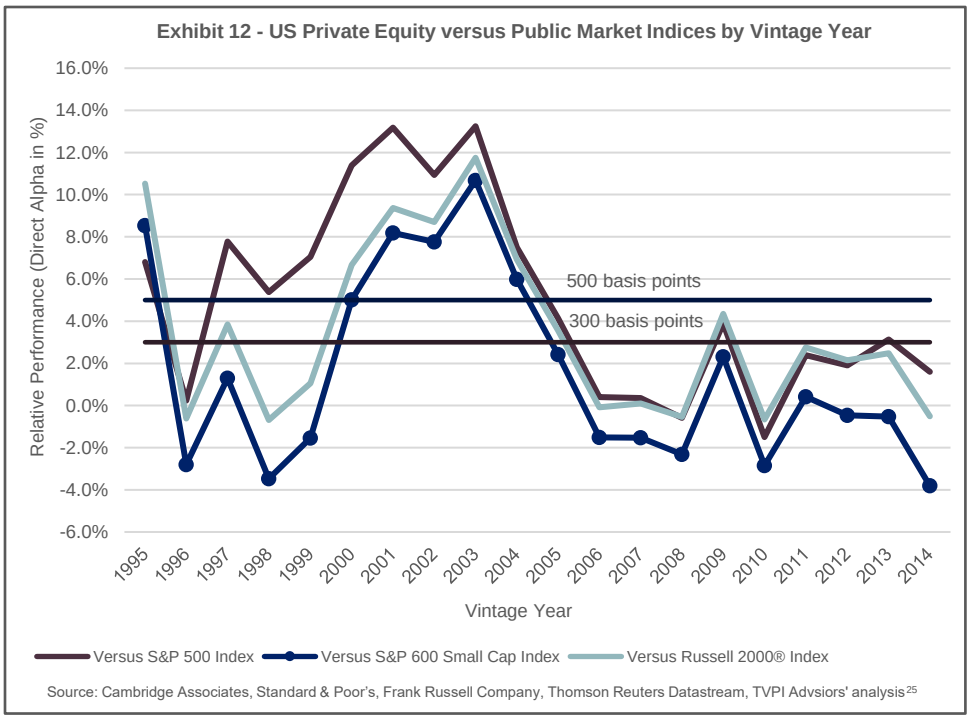
Exhibit 12 shows performance by vintage year for US "private equity" strategies versus three public-market indices.[25] The observed levels of over- or underperformance for each vintage year are compared to two levels that LPs have often used for the "premium" versus public stocks in their investment policy benchmarks: 300 and 500 basis points.

The first observation is the wide difference between the outperformance levels versus the broader-market S&P 500 Index (shown in purple, the performance of which is dominated by mega/large-cap stocks) compared to a small-cap index such as the S&P 600 Small Cap Index or the Russell 2000 Index. Since 1996, the outperformance of US private equity investments versus the S&P 500 Index is consistently larger than their outperformance versus the S&P 600 Small Cap Index. Because the same underlying private investment cash flows are used for each index, the actual performance by the S&P 600 Small Cap Index itself was higher than the performance of the S&P 500 Index over the lives and cash flow weightings of those vintages of funds.

[24] Source: Cambridge Associates, MSCI Inc., Thomson Reuters Datastream, TVPI Advisors' analysis. MSCI data provided "as is" without any express or implied warranties. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016. Performance for 509 Europe-focused direct private investment funds using Direct Alpha comparison to public markets stock indices. Vintage years based on first cash flow.

[25] Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, TVPI Advisors' analysis. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016. Performance shown for US-focused private equity funds (Buyout, Growth Equity, Mezzanine, Private Equity Energy) using Direct Alpha comparison to public markets stock indices. Vintage years based on first cash flow.

A second key observation is that US private equity's actual outperformance versus the S&P 600 Small Cap Index has often not met a target of 300 basis points, much less one of 500 basis points. This is the case even in many of the earlier vintages from the late 1990s, where relative performance versus the S&P 500 Index did exceed those targets.



A third observation is the implied poor performance of the Russell 2000 Index versus the S&P 600 Index for every time-period represented by a given vintage year's cash flow patterns in this analysis. While not shown on the exhibit, other U.S. small-cap indices such as the MSCI US Small Cap 1750 Index and the Dow Jones US Small Cap Index also outperformed the Russell 2000 Index over every vintage year's cash flow pattern from 1995 to 2014. ***Further data can be found in the Appendix section of this report.***

This third observation is somewhat problematic, since the Russell 2000 Index is quite frequently used as a policy benchmark for US small-cap stocks. At least in theory, the index has the potential advantages of representing the broad opportunity set of investable small-cap securities in the US and "fitting" together well with an LP's use of the Russell 1000 Index for benchmarking its mega, large, and mid-cap exposure in an overall allocation that together is benchmarked to the Russell 3000 Index.

As a result, what may look like "outperformance" by PE/VC investments versus small-cap stocks when using the Russell 2000 Index for benchmarking or in academic studies might essentially have been replicable by investing in the S&P 600 Small Cap Index or one of the other non-Russell small-cap indices. While a full discussion of the merits of these various small-cap indices is beyond the scope of this paper, LPs may wish to review additional analyses if they are currently using the Russell 2000 or 3000 Indices for their PE/VC Policy Benchmarks.[26]

[26] See, for example, "US Small Cap Equity: Which Benchmark is Best?", 2016, from Meketa Investment Group, which notes that the bias toward quality in the S&P 600 Small Cap Index's construction has led to sustained outperformance versus the more "pure" Russell 2000 Index.

There is no single "formula" that LPs should use to interpret such vintage-year results. Even a simple visual review of Exhibit 12 would suggest that a premium of 500 basis points versus small-cap stocks may be challenging. Some LPs may wish to review the weighted-average outperformance across a number of mature vintage years to help determine a premium, while others may assess each vintage year's contribution on a more equal-weighted basis. LPs can also choose whether to de-emphasize results from certain vintages that were heavily influenced by extreme events (e.g., the late 1990s tech bubble or the mega-buyout boom in the 2000s).

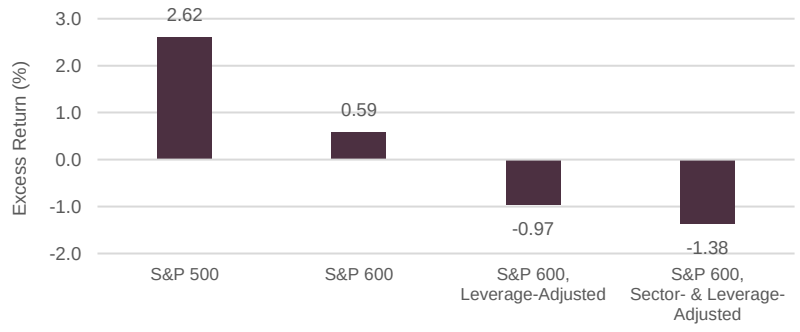
CONSIDERATION #4: LEVERAGE AND SECTOR EFFECTS

LPs should also consider how much of the apparent "outperformance" of private equity strategies versus indices such as the S&P 500 Index just represents leverage and sector effects.

A 2016 paper by a group of authors from the Canada Pension Plan Investment Board (CPPIB) and the Abu Dhabi Investment Authority (ADIA) highlighted the importance of considering that most private equity investments are much closer in size to small-cap or even micro-cap stocks, which represent a viable alternative use for LPs' capital. Using a PME-based approach, the authors found that U.S. Buyout funds from the 1986 to 2014 vintages in the Burgiss database had an implied excess return of 2.62% annually versus the S&P 500 Index, but only a 0.59% excess return when measured against the S&P 600 Small Cap Index, a difference of more than 200 basis points (for time periods ending March 31, 2015).[27]

The authors then made additional adjustments to the public-market returns to compensate for differences in leverage levels and sector exposures between buyouts and the public index. These two adjustments subtracted an additional 156 basis points and 41 basis points, respectively, from the excess return versus the S&P 600 Small Cap Index. Incorporating all three effects, as shown in Exhibit 13, the total excess return for US Buyouts dropped to negative 138 basis points, a full 4 percentage points below the excess return margin versus the unadjusted S&P 500 Index (2.62%).

Exhibit 13 - Excess Return for US Buyout Funds 1986-2014 Vintages, Value-Weighted (%)



Source: L'Her, Stoyanova, Shaw, Scott, and Lai[27]

While, for simplicity, many LPs may wish to continue setting their Policy Benchmark premiums in terms of the broadest opportunity set in a given geography (e.g., a broad market index such as the Russell 3000 Index or even the S&P 500 Index), they should consider whether a portion of the premium could partially be replicated by more targeted public-

[27] Jean-François L'Her, Rossitsa Stoyanova, Kathryn *Shaw*, William Scott, and Charissa Lai, "A Bottom-Up Approach to the Risk-Adjusted Performance of the Buyout Fund Market," *Financial Analysts Journal*, Volume 72, Number 4, 2016, p. 45. The authors compared both equal-weighted and value-weighted measures, the latter of which they favored as providing a more representative picture of the overall industry returns and which are included here. The implied excess return was calculated from the K&S PME ratio and the weighted average duration of the buyout funds.

market allocations. In this case, an index of small-cap stocks (or even active management in small-cap stocks) might better represent the opportunity costs for many LPs allocating to PE/VC, and could be considered as the base index for the Policy Benchmark.

On the other hand, for those wishing to continue using a broad market index such as the Russell 3000 Index (or even the S&P 500 Index) for consistency with their public equity benchmark, the historical outperformance of small-cap stocks over various extended time periods (as well as the leverage and sector effects highlighted by the CPPIB/ADIA authors), may suggest the value of setting a premium well above 300 basis points in excess of the Russell 3000 or S&P 500 Indices.

CONSIDERATION #5: MANAGER SELECTION SKILL AND/OR "ACCESS"

Another factor is the importance of manager selection skill and/or "access" to top-performing managers. If such skills and/or access are deemed to be necessary, investors should also consider whether their institution itself is likely to demonstrate above-average selection skills and/or access over the extended time periods that would be measured by a long-term Policy Benchmark. Many LPs regard the pursuit of "top-quartile" fund managers as central to their PE/VC investment strategy, while others believe that they may have limited capabilities to access the very best managers (for example, in areas like venture capital). Yet it is the top-performing managers whose performance heavily affects the industry's aggregated performance statistics.

How should LPs think about the portion of the potential premium that is represented by the "asset class return" for PE/VC investments versus the LP's own additional added value through its skill and access? It's likely that most LPs participating in PE/VC do so because they believe that they do have skills and access that can tilt the odds in their favor, but what might the "asset class return" be for an "average" investor with only average skills and access?

To help assess that question, Exhibit 14 shows the distribution of relative performance by quartiles for US private equity, venture capital, and distressed funds for the 1998 to 2014 vintage years.[28] As one might expect, the distribution is skewed, with the top quartile of funds accounting for much of the outperformance, while also outperforming by more than the bottom quartile of funds have underperformed.

For example, versus the S&P 500 Index, all four quartiles have an aggregated outperformance of 3.3%. For the "winners" and the "losers" (quartiles one and four, together) outperformance is an even stronger 6.9% versus the S&P 500 Index. Looking at only the middle of the distribution (quartiles two and three, together), however, outperformance drops to only 1.2%, more than 200 basis points behind the overall return.

[28] Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, MSCI Inc., Dow Jones Indexes, TVPI Advisors' analysis. MSCI data provided "as is" without any express or implied warranties. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016. Quartiles ranked by IRR within each vintage year, which is determined by year of first cash flow. Relative performance shown for US-focused direct private investment funds (buyouts, growth equity, private equity energy, mezzanine, distressed, and venture capital) using Direct Alpha comparison to public markets stock indices for vintage years 1998 to 2014.

Exhibit 14 - US Private Equity, Venture Capital, and Distressed: Relative Performance versus Public Markets (%)[28]

	S&P 500 Index	Russell 3000® Index	S&P 600 Small Cap Index	MSCI US Small Cap 1750 Index	Dow Jones U.S. Small Cap Index	Russell 2000® Index
All Quartiles	3.3	2.9	-0.3	0.2	0.5	1.5
Q1 and Q4	6.9	6.4	2.4	2.8	3.1	4.2
Q2 and Q3	1.2	0.9	-1.9	-1.4	-1.0	-0.2
Q1 Only	17.8	17.1	11.7	11.9	12.2	13.6
Q2 Only	3.9	3.6	0.6	1.0	1.3	2.3
Q1, Q2, and Q3	5.8	5.4	2.0	2.4	2.7	3.7
Q2, Q3, and Q4	-1.1	-1.3	-3.6	-3.2	-3.0	-2.0
Q3 Only	-2.2	-2.5	-5.0	-4.4	-4.0	-3.3
Q4 Only	-10.8	-10.9	-13.0	-12.2	-11.7	-11.4

When measuring performance relative to the S&P 600 Small Cap Index or other small-cap indices, the broad swath of funds in the middle two quartiles has delivered even worse results, with relative returns of -1.9% to -0.2%. Across the small-cap indices, investing only in the middle two quartiles cut around 150 basis points from returns versus the pooled average for all four quartiles.

LPs that were unable to access top quartile managers and had exposure only to the remaining 75% of funds in quartiles 2, 3, and 4 would have underperformed small-cap stocks by 2.0% to 3.6%. (Or, in other words, some 500 to 660 basis points of annualized underperformance versus a “small-cap stocks plus 300 basis points” Policy Benchmark.)

Even a hypothetical LP that only invested in funds in quartile 2 would have had disappointing results versus small-cap indices, with outperformance of just 0.6% versus the S&P 600 Small Cap Index. These mediocre results in terms of outperformance would have come despite the LP’s unrealistically high fund selection skills: a 100% hit-rate in selecting above-median managers and avoiding a single below-median fund.

These figures may have implications not only for LPs considering their premiums versus a public-market index, but also for LPs using private investment peer indices. If an LP were to assume that it did not itself possess above average skills/access, but that there are numerous other LPs in the market that do have such superior skills/access, would the aggregated results of the second and third quartiles be a better representation of the “average” asset class return it might expect?

The answer could very well be “yes.” However, a thorough answer would also depend on the degree to which top-quartile performance is persistent and identifiable in advance, or relatively random. If persistence is low, winners are hard to identify ahead of time, and results are essentially random, then even average-skilled LPs that make enough separate commitments may be able to achieve performance similar to the pooled averages.

On the other hand, in a world where there is moderate persistence and a group of more skillful LPs that do possess the ability to identify and access a disproportionate share of the top quartile

funds, newer LPs (typically lacking experience, established relationships, and/or access to top funds), as well as those without the ability to devote sufficient internal/external resources, or to develop the necessary skills and relationships, could find that the pooled peer-group indices represent a challenging Policy Benchmark. Without the effect of their proportionate share of the "winners," the results for such LPs are likely to be below the pooled averages, and so those pooled figures should not be used to set their premium. While it would be unusual to do so, such LPs could potentially even make a case for including a "negative premium" in their private peer-based Policy Benchmark if it continues to be based on pooled returns. (However, LPs considering this path should ensure that they also correspondingly adjust their return expectations for asset allocation purposes.)

Of course, the importance of manager selection skill and/or access can depend upon the time-period, strategy, and geography. Superior manager selection skills were not central to the case for private equity in Europe during the second half of the 1990s, when even many third-quartile funds beat large- and small-cap equities by 300 basis points or more.

On the other hand, there have been periods and strategies in which LPs without the ability to identify or access even just the top 5 or 10 percent of funds would have obtained substantially lower returns than the aggregated benchmark results. The most striking example is US venture capital during the tech bubble of the late 1990s. While that period may have been unique in the magnitude and concentration of riches that were generated by the very top funds, an analysis of more recent vintages shows that a very narrow slice of the industry continues to account for much of venture capital's performance and potential for outperformance versus stocks.

As shown in Exhibit 15, the aggregated IRR for the 779 US venture capital funds of the 2001 to 2014 vintages in the Cambridge database was 10.2% through December 31, 2016.[29] Removing only 39 (5%) of the best performing funds (ranked by IRR) -- an average of just 2.8 funds per vintage year -- causes the aggregated IRR to drop from 10.2% to 7.8%, a decline of 235 basis points. Or, in other words, more than two-thirds of the 300 basis points that some LPs might conceivably target as a minimum level of necessary outperformance disappear when the results of just the top 5% of funds are removed.

Exhibit 15: US VC Funds (vintages 2001-2014)[29]	Funds Omitted	Pooled IRR	Performance vs. Russell 2000®	Performance vs. S&P 600 Small Cap	Performance vs. NASDAQ Composite
All (779 funds)		10.2%	0.6%	-1.0%	-0.9%
Without top 5%	39	7.8	-1.7%	-3.3%	-3.2%

Furthermore, the 740 funds that represent 95% of the remaining venture capital funds underperformed public small-cap stocks by 1.7% to 3.3%, depending on the index. Adding in the top 5% of funds brought the overall relative performance up by around 2.3 percent, but still left the venture capital universe underperforming the S&P 600 Small Cap Index and the NASDAQ

[29] Source: Cambridge Associates, Frank Russell Company, Thomson Reuters Datastream, Global Financial Data, Inc., TVPI Advisors' analysis. Returns are net to LPs in USD and are through December 31, 2016 for US-focused Venture Capital funds of vintage years 2001 to 2014. Funds ranked by IRR, vintage years based on first cash flow. Relative performance calculated using Direct Alpha methodology.

Composite Index by around 100 basis points per year. Outperformance versus the Russell 2000 Index was 0.6%.

This type of effect is not limited to venture capital funds. As shown in Exhibit 16, a separate analysis of 627 US buyout and growth equity funds from the 1995 to 2008 vintage years demonstrates the effects of missing out on either the top 5% or the top 10% of funds.[30] In this case, the decline in IRR is 143 basis points when omitting the top 10% of funds. The declines in relative performance versus the S&P 500 Index and the S&P 600 Small Cap Index are 128 basis points and 125 basis points, respectively.

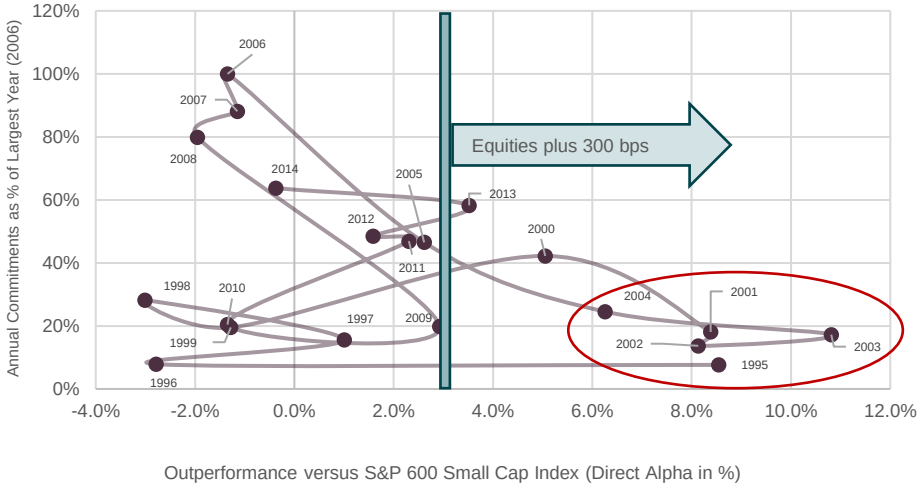
Exhibit 16: US Buyout Funds (vintages 1995-2008)[30]	Funds Omitted	Pooled IRR	Performance vs. S&P 500	Performance vs. S&P 600 Small Cap
All (627 funds)		11.4%	5.1%	1.2%
Without Top 5%	31	10.4%	4.2%	0.4%
Without Top 10%	62	10.0%	3.8%	0.0%

CONSIDERATION #6: STRATEGY/GEOGRAPHY ALLOCATION SKILL AND/OR "MARKET TIMING"

Another factor is whether LPs are likely to be able to add value through overweighting or underweighting particular strategies or geographies over time. Periods of excessive optimism and heavy fundraising have often been associated with poor subsequent returns for PE/VC managers. Conversely, a contrarian strategy of committing (or at least continuing to commit) capital during vintage years when fewer and smaller funds are being raised has at times been necessary to achieve the largest outperformance versus public stocks.

For example, Exhibit 17 shows that most of the US private equity vintages that out-performed equities by 300 or more basis points had relatively small amounts of capital commitments, whereas years with higher levels of commitments frequently failed to meet a target of equities-plus-300 basis points.

Exhibit 17 - US Private Equity: Outperformance versus Total Commitments, by Vintage Year



Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, TVPI Advisors' analysis[31]

[30] Source: Cambridge Associates, Standard & Poor's, Thomson Reuters Datastream, TVPI Advisors' analysis. Returns are net to LPs in USD and are through December 31, 2016 for US-focused Buyout and Growth Equity funds of vintage years 1995 to 2008. Funds ranked by IRR, vintage years based on first cash flow. Relative performance calculated using Direct Alpha methodology.

The exhibit tracks (along the horizontal axis) the relative performance versus stocks of US private equity funds of vintage years 1995 (starting in the lower right-hand corner) through 2012 (in the middle of the page, just to the left of the "Equities plus 300 bps" line) and the total LP capital raised in each vintage year (along the vertical axis).[31] The vertical axis is scaled to set the 2006 vintage year to 100%, since it was the largest vintage year in terms of total commitments during this period. Other than the first vintage year of this period (1995, selected partially since it is the first full year for which the benchmark S&P 600 Small Cap Index is available), the only vintage years with substantial outperformance versus a 300- to 500-basis point premium are 2001 to 2004. Each of these are relatively modest in size even compared to the capital raised in 2000 (three of the best performing years have commitment levels less than half of the 2000 level), much less when compared to the large amounts of capital raised subsequently for the 2006 to 2008 vintages (each of which has performed poorly).

d. Summary and Conclusions - Volume II

Setting the appropriate premium for inclusion in an LP's Policy Benchmark requires a thorough understanding of the returns that an LP needs for its Private Equity and Venture Capital investments ("PE/VC") to fulfill their assigned role in the LP's portfolio and asset allocation structure. It also requires a candid assessment of the industry's historical returns and the LP's own abilities to achieve average or above-average results going forward, which an LP can use as it reviews the current market environment and the types of PE/VC investments it expects to make in the years ahead.

There is no single consensus on what level of premium is sufficient, nor should there be a single level that would fit all LPs. Different LPs will have different return requirements to compensate for "illiquidity" risk, as well as for the many other risks associated with private investments. The most common return premium among surveyed ILPA members was 300 to 399 basis points; the most common return premium specified by Cambridge Associates' endowment clients was 300 basis points.

While many LPs are "on-the record" with current Policy Benchmark premiums of 250 or 300 basis points (or even less), such levels are not viewed as sufficient by many other LPs that have set premium targets of 400 or 500 basis points (or more). LPs with small allocations to PE/VC (as well as other illiquid assets) and low near- and medium-term spending requirements can likely afford to have lower premiums than LPs with large allocations to illiquid investments and high near-term spending requirements.

Once LPs have determined the level of returns that they require, including a premium versus other liquid securities, they should assess whether they believe their institution has a good chance of obtaining such returns and premiums. This assessment needs to include a review of the industry's prospective returns, as well as a realistic understanding of the LP's own likely chances of deviating

[31] Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, TVPI Advisors' analysis. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016. Performance shown for US-focused private equity funds using Direct Alpha comparison to the S&P 600 Small Cap Index. Size of total commitments per vintage year shown as a percentage of total LP commitments for the 2006 vintage year (in nominal terms, not adjusted for inflation). Vintage years based on first cash flow.

from the industry's average returns. Set the premium too high, to match a high requirement, and it may be unobtainable and encourage additional unwanted risk-seeking behavior, or lead to disappointments that cause a mid-course abandonment of what otherwise could have been a valuable program. Set the premium too low, and it may be easier for the LP to beat its benchmark while failing to meet the true required return for its assets (which could potentially also lead to future pressures to increase the size of the PE/VC allocation above what may be optimal for that LP).

The historical performance record of PE/VC in the United States, analyzed in this Volume, suggests that many LPs have likely failed to match their premium requirements with actual private investment returns that they have received over the last 20 years. LPs assessing their Policy Benchmark premium for the next 20 years should review the analyses and "Considerations" in the final section of this paper carefully as they consider whether a 300 basis point premium versus a broad market index such as the S&P 500 or Russell 3000 Index is sufficient compensation going forward. PE/VC funds in the US failed to come even close to meeting a 300 basis point premium versus the S&P 600 Small Cap Index across the full set of vintage years since 1995 (although some vintage years did exceed that target).

These results may seem surprising to LPs that have used the long-term "horizon returns" for the industry, especially for US venture capital, as part of their asset allocation and Policy Benchmark planning processes. On the surface, the horizon returns for US venture capital look very attractive, 25.4% annually for the industry as a whole and 35.2% for the early-stage segment over a 25-year period. These figures provide what appears to be a very high margin above any compounded annual return for public-market stocks over that period. Unfortunately, the horizon returns methodology provides highly misleading results that are entirely inconsistent with the subsequent observed returns for the industry, especially over the last 15 years. Even worse, the mathematics of using the IRR in the 25-year early-stage venture capital horizon returns implies that "N" years into the future, the "25+N"-year horizon return for early-stage US venture capital will also be essentially the same as the current level (i.e., 35%), regardless of the entire subsequent history of the industry from this day forward. Due to the impact of the IRR methodology on longer-term "horizon returns," LPs should use since-inception, Public Market Equivalent calculations when determining the appropriate premium for their organization.

Furthermore, the performance (and premiums) that the industry has generated has been quite concentrated, with the top 5%, 10%, and 25% of funds accounting for a disproportionate share of the positive results. LPs using "pooled" average historical results for setting their Policy Benchmark premiums should consider whether they are likely to be able to identify and access their proportionate share of the future top funds. Without those winners, their results are likely to be below the pooled averages. Such LPs should not necessarily use historical pooled average returns to set their premium, but should consider using lower figures. For example, LPs investing only in funds within the second and third quartiles (25^{th} to 75^{th} percentile range) from 1998 to 2014 had annualized results that were 150 to 200 basis points worse than the broad pool of all four quartiles. Even missing out on just the top 5% of US VC funds and US Buyout funds caused annualized outperformance to drop by around 230 basis points and 100 basis points, respectively.

These figures represent a large percentage of a 300 basis point premium that an LP might otherwise consider to be achievable.

Similarly, LPs should assess whether they are likely to continue investing in PE/VC during the time periods where it becomes unpopular and fundraising dries up, as well as whether they are likely to be able to slow down commitments when the market is overheated or moving into "bubble" territory. The only US private equity vintage years after 1995 that have substantially beaten a 300 basis points premium above small-cap stocks are 2000 to 2004, most of which had low levels of capital commitments following the bursting of the internet bubble.

These and the other analyses in the final section would primarily push LPs toward setting lower Policy Benchmark premiums overall, rather than higher ones, based on: 1) the relatively low premiums that the industry has generated overall on a total pooled returns basis, especially versus small-cap stocks; and 2) the even lower premiums that have been generated by the "average" funds, or by the industry minus the top 5% or 10% of its funds. The differentials in relative performance of PE/VC versus broad-market indices and small-cap indices, however, would suggest that for a given level of overall expectations of private investment returns, a premium of X versus the broad market index may need to be higher than the premium Y that would be sufficient versus a small-cap index.

LPs should then confirm whether these lower expected return premiums are greater than or equal to the premium requirement that they determined was necessary based on the role of PE/VC in their portfolio. If the answer is "yes," the Policy Benchmark premium can be set at the level of the premium requirement. If the answer is "no," the LP may need to reassess its portfolio and asset allocation return requirements, or consider changes to its implementation approach to increase the expected return premium of its PE/VC allocation.

Appendix

Appendix I - US PE, VC, Distressed IRRs and Relative Performance by Vintage Year Versus Various Broad-Market and Small-Cap US Indices

					Direct Alpha vs.					
Vintage Year	Fund Count	Total Capitalization ($Bn)	Pooled IRR (%)	Median IRR (%)	Russell 3000® (%)	S&P 500 (%)	S&P 600 Small Cap (%)	Russell 2000® (%)	Dow Jones US Small Cap (%)	MSCI US Small Cap 1750 (%, Gross)
1995	71	17.6	33.3	21.5	13.8	13.1	19.0	20.4	18.3	17.0
1996	76	19.1	30.8	9.5	14.8	14.4	18.8	19.7	16.8	16.0
1997	116	34.5	21.5	11.1	14.1	14.6	11.0	12.9	9.9	9.5
1998	135	59.6	9.1	6.9	6.8	7.7	-1.2	1.6	-0.6	-0.9
1999	162	66.6	4.3	0.2	1.9	2.7	-5.0	-2.6	-4.0	-4.3
2000	228	115.4	9.4	2.8	4.2	4.9	-0.6	1.0	-0.2	-0.3
2001	112	51.2	14.3	7.6	6.8	7.5	3.2	4.3	3.0	3.0
2002	72	35.4	15.8	8.9	7.2	7.8	4.6	5.4	4.3	4.2
2003	76	37.8	17.3	8.2	10.2	10.7	8.2	9.3	8.0	8.1
2004	119	59.2	10.6	6.7	4.7	5.0	3.4	4.4	3.2	3.2
2005	159	97.1	9.1	7.4	3.4	3.6	1.9	3.1	1.8	1.8
2006	185	211.4	7.8	7.9	0.4	0.6	-1.3	0.1	-0.9	-1.1
2007	178	194.8	10.9	11.2	1.0	1.2	-0.9	0.7	-0.1	-0.5
2008	159	170.8	12.7	10.9	-0.4	-0.2	-2.0	-0.3	-0.8	-1.3
2009	77	53.0	16.6	15.2	1.8	1.9	0.3	2.3	2.0	1.4
2010	104	57.7	13.9	13.3	0.3	0.2	-1.2	1.0	1.2	0.4
2011	119	106.1	16.3	13.0	2.9	2.8	0.9	3.3	4.0	2.9
2012	126	108.1	14.6	12.8	2.9	2.7	0.5	3.1	4.4	3.0
2013	136	125.5	12.2	9.7	2.6	2.4	-0.8	2.1	4.3	2.5
2014	143	142.4	11.2	9.4	2.2	2.1	-3.3	0.0	3.2	0.8
2015	134	141.1	11.8	4.1	0.0	0.2	-8.7	-5.4	-0.8	-4.0
2016	83	115.4	5.8	-10.1	-7.7	-6.5	-21.0	-19.1	-12.3	-16.0
Total 1995-2016	2770	2020.0	11.9	8.6	4.1	4.4	1.1	2.9	1.8	1.4
1998-2014 Only	2290	1692	10.3	8.8	2.9	3.3	-0.3	1.5	0.5	0.2
1995-2004 Only	1167	496	13.3	6.7	7.2	7.7	3.0	4.8	3.1	2.9
2005-2011 Only	981	891	10.5	10.2	1.1	1.2	-0.6	0.9	0.2	-0.1

Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, MSCI Inc., Dow Jones Indexes, TVPI Advisors' analysis. MSCI data provided "as is" without any express or implied warranties. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016 for US buyout, growth equity, mezzanine, private equity energy, venture capital, and distressed funds. Direct Alpha in dark shading represent outperformance by 500 basis points or higher, whereas figures in light shading represent outperformance by 300 to 499 basis points. Vintage years determined by timing of first cash flow.

Appendix II - US PE, VC, Distressed IRRs and Relative Performance by Vintage Year
Comparison of Direct Alpha, CA mPME, and K&S PME Ratio

Vintage Year	Fund Count	Total Capitalization ($Bn)	Pooled IRR (%)	Median IRR (%)	Direct Alpha vs. S&P 500 (%)	Direct Alpha vs. S&P 600 Small Cap (%)	CA mPME Delta vs. S&P 500 (%)	CA mPME Delta vs. S&P 600 Small Cap (%)	K&S PME Ratio vs. S&P 500	K&S PME Ratio vs. S&P 600 Small Cap
1995	71	17.6	33.3	21.5	13.1	19.0	17.5	22.2	1.59	1.75
1996	76	19.1	30.8	9.5	14.4	18.8	21.2	21.0	1.60	1.62
1997	116	34.5	21.5	11.1	14.6	11.0	17.2	11.8	1.66	1.38
1998	135	59.6	9.1	6.9	7.7	-1.2	7.8	-1.3	1.38	0.95
1999	162	66.6	4.3	0.2	2.7	-5.0	2.6	-5.7	1.13	0.77
2000	228	115.4	9.4	2.8	4.9	-0.6	4.7	-0.9	1.24	0.97
2001	112	51.2	14.3	7.6	7.5	3.2	7.7	3.4	1.32	1.13
2002	72	35.4	15.8	8.9	7.8	4.6	8.5	5.4	1.34	1.19
2003	76	37.8	17.3	8.2	10.7	8.2	11.0	8.8	1.48	1.36
2004	119	59.2	10.6	6.7	5.0	3.4	4.7	3.0	1.25	1.16
2005	159	97.1	9.1	7.4	3.6	1.9	3.3	1.6	1.20	1.10
2006	185	211.4	7.8	7.9	0.6	-1.3	0.5	-1.5	1.03	0.93
2007	178	194.8	10.9	11.2	1.2	-0.9	1.1	-1.0	1.05	0.96
2008	159	170.8	12.7	10.9	-0.2	-2.0	-0.3	-2.3	0.99	0.93
2009	77	53.0	16.6	15.2	1.9	0.3	2.1	0.3	1.07	1.01
2010	104	57.7	13.9	13.3	0.2	-1.2	0.2	-1.4	1.01	0.96
2011	119	106.1	16.3	13.0	2.8	0.9	3.2	1.0	1.09	1.03
2012	126	108.1	14.6	12.8	2.7	0.5	3.1	0.6	1.07	1.01
2013	136	125.5	12.2	9.7	2.4	-0.8	2.6	-0.9	1.05	0.98
2014	143	142.4	11.2	9.4	2.1	-3.3	2.3	-3.7	1.03	0.95
2015	134	141.1	11.8	4.1	0.2	-8.7	0.3	-10.3	1.00	0.92
2016	83	115.4	5.8	-10.1	-6.5	-21.0	-7.3	-27.8	0.97	0.91
Total 1995-2016	2770	2020.0	11.9	8.6	4.4	1.1	4.4	1.2	1.16x	1.04x
1998-2014 Only	2290	1692.2	10.3	8.8	3.3	-0.3	3.0	-0.4	1.13x	0.99x
1995-2004 Only	1167	496.5	13.3	6.7	7.7	3.0	8.3	3.3	1.34x	1.12x
2005-2011 Only	981	891.0	10.5	10.2	1.2	-0.6	1.2	-0.8	1.05x	0.97x

Source: Cambridge Associates, Standard & Poor's, TVPI Advisors' analysis. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016 for US buyout, growth equity, mezzanine, private equity energy, venture capital, and distressed funds. Direct Alpha and mPME figures in dark shading represent outperformance by 500 basis points or higher, whereas figures in light shading represent outperformance by 300 to 499 basis points. For K&S PME, values of 1.30 and above are in dark shading, and values between 1.15 and 1.30 are in light shading. Vintage years determined by timing of first cash flow.

Appendix III - US Private Equity IRRs and Relative Performance by Vintage Year Versus Various Broad-Market and Small-Cap US Indices

					Direct Alpha vs.					
Vintage Year	Fund Count	Total Capitalization ($Bn)	Pooled IRR (%)	Median IRR (%)	Russell 3000® (%)	S&P 500 (%)	S&P 600 Small Cap (%)	Russell 2000® (%)	Dow Jones US Small Cap (%)	MSCI US Small Cap 1750 Index (%, Gross)
1995	26	12.9	20.4	12.3	7.1	6.8	8.5	10.5	8.4	7.2
1996	37	13.3	6.6	6.7	0.0	0.2	-2.8	-0.6	-2.7	-3.3
1997	42	26.2	11.0	7.8	7.1	7.8	1.3	3.8	1.6	1.2
1998	53	47.4	6.4	9.5	4.5	5.4	-3.5	-0.7	-2.7	-3.0
1999	49	32.9	8.7	9.3	6.1	7.0	-1.5	1.0	-0.5	-0.8
2000	78	71.1	16.4	13.8	10.6	11.4	5.0	6.7	5.5	5.2
2001	38	30.4	20.8	19.1	12.4	13.2	8.2	9.4	8.1	8.0
2002	33	23.1	18.9	18.2	10.3	10.9	7.8	8.7	7.5	7.5
2003	32	29.0	20.0	15.0	12.8	13.2	10.7	11.8	10.4	10.5
2004	55	41.3	12.9	11.8	7.2	7.5	6.0	6.9	5.6	5.7
2005	88	78.3	9.4	7.9	3.9	4.1	2.4	3.6	2.3	2.3
2006	86	168.3	7.4	8.6	0.2	0.4	-1.5	-0.1	-1.1	-1.3
2007	88	148.3	10.7	11.5	0.2	0.4	-1.5	0.1	-0.6	-1.0
2008	79	134.5	12.4	12.0	-0.7	-0.6	-2.3	-0.5	-1.0	-1.6
2009	45	33.4	19.0	16.7	3.9	3.9	2.3	4.3	4.1	3.4
2010	45	34.4	11.7	13.5	-1.4	-1.5	-2.9	-0.7	-0.3	-1.2
2011	54	79.0	15.6	12.0	2.5	2.4	0.4	2.7	3.6	2.4
2012	62	81.6	13.6	13.1	2.1	1.9	-0.5	2.2	3.5	2.1
2013	66	98.0	13.0	9.8	3.4	3.1	-0.5	2.5	4.9	3.0
2014	70	107.3	10.8	11.1	1.7	1.6	-3.8	-0.5	2.6	0.3
2015	63	100.3	12.5	7.6	0.4	0.7	-8.6	-5.3	-0.5	-3.8
2016	47	99.8	7.6	-7.0	-6.1	-4.9	-19.8	-17.8	-10.9	-14.6
Total 1995-2016	1236	1490.7	11.5	10.8	4.2	4.6	0.9	2.7	1.6	1.3
1998-2014 Only	1021	1238.2	11.5	11.4	4.1	4.5	0.8	2.6	1.6	1.3
1995-2004 Only	443	327.5	12.8	11.4	7.5	8.2	2.6	4.7	3.0	2.7
2005-2011 Only	485	676.1	10.1	11.0	0.8	1.0	-0.8	0.8	0.0	-0.3

Source: Cambridge Associates, Standard & Poor's, Frank Russell Company, Thomson Reuters Datastream, MSCI Inc., Dow Jones Indexes, TVPI Advisors' analysis. MSCI data provided "as is" without any express or implied warranties. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016 US buyout, growth equity, mezzanine, and private equity energy funds. Direct Alpha in dark shading represent outperformance by 500 basis points or higher, whereas figures in light shading represent outperformance by 300 to 499 basis points. Vintage years determined by timing of first cash flow.

Appendix IV - US Private Equity IRRs and Relative Performance by Vintage Year
Comparison of Direct Alpha, CA mPME, and K&S PME Ratio

Vintage Year	Fund Count	Total Capitalization ($Bn)	Pooled IRR (%)	Median IRR (%)	Direct Alpha vs. S&P 500 (%)	Direct Alpha vs. S&P 600 Small Cap (%)	CA mPME Delta vs. S&P 500 (%)	CA mPME Delta vs. S&P 600 Small Cap (%)	K&S PME Ratio vs. S&P 500	K&S PME Ratio vs. S&P 600 Small Cap
1995	26	12.9	20.4	12.3	6.8	8.5	7.8	10.0	1.32	1.34
1996	37	13.3	6.6	6.7	0.2	-2.8	0.1	-3.1	1.01	0.88
1997	42	26.2	11.0	7.8	7.8	1.3	8.1	1.3	1.45	1.06
1998	53	47.4	6.4	9.5	5.4	-3.5	5.4	-3.9	1.30	0.84
1999	49	32.9	8.7	9.3	7.0	-1.5	6.4	-1.8	1.33	0.93
2000	78	71.1	16.4	13.8	11.4	5.0	11.3	5.4	1.52	1.23
2001	38	30.4	20.8	19.1	13.2	8.2	13.9	9.3	1.56	1.34
2002	33	23.1	18.9	18.2	10.9	7.8	11.9	9.0	1.51	1.35
2003	32	29.0	20.0	15.0	13.2	10.7	13.8	11.6	1.59	1.46
2004	55	41.3	12.9	11.8	7.5	6.0	7.1	5.6	1.37	1.28
2005	88	78.3	9.4	7.9	4.1	2.4	3.8	2.1	1.23	1.13
2006	86	168.3	7.4	8.6	0.4	-1.5	0.3	-1.7	1.02	0.92
2007	88	148.3	10.7	11.5	0.4	-1.5	0.3	-1.7	1.02	0.93
2008	79	134.5	12.4	12.0	-0.6	-2.3	-0.7	-2.7	0.98	0.91
2009	45	33.4	19.0	16.7	3.9	2.3	4.5	2.7	1.14	1.08
2010	45	34.4	11.7	13.5	-1.5	-2.9	-1.8	-3.4	0.95	0.91
2011	54	79.0	15.6	12.0	2.4	0.4	2.7	0.4	1.07	1.01
2012	62	81.6	13.6	13.1	1.9	-0.5	2.1	-0.6	1.05	0.99
2013	66	98.0	13.0	9.8	3.1	-0.5	3.4	-0.6	1.05	0.99
2014	70	107.3	10.8	11.1	1.6	-3.8	1.7	-4.3	1.02	0.95
2015	63	100.3	12.5	7.6	0.7	-8.6	0.8	-10.1	1.01	0.93
2016	47	99.8	7.6	-7.0	-4.9	-19.8	-5.5	-26.2	0.98	0.91
Total 1995-2016	1236	1490.7	11.5	10.8	4.6	0.9	4.1	0.8	1.18x	1.04x
1998-2014 Only	1021	1238.2	11.5	11.4	4.5	0.8	4.0	0.7	1.17x	1.03x
1995-2004 Only	443	327.5	12.8	11.4	8.2	2.6	8.2	2.8	1.42x	1.13x
2005-2011 Only	485	676.1	10.1	11.0	1.0	-0.8	0.9	-1.0	1.04x	0.96x

Source: Cambridge Associates, Standard & Poor's, TVPI Advisors' analysis. Pooled returns are in US Dollars net to Limited Partners, through December 31, 2016 for US buyout, growth equity, mezzanine, private equity energy, venture capital, and distressed funds. Direct Alpha and mPME figures in dark shading represent outperformance by 500 basis points or higher, whereas figures in light shading represent outperformance by 300 to 499 basis points. For K&S PME, values of 1.30 and above are in dark shading, and values between 1.15 and 1.30 are in light shading. Vintage years determined by timing of first cash flow.

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