

How Good are Private Equity Returns?

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Private equity investment has surged around the globe. Some herald private equity governance as value creation at its best. Critics point to huge management fees, reduced transparency, and concern over lost jobs. What is clear is the tidal wave of funds going to the sector. Primary suppliers are institutions seeking higher returns and diversification. But what has been the track record of private equity investing? Taking advantage of recent research and new private equity benchmarks, this paper looks at how returns and risks have played out for investors.

The bottom line of our analysis is that the average net returns (after management fees) to investors in private equity have not been nearly as attractive on a risk-adjusted basis as many have assumed. Risks are often understated and returns overstated, owing in large part to the way in which the assets of private equity firms are periodically valued and disclosed. Our findings suggest that successful investors in private equity must have both the ability to identify as well as access to superior private equity firms and their funds.

Background on Private Equity Returns

Until recently, conventional wisdom was that private equity had been a good investment historically. Each quarter, the National Venture Capital Association (NVCA), in partnership with Thomson Venture Economics, reports strong long-term performance for private equity in the U.S. Typical is the news release statement, made by NVCA president Mark Heesen after the close of 2005, that “long-term private equity continues to be a very attractive investment.” Backing this statement are NVCA compilations of comprehensive averages that show private equity returns outstripping those available on public equity for 10- and 20-year investment horizons. For the 20-year period ending September 30, 2005, NVCA reported that investors in the 1750 private equity funds they track averaged annual returns of 14.3% (after all management fees), as compared to 11.2% for the S&P 500 and 12.6% for the NASDAQ.

Some observers are understandably wary that future performance may not match the past, especially given the

scale of inflows to funds. In addition, and more germane to the present paper, closer examination of history spurs new questions about what private equity returns have actually been. Some savvy practitioners have long claimed that success in private equity investing comes from picking top funds, not from adding “average” private equity results to a portfolio. David Swensen, Yale’s Chief Investment Officer, has written: “No sensible investor manages private assets passively. Even if participation in a broadly diversified market alternative were available, investors would face nearly certain disappointment...Investors justify the inclusion of private equity in portfolios only by selecting top-quality managers pursuing value-added strategies with appropriate deal structures.”²

We focus on investment decisions facing large diversified investors such as university endowments and pension funds. Such investors have large pools of capital and can handle the illiquidity of private equity. We use data that are readily available to these investors in analyzing risks and returns, paying particular attention to problems inherent in reported data when assets do not trade actively in markets. Given the large U. S. role in private equity, its longer history of returns, and its richer array of data, we focus on the U.S. setting. We use new benchmarks of private equity returns to provide a more complete picture of returns and risk. The benefits of adding private equity to diversified portfolios are dramatically reduced once we introduce the new information. The private equity allocation even drops to zero for some sets of assumptions that are well within the range of the historical estimates of average risk and return.

Private Equity Risk and Returns

In a literal sense, private equity covers all equity claims not traded in public markets. In practice, the term is used in many ways with various subcategories. For our purposes, private equity will refer to private equity investments in all stages of a company’s life. We focus on investments by outside investors versus entrepreneurial investment by individuals and families. Most of this outside investment flows through limited partnerships. The partnership is controlled by the general partner (the private equity firm), which obtains commitments from limited

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2. David F. Swensen, *Pioneering Portfolio Management* (New York: The Free Press, a Division of Simon and Schuster, Inc., 2000,) p. 239.

partners that are qualified investors such as financial institutions, endowments, pension funds, and wealthy individuals. When the general partner identifies investments, it “calls” the required capital, which is supplied by limited partners on a pro rata basis. These investments create the private equity fund’s portfolio of companies. The limited partners receive a return that is net of management fees (which are typically in the range of 2% annually) and carried interest to the general partner. Carried interest is typically 20% of profits. While funds generally have a finite life (approximately 10 years), general partners often start additional funds. General partners normally take an active interest in the governance and management of portfolio companies, often providing management expertise.

Measurement Challenges

Attempts to measure private equity returns face a number of problems that arise when assets are not frequently traded.

Stale Prices and Illiquidity. Measuring returns to private equity funds is complicated because market prices are typically old or not available. For limited partnerships, there are two layers of illiquidity to be concerned about. First, the partnership claims are generally not traded.³ Unlike a publicly traded conglomerate firm, there is no ready market price for the portfolio of a private equity fund’s assets. Second, the underlying assets in the fund are themselves not traded in markets. Thus, unlike mutual funds, the current prices of the individual fund assets are not available to mark the fund’s portfolio to market. Whatever market pricing information exists for the fund’s underlying assets is likely to be stale, since years may have elapsed since the purchase of a company or a funding round.

Over and above the challenges in measuring returns, the illiquidity of partnership claims complicates comparisons with other assets that are liquid (including publicly traded stocks). To the extent that liquidity is valuable, investors demand higher returns on illiquid assets. For instance, one fairly recent study estimates that investors demand an annual premium of 100 basis points or more to hold illiquid equity index-linked bonds that have the same payoffs as the liquid equity index.⁴

Most public information on private equity comes from limited partnerships in which there are specific complications in estimating returns.⁵ Industry practice is to report internal rates of return to limited partners based on their cash outflows

and inflows. Cash distributions come from the proceeds as the fund sheds portfolio companies and all cash flows are net of the fund’s management fees and carried interest. After the fund is completely liquidated, the internal rate of return reflects cash flows actually realized.

Prior to the end of the fund’s life, however, standard practice is to report an internal rate of return based on the distributions to date plus an estimate of the remaining value (“remaining value to paid-in”) of the fund. This remaining value is estimated by the general partner. As a result, returns reported prior to a fund’s liquidation reflect general partner estimates that may be affected by stale price information, infrequent updating, or any general partner biases. What’s more, remaining values are a significant component of most funds’ returns. At the end of 2004, the European Venture Capital Association estimated that, on average, the remaining values were contributing over 40% of the value expected to be delivered to investors in European private equity funds.⁶

Another potential complication comes from relying on self-reporting to generate a sample. There may be an upward bias in reported returns if funds with particularly good performance are overrepresented, and those with poor performance are underrepresented. We have no specific evidence attesting to this bias. Moreover, any such bias is less likely to contaminate current data because reporting has been subjected to considerable attention. Nonetheless, the potential for the bias creates an additional uncertainty about how well past returns have been captured by the data.

Investor Access and Skill. Additional complications for understanding returns from private equity come from differences in investor access and skill. Information asymmetry is typically higher in private than in public transactions. Moreover, general partners provide management talent and monitoring for their portfolio companies that may limit the general partner’s scale of investments. As a consequence, while public markets generally offer securities to the highest bidder, general partners may allocate funds to investors on the basis of a number of attributes.⁷ In addition, limited partners may have differential skills in selecting private equity funds. These factors all work to increase the chances that returns realized by any single type of investor will not be representative of returns typical in the private equity universe.

Limited History. There is limited history on private equity as compared to stocks or bonds. Over the last three decades,

3. There is a limited but growing secondary market for limited partners to sell their interest in a private equity fund prior to its final liquidation. Traditionally, such transactions have involved substantial discounts to net asset value. Also, recent initial public offerings by private equity funds such as Blackstone may alleviate some liquidity issues.

4. See Elroy Dimson and Bernd Hanke, 2004, “The Expected Illiquidity Premium: Evidence from Equity Index Linked Bonds,” *Review of Finance*, Vol. 8, No.1, 19–47.

5. Venture Economics is a standard public source for these returns. Thomson Financial partners with the National Venture Capital Association in the United States (NVCA) as well as other industry groups around the globe such as the European Private Equity and Venture Capital Association (EVCA). Calculations are based on cash flows reported to Venture Economics by the funds.

6. Specifically they cite that value realized is expected to be 1.32 times invested capital. Of this 0.72 has been distributed and 0.60 is based on the estimate of remaining value. Source: EVCA and Thomson Financial June 16, 2005 press release obtained from the EVCA website.

7. There are exceptions in public markets such as the allocation of shares in Initial Public Offerings which are often significantly under-priced. Lerner and Schoar (2004) argue that a potential limited partner investor’s ability to withstand a liquidity shock makes it more attractive to the general partner. Another possibility is that the limited partner contributes to the general partner’s ability to attract other funds (e.g. “reputation of a smart investor”) or to monitor and manage the companies in the fund. Also see Lerner, Schoar and Wong (2005).

private equity investment has grown dramatically in the U.S., and more recently it has accelerated around the world. Interpretation of the data, especially for investment outside the U.S., presents extra challenges since returns can vary dramatically over cycles. A limited history also means that investors are less confident in their estimates of prospects for return and risk. This “parameter uncertainty” is an additional concern.

Recent Research on Private Equity Returns and Risk

Using an array of aggregate U. S. data (such as the Survey of Consumer Finance and the Flow of Funds), a study published in the *American Economic Review* in 2002 estimated overall returns on private equity from 1990 through 1998.⁸ The authors note their data primarily cover entrepreneurial investments in small business. During that period, private equity returns averaged 13.5% per year, well short of the general return in public equity markets (16.8%) and the returns provided by small public firms (24.3%). Additionally, the analysis did not suggest that private equity is safer than public equity. The authors suggest that private equity’s subpar investment performance may be partly attributable to non-pecuniary benefits to entrepreneurs or the lack of sophistication of first-time investors.

More recent research uses three broad sources of information to look at the experience of institutions or other outside investors: internal rates of return to limited partners in private equity funds; valuations of specific assets owned by private equity funds; and stock prices of traded securities with private equity characteristics.

Internal Rates of Return to Investors in Private Equity Funds

One strand of research looks at cash flow internal rates of return to limited partners in private equity funds. A 2005 study by Kaplan and Schoar used Venture Economics data for the period 1980–2001 and focused on liquidated funds to avoid possible contamination by general partners’ estimates of remaining value. Kaplan and Schoar reported median returns of 12% across all funds (buyouts as well venture capital), with buyout firms experiencing a slightly better performance (median return of 13% vs. 11% for venture funds). At the same time, the mean returns—17% for venture funds and 18% for buyout funds—far outstripped median returns, reflecting the very high performance of top funds.

To provide comparison to public equities, Kaplan and Schoar calculated a performance ratio (PME for Public Market Equivalent) that assumes that private and public equity (proxied by the S&P 500) carry equivalent risk. Median PMEs were below one for both venture capital funds (median of 0.66) and buyout funds (median of 0.80). As a result, if a fund falls in the middle of the pack among its

peers, it appears to provide returns worse than those available in the public markets. On the other hand, mean PMEs, especially on a size-weighted basis, cast private equity in a more positive light. On a size-weighted basis, the mean PME for all funds was 1.05, suggesting performance at least on par with the S&P 500. Using this metric, venture capital funds look reasonably attractive (a PME of 1.21), while buyout funds do not (PME of 0.93).

Underlying the averages, Kaplan and Schoar find a particularly striking pattern of persistence in fund performance. Unlike the case of mutual funds, private equity partnerships that outperformed their peers were more likely to outperform in subsequent funds they raised. Given the large dispersion across fund returns, this persistence implies a significant advantage to investors who can get into follow-on funds of high performers.

In another 2005 study, Phalippou and Zollo began by arguing that liquidated funds (such as those studied by Kaplan and Schoar) are a biased sample. They hypothesized that funds that have not yet liquidated are not as likely to have similarly successful investment results (e.g. profitable IPOs and asset sales). Such funds may also have incentives to mask poor performance by delaying liquidation and keeping assets on the books at unrealistically high values. To the extent that this is true, funds that have liquidated at any point in time may have higher returns than those generally available from private equity.

Using the same Venture Economics data as Kaplan and Schoar and tracking performance through 2003 of U.S. funds raised between 1980 and 1996, Phalippou and Zollo tested their hypothesis by examining 981 “quasi-liquidated” funds (officially liquidated or not active the last two years of their sample period) and 1,391 other funds that were still active and had made at least four investments and one exit. As expected, the returns of the liquidated funds were shown to be unrepresentative of the entire population, reflecting a higher proportion of “good” outcomes, such as IPOs, and a lower proportion of “bad outcomes”, such as bankruptcies. When making adjustments for sample selection bias caused by using liquidated funds, Phalippou and Zollo estimated a drop in value-weighted returns of about 270 basis points below those reported by Kaplan and Schoar. And after adjusting for the tendency of the (1,391) active funds to carry assets on their books at inflated values, the study concludes that the return of private equity funds raised between 1980 and 1996 lagged the S&P 500 return by as much as 3.3% per annum.⁹

In yet another 2005 study, Lerner, Schoar, and Wong segmented returns based on the form of institutional investor. Using as their primary data source Private Equity Intelligence’s *2004 Private Equity Performance Monitor*, the

8. Moskowitz, T. J. and A. Vissing-Jorgensen, 2002, “The Returns to Entrepreneurial Investment: A Private Equity Premium Puzzle?” *American Economic Review* 92, 745–778.

9. Phalippou, Ludovic and Maurizio Zollo, 2005, “The Performance of Private Equity Funds,” Working paper. September. University of Amsterdam, Faculty of Economics and Econometrics and INSEAD, p.1.

authors examined the results of 7,587 investments by 417 limited partners in 1,398 funds. The study's main finding was that endowments significantly outperform other institutions, while investment advisers and banks do poorly. For instance, the authors find the following annual returns (weighted fund IRR in parentheses) for investments in private equity: public pension funds (2.6%); corporate pension funds (3.1%); endowments (16.9%); investment advisors (-3.0%); insurance companies (2.1%); banks and finance companies (-4.1%); and other investors (5.1%). The differences among institutions are robust to controls for type and year of investment. The authors also conclude that endowments are better at forecasting the performance of follow-on funds and use this ability to make wise reinvestment decisions.¹⁰

Evidence from Investments Made by Private Equity Funds

A 2005 study by John Cochrane examined the performance of companies in which private equity funds invested.¹¹ The returns on these investments do not reflect the fees or diversification inherent in the fund. Using the VentureOne database from 1987 through June 2000, Cochrane tracked 7,765 companies for financing rounds or whether they went public, were acquired, or went out of business.

Using valuations at the time of transactions (for example, comparing the offering price in an IPO to the value in an earlier financing round), the study estimates mean arithmetic returns greater than 600% (with a standard deviation of over 3,000%!). After adjusting for the selection bias built into such a method, the average annual arithmetic returns falls to 59%, with a standard deviation of 109%. Returns were still lower in later rounds of financing, which is to be expected as a firm becomes more established over time. On the basis of such returns, Cochrane likens such private equity investments to options with a small potential for huge payoffs along with a material probability of complete loss of capital.¹² He also observes that "these puzzles" are not unique to venture capital, and that the smallest NASDAQ stocks have similarly large means and volatilities during this time period.

In an earlier study, Susan Woodward and Robert Hall also used valuations of companies financed with venture capital to construct an overall private equity index.¹³ In so doing, they noted that valuations revealed in episodic transactions (such as an initial public offering or a company liquidation)

create problems similar to those in constructing a real estate index from individual property prices. They conclude that general partner estimates of companies' remaining values lag market conditions by six- to- nine months. As a consequence, returns constructed using these remaining value estimates are too high in falling markets and too low in rising markets. To correct this distortion, Woodward and Hall use an iterative procedure that updates remaining value estimates based on transactions that have recently occurred. Unlike Cochrane, they reject a "parametric" approach to dealing with selection bias¹⁴ and instead attempt to track down data that are typically missed in constructing private equity benchmarks—for example, instances in which no valuation is reported and often coincide with bad investment outcomes (such as going out of business).

While Woodward and Hall display only graphs of the index, elsewhere Woodward reports an annual return on private equity investment of "about 20 percent before paying the venture capitalist general partner and after, 16 percent" for the period 1980-2004. Moreover, she concludes that the beta of private equity investment "is about two (2.0)... and the standard deviation of return on an annual basis is 45 percent, (nearly triple the stock market)." Given the definition of beta, these figures imply a significant positive correlation of about 0.67 between private and public equity returns. Woodward then goes on to conclude that, given its risk, "the return on venture capital is just about where we would expect it to be," implying that the "market for venture capital, despite its opacity and hyperbole, is efficient."¹⁵

Evidence from Listed Securities with Private Equity Characteristics

A natural research extension is to examine prices of traded securities with private equity characteristics. A 2005 study (hereafter referred to as Zimmerman et al. (2005)) examined the returns of securities where the firm's principal business is private equity investing and the firm is quoted on an exchange.¹⁶ They classified listed private equity securities (LPEs) into one of three categories: (1) public companies whose core business is private equity (such as 3i); (2) quoted investment funds that co-invest with specific private equity funds, and (3) specially structured vehicles that invest directly in private companies and/or indirectly through various

10. Lerner, Josh, Antoinette Schoar and Wan Wong, 2005, "Smart Institutions, Foolish Choices? The Limited Partner Performance Puzzle," Working Paper No. 11136, National Bureau of Economic Research.

11. Cochrane, John H., 2005, "The Risks and Return of Venture Capital," *Journal of Financial Economics* 75, 57-82.

12. Since a portfolio of options on specific assets is more valuable than an option on the portfolio, option-like payoffs on venture capital investments would provide incentive for the "holding company" like structure of a private equity fund as opposed to common corporate ownership of assets such as a conglomerate firm. The motivation would be to keep limited liability on each underlying asset.

13. Woodward, Susan E. and Robert E. Hall, 2003, Benchmarking the Returns to Venture, Working Paper 10202, National Bureau of Economic Research.

14. Woodward and Hall report that their return data are not log-normally distributed

and as a consequence they do not use the repeat-sales regression approach or parametric specifications (such as used in Cochrane (2005) and Hwang, Quigley and Woodward (2005)). Using essentially the same data as in Woodward and Hall (2003) but alternate techniques, Wang, Quigley and Woodward (2005) report quite different results. They find a beta of private equity investment to be only 0.6 with the S&P500 and much lower standard deviations.

15. Woodward, Susan E., 2005, Book Review, *Journal of Economic Literature*, Vol. XLIII, 834-835, Venture Capital Contracting and the Valuation of High-Technology Firms, Edited by Joseph McCahery and Luc Renneboog, p. 834.

16. Zimmerman, Heinz, Stéphanie Bilo, Hans Christophers and Michèl Degosciu, 2005, Risk, returns, and biases of listed private equity portfolios, Working Paper No. 1/05, WWZ/Department of Finance, University of Basel.

Table 1 **Data Sources on Private Equity Returns and Risk**

Type of Return	Comment	Sources	Data Used
Returns to Limited Partners	<ul style="list-style-type: none"> • Net Return to Limited Partner • Includes General Partner Estimates of Remaining Value. 	Thomson Venture Economics—quarterly reporting by general and limited partners. www.ventureeconomics.com	<ul style="list-style-type: none"> • VentureXpert Web Analytics used to calculate returns for various time horizons—both multi-period and quarterly internal rates of return. • Data for over 3 decades, over 1,700 private equity funds that can be partitioned by fund type.
Returns on Underlying Companies	<ul style="list-style-type: none"> • Gross Return to Limited Partner • Econometric methods used to deal with intermittent pricing and selection bias (parallels real estate research). 	Sand Hill Econometrics—monthly index covering underlying companies that are financed with venture capital. www.sandhillecon.com	<ul style="list-style-type: none"> • Sand Hill Index® of Venture—over 60,000 valuation events for approximately 20,000 companies (e.g. funding round, IPO, acquisition); 1989 to date.
Returns on Publicly Traded Securities	<ul style="list-style-type: none"> • Market Returns on listed private equity companies (LPE's)—Listed companies whose business is private equity investing. • Market Returns on Post IPO listed companies. 	<p>LPX GmbH—daily return indices on the largest and most liquid LPE's. www.lpx.ch</p> <p>Thomson Venture Economics—daily returns on companies that have gone public after previous private equity financing. www.ventureeconomics.com</p>	<ul style="list-style-type: none"> • LPX®America Index—American LPE's, backdated since 1997. • Thomson Venture Economics Post-Venture Capital Index (PVCi) – covering over 600 public companies that previously received venture capital or buyout financing. The index begins in 1986 and tracks venture-backed stocks from the point of going public. After 10 years of trading, a company is removed from the index.

private equity funds. Zimmerman et al. found 287 LPEs during the period 1986–2003 representing the entire range of financing stages and approaches: early stage, later stage, expansion, buyouts, and turnarounds. Sixty percent of the funds have been listed since 1997, though only eight LPEs existed at the beginning of the sample period. Over half of the funds are listed in Europe (with 40% in the U.K. alone), almost 30% in North America, and just over 10% in Asia. The U.K.'s large share of the funds is attributable to tax alleviation provisions that have led to Investment and Venture Capital trusts.

While liquidity is one motive for LPEs, Zimmerman et al. show that many of these vehicles provide quite limited liquidity compared to that of other public stocks. Over 40% of the LPEs had average bid-ask spreads exceeding 20%. Risk and return estimates for LPEs are highly sensitive to liquidity issues and to the time period studied. They are also confounded by concerns of survivorship bias that the study only partly addresses. The average annual return estimates are substantially reduced once one adjusts for transactions cost implied by the large bid-ask spreads. The risk estimates increase dramatically once one corrects for the downward biases associated with thin trading. For example, the beta of the funds jumps from 0.60 to 0.99.

Other market proxies are sometimes used as surrogates for private equity. For instance, a 2005 study by Ennis and Sebastian used the Post-Venture Capital Index (PVCi) compiled

by Venture Economics to examine private equity's place in portfolio allocation decisions. PVCi tracks companies after they leave private equity funds and become publicly traded. And since the index is valued daily and companies remain in it for a decade after going public, PVCi is a market proxy for returns on new public firms. Small stock indices (e.g. NASDAQ) are also sometimes used by practitioners to help gauge success in private equity.

Summary

Recent studies of entrepreneurial investment suggest that private equity, on average, has failed to provide returns that are competitive with the returns provided by public equity, particularly considering the greater risks and illiquidity of private equity investments. Studies of private equity investment through limited partnerships also find that public equity returns are on a par or better than private equity. On the other hand, the differences between the mean and median returns suggest that the best private equity firms do outperform the market—and on a fairly consistent basis. What's more, certain kinds of institutional investor, notably endowments, have done remarkably well in private equity, presumably by focusing their investment in the best-performing private equity firms. But even so, the clear suggestion of the research is that private equity's attractiveness as a general asset class is overstated by looking at just reported returns.

Table 2 Returns and Risk for Public Equity, Bonds and Private Equity
Private Equity Returns are based on Reported Limited Partner Data
Annualized figures based on Quarterly data 1989–2005*

	Mean Return	Standard Deviation	Correlation with S&P500	Beta
S&P500	12.40%	15.33%	1.00	1.00
NASDAQ	14.70%	28.59%	0.88	1.64
Bonds	8.08%	7.61%	-0.16	-0.08
PEQR	16.00%	12.99%	0.63	0.53

*Statistics are calculated without any correction for autocorrelation. PEQR is derived from reported returns to limited partners using Venture Economics Data.

Our Study: Empirical Results and Implications for Portfolio Choice

Given these questions raised by recent research, one's view of private equity's attractiveness is bound to be shaped by the data used as a reference. With that in mind, we performed our own study by harnessing data from each strand of recent research and pursuing its implications for large investors' decisions. We used only information that would be readily available to practitioners trying to understand the risks and returns of private equity investment. As illustrated in Table 1, the data can be seen as falling into the three categories we discussed above: (1) returns to limited partners (using traditional measures compiled and reported by Venture Economics¹⁷); (2) returns on the underlying companies that have been used to construct a private equity index (from Sand Hill Econometrics¹⁸); and (3) market data on traded securities that resemble private equity investments (from LPX¹⁹ and Venture Economics).

Our study focused on the period 1989 through 2005 since this is the longest window for which data are available in each of the three categories. But we also examined other windows to take advantage of newer market data from LPX that begin in 1997. As can be seen in Table 1, our data cover over 1700 private equity funds, over 60,000 valuation events for approximately 20,000 companies owned by private equity firms, and hundreds of publicly traded securities with private equity characteristics. Since our focus was on investment choices by large institutions, the typical private equity investors, we also used data on 10-year U. S. Government Bonds (from Datastream) and CRSP data on stocks of large public firms (the S&P 500) and small public firms (NASDAQ) to compare private equity returns to those of investments in the public debt and equity markets.

The ultimate aim of our study was to examine private equity as an asset class in the context of a diversified portfolio—the typical framework for portfolio choice. Given the returns, risks and correlations among a set of asset classes, we identify efficient frontiers that yield the maximum expected portfolio return for a given level of portfolio risk. We also report various risk-adjusted performance measures for private equity.

Using Venture Economics data, we constructed a quarterly time series of private equity returns (PEQR). Since this return comes directly from Thomson's VentureXpert Web Analytics, it is exactly what a practitioner sees if he uses the Venture Economics service. Since reporting only occurs every three months, the series is quarterly and is based on selecting all private equity funds reporting. The quarterly return is similar to a value-weighted return that sums distributions and remaining values at the end of the quarter and compares that to the sum of beginning-period values.

Results Using Reported Returns from Private Equity Funds

Table 2 compares the private equity quarterly index (PEQR) to returns from public stocks and bonds. For the 1989–2005 period, this measure of private equity shows quite attractive features. Mean returns outstrip those for public stocks (both the S&P 500 and NASDAQ). In addition, PEQR shows lower risk as measured by both standard deviation and beta. These data echo the conventional wisdom on private equity's track record.

Figure 1 translates Table 2 into implications for portfolio choice. We view this as a “straw man” that makes the naïve assumption that future returns will mirror the past and ignores complications in the measurement of private equity returns. Not surprisingly given the data in Table 2, the addition of

17. Venture Economics collects data on limited partner returns from general and limited partners over a wide array of private equity funds.

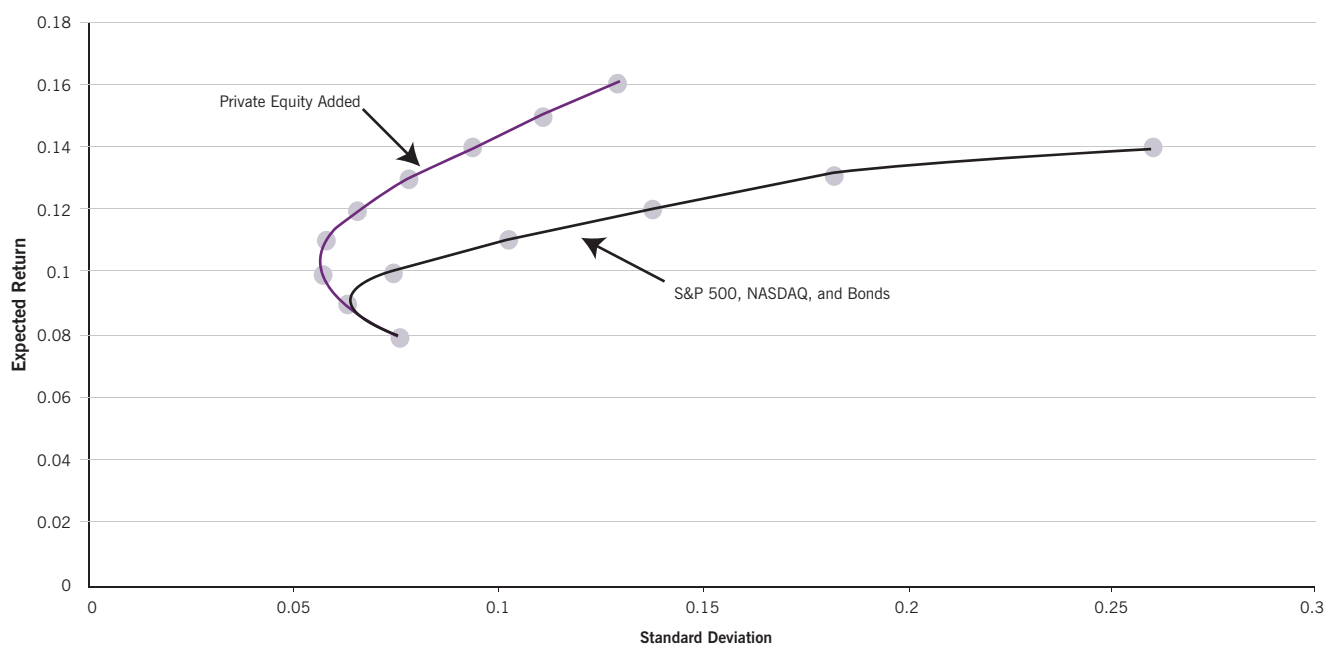
18. Sand Hill Econometrics (www.sandhillecon.com) provides benchmarking and consulting services (and was founded by Susan Woodward and others based on their research). As discussed by Woodward and Hall (2003), the index construction involves various econometric adjustments and approximations and is only an estimate of market pricing. To make Sand Hill returns on underlying assets comparable to the investor returns in the other series, we adjust them downward to reflect management fees and carried interests. Specifically we subtract a 2% annual management fee (0.5% per quarter) and carried interest calculated as 0.20 times the difference between the index return and a hurdle of 10%. In no case do we allow the adjustment to boost net returns above the underlying gross return. This is a crude adjustment since actual charges depend on

specific investments in individual funds over time.

19. The Swiss company LPX GmbH (www.lpx.ch) provides a number of LPE indices, including those broken out by region (America and Europe) and type of fund (e.g. buy-out). Zimmerman et al. (2005) is related research, and three of the study's authors—Zimmerman, Christophers, and Degosciu—are all affiliated with LPX GmbH. LPX focuses on the largest and most liquid funds, which addresses some of the empirical concerns about smaller LPEs; however, it leaves open how representative such indices are for the full set of private equity investments. For instance, LPX America includes only 13 firms, of which 8 are listed on the NASDAQ, 4 on the NYSE, and 1 on the Toronto Exchange. Another concern is possible survivorship bias since the LPX indices were initiated in 2005 and backdated to earlier years. CSFB Warburg Pincus collaborated with Venture Economics to develop PVCI.

Figure 1 **Efficient Portfolios With and Without Private Equity as an Asset Class, Using Reported Returns**

Returns are annualized based on quarterly data for 1989–2005



Private Equity is measured by PEQR with risk parameters estimated using historic data.

private equity to a portfolio substantially improves the efficient frontier relative to the case with only public bonds and stocks. The portfolio allocations underlying Figure 1 would suggest massive shifts of funds to private equity. To obtain an annual expected return of 10%, the efficient frontier portfolio would have 0.20 (20%) allocated to PEQR. Once the expected return reaches 12%, PEQR would be half of the portfolio (.50). Though Figure 1 is a straw man, it is based precisely on the typical historical information on these asset classes. It is apparent that institutions are not as aggressive as Figure 1 suggests they might or should be. For instance, in 2006 university endowments had about 8% of their assets in private equity.²⁰

As always, one can argue that future returns to private equity (or any asset class) will not replicate the past. Many current observers express this view, especially in light of the flows of funds to this sector. For the present, we take another tack and address different but related questions. Even using past data as a guide, what revisions would informed practitioners make in assessing the attractiveness of private equity? What are the investment implications of these revisions?

Evidence from Other Sources on Risk and Return

As alternatives to the picture portrayed by reported returns (PEQR), we study our other private equity data series over the same time period. Moreover, we pay particular attention to estimates of the variance/covariance structure since it is critical for portfolio choice and should capture the best estimates of economic risks. For instance, even if one accepted the mean return figures, the PEQR index does not fully capture risk since it relies on general partner estimates of remaining value, not market prices. PEQR is akin to a “smoothed” series that understates true economic risk. With such smoothing, market value changes feed only gradually through the reported data. We note in passing that some investors may find the smoothing inherent in private equity reporting attractive if it dampens volatility in their own reported portfolio returns.

As a correction for any smoothing, we use Dimson’s approach to capture both the contemporaneous and lagged correlation between an index (e.g. PEQR) and the market.²¹ The so-called Dimson beta is the sum of regression coefficients on the S&P 500 and its lagged values. We also use these

20. The National Association of College and University Business Officers Endowment Survey (2007) shows the dollar-weighted average allocation to private equity (including venture capital) to be 7.8%. For large endowments (in excess of \$1 billion in assets), the average allocation was 9.4%. The equally weighted allocation across endowments was 2.8% to private equity, reflecting the small weights in small endowments that often do not have critical mass to tap this market.

21. For a discussion of this approach, see the Appendix to this article and Elroy Dimson, 1979, “Risk Measurement When Shares are Subject to Infrequent Trading,” *Journal of Financial Economics*, 7(2), 197–226. In the regressions in our study, we used the

contemporaneous market (S&P500) return and up to five lags of the market. In PSCI regression, no coefficients on lags were significant at even the 0.10 level. In contrast, both PEQR and Sand Hill regressions had significant coefficients (0.05 level) on lagged market values—Sand Hill and PEQR for four. LPX America had a significant (0.05 level) lagged coefficient on the one month lagged value of the market. The patterns show the general absence of autocorrelation for series based on market prices (e.g. PSCI) and positive autocorrelation for the indices relying in part on remaining value estimates (PEQR and Sand Hill).

Table 3 **Private Equity Risk and Return Implied by Different Proxies and Adjustments for Stale Pricing**

Annualized figures based on either quarterly or monthly data as indicated

A. Quarterly data, 1989-2005, Initial Estimates

	Mean Return	Standard Deviation	Correlation with S&P500	Beta
PEQR	16.00%	13%	0.63	0.53
Sand Hill	15.97%	18%	0.76	0.90
PVCI	16.59%	34%	0.85	1.89
Estimates Adjusted for Stale Pricing*				
PEQR	16.00%	25%	0.74	1.17
Sand Hill	15.97%	31%	0.84	1.71
PVCI	16.59%	34%	0.85	1.89

B. Monthly data, January 1998-December 2005

Initial Estimates				
PVCI	11.13%	37%	0.74	1.75
LPX America	9.43%	26%	0.68	1.15
Estimates Adjusted for Stale Pricing*				
PVCI	11.13%	37%	0.74	1.75
LPX America	9.43%	32%	0.69	1.41

*Regressions use contemporaneous and up to four lags of the S&P500 to calculate a Dimson beta. We used the longest statistically significant lag (5% level) and any shorter lags. For PEQR and Sandhill the longest significant lag was four, for LPX one and for PVCI no lags were significant. The appendix discusses the method of estimating the correlation and standard deviation in the presence of autocorrelation. Initial estimates make no correction for autocorrelation.

regression results to provide alternate estimates of standard deviation and market correlation for private equity (see the Appendix for more detail). In essence, the procedures view the current observed reported return as a weighted average of current and past true returns. As alternative sources of information, we examine private equity proxies (PVCI and LPX America) that do have frequent market pricing.

Panel A of Table 3, which reports risks and returns for the entire time period (1989-2005), shows that the risk to private equity is two to three times higher than initial estimates for PEQR would suggest. Standard deviations, market correlations, and beta estimates are dramatically higher for the Sand Hill Index and PVCI than they are for PEQR. Moreover, when we adjust for the impacts of a smoothed series, PEQR's beta more than doubles, from 0.53 to 1.17. The Sand Hill index also shows some autocorrelation and its adjusted beta is 1.71. As would be expected given up-to-date market prices, PVCI shows no autocorrelation and its beta is 1.89. All of the data suggest substantial undiversifiable risk from private equity investment. By comparison, the NASDAQ's beta for this time period is 1.64.

Panel B compares the two proxies that use market prices for the period that LPX is available. A comparison of Panels A and B shows that PVCI had slightly lower correlation with the market during the 1998-2005 period, which is not surprising given the boom and bust of the last five or so years for venture-backed companies. At the same time, PVCI still remains quite risky, with a beta of 1.75 and a standard deviation over twice that of the S&P 500 for this time period. LPX America shows somewhat lower risk than PVCI but still well in excess of the market. The autocorrelation evident in LPX America may reflect limited liquidity in the companies comprising this index. Panel B also shows that private equity returns were lower in the 1998-2005 period than for the full window of time in Panel A. This drop reflects the severe declines in the technology and IPO markets.

One difficulty with using PVCI to measure the returns actually available to an investor comes from the nature of the well-documented underpricing of IPOs.²² Since a company enters PVCI at the offering price when it goes public, the index returns benefit from the initial run-up in market price at the time of the IPO. In practice, however, the offering price

22. See, for example, Ritter, Jay R. and Ivo Welch, 2002, A Review of IPO Activity, Pricing and Allocations, *Journal of Finance*, Vol. 57, No. 4, 1795-1828.

Table 4 Risk Adjusted Performance Measures Implied by Different Proxies and Adjustments for Stale Pricing
Annualized figures based on quarterly data, 1989-2005

Initial Estimates		
	Sharpe Ratio*	Alpha** (t-value)
S&P500	0.296	NA
NASDAQ	0.221	-2.92% (-0.85)
PEQR	0.576	7.32% (2.84)
Sand Hill	0.442	4.44% (1.48)
PVCI	0.251	-3.08% (-0.67)
Estimates Adjusted for Stale Pricing		
S&P500	0.296	NA
NASDAQ	0.221	-0.72% (-0.18)
PEQR	0.293	3.62% (1.43)
Sand Hill	0.274	0.56% (-0.20)
PVCI	0.251	0.25% (0.05)

*Excess return (return minus return on bonds) per unit of standard deviation

**Alpha is the intercept of a regression using excess returns (subtracting out the risk free rate).

would often not be available to outside investors. As a result, any strategy to replicate the returns from PVCI would result in lower returns than those reported by PVCI.

To estimate the size of this impact, we obtained Jay Ritter's annual estimates of one-day underpricing of U.S. IPOs. Weighting each year equally, this figure averaged 17.9% for our sample period 1988-2005 (though in some years exceeded 50%). For a given year, we multiplied the IPO underpricing effect by our estimate of the proportion of PVCI that entered the index that year. We then subtracted the result from the PVCI return to create an adjusted PVCI return.²³ The effect is negligible in some years but not all. On average, the mean return for PVCI drops by 2.18% per year if one has to buy at the closing price of the first day's trading rather than the IPO offering price. While our adjustment is only an approximation, it shows that the underpricing impact can be substantial.

Table 4 reports Sharpe ratios and alphas. The results illustrate the dramatic impact of the choice of data on measures of risk-adjusted return for private equity. Based on initial estimates, both PEQR and Sand Hill suggest extraordinary risk-adjusted performance for private equity. In contrast, the results with stale pricing adjustments (lower part of Table 4) show private equity returns more in line with public stocks

Table 5 Private Equity Allocations Using Reported Fund Returns

Return and Risk Estimates are annualized based on quarterly data, 1989-2005

Reported Private Equity Returns (PEQR) are from Venture Economics

	Initial Risk Estimates*	Adjusted Risk Estimates**
Portfolio	Private Equity	Private Equity
Expected Return	Allocation	Allocation
9%	0.04	0.02
10%	0.20	0.14
11%	0.36	0.26
12%	0.50	0.37
13%	0.62	0.48
14%	0.75	0.61

* Initial standard deviations and correlations are not adjusted for smoothing in PEQR.

** Standard Deviations and correlations are adjusted for smoothing using Dimson beta approach as outlined in the appendix.

Correlations with both the S&P500 and NASDAQ were adjusted. The estimate of private equity's standard deviation was the simple average of the standard deviations implied by the S&P500 and NASDAQ results.

on a risk-adjusted basis. The alphas for Sand Hill and PVCI are essentially zero. The alpha for PEQR is positive but not significantly different from zero, and these figures do not take account of any concerns about illiquidity or possible biases in the sample of funds covered by PEQR. Moreover, as noted earlier, while PVCI does not suffer from stale pricing, this index likely overstates the returns that can actually be achieved by investors since new companies enter at an IPO offering price that is not generally available to all investors.

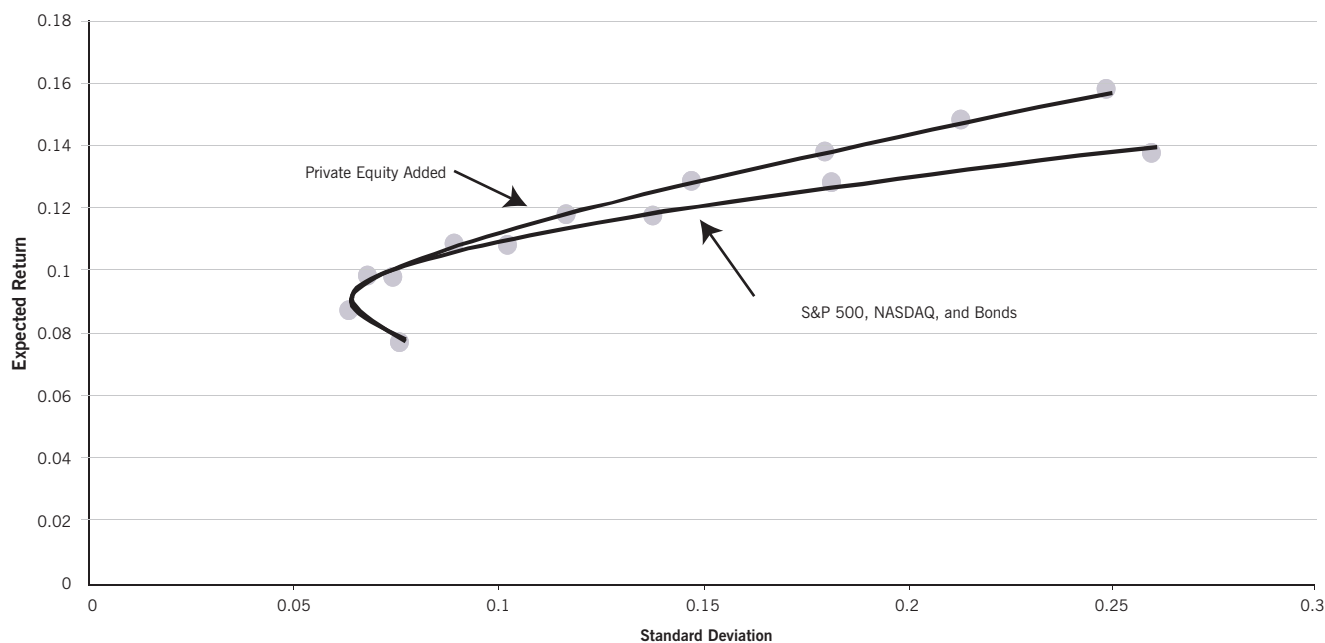
Portfolio Choice Using a Range of Information on Private Equity Risk and Return

What is an informed investor to make of the results in Tables 3 and 4? What jumps out is the understatement of risk when using naive PEQR estimates. More difficult is the question of what private equity proxies to use.

One strategy for investors is to continue to use mean reported limited partner returns (such as PEQR) to measure the long-run expected return on private equity but adjust risk estimates upward to correct for smoothing. Table 5 demonstrates that such a step dramatically reduces the apparent attractiveness of private equity as a portfolio addition (and Figure 2 displays the results graphically). For instance, assuming a 10% portfolio expected return, the optimal private

23. We thank Jay Ritter for supplying updated data (<http://bear.cba.ufl.edu/ritter>). Since firms stay in PVCI for a decade, in a given year we estimate the proportion of firms entering the index via IPO as the ratio of that year's number of IPOs to the total number for that decade (the year and the preceding nine years from Ritter's data). This assumes that the index mirrors trends in IPOs generally. To calculate quarterly returns, we adjust each quarter by one-fourth of the annual effect.

Figure 2 **Efficient Portfolios With and Without Private Equity as an Asset Class, Adjusting for Smoothing in Reported Returns**



equity allocation is 0.14 (14% of assets) once one adjusts for smoothing. This allocation is considerably less than the level implied by the non-adjusted risk measures. Comparing the portfolio standard deviations in Figure 2, one sees that adding private equity results in very little reduction in portfolio risk, except for the highest levels of return. Given that Figure 2 assumes PEQR has mean returns exceeding those of both the S&P 500 and NASDAQ, these high-return portfolios necessarily have large private equity allocations since this is the only feasible means to achieve the highest return levels.

Another strategy for investors is to use market proxies for private equity. PPCI has attractive features in terms of current price information but one can debate how well it mirrors the underlying assets in private equity firms. For instance, the PPCI firms have gone public and thus are not early-stage investments, which would likely be more risky. On the other hand, companies owned by private equity firms may be more likely to be going through firm-specific transformations that are not as correlated with the market as the ongoing PPCI firms.

Using PPCI as a proxy, the first columns of Table 6 show some portfolio benefits of adding private equity; however, private equity allocations are much smaller than those implied by limited partner returns even when reported return risk measures are adjusted for smoothing (Tables 3 and 5). Private equity's reduced role is the straightforward result of higher correlations and risk in the PPCI series. S&P 500 allocations

are correspondingly larger when PPCI is used. NASDAQ stocks are never attractive investments in any of the efficient portfolios when PPCI is available.

When we adjust PPCI to remove the impact of IPO underpricing, private equity's attractiveness as a portfolio addition completely disappears. Using the adjusted PPCI returns to re-estimate risk and optimal portfolio allocations, private equity does not enter any of the efficient portfolios as shown in the rightmost columns of Table 6. While the private equity risk estimates are essentially unchanged, the drop in return makes PPCI less attractive than NASDAQ as a way to boost returns from bonds and the S&P 500.

Tables 5 and 6 show private equity is not nearly as attractive an investment as reported limited partner returns would indicate. At least four additional issues complicate private equity for investors. First is liquidity. Tables 5 and 6 have not built in any return premium demanded for illiquidity. Such a premium would reduce the effective return from private equity and make it less desirable. For instance, if we reduce the expected return on PEQR by 1% per year to reflect its lack of liquidity, the allocation to private equity drops significantly. The efficient portfolio with an expected return of 10% then has a private equity allocation of just .04, which is less than half the level shown in the rightmost portion of Table 5. Second is parameter uncertainty about estimates of risk and return. Prior research and our analysis suggest that investor parameter uncertainty is larger for private equity

Table 6 **Private Equity Allocations and Portfolio Risk Using a Market Proxy**

Return and Risk Estimates are annualized based on quarterly data, 1989-2005
PVC I is used as a proxy for Private Equity Returns

PVC I as Private Equity*			PVC I as Private Equity Return Adjusted for IPO's**	
Portfolio Expected Return	Private Equity Allocation	Portfolio Stand. Dev.	Private Equity Allocation	Portfolio Stand. Dev.
9%	0.00	6%	0.00	6%
10%	0.00	7%	0.00	7%
11%	0.03	10%	0.00	10%
12%	0.08	14%	0.00	14%
13%	0.14	18%	0.00	19%
14%	0.38	22%	0.00	25%

*Regressions use contemporaneous and up to four lags of the S&P500 to calculate a Dimson beta. We used the longest statistically significant lag (5% level) and any shorter lags. For PEQR and Sandhill the longest significant lag was four, for LPX one and for PVC I no lags were significant. The appendix discusses the method of estimating the correlation and standard deviation in the presence of autocorrelation. Initial estimates make no correction for autocorrelation.

Table 7 **Internal Rates of Returns to Private Equity Limited Partners**

Returns are cash flow internal rates of return for
1,747 funds*
1969-2005 data from Venture Economics as of
September 30, 2005

	IRR
Simple Mean	11.90%
Pooled Average**	14.30%
Top quartile	15.90%
Median	5.60%
Lower quartile	-2.60%

* Returns are net of management fees and carried interest

** Internal Rate of return on the pooled cash flows across private equity funds

than for public stocks and bonds. This is an additional layer of risk. Third, even if an investor could buy a private equity index, future returns may not mirror history. Fourth, equally problematic for private equity is that no index is readily available for purchase and access to some funds may be impossible. As a consequence, even investing in a number of private equity funds may not achieve the profile of returns suggested by the universe of all private equity. To illustrate the magnitude of the challenge, Table 7 reports the cross-sectional distribution of limited partner IRRs reported by Venture Economics. While the pooled mean IRR is 14.3% per year,²⁴ the median fund's IRR is 5.6% and only a quarter of funds have an IRR of 15.9% or above. Buying median funds will clearly not be a winning strategy.

Caveats and Conclusions

Using returns reported by private equity funds and market returns on companies participating in private equity investments, we show that private equity's attractiveness as an asset class is often overstated. Average net returns (after management fees) to investors have not been nearly as attractive on a risk-adjusted basis as many have assumed. The root causes of the overstatement are biases in reported data when assets are not traded. Our results suggest that "average" returns in private equity may not be sufficient to justify the illiquidity and costs associated with adding the asset class to one's portfolio. This is not to say, however, that private equity investment is not a good strategy for those with superior ability to analyze and invest in specific deals.

Moreover, our analysis fails to take account of some key practical attributes of private equity investing. The "time weighted" returns used to create standard indices for asset classes such as bonds and public stocks do not mirror some of the dynamics of private equity investing. Funds have finite lives, the general partner decides when to call capital from investors and there are substantial interim cash flows paid out to investors when the fund sells assets. Unlike the case in public markets, investors in private equity may not be able to put their money to work quickly and reinvestment opportunities may be limited. Moreover, it is not possible to buy a comprehensive private equity index such as would be the case in public markets. Generally, investors select a number of private equity funds and may not have access to a particular fund. Given the large dispersion and skew in the cross-section of fund returns, investment performance will depend critically on the set of funds chosen.

24. The data reported here cover a longer time period than the data for PEQR in our other tables. In addition, the pooled mean is effectively weighted by the amount of cash flows in a time period as opposed to the equal weighting of time used to construct PEQR.

In sum, our analysis offers a cautionary note. Those investors considering private equity additions to their investment portfolios should not construe past data as strong evidence that random draws from the universe of private equity funds will lead to enhanced portfolio performance. Here, as in most aspects of economic life, there appears to be no free lunch.

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Appendix: Using Dimson's Beta

The Dimson beta is the sum of regression coefficients on the contemporaneous and lagged S&P 500 terms. It estimates the beta of the unobservable "true" private equity return and captures movements in private equity which may not show up in reported data for a number of periods. We also use the regression results to provide an alternate estimate of private equity's correlation coefficient with the S&P 500. This is the square root of the multiple R-squared of the regression and thus reflects the full impact of the market. Rearranging the standard equation for beta we can use the Dimson beta and this new estimate of correlation to get an implied estimate of the "true" standard deviation for private equity. In particular, the standard deviation estimate is the Dimson beta divided by the estimated correlation coefficient all multiplied by the standard deviation on the market. For a series with up-to-date market prices (such as PNCI) we expect (and it is the case) that the naïve estimate using only contemporaneous data (no lags in a Dimson regression) yields essentially the same result as that obtained by this procedure. In essence, this is because all the current economic impact is reflected in the current price.

Our procedure above can be shown equivalent to that used by EVCA (2004) applying the following steps. Assume the observed private equity return series is the weighted sum of current and past "true" private equity returns, the weights summing to one. With the weights summing to unity the expected value of the true return is the same as that of the observed return. The variance of the true return will depend on the weights as well as the variance of the observed return. If one assumes that the true returns are uncorrelated with constant variance over time, the observed variance will be equal to the true variance times the sum of the squared weights. To implement this approach, the Dimson procedure provides estimates of the weights. In particular, the true

private equity return in any period is assumed to be a constant plus the true beta times the market return (plus an error term). Substituting this model of the true return into the equation for the observed return and rearranging shows that the regression coefficient on the market for any time period is just the true beta times the weight for that time period. Since the weights sum to unity, the sum of the coefficients (the Dimson beta) is equal to the true beta. The weight for a particular period can then be retrieved by dividing the regression coefficient for that period by the Dimson beta (which is the sum of the coefficients). Using these weights, the true variance can be expressed in terms of the Dimson beta, the individual regression coefficients and the observed variance on private equity. The final step to show that our procedure is equivalent to this is to express R-squared in terms of the observed variance on private equity, the regression coefficients and the market variance. Rearranging terms shows the equivalence of the two methods. More generally, either method can be applied for any factor thought to drive true private equity returns, not just the S&P 500. For instance, one could model private equity returns as a function of contemporaneous and lagged values of NASDAQ. The results would allow estimates of private equity's standard deviation and its correlation with NASDAQ.

This approach likely underestimates true risk since it does not fully capture impacts of all factors that may induce other correlations over time and additional measurement error.

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