PitchBook

Return Smoothing in Private Markets

Estimating the true volatility of private market returns

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Contents

Key takeaways

- Fair value accounting practices and conservative valuations have resulted in artificially smoothed reported returns in private markets.
- Artificially smoothed returns systematically underestimate risk and overestimate diversification benefits of private market asset classes. The estimated true volatility for PE is 17.1% versus reported volatility of 9.8%. The estimated true volatility for VC is 53.2% versus reported volatility of 21.2%.
- Applying a desmoothing technique to private market returns can dramatically alter volatility and correlation estimates. These adjustments are imperative for reliable asset allocation modeling.

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Introduction

One of the challenges of incorporating private markets into a multi-asset investment portfolio is determining the risk and return characteristics of private market asset classes. For public markets, the determination process is generally straightforward because prices are based on actual transactions with details that are publicly available. Assuming a frictionless market, public market investors know the exact value that they could have realized from their investments over time. Therefore, calculating investment characteristics, such as return and volatility, is a simple exercise. Conversely, prices of private market investments are updated infrequently (generally once per quarter) and are typically unaudited approximations of how much the investment would have sold for in an arms-length transaction. Pricing investments in this manner, known as appraisal-based pricing, introduces a source of error and potential bias in reported private market returns, which results in understated volatility and correlation (with public market asset classes) estimates for private market asset classes. Failure to appropriately adjust volatility and correlation estimates can lead investors to make misinformed asset allocation decisions.

Economic versus smoothed returns

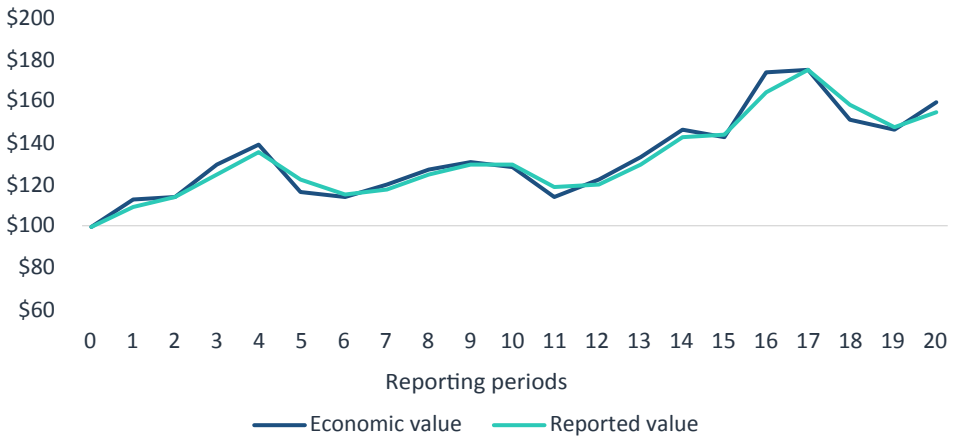
An economic return represents the change in the true value of an asset during an arbitrary period, and in most cases, is simply referred to as the "return." The true value of an asset is defined as the agreed-upon price of an orderly transaction between a willing buyer and a willing seller. As noted previously, the true value of private portfolio companies (or properties in the case of real estate) is often unknown and needs to be estimated using fair value accounting.[1] Research has shown that fair value accounting practices at PE firms tend to result in conservative valuation estimates,[2] which means these firms underestimate both positive and negative changes in the economic value of the portfolio. Conservative valuation estimates result in artificially smoothed reported private market returns. For example, one could consider a private market fund that conservatively reports the change in value of its entire portfolio by 30%. Assuming a starting value of $100, the chart on the following page shows the economic value versus the reported value of a simulated portfolio over 20 periods.

Over a full investment cycle, the mean of both return series will be the same. However, this is not the case for volatility. The artificial smoothing process systematically lowers observed volatility. In the accompanying visual, the economic return series has a standard deviation of 9.3% versus just 7.1% for the reported return series. This makes private market asset classes look more attractive on a risk-adjusted basis than public market asset classes, all else equal. The extent to which smoothing returns dampens volatility is a function of the timing and degree of conservativeness in the valuation

1: Starting in 2009, US private funds are required to value their investments at "fair value" (i.e., mark-to-market) based on Financial Accounting Standards Board Statement 157. The statement prioritizes the use of public market comps in the valuation process. If no public comps are available, private manager may use fundamental valuation methods, such as discounted cash flow models.
2: "How Fair Are the Valuations of Private Equity Funds?", Tim Jenkinson, Miguel Sousa, and Rüdiger Stucke, 2013.

process. The more conservative the valuations are, the longer it will take the price to reflect changes, and the greater the dampening effect will be on reported volatility.

Economic versus reported value of simulated private market portfolio



Source: PitchBook
Note: For illustrative purposes only

Artificial smoothing also has an impact on private market assets' perceived diversification benefits. Many investors have held a longstanding view that private market asset classes, such as PE, are diversifying to other risky assets. This view has been routinely challenged in academic literature[3] and in PitchBook's own research. Similar to its dampening effect on volatility, smoothing returns pulls correlations toward zero, causing private market assets to have smaller observed correlations with public market assets than they really do. To understand why this occurs, one should recall that the correlation between two assets measures the (standardized) co-movement of their returns. Additionally, as we noted earlier, smoothed returns are a weighted average of current and past returns. Thus, calculating the correlation between two return series when one is smoothed does not fully capture the co-movement between the two. It is only partially captured, and the contribution of prior returns may add noise that further complicates the desired measurement.

Desmoothing private market returns

Simply knowing that reported returns in private markets underestimate volatility and overestimate diversification benefits is helpful for asset allocators, but it does little from the practical standpoint of managing portfolios. Allocators need a systematic way to estimate private market volatility more accurately to compare them with public market returns and incorporate private markets into asset allocation modeling. While there have been several proposed approaches, we will demonstrate one of the most popular and widely cited ones that was developed by David Geltner, a Professor of Real Estate Finance in the Department of Urban Studies &

3: "Private Equity's Diversification Illusion: Economic Comovement and Fair Value Reporting," Kyle Welch, Harvard Business School, 2014.

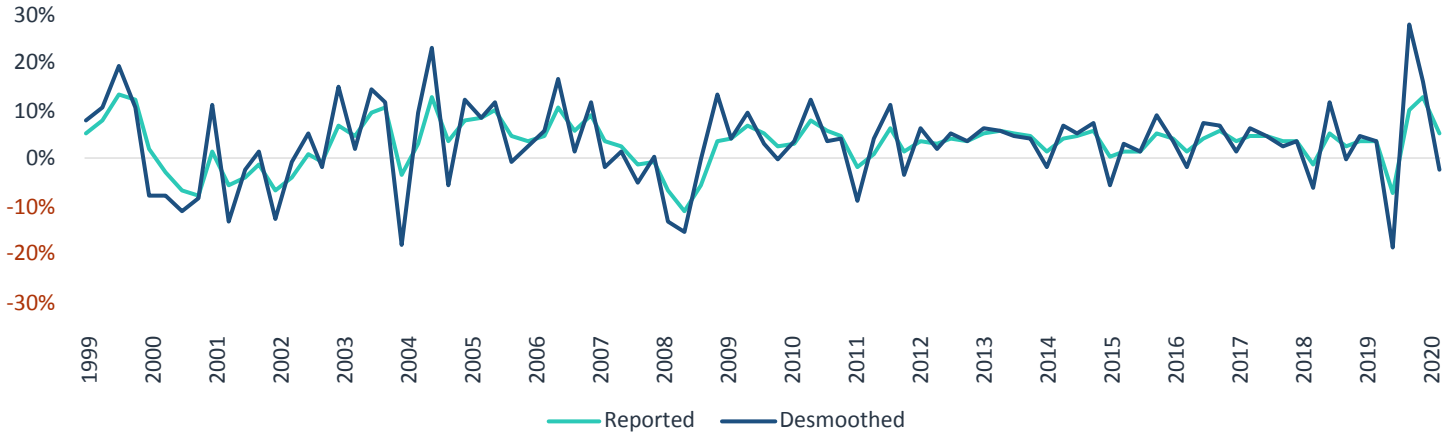
Planning at MIT.[4] At a high level, this method starts with the assumption that the weighted average process of smoothed returns is simple exponential smoothing. This means that the weights of prior returns on the current reported return decline exponentially from the current period to the beginning of the time series. However, the decay parameter of the exponential smoothing process is unobservable. If we make the additional assumption that all companies are valued at the end of each period, it is possible to express this exponential smoothing process as a first-order autoregressive function, which is observable from the reported return series. We can then use this function to estimate the economic return series from the reported return series using the following equation:

$$r_{desmoothed,\,t} = \frac{r_t - (r_{t-1} \times ACF_{t-1})}{1-ACF_{t-1}}$$

In this equation, ACF_{t-1} is the first-order autocorrelation coefficient of the report return series.[5] Once the economic return series has been estimated from the reported return series, we can use it to calculate risk metrics and correlations without making any further adjustments.

To make this process more concrete, we will review the results of applying the Geltner desmoothing method to three of PitchBook's quarterly asset class returns: PE, VC, and real estate. To start, the following chart shows the full reported versus desmoothed quarterly return series for PE.

Reported versus desmoothed quarterly PE returns



Source: PitchBook

4: "Estimating Market Values from Appraised Value Without Assuming an Efficient Market," David Geltner, The Journal of Real Estate Research, 1993.
5: The first-order autocorrelation coefficient of a time series quantifies the linear relationship between the time series and a one-period-lagged version of itself.

The most noticeable differences between the two time series occur in periods with large absolute returns. This phenomenon is due to the assumption that the reported return does not fully reflect the change that happened during the period. The reported return also partially includes effects from changes in prior periods. The reported quarterly returns of -7.3% and 10.1% in Q1 and Q2 of 2020, respectively, highlight this dynamic well. If a portion of the decline in Q1 is not valued until the following quarter, then the reported gain in Q2 must be understated. After the desmoothing process, the estimated Q2 return is 27.7%, which is significantly higher than what was reported.

The following table summarizes the results of the desmoothing process for each of the three asset classes for the period of 1999 through 2020.

Summary of desmoothing results

	Reported volatility	Desmoothed volatility	ACF_{t-1}
PE	9.8%	17.1%	0.50
VC	21.2%	53.2%	0.73
Real estate	11.8%	17.0%	0.34

Source: PitchBook

We find a significant degree of autocorrelation in each return series, which provides compelling evidence that reported private market returns are indeed smoothed. These results also suggest that private markets are significantly riskier than they appear as measured by volatility (standard deviation of returns). The estimate of PE volatility almost doubles from 9.8% to 17.1% in this period, putting it more in-line with the volatility experienced in public equities. VC volatility is estimated to be an astounding 53.2%. The extremely high first-order autocorrelation coefficient suggests company valuations are slow to adjust and heavily dependent on prior valuations. This makes sense given the difficulty in valuing pre-revenue startups that may not have many (or any) public company comparisons. Real estate returns exhibit the lowest degree of smoothing among the three asset classes, but the estimated volatility still materially increases from 11.8% to 17.0%.

Impact on asset allocation

Several landmark studies have shown that asset allocation is the most important factor in determining the long-term performance of institutional investment portfolios over time.[6,7] Because of its importance, institutional investors place a heavy emphasis on asset allocation modeling, or the process of determining the capital allocation within a portfolio to each investable asset class based on the risk and return expectations of those asset classes. There are typically three key inputs into asset allocation modeling that come from classical modern portfolio theory: expected returns, expected risk, and expected correlations. While return

6: "Determinants of Portfolio Performance," Financial Analysts Journal, Gary P. Brinson, Randolph Hood, Gilbert L. Beebower, 1986
7: "Determinants of Portfolio Performance II," Financial Analysts Journal, Gary P. Brinson, Brian D. Singer, Gilbert L. Beebower, 1991.

Since historical risk and correlations for private market asset classes are biased, investors have struggled to incorporate them into this process. Even worse, investors that fail to make appropriate adjustments to the private market inputs could potentially make misinformed decisions.

expectations are often derived from proprietary forward-looking models, it is normal to use historical risk and correlations as a proxy for future risk and correlations. Since historical risk and correlations for private market asset classes are biased, investors have struggled to incorporate them into this process. Even worse, investors that fail to make appropriate adjustments to the private market inputs could potentially make misinformed decisions.

To illustrate the effect desmoothing returns can have on asset allocation modeling output, we generated two efficient frontiers: one that uses the reported private market returns to estimate risk and correlations, and one that uses desmoothed returns. An efficient frontier represents a series of optimal portfolio allocations that maximize the expected return for a given level of volatility.[8] Both efficient frontiers use the same set of geometric return expectations. In addition to the three private market asset classes discussed earlier, the universe of investable asset classes includes US large cap equity, US small cap equity, non-US large cap equity, US core bonds, and US high-yield bonds. Please see the Appendix for further details about the optimization methodology. The following chart shows the two efficient frontiers with the color of the line representing the optimal allocation to private markets in aggregate as a percentage of the total portfolio.

Efficient frontiers using reported and desmoothed inputs

Source: PitchBook
Note: For illustrative purposes only

There is a dramatic difference in the suggested allocation to private markets for a given level of volatility between the two frontiers. For example, the portfolio with approximately 10% expected volatility has an allocation of 65% in private markets using the reported returns versus only 35% using the desmoothed returns. Additionally, using reported returns as model inputs overestimates the total portfolio return an investor expects to receive at each risk tolerance. The mean expected return for a 10% volatility portfolio using reported returns is 12.6% compared to just 8.9% when using

8: Portfolio optimization is used for illustrative purposes, and a discussion of its merits and limitations are outside of the scope of this note.

desmoothed returns. Failure to appropriately adjust expected volatility and correlation inputs for private market asset classes may lead investors to be materially misinformed about the appropriate allocation to those assets and to a portfolio with a below-target expected return.

Appendix

Mean-variance optimization

We created the efficient frontiers with only minimal constraints to highlight the impact of using desmoothed volatility and correlation estimates. The only two constraints placed on the optimization were that investments must be long-only and all portfolio weights must sum to 100%. The geometric return expectations were set such that the market is in "equilibrium," meaning each asset class has the same return-risk ratio of 0.4 (based on desmoothed volatility). We did this so no asset was arbitrarily favored during the optimization based on its return expectation. A summary of the inputs is shown in the following table.

Summary of inputs for simulation

Asset Class	Index/Source	Expected return (Geometric)	Smoothed volatility	Desmoothed volatility
PE	PitchBook	6.8%	9.8%	17.1%
VC	PitchBook	21.3%	21.2%	53.2%
Real estate	PitchBook	6.8%	11.8%	17.0%
US large cap equity	S&P 500	6.7%	16.8%	16.8%
US small cap equity	Russell 2000	9.0%	22.5%	22.5%
Non-US large cap equity	MSCI World ex US	7.8%	19.5%	19.5%
US core bonds	BBgBarc US Aggregate Bond	1.3%	3.4%	3.4%
US high-yield bonds	BBgBarc US Corporate High Yield	4.1%	10.3%	10.3%

Source: PitchBook
Note: For illustrative purposes only