



Demystifying Illiquid Assets: Expected Returns for Private Equity

Executive Summary

The growing interest in private equity means that allocators must carefully evaluate its risk and return. The challenge is that modeling private equity is not straightforward due to a lack of good quality data and artificially smooth returns. We try to demystify the subject, considering theoretical arguments, historical average returns, and forward-looking analysis. For institutional investors trying to calibrate their asset allocation decisions for private equity, we lay out a framework for expected returns, albeit one hampered by data limitations, that

is based on a discounted cashflow framework similar to what we use for public stocks and bonds.

In particular, we attempt to assess private equity's realized *and* estimated expected return edges over lower-cost public equity counterparts. Our estimates display a decreasing trend over time, which does not seem to have slowed the institutional demand for private equity. We conjecture that this is due to investors' preference for the return-smoothing properties of illiquid assets in general.

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We thank Daniel Villalon, Thomas Maloney, Peter Hecht, Scott Richardson, Marina Niessner, and Tobias Moskowitz for helpful comments and suggestions, and Daniel Rasmussen for data.

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Introduction

As investors increasingly embrace private equity (PE), they find themselves posing the following questions: How much should they allocate? What are good yardsticks for assessing performance? Are the higher fees of PE justified by higher expected returns over public equity counterparts? What is the risk and diversification potential of PE?

The comparison to public equity is not straightforward. In general, illiquid assets are inherently harder to model, and this is exacerbated by a lack of good quality and transparent data. We try to demystify the subject of PE risk and return, focusing on the medium-term expected return (ER) of PE. We view the topic from multiple lenses: theoretical required returns, historical performance, and finally our favored approach of extending our discounted-cashflow-based (DCF) methodology for equity and fixed income to the realm of PE. A common framework helps highlight how the ER of PE is anchored to that of public equity by similar drivers — say, yield and growth. While we focus on returns, our analysis also touches on the hidden risks and factor exposures of PE, and thereby suggests potentially better performance benchmarks and comparisons to public equity.

We observe that PE has grown in popularity despite a decreasing expected and realized return edge over public equity counterparts.

We posit that this surprising outcome reflects the illusion of the lower risk of illiquid assets or the appeal of their artificially smooth return streams. Due to the absence of mark-to-market accounting, the reported volatility and equity beta of private assets tend to be understated unless one desmooths their returns, which may not be a clear-cut exercise. This overstates their diversification potential or naïvely measured alpha.¹ Even if one expected PE to provide zero excess return over public equity, the assumption that PE was less risky, and lowly correlated to public equity, would call for an increased allocation to PE. Furthermore, understating the reported risk compared to economic risk may in itself appeal to investors. The shrinking valuation gap between private and public equity, which we show later on, is one indication of investor willingness to pay, perhaps knowingly overpay, for these return-smoothing characteristics.

This report is targeted at investors interested in understanding the relation between private and public equity at some depth, and it serves as a background piece for the readers of our annual Capital Market Assumptions edition of AQR Alternative Thinking. Our 2019 edition will now include a brief section on illiquid asset classes which may suffice for most readers, but those wanting more detail can refer to this report.²

1 For example, if one expects PE to deliver a 3% excess return over public equity and the equity risk premium to be 5%, the implied alpha of PE is 0.5% if PE's beta to public equity is deemed to be 1.5, and 5.5% if using a beta of 0.5 based on the artificially smooth PE return series.

2 A companion piece Ilmanen et al. (2019) discusses another illiquid asset class, real estate.

Frameworks for Expected Returns

We try to estimate the medium-term real ER for private equity, focusing on its edge over public equity. Specifically, our estimates are for the largest segment of the private equity market, U.S. buyouts.³ Our expected return estimates are net of fees, as fees can be a substantial component of returns for illiquid assets.⁴

We approach the topic through three complementary perspectives as described in Ilmanen (2011): theoretical required returns, historical evidence on past average returns, and yield-based analysis that considers current valuations and market conditions.

As is the norm with other asset classes, we present real (inflation-adjusted) compound rates of return for the asset class as a whole for a horizon of 5 to 10 years. Over such intermediate horizons, initial market yields and valuations tend to be the most important inputs. For multi-decade forecast horizons, the impact of starting yields is diluted, so theory and long-term historical average returns (or yields) may matter more in judging expected returns. Our estimates are intended to assist investors with their strategic allocation and planning decisions, and, in particular, with setting appropriate medium-term expectations. They are highly uncertain, and not intended for market timing. The broad framework may

be more useful and informative than the point estimates themselves.

Theory

Theoretical or risk-based explanations of asset returns follow the premise that higher return is the compensation investors require for taking on additional risk. So, if PE has greater exposure than public equity to certain risk factors, and if those risk factors have positive expected returns, one would expect it to have both higher risk and return. Based on economic intuition and empirical evidence that we describe later, we expect PE to have the following factor tilts over public equities: equity risk, (il)liquidity premium, size, and value:

- **Equity Risk:** The principles of corporate finance dictate that all else equal, companies with greater debt-to-equity (D/E) should have higher volatility and equity beta, as the required interest payment to debt holders increases the riskiness of the remaining cashflow to equity holders. Studies indicate that PE firms take on 100-200% debt for every dollar of equity (down from the 300-400% D/E ratios in the 1980s), whereas publicly listed firms, on average, add 50% of debt for every dollar of equity.⁵ This suggests PE's equity beta is well above 1.⁶

3 The terminology is mixed, as private equity could either refer to buyouts only, or include other segments like venture capital. We use the term to refer to buyouts only. Buyouts account for over 60% of the aggregate private equity market, as per market segment estimates by Døskeland and Strömberg (2018), based on Preqin data on funds raised 2012-17.

4 Gross expected returns could be 5 to 7% higher. See Døskeland and Strömberg (2018).

5 See Døskeland and Strömberg (2018). Further, Axelson et al. (2013) find median debt-to-enterprise value ratios of 70% for LBOs and 35% for public industry-and-region matched companies, implying D/E ratios of 233% for LBOs and 54% for the public match. As of June 30 2018, Bloomberg estimates of the weighted average D/E ratio for the S&P 500 and Russell 2000 are in-line, at 45% and 49%, respectively.

6 As per Modigliani and Miller (1958), in general, $r_l = r_u + (D/E)(r_u - r_d)(1 - T_c)$ where r_l = required rate of return on levered equity, r_u = unlevered cost of equity (or the return on assets) for an all-equity-financed firm, r_d = cost of debt, and T_c is the tax rate. This implies $\beta_l = \beta_u + (D/E)(\beta_u - \beta_d)(1 - T_c)$. Thus a levered firm (a firm with debt) has a higher required equity return and expected equity beta than an unlevered firm if $D > 0$ and $r_d < r_u$.

Why then is PE vaunted for its diversification benefits? The answer lies in the lack of regular, mark-to-market pricing for illiquid assets in general. This induces the common practice of appraisal-based or self-reported NAVs that do not reflect the daily fluctuations in public markets, making for artificially smoothed returns that understate risk and correlation to public markets. Naïve regression-based equity beta estimates tend to be below 1.0, even if adjusting for illiquidity by using lagged betas.⁷ Many empirical studies conclude that a beta estimate of 1.2-1.5 is more realistic, implying PE has higher volatility and lower risk-adjusted returns than naïve reported returns suggest.⁸

In short, while PE has low *reported* risk, it is *economically* riskier and has higher exposure to the equity risk premium than public equities, a combination that many investors may find appealing. The full risk of PE is most likely to materialize in prolonged bear markets, not in relatively fast ones like 2008-9.

- **(Il)liquidity Premium:** In principle, locking up capital for a 5-10 year window warrants a significant illiquidity premium, as suggested by Ang (2014).⁹ However, as we argue later, the data suggests that even if such a “fair” illiquidity premium existed, it may in practice be largely offset by investor willingness to overpay for the return-smoothing described earlier. If

increased investor demand for PE drives up the purchase multiples of buyout targets, one may expect their future returns to be lower.

- **Size:** Buyout targets tend to have smaller capitalizations and therefore provide exposure to the size factor.¹⁰ This implies a more appropriate benchmark would be a leveraged small-cap index that accounts for both the higher leverage and small-cap bias. The small-cap tilt is evident from holdings-based analyses that present the firm characteristics of typical buyout targets, but even this basic fact is hard to confirm with returns-based regressions, due to the artificial smoothness of PE returns.¹¹
- **Value:** Over and above a small-cap bias, buyout targets have tended to trade at lower valuation multiples than the market, though venture capital targets are more likely to be growth companies. While Stafford (2017) and Chingono and Rasmussen (2015) report a value tilt, broader evidence is mixed. Further, as we show later, the PE industry overall no longer has the valuation discount versus public equities it used to have. While this may be partly due to a changing industry composition of buyout targets, it is unclear whether PE’s historical value bias will persist.

7 Desmoothing illiquid asset returns using a simple auto-regressive AR1 variant may not suffice. Anson (2017) finds that PE lagged betas are significant up to three quarters back, while Real Estate lagged betas are significant up to four quarters back.

8 See Døskeland and Strömberg (2018) which summarizes betas and risk factor loadings across several papers, datasets and methodologies. All else equal, higher leverage tends to increase beta, while performance fees dampen net-of-fee returns above the hurdle rate, thus lowering beta.

9 Ang (2014) discusses a model which suggests investors should require a 4-6% illiquidity premium to lock up their capital for 5-10 years. However, broad evidence on realized illiquidity premia in many asset classes is mixed.

10 Banz (1981) shows that empirically, small-cap stocks have earned higher returns than large-cap stocks. The size premium is much-debated and may not be as robust as other factor premia, as discussed in Alquist et al. (2018).

11 See L’Her et al. (2016) who find that the average size of LBOs is very small in comparison to listed small-cap equities.

Crudely assuming that the fair illiquidity premium of PE gets fully offset by the overpayment for smooth returns, investors may still require and expect a higher return from PE than public equity due to its higher equity beta and small-cap bias. This could thus help inform a public proxy approach for a minimum required return for PE. As a purely illustrative example, if investors assumed PE had a 1.2 beta and no net-of-fee alpha to public small-cap equities, and expected small-caps to return 5% excess of cash (this includes both the equity risk premium and the size premium), the implied PE net-of-fee expected excess return over cash would be 1.2 times 5%, or 6%.

Historical Performance

Now that we've outlined the economic rationale for the expected excess return of PE over public equities, what does historical evidence have to say?¹² **Exhibit 1** compares PE's historical performance to various publicly traded benchmarks as well as to baskets of stocks that account for PE's factor exposures.

For the reasons mentioned earlier, comparing PE reported returns directly to large-cap equities is not a fair measure of alpha or the illiquidity premium. Leveraged, small-cap indices are more appropriate as benchmarks. Exhibit 1 shows that over the period 1986

Exhibit 1

Historical Performance of Private Equity: Scant Illiquidity Premium

July 1, 1986 - December 31, 2017

	Cambridge Private Equity (U.S. Buyout)	Cambridge Private Equity (U.S. Buyout) Desmoothed	S&P 500	Russell 2000	1.2x Russell 2000	Russell 2000 Value	Small Value Stocks (Fama French)
Average Return (Arithmetic)	9.9%	9.9%	7.5%	7.6%	9.1%	8.5%	11.4%
Excess Return over Public (Arithmetic)			2.3%	2.3%	0.7%	1.4%	-1.6%
Average Return (Geometric)	9.8%	9.2%	6.4%	5.5%	6.0%	6.7%	9.4%
Excess Return over Public (Geometric)			3.4%	4.3%	3.7%	3.1%	0.4%
Volatility	9.3%	13.8%	15.8%	20.7%	24.9%	19.4%	21.4%

Source: AQR, Bloomberg, Cambridge Associates (using internal-rate-of-return (IRR)-based raw index returns and an AR(1)-desmoothed variant), Kenneth French Data Library. PE returns are based on pooled horizon IRRs, net of fees, expenses, and carried interest. Public index returns are gross of fees and of trading costs. Excess return over public refers to the raw Cambridge PE return in excess of each of the public market indices to the right. For illustrative purposes only and not representative of any portfolio or strategy that AQR currently manages.

12 We stress that the question of how much excess return over public equities investors require from PE (to compensate them for the greater illiquidity and risks associated with PE) is distinct from the question of how PE firms can generate those excess returns, over and above covering their high fees. The various ways PE firms meet this high return hurdle are described in Kaplan and Strömberg (2009) and Døskeland and Strömberg (2018). PE firms may be able to add significant value through prudent selection of buyout targets; opportunistic timing; as well as operational, financial, and governance engineering that improve the efficiency and growth prospects of the companies they hold.

to 2017, PE outperformed large-caps by 2.3%, looking at arithmetic means (AM). But when compared to a 1.2x leveraged small-cap index, this falls to just 0.7%, and PE actually underperformed a basket of small-cap value stocks by 1.6%.¹³ This is corroborated by Stafford (2017) who finds that the long-run average excess returns of PE over public equity can be matched by a leveraged, small-cap value strategy. Thus, it appears that the PE industry, on average, has offered scant illiquidity premium beyond these typical factor tilts.¹⁴

Nevertheless, for many investors, the bottom line is that PE firms have delivered clearly higher net-of-fee returns than the S&P 500 over the past 30 years even if those excess returns could be largely accounted for by using more representative publicly traded benchmarks. Further, top-quartile managers would have served end-investors (LPs) better than the industry average results.¹⁵ PE managers' exceptional skill becomes even more evident when we consider their performance before fees, which are estimated at around 6% per year.¹⁶

In Exhibit 1, we show internal-rate-of-return (IRR)-based returns for PE because they are commonly used. But we caveat that IRRs for individual managers are notorious for their "gameability".¹⁷ A better metric of relative performance is the "public market equivalent" (PME) that is strongly preferred by academics (see Kaplan and Schoar (2005)). The PME approach involves comparing the amount of capital generated by a PE strategy to that generated by a public market index (the benchmark) over the lifespan of the fund, assuming similar amounts were invested with the same timing.

Irrespective of whether one uses IRRs or PMEs, the choice of benchmark is critical. For example, Harris et al. (2014) find a long-run average PME of roughly 1.2 versus the S&P 500. A PME of 1.2 implies 20% outperformance by PE over the period capital is deployed. Assuming a typical investment period of six years, that implies PE has outperformed the S&P 500 by 3.1% annually, net-of-fees. However, L'Her et al. (2016) find that the long-run average PME shrinks to 1 (implying no PE outperformance) when benchmarked against a leveraged, small-cap index.

13 The 1.2x reflects the market beta of PE versus a small-cap index. Both Driessen et al. (2012) and Franzoni et al. (2012) find a beta of 1.3 against a broad stock index, implying a beta of 1.2 versus a small-cap index. Thus this 1.2x small-cap proxy can also be viewed as the normative PE required return based on PE's exposure to the equity premium and the size factor, or the PE expected return using a public proxy approach.

14 PE would look better if using geometric means (GMs) or public equity returns net of trading costs. In any case, the PE index returns in Exhibit 1 are IRRs that are not directly comparable to equity total returns.

15 That said, it may be too common for end-investors to assume that they can get top-quartile managers (which may be yet another reason for the popularity of PE). Such overconfidence may be boosted by the fact that, as described by Harris et al. (2012), *about half of PE funds describe themselves as top quartile*. The flexibility that PE funds have in slicing and dicing the data — comparison universes and time periods — makes this feat possible.

16 It is not straightforward to translate typical PE fund fees of 2% management fee, 20% carry, a hurdle rate and additional portfolio company fees into a fixed yearly fee. Døskeland and Strömberg (2018) cite a McKinsey (2017) CEM Benchmarking study among large institutional investors which estimates total fees to be 5.7% p.a. comprising 2.7% in management fees, 1.9% in carried interest (performance fee), and 1.2% for other fees, including net portfolio company fees.

17 Unlike most index returns, IRRs are not time-weighted and are affected both by the magnitude and timing of cash-flows. Larger cashflows have a greater effect on IRRs, and IRR calculations embed a non-innocuous assumption that interim cashflows can be reinvested at the IRR. Thus, PE GPs can time capital calls from LPs as well as deal exits so as to boost IRRs.

Exhibit 2 plots PME for various vintages, alongside the valuation gap at deal inception between public equity and PE.¹⁸ Panel A plots the EBITDA/EV, or inverted purchase multiple, for PE alongside the EBITDA/EV for public equity, and thus depicts *the ex-ante return edge* PE may have due to its lower valuations. Panel B plots PMEs for each vintage-year, with and without adjustments for leverage, size and sector, and thus shows *the future realized return edge* of PE over two public equity benchmarks (roughly for the next five to six years). We see that as PE has grown relatively richer and the valuation gap has narrowed, PE's outperformance over public equities has declined, with realized outperformance for post-2006 vintages dropping to virtually zero (PME near 1), even before adjusting for size and leverage.

The key question then is what net returns end-investors can expect in today's environment of tighter valuations and greater competition for deals. How should we weigh the longer 30-year history and the more recent 10-year evidence when estimating future PE outperformance?

Normally we give greater credence to longer-run evidence, but two disconcerting trends point to overweighting the more recent history. First, Exhibit 2 depicts a shrinking valuation gap between PE and public equities, and PE outperformance ceased at roughly around the same time as the valuation gap closed. This corroborates our earlier point that increasing investor demand may have driven up PE valuations. Second, many academic studies

show that PE fund returns tend to be lower after “hot-vintage” years characterized by high fundraising activity or capital deployment, attractive financing conditions, and easy leverage.¹⁹ Skeptics stress that the current environment can be characterized by low financing rates coupled with increasing institutional demand for PE, more PE firms, record-high dry powder (committed uncalled capital), and competition from cash-rich public companies and sovereign wealth funds. Thus, PE faces headwinds that make it less likely to deliver the strong returns it has in the past. Of course, richness versus history is not unique to PE: as described in our Capital Market Assumptions editions of AQR Alternative Thinking, many other asset classes appear expensive today, perhaps reflecting the easy global monetary policies of the 2010s.

In contrast to our conservative forecasts, institutional investors widely expect PE to outperform public equity by 2-3%.²⁰ Despite its recent lack of outperformance, investors remain optimistic on PE, even as they increasingly question the value-add of other forms of active management. Some reasons for this may be the lack of transparency on PE returns and fees, slow learning about performance, and the use of misspecified benchmarks. PE returns are often presented as IRRs, which can be easy to game and which evolve slowly. It's also plausible that investors are cognizant of the points we raise and knowingly accept a more modest, even zero, net-of-fee outperformance over public equities because they find the artificially smoothed returns of private assets desirable.

18 We caveat that the PME data for most recent vintages may not be fully representative of those vintages, as it is likely based only on the subset of deals that have been exited (the so-called J-curve effect).

19 Kaplan and Strömberg (2009), Axelson et al. (2013), Harris et al. (2014), Robinson and Sensoy (2015), and L'Her et al. (2016) find that private equity returns are inversely related to the amount of money flowing into the PE industry as well as GP access to cheap financing.

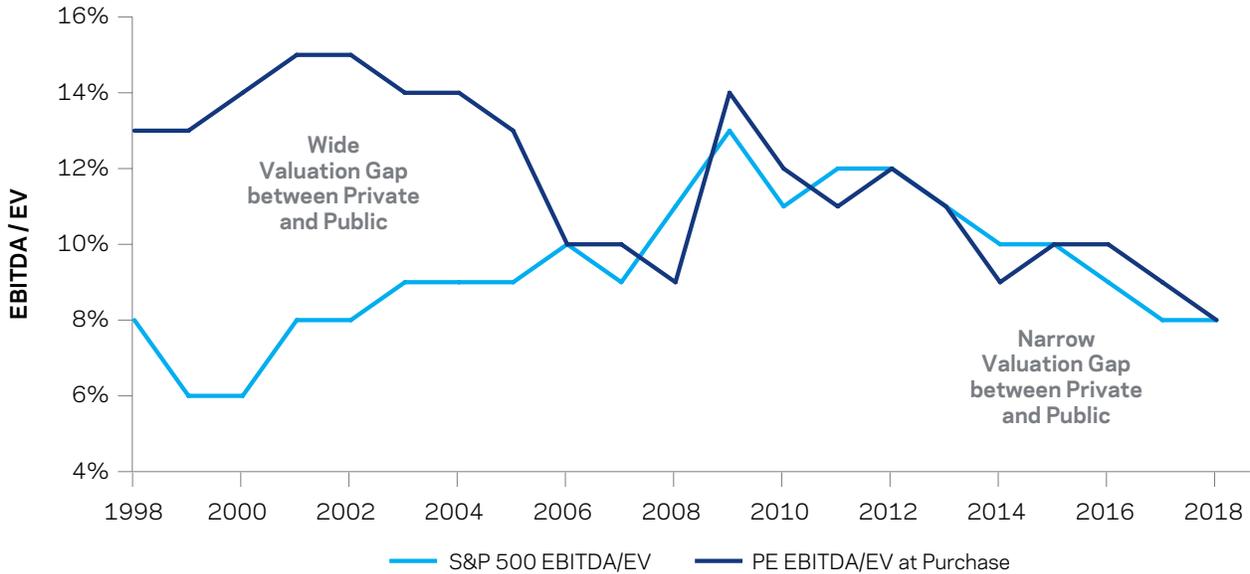
20 Andonov and Rauh (2018) find that institutional investors extrapolate past performance when setting return expectations, and in recent years have expected the PE industry to outperform public equity by 2.5% (arithmetic) and 1.5% (geometric) over the long run.

Exhibit 2

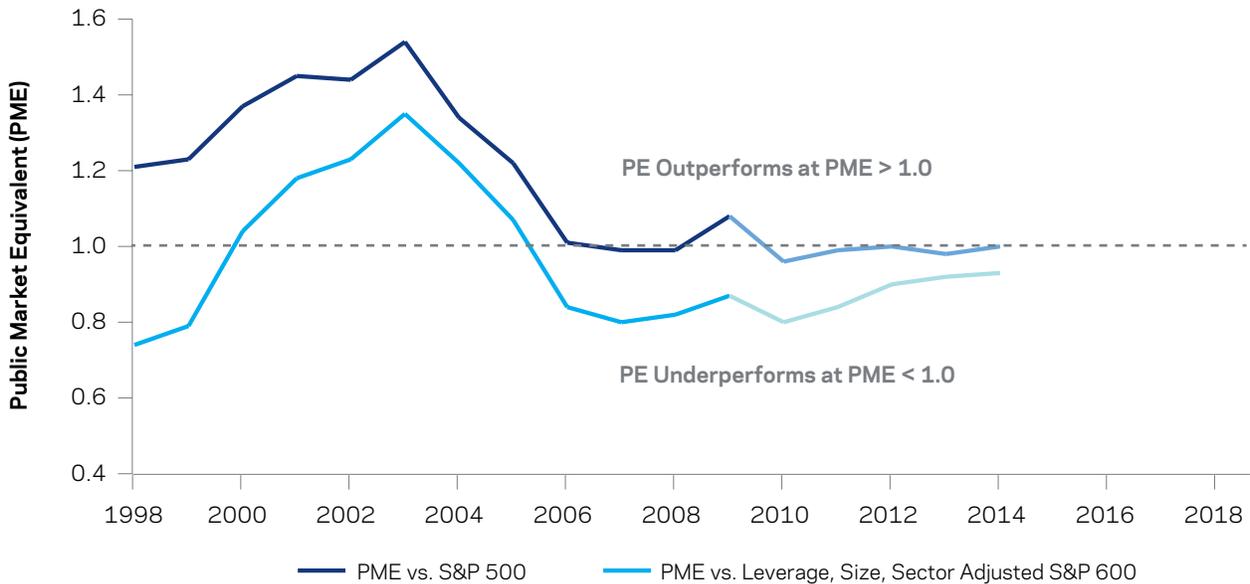
The Valuation Gap and Performance Gap between PE and Public Equities

January 1, 1998 - September 30, 2018

Panel A: Ex Ante Valuation Gap



Panel B: Ex Post Performance Gap



Source: PMEs from L'Her et al. (2016). Vintage years are assigned based on the year of the first investment by a fund. EBITDA/EVs from 2008 to 2018 are calendar-year averages of the median EBITDA/EV from Pitchbook and the average EBITDA/EV from Bain & Company. PE EBITDA/EV from 1998 to 2008 are a proprietary dataset from Dan Rasmussen, based on data from Cambridge Associates and CapitalIQ. S&P 500 EBITDA/EV is from Bloomberg.

Yield-Based Approach

Our third approach to PE ER estimation is yield-based. Here we apply the discounted cashflow (DCF) framework we use to forecast 5-10 year expected returns of public equities and bonds in our Capital Market Assumptions editions of AQR Alternative Thinking.

Admittedly, each of our inputs is debatable as data limitations on PE necessitate many simplifying assumptions. Still, the broad framework remains relevant, as it explains the mechanism of how PE firms can generate higher returns than public equity. PE firms can employ multiple levers to boost returns: namely, higher starting yields through deal

selection; higher earnings growth rates through operational improvements; multiple expansion through opportunistic timing of entries/exits; and financial leverage. We should expect yields and growth rates for PE to be at least loosely anchored to those for public equities.

Exhibit 3 illustrates our framework for PE ER. First, we estimate unlevered ER r_u using the DDM: $r_u \approx y_u + g_u$, where y_u = dividend yield and g_u = real earnings-per-share growth rate. Then, we estimate the theoretical required levered return to equity r_l by plugging in leverage D/E and the cost of debt k_d , to which we finally add expected multiple expansion m to arrive at gross PE ER r_g .²¹

Exhibit 3 Building Blocks for U.S. Private Equity Expected Real Returns

	Unlevered			Financial Leverage		Levered				
	y_u	g_u	$r_u = y_u + g_u$	D/E	k_d	$r_l = r_u + (D/E) * (r_u - k_d)$	m	$r_g = r_l + m$		
	Earnings Yield	Real Growth Rate	Real Return	Debt to Equity	Real Cost of Debt	Real Return	Multiple Expansion (Ann.)	Gross Real ER	Fees	Net Exp. Real Return
Current	2.1%	+ 3.0%	= 5.1%	109%	1.2%	9.3%	+ 0.3%	= 9.6%	- 5.7%	= 3.9%
Historical Average (1993-2018)	3.1%	+ 3.0%	= 6.1%	181%	2.3%	12.9%	+ 1.0%	= 13.8%	- 5.7%	= 8.1%

Source: AQR, Pitchbook, Bain & Company, Bloomberg, CEM Benchmarking, Consensus Economics. Current estimate as of September 30, 2018, and subject to change. Historical averages cover period January 1, 1993 to September 30, 2018. Please see the Appendix for further detail. For illustrative purposes only and not representative of any portfolio or strategy that AQR currently manages. There is no guarantee, express or implied, that long-term return targets will be achieved. Realized returns may come in higher or lower than expected.

21 Strictly speaking, we should lever up *arithmetic* mean (AM) estimates of the unlevered expected return, in the equation described in footnote 6 and numerically estimated in Exhibit 3. Assuming that our unlevered return is more like a *geometric* mean (GM) and we want to ultimately derive GM-like ERs, a more precise estimate would involve a “roundtrip” of converting unlevered ER into AM, then applying leverage and adjusting for multiple expansion and fees, and then converting back to GM. Under the current conditions depicted in Exhibit 3, we estimate the net impact of this roundtrip from GM to AM and back to GM as -0.3%. to +0.3% on PE ER, depending on the assumed PE volatility level (10-25%) and leverage conditions. Our approximate approach in Exhibit 3 ignores this roundtrip for simplicity, given the small magnitude of error.

We elaborate on our framework and our assumptions for PE in the Appendix. To summarize:

- **Yield:** We assume PE's payout yield to be half of its *unlevered* earnings yield (EBIT-to-EV), and somewhat crudely estimate EBIT-to-EV as half of the EBITDA/EV at time of purchase, based on historical averages observed for public equities.
- **Growth Rate:** We assume an unlevered real growth rate of 3%, which is more than double what we assume for public equities. This is further amplified through financial leverage.
- **Leverage:** For the post-2008 period, we interpolate annual D/E ratios from Pitchbook. Pre-2008, we assume an aggregate D/E ratio that tapers from 300% in the 1990s to the 150% D/E reported in 2008, to capture the documented downtrend in PE leverage.
- **Cost of Debt:** We estimate PE's cost of debt as real LIBOR plus a spread proxied by 33% of the High Yield index OAS over duration-matched Treasuries.

- **Multiple Expansion:** We estimate the return from multiple expansion as the annualized return if PE multiples converge partly (20% of the way) toward the initial public market multiple, over the lifetime of the deal (assumed to be six years).
- **Fees:** We assume PE fees of 5.7%, as per the Døskeland and Strömberg (2018) and CEM Benchmarking survey estimate average.

Putting it together, we estimate a real ER for U.S. PE of 9.6% gross and 3.9% net-of-fee.²² In comparison, our U.S. public equity real return estimate is 3.1%, net of a 10bps fee for passive investing.²³ We thus expect PE to have a roughly 80bps higher net-of-fee ER.²⁴ As mentioned earlier, we do not interpret this outperformance of PE as an illiquidity premium, but the warranted risk premium given the higher equity risk of PE.

There is no guarantee, express or implied, that long-term return targets will be achieved. Realized returns may come in higher or lower than expected.

22 PE returns and ERs can be measured for a given vintage or across many vintages for a given period. Our approach uses the most recent purchase multiple and tries to loosely estimate the ER for the current vintage year for the next 5-10 year period. (In practice, vintage year data may provide better transparency on prevailing PE valuations even if it only reflects just-deployed capital. We implicitly assume that if the capital deployed in previous vintages were properly marked-to-market at the same point in time, and was deployed to a similar mix of industries, under similar financing conditions, it would have similar valuations and expected returns. In this light, our estimates apply to the whole buyout market, although a value-weighted purchase multiple may better represent the entire market than the median purchase multiple we use).

23 See Alternative Thinking Q1 2017. Averaging our two methods for public equities would lead to a higher ER for U.S. public equity (the S&P 500), as that includes net buybacks. However, here we estimate public equity real ER using only the earnings yield based methodology, ignoring net buybacks, as that is closer to our PE framework.

24 It may seem misleading to compare PE fees to equity index fund fees, when a more natural comparison would be against active public equity funds. Since our focus is on asset class expected returns, we use public equity index funds as the implicit PE benchmark, but we note that the PE edge over public equity would be higher against a benchmark of active equity funds if the latter are collectively assumed to underperform passive funds due to their higher fees.

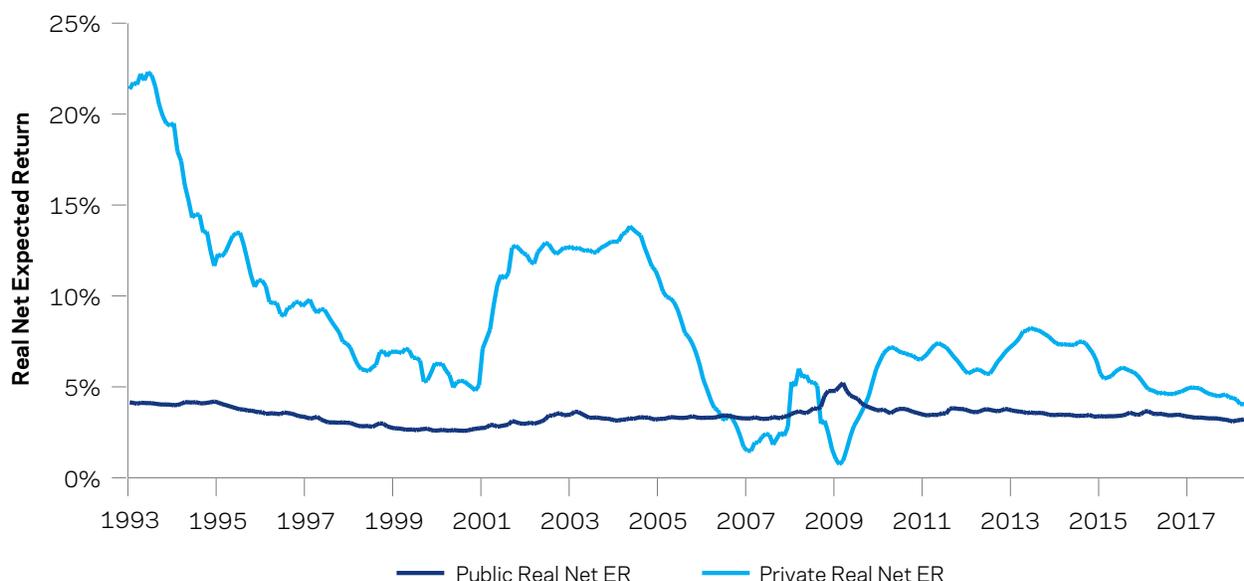
Our current estimate of PE outperformance is undoubtedly low compared to history. **Exhibit 4** charts net-of-fee PE ER and public equity ER through time (we caveat that limited data especially in the earlier part of the sample necessitates the use of simplifying assumptions and imperfect proxies which we describe in the Appendix). The gyrations in the PE ER line are driven most by fluctuations in the cost of debt, as it is the only input based on mark-to-market data.²⁵ We clearly discern a downtrend in PE ER from the 1990s to

the 2010s, driven by richening PE multiples (resulting in both lower yields and lower multiple expansion) and a gradual decline in leverage. The early 1990s and 2002-5 were halcyon years when both PE valuations and the cost of debt were low; it is no wonder then that those vintages delivered high subsequent returns. Our current outlook is far more modest reflecting PE's rich valuations and low leverage. The Appendix includes a visual decomposition of the PE expected return edge over public equity.

Exhibit 4

Net-of-fee Expected Returns for Private Equity and Public Equity

January 1, 1993 - September 30, 2018



Source: AQR, Pitchbook, Bain & Company, Shiller, Consensus Economics, Bloomberg. For public equity real net ER, see Alternative Thinking Q1 2017 and footnote 23. Private equity real net ER described in the Appendix in further detail. There is no guarantee, express or implied, that long-term return targets will be achieved. Realized returns may come in higher or lower than expected. For illustrative purposes only and not representative of any strategy that AQR currently manages.

²⁵ One limitation of our PE framework may be its sensitivity to the cost of debt, and our imperfect proxy for the cost of debt. During periods like 2000 when real cash rates were high, or 2008-9 when credit spreads spiked, our cost of debt may be overstated and our methodology can give misleadingly low estimates of broad PE market ER. Under such conditions, new leveraged buyouts become uneconomical and primary PE markets slow down as the cost of debt is too high to warrant more leverage. On these rare occasions, the secondary market may be more active and provide a better estimate of actual transaction prices and thus the broad PE market ER. During the 2008-9 turmoil, the secondary market pointed to a very high ER, which seems more intuitive than the low ER seen in Exhibit 4.

Conclusion

Our analysis suggests that private equity does not seem to offer as attractive a net-of-fee return edge over public market counterparts as it did 15-20 years ago, from either a historical or forward-looking perspective. Institutional interest in private equity has increased despite its mediocre performance in the past decade versus corresponding public markets, and weak evidence on the existence of an illiquidity premium. While this demand may reflect a (possibly misplaced) conviction in the illiquidity premium, it may also be due to the appeal of the smoothed returns of illiquid assets in general. One possibility is that investor overpayment for the smoothing characteristics offsets a large part of the fair illiquidity premium.

Recent surveys suggest that investors still have high expectations of prospective PE returns. This may be due to the inherent difficulty of modeling illiquid assets, and lack of transparency on fees and performance. In this article, we present more comparable benchmarks or suitable adjustments for evaluating past performance, and a yield-based framework to estimate future returns. While some specific assumptions are debatable, our framework helps to illustrate the basic arithmetic or the ‘moving parts’ underlying expected returns for private equity. We humbly admit that return estimates for any asset class come with a great deal of uncertainty, and our framework is a work in progress that we may fine-tune in the future. We hope it is a first step toward a more intuitive and transparent comparison between public and private equity.

Appendix: Assumptions

Here we expand on the assumptions for expected returns that were summarized in the main body:

- Yield:** We average EV/EBITDA purchase multiples from several sources as data on PE purchase multiples often covers only a small subset of the deal universe and can thus be noisy. We define PE's *unlevered* earnings yield as its EBIT-to-EV, which we approximate as half of its EBITDA-to-EV, based on historical averages of public equities.²⁶ While PE does not have regular payouts the way public equities pay dividends, we then estimate the payout yield of PE as half of its EBIT-to-EV, along the lines of our methodology for public equities.²⁷ As seen in Exhibit 2, until the mid-2000s, PE yields were almost always higher than public equity yields.
- Growth Rate:** We assume that, even in the absence of financial leverage, PE firms may achieve higher earnings growth rates through operational improvements resulting in higher margins, and by being overweight sectors with higher growth rates.²⁸ Leverage may further amplify this effect if operating income exceeds the interest expense. Our 3% unlevered real growth assumption factors in both the initial higher growth rate as the GPs improve operations, as well as the later, lower steady-state growth rate after the company goes public. The latter will be closer to our 1.5% earnings-per-share real growth assumption for public equities.
- Leverage:** In principle, leverage (higher D/E) should boost equity returns if operating income is greater than the interest expense on the debt. In reality, however, Axelson et al. (2013) show that low funding costs and high leverage tend to coincide with hot, overpriced vintages that have lower future returns. Our usage of PE yield and multiple expansion partly captures this effect. While historical simulations often assume a constant D/E ratio of, say, 200% over time, PE leverage levels have been trending lower despite lower funding costs.²⁹ For the post-2008 period, we use D/E ratios from Pitchbook. Pre-2008, we assume an aggregate D/E ratio that tapers from 300% in the 1990s to the 150% D/E reported in 2008. This is roughly in-line with the D/E trends depicted in Axelson et al. (2013).

26 For the Russell 2000, on average, EBITDA is roughly twice EBIT over the period January 1, 1995 to September 30, 2018. We perform this additional step of estimating EBIT-to-EV from EBITDA-to-EV, as EBIT-to-EV does not include depreciation and amortization and is thus more comparable to the earnings yield we use for public equities, that is based on net income and thus, net of depreciation and amortization too.

27 See AQR Alternative Thinking Q1 2017: Capital Market Assumptions. Historically, the dividend payout ratio for public equities (the S&P 500) has averaged roughly 50% over the period January 1, 1900 to December 31, 2016.

28 Acharya et al. (2013) find that PE ownership causes the operating margin (EBITDA/Sales) to increase by around 4% on average relative to the pre-acquisition phase, while Guo et al. (2011) report an even higher 12% increase in net cash flow to sales. On the other hand, Cohn et al. (2014) suggest that operating improvements are way more modest and emanate from a natural mean-reversion in operating efficiency, not the changes introduced by PE GPs. Døskeland and Strömberg (2018) find that PE tends to be overweight Technology and underweight Financials, even if excluding the venture capital and growth equity segments of PE.

29 Both Axelson et al. (2013) and L'Her et al. (2016) find a decreasing trend in D/E for LBOs. This likely reflects evolving risk preferences by GPs (bigger firms protecting their brands) and their LP clients (pension funds may be less risk tolerant than family offices and endowments).

- **Cost of Debt:** Studies indicate PE firms have superior access to credit and borrow more when credit is cheap. A high proportion of PE debt is secured bank debt financed at floating rates plus a spread. In the absence of historically accurate bank loan data for PE, we proxy the PE bank loan spread as two-thirds of the OAS of the High Yield (HY) index over duration-matched Treasuries.³⁰ As the entire spread overstates the cost of debt ultimately borne by the firm, we estimate the actual PE cost of debt as half of this, at real LIBOR plus one-third of the HY OAS.³¹ As the purchase multiples we use are one-year averages, we also use one-year averages of the cost of debt.

The tax deductibility of interest expense decreases a company's *de facto* cost of debt, giving rise to a debt tax shield that is touted as a value-add of PE. However, as tax laws vary by jurisdiction, we do not account for taxes here. Our assumption effectively increases the cost of debt for PE, but this is offset by the aforementioned haircut we apply to the cost of debt.

- **Multiple Expansion:** We assume no multiple expansion in our yield-based frameworks for passively managed public equities and fixed income. However, we make an exception for PE due to its active ownership and some evidence that PE GPs can time deal entries and exits.³² The principle of mean-reversion suggests that PE multiple expansion is more likely if it has an initial discount versus the market. Hence, as described in the main body, we estimate the return from multiple expansion as the annualized return if PE multiples converged partly, say 20% of the way, towards the initial public market multiple, over the lifetime of the deal, assumed to be six years. We floor this return at zero; that is, we do not allow for multiple compression, as there is evidence that PE GPs delay exits so as to sell at higher multiples. Given the arbitrary nature of our estimate, our general skepticism around multiple expansion for any asset class, and the noise in data on PE purchase multiples, we choose to apply only a conservative, partial convergence towards the market multiple.³³
- **Fees:** PE fees are partly based on performance. As our assumption of 5.7% is based on historical averages and we expect future PE returns to be lower than in the past, at least performance fees may be lower going forward. We stick with the historical average of 5.7% as our best estimate, as PE fees can vary vastly based on deal terms.

30 Axelson et al. (2013) suggest that a large proportion of LBO debt is secured bank debt that is generally financed at lower rates than HY bonds. Demiroglu and James (2010) find that over the period 1997 to 2007, PE firms incurred a spread over LIBOR that averaged around 70% of the HY OAS and was less sensitive to credit conditions than HY spreads. Our use of a constant proportion of the HY OAS may thus overstate the PE cost of debt when HY spreads spike, as in 2008-9.

31 As explained in AQR Alternative Thinking Q1 2016, investors do not earn the entire credit spread as they incur default losses. Giesecke et al. (2011) find that over the long-term, the average credit risk premium that investors realize is roughly half the average credit spread. The flip side of this is that the issuing firm's actual cost of debt ends up being lower, roughly by half the credit spread, as the lenders take on part of the default losses.

32 Jenkinson et al. (2018) present some evidence of PE managers' market timing skills related to entries and exits, while Kinlaw et al. (2015) point to sector timing abilities.

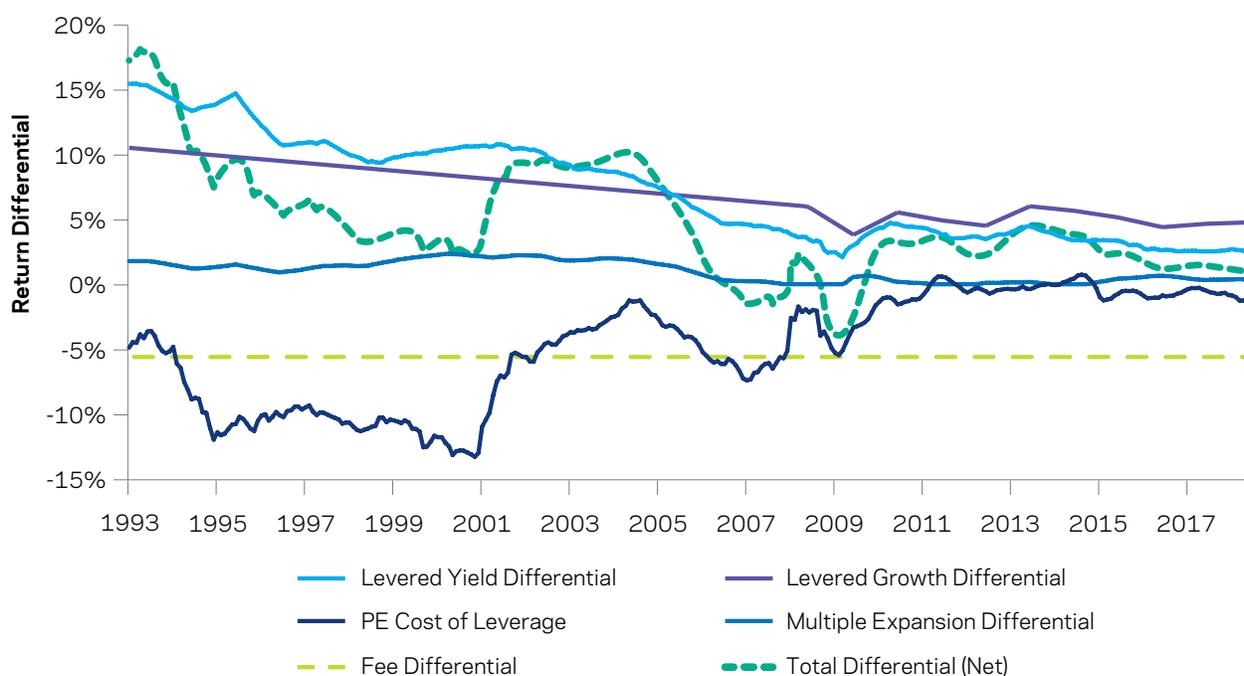
33 The multiple expansion we assume here does not involve assuming that the whole PE asset class richens but rather that even amidst an unchanged capital market environment, at the time of deal exit, individual deals are able to justify higher multiples than their purchase multiples, thanks to GPs' skills in entry/exit timing or to operational improvements that boost expected growth beyond the going-public date. This is analogous to the rolldown gains bonds can earn when we assume an unchanged yield curve. The market timing skills of GPs may not help LPs if they fund their PE allocations from public equity.

To illustrate the effect of these inputs on our estimates of PE ER, we can decompose the expected PE net-of-fee return edge over public equity into its different moving parts. **Exhibit A1** presents this decomposition and reveals that, under our yield-based framework, the declining expected return differential of PE over public equity has been driven first by the relative richening of PE mentioned earlier, and second by the decrease in PE leverage which is reflected in both the declining levered growth differential and partly in the decreasing levered yield differential.³⁴ As PE leverage has declined from around 300% D/E in the 1990s to 100%-150% D/E more recently, it has had less of an amplifying effect on PE ER.

Exhibit A1

Decomposition of the Net-of-Fee Expected Return Differential of Private over Public Equity

January 1, 1993 - September 30, 2018



Source: AQR, Pitchbook, Bain & Company, CEM Benchmarking, Shiller, Consensus Economics, Bloomberg. For public equity real net ER, see Alternative Thinking Q1 2017 and footnote 23. Private equity real net ER described in the Appendix.

³⁴ For simplicity, the decomposition shows the difference in levered yields and levered growth rates. Thus, it does not disentangle the effect of time-variation in PE leverage from the effect of time-variation in the unlevered yield.

We describe the decomposition below:

As per AQR Alternative Thinking Q1 2018 and the dividend discount model (DDM),

$$\text{Net-of-fee Public Equity ER} = y_{\text{pub}} + g_{\text{pub}} + m_{\text{pub}} - f_{\text{pub}} \quad 1)$$

where

y_{pub} = dividend yield

g_{pub} = long-term expected growth rate (assumed to be a constant 1.5%)

m_{pub} = multiple expansion (assumed to be zero)

f_{pub} = management fee (assumed to be 10 bps) for public equities

As per Exhibit 3 and the Modigliani-Miller equation,

$$\text{Net-of-fee PE ER} = r_u + (D/E) * (r_u - k_d) + m_{\text{pvt}} - f_{\text{pvt}} \quad 2)$$

where

r_u = unlevered PE ER

D/E = debt-to-equity

k_d = PE cost of debt

m_{pvt} = PE multiple expansion

f_{pvt} = PE fees (assumed to be a constant 5.7%) for PE

As $r_u = y_u + g_u$, Equation 2 can be re-written as

$$\text{Net-of-fee PE ER} = y_{\text{pvt}} + g_{\text{pvt}} - d_{\text{pvt}} + m_{\text{pvt}} - f_{\text{pvt}} \quad 3)$$

where

$y_{\text{pvt}} = y_u * (1 + D/E)$, i.e., the levered yield of PE³⁵

$g_{\text{pvt}} = g_u * (1 + D/E)$, i.e., the levered growth rate of PE

$d_{\text{pvt}} = k_d * (D/E)$, i.e., the interest expense or payout to debtholders

35 Penman et al. (2018) show the relation between unlevered and levered earnings yield as per Modigliani and Miller (1958).

Thus, subtracting 1) from 3), the PE net-of-fee return edge over public equity can be attributed to 5 components:

- **Levered Yield Differential:** PE levered yield minus that of public equities.
- **Levered Growth Differential:** As we make the simplifying assumption of constant unlevered growth rates for both private and public equity, the difference is driven entirely by the time-varying leverage of PE. The near-steady decline we see is due to the declining trend in PE leverage.
- **Multiple Expansion Differential:** As we assume zero multiple expansion for public equities, this equals PE expected multiple expansion. As seen in Exhibit A1, this is just a small component of the return differential.
- **Fee Differential:** As we assume constant fee for PE (5.7%) and public equities (10bp), this is a constant -5.6%.
- **PE Payout to Debtholders:** Listed firms also pay interest expense to their debtholders. But as our method for public equity ER starts from dividend yields, it is already net of interest expense, and thus already accounted for.

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