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Expanding Long-Term Asset Class Forecast

Long-Horizon Risk and Private Assets

Alexander Rudin, Ph.D.
Managing Director,
Global Head of Multi-Asset and Fixed Income Research

Daniel Farley
Chief Investment Officer, Investment Solutions Group

STATE STREET GLOBAL ADVISORS

Contents

Executive Summary

Returns on most financial assets can be effectively separated into a long-term component linked to economic fundamentals and a short-term component linked to “excess volatility” or “noise”. This property of asset returns resonates with investors’ need to balance strategic portfolio optimality with short-term risk control. With that in mind, we expanded our long-term return forecasts to include long-horizon as well as short-horizon risk estimates. While our suggested framework has universal applicability, it is particularly useful for strategic portfolios incorporating private assets. We will introduce the concept of “long-horizon risk” and explain the important role it plays in constructing strategic portfolios. We will also detail our newly developed forecasting methodologies for private equity and private debt.

Dual Nature of Financial Assets

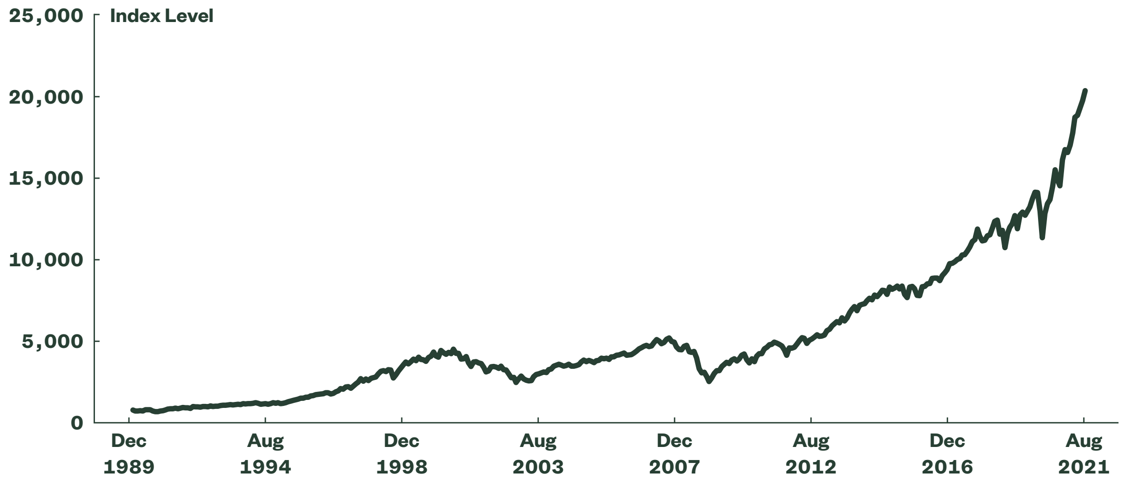
Most long-term allocators use monthly or quarterly performance data to assess the risk of financial assets. A typical process involves taking monthly performance figures over a sufficiently long period of time (10 or 20 years), calculating monthly asset volatilities and correlations over these periods, annualizing volatilities by multiplying monthly figures by the square root of 12 (while leaving correlation estimates untouched) and then deploying results as “long-term risk estimates”.

This approach works well in the context of estimating asset risks over short investment horizons of say a month or a quarter. But in the context of much longer investment horizons, it would make more sense to lengthen the time horizons of our risk estimation as well. One way to go about this would be to decompose historical asset price patterns into persistent components and short-term “noise” and then focus on the former (Figure 1).

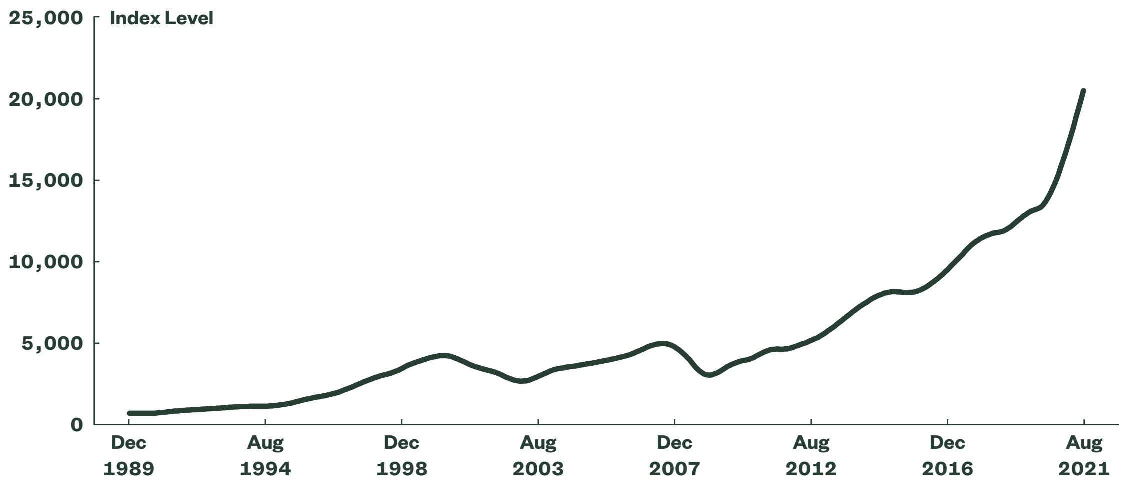
The two components of S&P 500 differ not only in terms of speed of change but also in terms of their long-term dynamic. The slow, “persistent” component grows over time, reflecting growth in real economy and corporate earnings. The fast, “transient” component is directionless and strongly mean reverting. Granted, these characteristics were effectively assured by our decomposition methodology, but they also reflect the dual nature of the price dynamic of most financial assets, including public equity.

Figure 1
Decomposition of Historical Asset Price Patterns on S&P 500

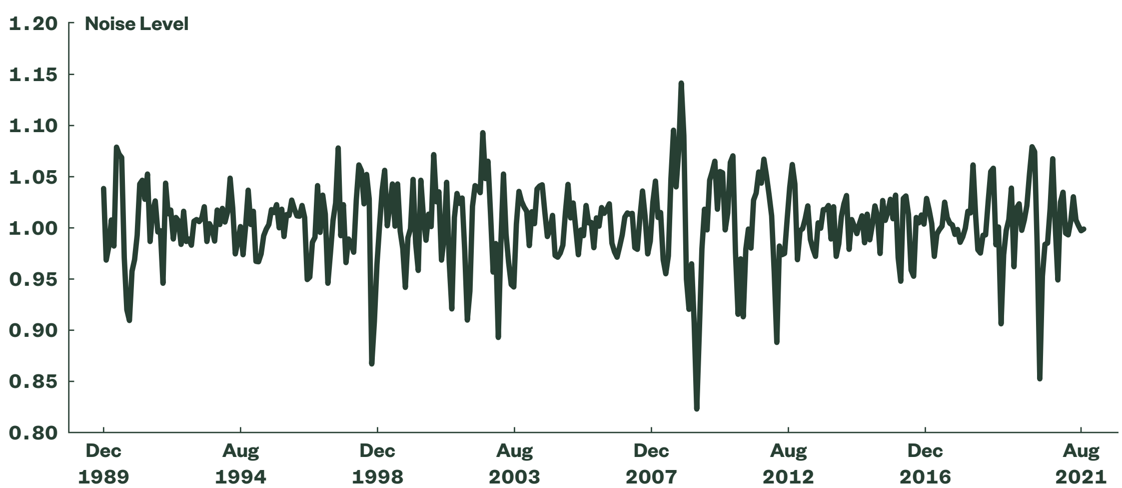
Total Return Series



Presistent Component



Short-Term Noise



Note: Persistent component series + short-term noise series = total return series. We used the Hodrick-Prescott filter (see References 2) to perform this decomposition; the filter produces a "trend line" component by minimizing both the mean-square deviation of the input signal from the trend line and the curvature of the trend line.
Source: State Street Global Advisors, as at 31 August 2021.

Equity Price Dynamic and Economic Fundamentals

Ever since Robert Shiller's seminal work, it is well expected that over the long term public equity returns are anchored to economic fundamentals, while over the short term they are subject to the so-called "excess" volatility.[3]

The challenge until recently was to find an observable proxy for such "fundamentals", and perhaps equally importantly, to understand the relationship between public and private equity (PE) returns. Our recent work took a step toward resolving both these challenges.[4] We pointed out that PE valuation processes are primarily designed to mirror earnings expectations of underlying companies and as such are much less exposed to excess volatility compared with their public counterparts. This could mean that private asset prices may offer the best way to directly observe market expectations of economic fundamentals for both private and public companies.

We translated this hypothesis into an econometric model, which connects public and PE returns (see Appendix for a summary). The model demonstrated that in order to make *fair* comparisons between public and private asset prices, one needs to apply systematic adjustments — for smoothness and leverage — to the observed figures. Once these adjustments were made, the apparent advantage that the broad PE market had over the public market was seen to disappear almost entirely.

It is important to note here that this process does not consider the ability of managers to select deals or add alpha relative to the broader market. While this alpha generation ability indeed results in incremental returns, given there are winners and losers, the advantage is offset when the market as a whole is taken into consideration.

The model also provides an intuitive interpretation of Figure 1. The smooth, "persistent" component of equities represents economic fundamentals and business impact, which are essentially the same for both public equity and PE in terms of direction and magnitude (after adjusting for leverage). Conversely, the mean-reverting component is the manifestation of Mr. Schiller's concept of excess volatility.

Public equity is exposed to excess volatility to a much higher degree, which explains the relative advantage that PE has over its public counterpart during short- to medium-term horizons. This means, as the horizon extends, excess volatility gradually dissipates, resulting in the convergence of the price behavior between public equity and PE. The implication is that for the requirements of strategic asset allocation (SAA), the horizon needs to be made appropriately long enough to accommodate for the persistent component of asset returns.

Dual-Horizon Price Dynamic of Financial Assets

Multiple researchers have convincingly demonstrated that prices of many core asset classes — not just equity — exhibit the dual-horizon price dynamic. Over the long term, prices are anchored to some sort of a slow-moving, fundamentals-based process, while in the short term, these prices quasi-randomly cycle around such anchors.

Real Estate

Hoesli and Oikarinen,[5] Ang et al.[6] and Kouzmenko et al.[7] have all pointed out that prices of publicly traded real estate investment trusts (REITs) are anchored to the prices of either direct real estate or the so-called “real estate factor”, which appears to be extremely close to direct real estate prices, over the long term. Although REITs exhibit a fair amount of volatility around the anchor, the volatility is more or less short lived and dissipates as the time horizon increases.

High Yield and Private Debt

Private debt is a much newer asset class compared with PE or real estate. Consequently, the relationship between private debt and its most likely public counterpart — high-yield (HY) debt — has received far less scrutiny compared with equity. That said, both private debt and HY assets are arguably exposed to similar credit fundamentals, with publicly traded HY bonds additionally exposed to their own version of excess volatility (related to flows, investor anxiety, liquidity, among others).

It is compelling to apply to private debt and HY the same considerations that we had earlier applied to public equity and PE (see Appendix).[4,8] Results strongly suggest that HY prices fluctuate around a relatively persistent anchor that could be proxied by observed prices for private debt (after adjustments). Similar to equity, the “excess volatility” component of public HY returns mostly dissipate as time horizon increases.

Sovereign Yield

A lot of recent innovation in forecasting Treasury yields has been stemming from a potent idea advanced by Cieslak and Povala,[9] which was further extended by Rebonato and Hatano.[10] Similar to the arguments made above, the idea suggests that the behavior of many sovereign yields can also be decomposed into slow-moving, persistent as well as short-term, transient components. As in the case of other asset classes, the short-term components were shown to strongly revert to the long-run mean.

With a caveat, this property of financial assets also suggests strong structural links between public and private assets. Although public and private assets have more or less similar exposure to market fundamentals, their exposure to noise varies vastly.

Dual-Horizon Long-Term Asset Forecasting

At State Street Global Advisors, our long-term asset class (LTAC) forecasting process seeks to incorporate both the dual-horizon nature of financial prices as well the structural links between public and private assets. To explain the thought process behind this evolution, let us recall the core purpose of LTAC forecasts: they are meant to provide inputs for an SAA framework.

Typically, such frameworks are based on a version of mean-variance optimization and require data related to expected returns, volatilities and correlations. Usually, expected returns are generated independently for all assets by forecasting the economic fundamentals and risk premia of the assets. Expected volatilities of portfolio assets and their correlations are calculated based on a long time series of monthly or quarterly data, without explicitly differentiating between short- or long-horizon risk dynamics (term structure of risk).

Based on considerations expressed in previous sections, we believe that such SAA frameworks may benefit substantially from:

1 Changes to inputs, including replacing volatility and correlations with their long-horizon versions

2 Changes to constraints, in terms of incorporating short-term risk dynamics

Although we focus only on the input component — LTAC forecasts — details on both types of enhancements can be found in the paper.[8]

Replacing traditional volatility and correlation estimates with their long-horizon versions could be transformational. For publicly traded assets such as equity, credit and real estate, such an approach should potentially help in expunging excess volatility, thereby reducing their volatility figures to levels that are closer to that of their private counterparts (after adjusting for leverage).

This change has the potential to clarify some strong long-term relationships between public and private assets, which are obscured in short-term correlation analysis. Figure 2 shows annualized long-horizon volatility estimates for some of the major asset classes.

Figure 2
Long-Horizon Volatility Estimates for Major Asset Classes

Asset Class	Asset	Observed Price Volatility (%)	Long-Horizon Volatility (%)	Volatility Ratio
Equities	US Large Cap	14.67	4.55	0.31
	Global Equities (ACWI) ex US	14.59	5.06	0.35
	Global Equities (ACWI)	14.08	4.66	0.33
	Europe	15.21	5.14	0.34
	Emerging Markets (EM)	20.09	8.48	0.42
Sovereign Bonds	US Government Bonds	4.12	1.33	0.32
	Non-US Government Bonds	3.05	1.25	0.41
	UK Government Bonds	5.99	1.72	0.29
	Japanese Government Bonds	3.31	1.13	0.34
Credit	US Investment Grade Bonds	3.57	1.22	0.34
	US HY Bonds	8.43	3.13	0.37
Publicly Traded Alternatives	HFRI Fund of Funds	3.92	1.33	0.34
	Global Real Estate (REITs)	17.38	6.64	0.38
	Commodities	14.49	5.27	0.36
Private Alternatives	Buyout	10.56	7.60	**0.72**
	Private Debt	10.48	5.93	**0.57**
	Direct Real Estate	6.47	6.07	**0.94**

Note: We used the Hodrick-Prescott filter (see References 2) for this estimation; observed volatility denotes annualized standard deviation of monthly (for all categories except Private Alternatives) and quarterly (for Private Alternatives) figures between January 2006 and December 2020; long-horizon volatility denotes the same calculation applied to the "trend" component of the Hodrick-Prescott filter output.
Source: State Street Global Advisors, as at December 2020.

Long-horizon volatility is lower than observed volatility for all assets, but this differs across asset classes. In a pure mean-variance portfolio optimization process, switching to long-horizon risk estimates would give a moderate boost to large cap and global equities and US and UK sovereign bonds, at the expense of emerging market equities, non-US sovereign bonds, credit and publicly traded alternatives.

Private assets also demonstrate a reduction in risk in the long horizon but at a much lesser degree. **This is entirely intuitive.** PE and debt are — over the long term — simply leveraged versions of public equity and HY debt (at the rate of 1.3x and 1.6x, respectively).[4,8] This is why when excess volatility dissipates, PE and private debt become riskier compared with their public counterparts (while observed — or short-horizon — figures tell a different story).

Benefits of adding long-horizon risk dimension are self-evident. First, it helps us to focus on the strategic optimality of SAA, even when only publicly traded assets are included. Second, when private assets are included as part of SAA, risk-adjusted returns for those assets and related public counterparts are harmonized without the need to apply arbitrary adjustments to private asset risk figures.*

* As discussed, quarterly performance based risk-adjusted returns for private assets materially exceed those of public ones leading to private assets' dominance in an optimized portfolio. To reign in the dominance, most institutional investors either cap private allocation at some moderate levels or dramatically (and, in our view, arbitrarily) inflate volatility expectations for private assets from actually observed levels of 10%–12% (annualized) to 25+%. In our view, neither of these methods is satisfactory and they are mere "fixes" as opposed to self-consistent "solutions" and reflect investor's level of discomfort with illiquid private assets. Switching to long-horizon risk estimates eliminates the need for such fixes.

Long-Term Forecasts for Private Assets

Now that we have introduced the concept of long-horizon forecasting and demonstrated the structural link between public and private assets, we will switch our attention to actual forecasts for some private assets.

Private Equity

We have a well-established process for forecasting long-term returns of public equities, which is based on fundamental analysis.[1] Since we have established the commonality between public equity and PE based on fundamentals, this process can be employed for PE forecasts after adjusting for leverage.

As discussed in the Appendix, PE funds (we focus on buyouts) have a leverage advantage of approximately 1.3x over S&P 500. This means:

Buyout PE 10-Year Return Forecast = 1.3x US Equity 10-Year Trailing Return Forecast

Private Debt

Private debt funds have approximately 1.6x leverage advantage over US HY debt. This means:

Private Debt 10-Year Return Forecast = 1.6x US HY 10-Year Trailing Return Forecast

In this context, it should be noted that in contrast to the world of publicly traded assets where one can easily have passive exposure to a broad swath of the market (for example, US equities) via index funds or ETFs, private investment exposure is always active and somewhat idiosyncratic. Since there is no such thing as a US PE investable fund, our study was based on uninvestable indexes of private assets. In practice, this means, investable products may substantially differ from uninvestable indexes and from each other. Some of these differences are in terms of:

- Leverage
- Strategic composition — for instance, sector composition or percentage of venture versus buyout in PE
- Alpha generation capability of managers (proven or expected)
- Concentration (investable private products are always more concentrated than uninvestable indexes)

Articulating these differentiation points for specific products is beyond the scope of this paper and our LTAC process. Yet these points may lead to substantial differentiation in both the return and risk components of such forecasts. Our recent research on the effects of concentration on both short- and long-term measures of PE performance may serve as a case in point.[11, 12]

Concluding Remarks

We see multiple advantages in expanding LTAC to include long-horizon measures of risk. Long-horizon volatility estimates not only reduce transient effects of excess volatility but also helps to create better strategic portfolios, and perhaps most importantly, adds clarity to the risk estimation process.

The new lens through which we now assess long-term risk also helps to illuminate the relationship between public and private asset returns and informs our newly developed LTAC forecasts for PE and private debt.

Appendix: Connecting Returns of Public and Private Assets

Equity

Mr. Schiller's concept of equity excess volatility may be schematically expressed as a following relationship:

PE Returns = Change in Economic Fundamentals + Excess Volatility A.1

PE valuation processes are primarily designed to mirror earnings expectations of underlying companies and as such are much less exposed to excess volatility compared with their public counterparts. This may mean that private prices provide a better way to directly observe market expectations of economic fundamentals regardless of *whether we discuss fundamentals of private or public companies.*

This hypothesis can be translated into an econometric model that connects public equity and PE returns by using observed PE returns in lieu of the "fundamentals" used in equation A.1. Two adjustments have to be applied to the observed PE returns: (1) they have to be "unsmoothed" and (2) a "leverage adjustment ratio" need to be introduced to reflect the well-known difference between typical leverage of private buyout deals and that of public companies.

The suggested model takes the following form:

$$r_t^{PUBLIC} = \alpha + \frac{r_t^{PE\_TRUE}}{LAR} + \varepsilon_t^{EXCESS} \qquad \text{A.2}$$

α represents excess returns net of fees and cost of leverage, *LAR* is the leverage adjustment ratio, while $r_t^{PE\_TRUE}$ represents PE returns that underwent the "unsmoothing" procedure.

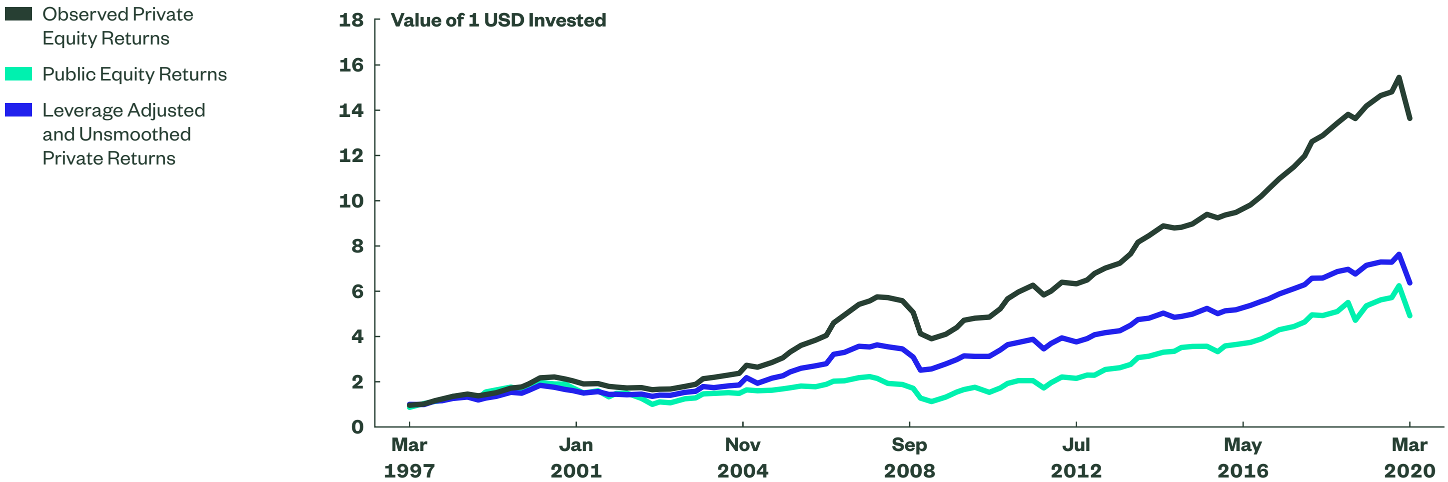
The link between such unsmoothed ("true") PE returns and observed one was established as:

$$r_t^{PE\_TRUE} = \frac{r_t^{PE\_OBSERVED} - \theta\, r_{t-1}^{PE\_OBSERVED}}{1-\theta} \qquad \text{A.3}$$

Both smoothing coefficient θ and *LAR* can be determined via a two-step regression analysis, with the unsmoothing step happening first. Results demonstrate the high significance of both the variables (Figure 3a and 3b).

Figure 3
Relative Performance of Public and Private Equity

Coefficient	Estimate Value (T Statistic)	P Value
θ	0.385 (3.80)	0.00026
LAR	1.323 (9.86)	0.00000
α	-0.004 (-0.15)	0.88402



Source: State Street Global Advisors, as at 31 March 2020.

The model's first implication is that — similar to real estate — some systematic adjustments need to be applied to the observed PE prices before comparing them with public ones. By combining such adjustments for smoothness and leverage, we had argued that to make the public to private comparison fair, one needs to use "adjusted PE returns" constructed from equations A.2 and A.3.[4]

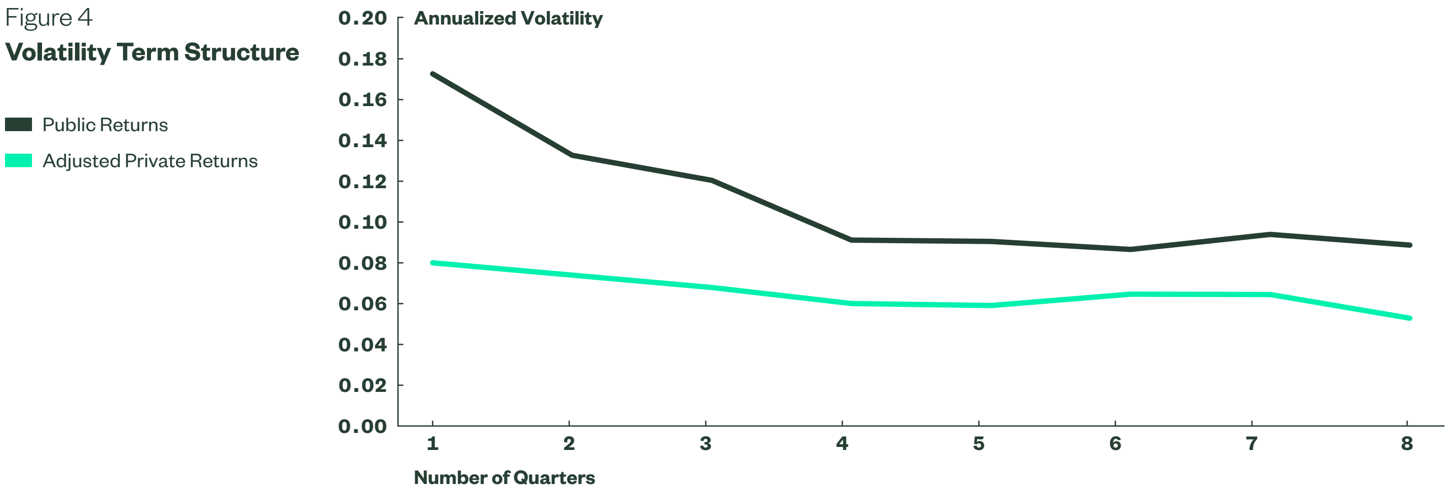
$$r_t^{PRIVATE} = \frac{1}{LAR} \frac{r_t^{PE\_OBSERVED} - \theta r_{t-1}^{PE\_OBSERVED}}{1-\theta} \qquad \text{A.4}$$

Figure 3 illustrates the outcome of such a comparison: (1) using the observed PE returns as proxy for the "fundamentals" component of public equity was highly effective and consistent with empirical evidence and (2) while observed PE returns substantially and consistently outperformed public equity, this advantage largely evaporated after adjustments for smoothness and leverage were made.

One can also witness this phenomenon by studying volatility and correlation term structures for public equity and PE returns (Figure 4). The term structure is approximately flat for (adjusted) PE returns. For public equity, however, risks are inflated in the short term by excess volatility.

Longer term, they gradually subside, approaching (adjusted) PE levels at horizons of around two years. The correlation between the two time series also increases to almost one with increasing horizon.

Figure 4
Volatility Term Structure



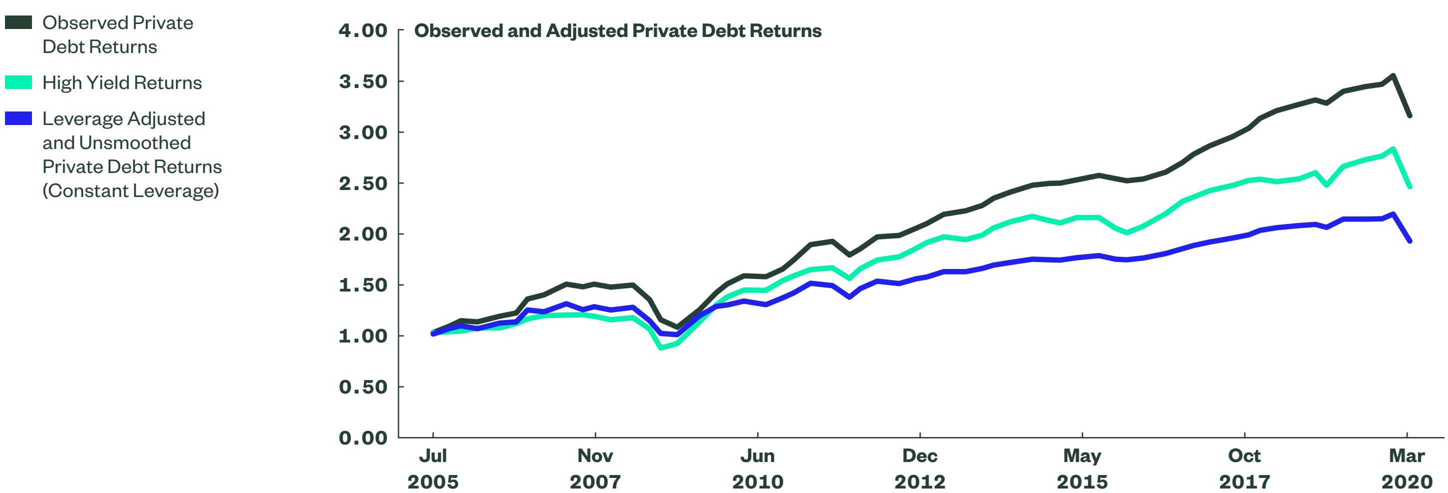
Note: State Street Public Equity Buyout Index and S&P 500 trailing returns were used as proxies for private and public equity markets; time horizon was March 2008–June 2020; the difference between the 84th and 16th percentiles for return distribution were used in lieu of volatility.
Source: State Street Global Advisors, as at June 2020.

Credit

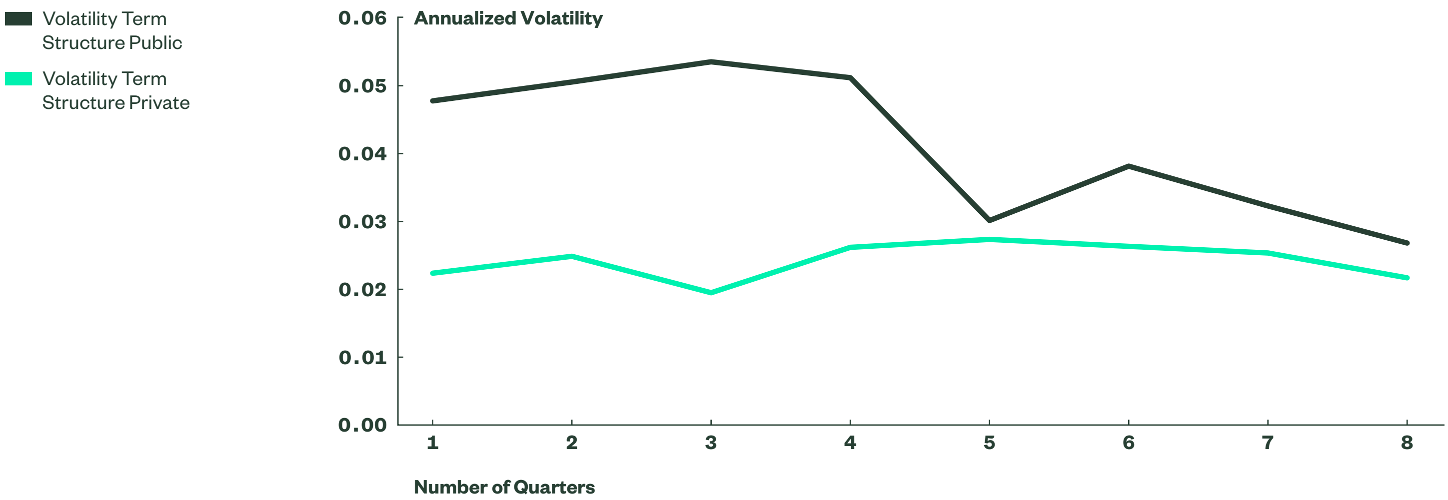
It is compelling to apply the considerations applied to public equity and PE to private debt and HY debt as well.

Figure 5
Private Debt vs. HY Debt

Coefficient	Estimate Value (T Statistic)	P Value
θ	0.37 (2.80)	0.00599
LAR	1.60 (11.90)	0.00000
α	0.02 (1.10)	0.25800



Source: State Street Global Advisors, as at 31 March 2020.



Source: State Street Global Advisors, as at 31 March 2020.

Figure 5 summarizes the results of deploying the methodology employed in equations A.2 to A.4 to private debt and HY debt and the results correspond to that of PE. Smoothness and leverage adjustments that are needed for private debt are large and highly significant.

Observed private debt returns are higher than that of HY debt, but after adjustments they actually become lower, indicating the *negative* alpha associated with the private debt market (albeit this result is only borderline in terms of its statistical significance). Volatility term structure for private debt is flat, while for HY debt it decreases as time horizon increases.

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Equity securities may fluctuate in value and can decline significantly in response to the activities of individual companies and general market and economic conditions.

Bonds generally present less short-term risk and volatility than stocks, but contain interest rate risk (as interest rates raise, bond prices usually fall); issuer default risk; issuer credit risk; liquidity risk; and inflation risk. These effects are usually pronounced for longer-term securities. Any fixed income security sold or redeemed prior to maturity may be subject to a substantial gain or loss.

Investing in high yield fixed income securities, otherwise known as "junk bonds", is considered speculative and involves greater risk of loss of principal and interest than investing in investment grade fixed income securities. These Lower-quality debt securities involve greater risk of default or price changes due to potential changes in the credit quality of the issuer.

The use of leverage, as part of the investment process, can multiply market movements into greater changes in an investment's value, thus resulting in increased volatility of returns.

Index returns are unmanaged and do not reflect the deduction of any fees or expenses. Index returns reflect all items of income, gain and loss and the reinvestment of dividends and other income as applicable.

Investing in REITs involves certain distinct risks in addition to those risks associated with investing in the real estate industry in general. Equity REITs may be affected by changes in the value of the underlying property owned by the REITs, while mortgage REITs may be affected by the quality of credit extended. REITs are subject to heavy cash flow dependency, default by borrowers and self-liquidation. REITs, especially mortgage REITs, are also subject to interest rate risk (i.e., as interest rates rise, the value of the REIT may decline).

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