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A closer look at the diversification potential of private assets

From the Field
March 2024

Key Insights

- A growing number of investors are seeking to enhance return potential and improve diversification by including allocations to private assets in their portfolios.
- We have developed a framework for evaluating private assets alongside publicly traded assets that we think better reflects their risks compared to reported data.
- Our analysis suggests that private assets can be return enhancers in a portfolio. However, their diversification and risk reduction potentials can be overstated.

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Private assets—including private equity, private real estate, and private credit—represent an increasingly large and growing portion of the global investment universe. As their popularity continues to rise, many clients are asking us for our views on the potential benefits of incorporating private assets in diversified portfolios.

Private assets often have unique characteristics that differentiate them from publicly traded investments, creating potential opportunities to improve the overall risk/return profile of a multi-asset portfolio. However, combining public and private assets in a portfolio can present a difficult challenge for portfolio construction—particularly when it comes to modeling the appropriate allocation weights for both categories.

To assist investors in this effort, T. Rowe Price has developed a comprehensive process for evaluating private assets alongside public investments, one that can be used consistently across portfolio construction projects. Using this framework, we analyzed the historical performance of three key private asset categories, taking into account the significant differences between the way private and public asset indexes are constructed, how their returns

are calculated, and how frequently those returns are reported.[1]

Based on this analysis, we examined the impact of incorporating a 20% allocation to private assets in a hypothetical 60/40 U.S. public stock/bond portfolio. We found that while private assets would have improved the portfolio's risk/return profile, the optimal allocations were extremely sensitive to the assumptions used—including the assumed ability of private asset managers to generate positive excess returns. Under these conditions, manager selection becomes an especially critical step in the portfolio construction process.

Comparing private and public assets

Historically, many private asset categories offered attractive return potential, driven by factors such as illiquidity premia, deal-sourcing advantages, and lower market transparency. Reported volatilities in many private asset categories also were lower than for their public market counterparts, and their low reported equity correlations appeared to create attractive diversification opportunities.

However, unlike indexes for public assets—which typically only include investible securities and have transparent guidelines for index construction—private asset indexes represent an aggregation of active manager results (often self-reported), with meaningful dispersion between the highest and lowest performers. This dynamic can make it difficult to separate alpha from beta.

Additionally, reported returns on private assets also are usually cash flow-based (e.g., represent internal rates of return), require appraisals of the underlying investment values (not market prices), and typically are only reported quarterly.

An expanding opportunity set

For many investors, the private asset universe has become too big to ignore. While traditional, publicly traded equity and fixed income assets represented USD 151.5 trillion in global market capitalization at the end of the third quarter of 2023, alternative assets totaled over USD 27 trillion, J.P. Morgan reports.[2]

What's more, the private universe has expanded at a much faster pace, with an annualized growth for global market capitalization of 17.7% for private equity and 16% for private fixed income since 2005 versus just 5.1% for public equity and fixed income.[2]

Smoothed, appraisal-based valuations and a lack of mark-to-market pricing can produce reported performance results that are not comparable with public assets. Some investors welcome this smoothing effect as it reduces apparent maximum drawdowns and can mitigate negative behavioral reactions. However, from a multi-asset perspective, the smoothed results do not accurately represent the actual volatility and correlation characteristics of private investments. We find evidence for this in several places.

- Analysis over longer holding periods washes away the impact of smoothing and increases comparability. Private-equity volatility, for example, was comparable with U.S. large-cap equity over rolling one-year periods and higher over rolling three-year periods (Figure 1).
- Many private investments can be sold on the secondary market, and these transactions may provide market-based prices that are more reflective of their intrinsic value. This can be observed in the discounts to net asset value (NAV) required to sell private investments in secondary markets, particularly in periods of market stress.
- During the 2008 global financial crisis, some private-equity investors were forced to sell assets at up to a 60% discount to NAVs, which for the most part had not been marked down. While this may have been due in part to lower secondary market liquidity, it does suggest that the intrinsic value of these assets was lower than their reported value.

Observed private asset volatility consistently appears artificially low when compared with similar public assets. To directly compare the two, then, we need to adjust reported returns to estimate the "true" risk of private assets. We can do this by taking into account the artificial smoothness of appraisal-based prices. Without such adjustments, private assets will tend to dominate multi-asset portfolios in a traditional mean-variance optimization exercise.

Adjusting risk estimates on private assets

Given that private assets rely on appraisal-based valuations while comparable public assets typically are marked to market daily, price movements for public assets tend to be reflected in private assets but only with a time lag—an impact that can persist over several quarters and that also tends to smooth reported returns.

This tendency can create high levels of autocorrelation in private asset returns, meaning there is a strong positive relationship between the return in the current quarter and the return in the prior

[1] For purposes of this project, we focused on private equity, private credit, and private real estate as asset classes. The private investment universe is broader and includes more subsets, but, typically, our clients are interested in building diversified private asset portfolios that are well represented by these three buckets.

[2] Source: J.P. Morgan, "Alternatives Investments Outlook and Strategy," October 13, 2023.

quarter and a likelihood of a similarly strong relationship in subsequent quarters (Figure 2).

While smoothed returns and lower reported risk can make private assets look highly attractive on first impression, we think it's prudent to adjust for smoothness and autocorrelation to arrive at their "true" risk characteristics—i.e., estimates that are more comparable with public assets. One common technique adjusts each quarter's reported return for a private asset to reflect a weighted average of the "true," unobserved return in that quarter and the return in the prior quarter.[3]

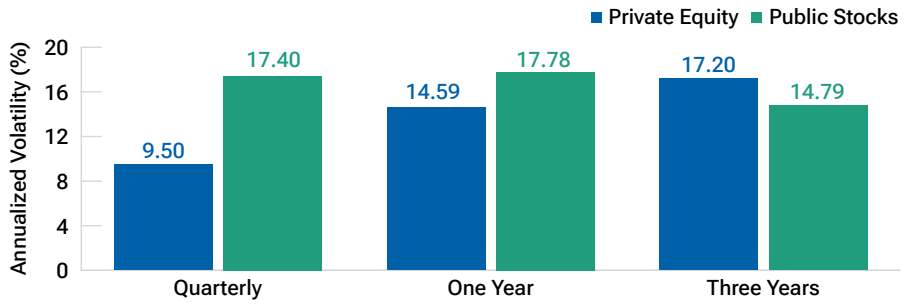
While this technique adjusts for much of the smoothing in reported volatility, we prefer an even more robust approach that unsmooths returns based on optimal lag lengths, rather than a single lagging period. There are several reasons for this.

- Because of the appraisal-based nature of many private asset valuations, the impact of autocorrelation can persist for more than just one quarter. Private real estate indexes, for example, are only required to update property values on an annual basis. This produces an optimal lag length of four quarters for that asset class (Figure 3).
- Other private asset classes also have their own intrinsic characteristics and therefore different lag structures, which we think should be taken into account.
- By unsmoothing private asset return data with our more targeted approach, we think we can obtain more accurate measures of true economic risk. Once we do this, we typically find that the volatility of private assets is roughly comparable with their public asset counterparts (Figure 4).

[3] Among asset allocation analysts, this method is known as 1-lag autoregressive model, or AR(1), unsmoothing.

Measurement over longer periods can reveal higher volatility

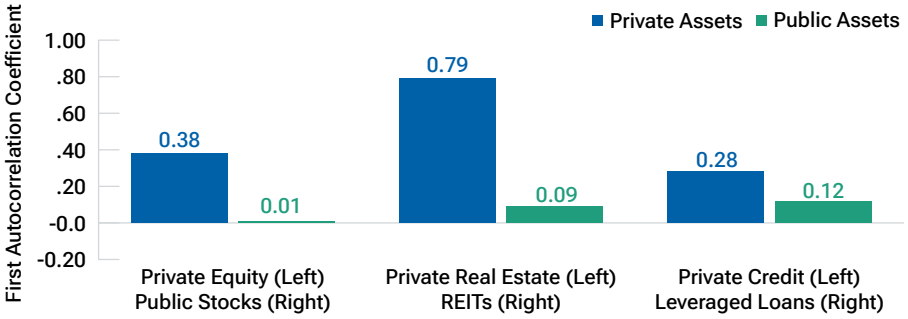
(Fig. 1) Annualized volatility by rolling holding period



June 2005 through June 2023.
Sources: Cambridge Associates LLC, Standard & Poor's (see Additional Disclosures). All data analysis by T. Rowe Price. See the appendix for a list of representative benchmarks for the asset classes shown.

Autocorrelation tended to smooth private asset returns

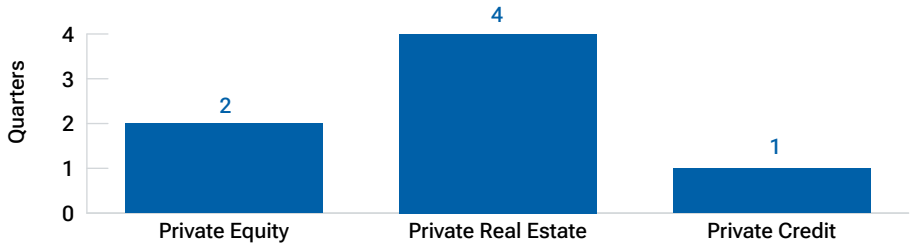
(Fig. 2) Average correlation between returns in consecutive quarters



June 2005 through June 2023.
Past performance is not a reliable indicator of future performance.
Sources: Cambridge Associates LLC, Standard & Poor's, National Council of Real Estate Investment Fiduciaries (NCREIF), Wilshire Associates, Cliffwater LLC, Morningstar (see Additional Disclosures). All data analysis by T. Rowe Price. See the appendix for a list of representative benchmarks for the asset classes shown.

Autocorrelation effects may persist over multiple quarters

(Fig. 3) Optimal lag periods for different private assets*



June 2005 through June 2023.
Sources: Cambridge Associates LLC, NCREIF, Cliffwater LLC (see Additional Disclosures). All data analysis by T. Rowe Price. See the appendix for a list of representative benchmarks for the asset classes shown.
*Optimal lag period defined as the number of quarters beyond which the autocorrelation coefficient drops below a 95% confidence interval, using partial autocorrelation.

Unsmoothing revealed risk characteristics comparable with public assets

(Fig. 4) Reported and adjusted annualized volatilities and public equity correlations

Asset Class	Reported Total Return	Reported Volatility	Adjusted Volatility	Reported Correlation to Public Stocks	Adjusted Correlation to Public Stocks	Reported CVaR (95%)†	Adjusted CVaR (95%)†
Private Equity	14.6%	9.5%	16.3%	0.8	0.8	-10.3%	-20.0%
Private Real Estate	7.7	5.3	17.8	0.1	0.4	-7.0	-28.1
Private Credit*	9.1	3.6	5.3*	0.7	0.7	-4.3	-6.9

June 2005 through June 2023.

Past performance is not a reliable indicator of future performance.

Sources: Cambridge Associates LLC, NCREIF, Cliffwater LLC (see Additional Disclosures). All data analysis by T. Rowe Price. See the appendix for a list of representative benchmarks for the asset classes shown and additional detail on the methodology for the adjusted results.

*The low unsmoothed volatility for private credit could be explained by the fact that there is no mark-to-market for these assets and private credit funds can restructure loans rather than realize defaults. Even the adjusted volatility may underestimate the true economic risk, in our view. Therefore, we think investors may want to view private credit risk as comparable with the risk for leveraged loans, given the comparability of underlying assets.

† CVaR (conditional value at risk) is the weighted average of the "extreme" losses in the tail of a distribution of returns. 95% CVaR = the weighted loss in the lowest 5% of extreme tail events.

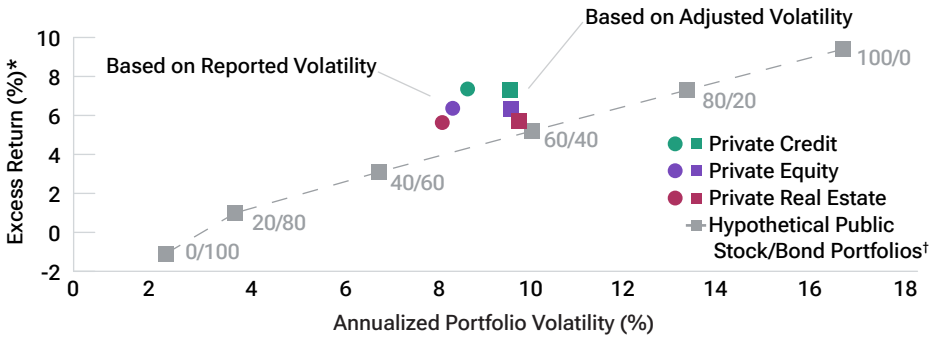
Impact of return unsmoothing

Although our analysis confirmed that incorporating private assets can improve diversification in multi-asset portfolios, those benefits were significantly lower when the reported risk characteristics were unsmoothed.[4] To illustrate this effect, we looked at the impact of adding a 20% allocation to three private asset classes—private equity, private credit, and private real estate—to a hypothetical 60/40 U.S. public stock/bond portfolio. Based on the historical performances of the asset classes involved, we then estimated risk and return outcomes for the hypothetical combined public/private portfolios, using as inputs both reported private asset volatilities and our own unsmoothed adjustments.[5]

Figure 5 illustrates the impact on hypothetical portfolio performance. The line represents the optimal risk and return frontier for a set of hypothetical portfolios

Unsmoothing risk significantly reduced diversification benefits

(Fig. 5) Performance of a hypothetical 20% private asset allocation based on reported and adjusted volatility



June 2005 through June 2023.

Sources: Bloomberg Finance L.P., Standard & Poor's, Cambridge Associates LLC, Cliffwater LLC, NCREIF (see Additional Disclosures). All data analysis by T. Rowe Price. See the appendix for a list of representative benchmarks for the asset classes shown.

*Excess return relative to the yield on 90-day U.S. Treasury bills.

† Dashed line shows the efficient frontier for hypothetical portfolios with varying allocations to public stocks and bonds. The efficient frontier marks the highest return that can be achieved for a given level of volatility (or, conversely, the lowest level of volatility that can be achieved for a given return) with the combination of assets in a portfolio.

The information shows hypothetical results, which are shown for illustrative purposes only and are not indicative of realized past or future performance. Actual investment results may differ significantly. As the hypothetical portfolios are based on the performances of market indexes as described, performance does not incorporate fees, expenses, or any other costs associated with an actual investment. See the appendix for additional details on the study methodology and for important information regarding hypothetical performance.

[4] Our analysis was based on historical returns from June 2005 through June 2023. Since returns on private assets typically are reported quarterly, performance metrics for both public and private assets were calculated quarterly and then annualized to make them comparable.

[5] The 20% private-equity allocation was assumed to be funded entirely from the public stock component of the 60/40 hypothetical portfolio. The 20% private credit and 20% private real estate allocations were assumed to be funded on a pro-rated basis from both the public stock and public bond components. See the appendix for the actual allocation weights in the hypothetical portfolios and a list of the benchmarks used to represent the various asset classes. Hypothetical portfolio weights were rebalanced quarterly over the period studied.

Hypothetical portfolio outcomes using reported and adjusted volatilities

(Fig. 6) Annualized risk and return results from adding a 20% allocation to private assets

Hypothetical Portfolios	Excess Return	Reported Volatility	Adjusted Volatility	Reported Sharpe Ratio	Adjusted Sharpe Ratio	Reported CVaR (95%)	Adjusted CVaR (95%)
Base 60/40 Public Stock/Bond	5.20%	9.77%	9.77%	0.53	0.53	-11.70%	-11.70%
With 20% Private Equity	6.00	8.12	9.49	0.74	0.63	-9.70	-11.70
With 20% Private Real Estate	5.40	7.99	9.70	0.68	0.56	-9.60	-13.10
With 20% Private Credit	5.70	8.33	9.48	0.69	0.60	-10.00	-10.50

June 2005 through June 2023.
Sources: Bloomberg Finance L.P., Standard & Poor's, Cambridge Associates LLC, Cliffwater LLC, NCREIF (see Additional Disclosures). All data analysis by T. Rowe Price. See appendix for a list of representative benchmarks for the asset classes shown.
*Excess return relative to the yield on 90-day U.S. Treasury bills.
The information shows hypothetical results, which are shown for illustrative purposes only and are not indicative of realized past or future performance. Actual investment results may differ significantly. As the hypothetical portfolios are based on the performances of market indexes as described, performance does not incorporate fees, expenses, or any other costs associated with an actual investment. See the appendix for additional details on the study methodology and for important information regarding hypothetical performance.

with differing public equity/public fixed income weights. The dots each show the results of adding a 20% allocation to each private asset class to the 60/40 hypothetical portfolio.

Based on reported volatility, inclusion of private assets appeared to meaningfully reduce overall risk in our hypothetical portfolios. All three private asset classes moved the risk/return trade-off toward the upper left-hand corner of the chart—a clear improvement in portfolio efficiency, as measured by the Sharpe ratio.

However, when we replaced the reported volatilities with our unsmoothed estimates, the diversification benefits were reduced. This was largely due to the higher volatilities and equity correlations that unsmoothing revealed for both private equity and private real estate.

These key portfolio metrics are summarized in the table in Figure 6.

Sensitivity analysis

As discussed above, we believe that incorporating private assets in multi-asset portfolios can enhance diversification and improve both absolute and risk-adjusted return potential—provided that the private asset managers employed are skilled enough to take advantage of that potential.

The required return that the manager of a private asset strategy would need to generate to justify inclusion in a multi-asset portfolio depends on the strategy's expected risk (higher volatility implies a higher required return) and its correlation to equities (higher correlation also implies a higher required return).

Figure 7 illustrates our estimates of the returns that were needed for a private asset to improve risk-adjusted results

Hurdle rates for private assets were relatively low in our analysis

(Fig. 7) Excess return* required to improve performance in a hypothetical 60/40 portfolio

Correlation With Public Stocks	Annualized Volatility†			
	8%	12%	16%	20%
0.1	-3.6%	-3.3%	-2.9%	-2.4%
0.3	-3.2	-2.7	-2.2	-1.5
0.5	-2.9	-2.2	-1.5	-0.8
0.7	-2.5	-1.8	-0.9	-0.1
0.9	-2.2	-1.3	-0.4	0.6

Correlation and volatility ranges based on data from June 2005 through June 2023.
For Illustrative purposes only. Does not represent actual results and actual results may have differed materially. Additionally, changing the assumptions could yield different results.
Source: T. Rowe Price. See the appendix for the representative benchmarks for the asset classes shown.
*Excess return relative to the yield on 90-day U.S. Treasury bills plus an assumed equity return premium of 4 percentage points for public stocks over public bonds. This premium is consistent with the returns for Treasury bills, U.S. large-cap stocks, and U.S. aggregate bonds reflected in T. Rowe Price's own capital markets assumptions as of March 2024.
† From June 2005 to June 2023, U.S. public large-cap stocks had a standard deviation of 16.6%, so the private asset was viewed as less risky in the columns with 16% volatility or less, and riskier in the 20% volatility column.

for our hypothetical 60/40 portfolio over the historical period we examined. Not surprisingly, if the expected risk and/or equity correlation was relatively low for a particular private asset strategy, so was the return hurdle needed to justify its inclusion in the hypothetical portfolio, given the potential reduction in overall risk.

For example, if we consider a private asset strategy with 12% expected annualized volatility and a 0.5 correlation to U.S. large-cap equities, the strategy only needed to clear a hurdle rate of return no more than 2.2 percentage points below the total equity return in order to improve risk-adjusted returns in the hypothetical portfolio.

Because even higher-risk private assets can offer at least some diversification benefits as long as their equity correlations are less than one, our analysis found that the rates of return required to justify inclusion in a hypothetical 60/40 portfolio were lower than what skilled managers historically have been able to deliver in the private asset space.[6]

However, we want to stress again that the forward-looking potential for private assets to enhance portfolio diversification is sensitive to the risk and return assumptions incorporated in an optimization analysis. Because the universe of private assets is extremely heterogeneous, the appropriate allocation also can depend heavily on the style and expected performance characteristics of the specific strategies under consideration—not least the active skill of the managers used.

[6] Academic and industry research both have found significant return advantages for private asset managers in top performance quartiles. See Korteweg, Sorensen, 2017, "Skill and luck in private equity performance," *Journal of Financial Economics,* Volume 124, Issue 3), and McKinsey & Company, *McKinsey Global Private Markets Review 2022,* March 2022, Exhibit 6, page 12. On the Web at: McKinsey Global Private Markets Review 2022.

Conclusions

Our analysis suggests that while the diversification benefits of private assets are real, they likely are overstated in asset allocation models that use reported volatility as an optimization input. These results may be artificially smoothed—relative to comparable public asset categories—by the methodologies used to calculate returns and the frequency of reporting.

Even taking into account the impact of return smoothing and autocorrelation, a portfolio optimization exercise narrowly focused on the risk/return trade-off still could include meaningful allocations to private assets—perhaps considerably larger than the 20% weight we used in the hypothetical examples above.

However, in our view, it still would be prudent to constrain such allocations, due to the challenge of identifying and selecting top-tier managers in the space, the potential liquidity considerations (smaller and/or less frequent cash flow requirements might justify higher private asset allocations), and the potential for large drawdowns in times of market stress compared with purely public asset portfolios.

We believe our analytical framework can help investors better approximate the quantitative impacts of allocating to private assets. However, how much to allocate—and to which private asset classes—are both highly specific questions. The answers will vary from investor to investor, depending on their investment objectives, funding sources, and access to top-tier managers.

We remain confident that private assets can enhance diversification in multi-asset portfolios. But investors need to be sure they understand the significant differences between the reported risk characteristics of private assets—based on smoothed returns—and the actual economic benefits that can be delivered by these allocations.

Appendix

Figure A1: Representative indexes

Public Stocks (U.S. Large-Cap)	S&P 500 Index
Public Bonds (U.S.)	Bloomberg U.S. Aggregate Bond Index
Cash	90-Day Treasury Bill
Leveraged Loans	Morningstar LSTA U.S. Leveraged Loan Index
REITs	Wilshire U.S. REITs Index
Private Equity	Cambridge Associates LLC U.S. Private Equity Index
Private Credit	Cliffwater Direct Lending Index
Private Real Estate	NCREIF Property Index

Figure A2: Allocation weights in hypothetical portfolios

	Portfolio Weights				
Hypothetical Portfolios	**Public Stock**	**Public Bond**	**Private Equity**	**Private Real Estate**	**Private Credit**
Base 60/40 Stock/Bond	60%	40%	–	–	–
With 20% Private Equity	40	40	20%	–	–
With 20% Private Real Estate	48	32	–	20%	–
With 20% Private Credit	48	32	–	–	20%

Autocorrelation methodology[7]

The econometric model used in our process for adjusting reported private asset volatility assumes that the observed (i.e., reported) returns can be modeled as a moving average[8] of the recent history of actual[9] but unobserved returns given by the following equation:

$$r_{obs,t} = \sum_{i}^{Q} \omega_j \, r_{t-j}$$

[7] For more details, see Pedersen, N., Page, S., He, F., 2014, "Asset Allocation: Risk Models for Alternative Investments," *Financial Analysts Journal*, 70(3), 2014.
[8] The MA(Q) model assumes that the actual (unobserved) returns are independent and identically distributed random variables.
[9] The returns that would have resulted from a transaction-based pricing process.

Where $r_{obs,t}$ is the observed return, r_t is the unobserved actual return, Q is number of lags and ω_j are weights reflecting the impact of past realized returns on current, observed returns. Further constraints are applied, so that $\sum_i^Q \omega_j = 1$ and $\omega_j > 0$. Thus, a maximum likelihood estimation on observed returns gives an estimate of the ωj and the appropriate number of lags (Q) is selected based on their statistical significance.[10]

Since the returns of any asset may be expressed as a linear combination of risk factor returns: $r_t = \alpha + \sum_i \beta_i f_{i,t} + \epsilon_t$, this can be re-expressed as $r_t = \sum_j^Q \omega_j \alpha + \sum_i^N \beta_i \sum_j^Q \omega_j f_{i,t-j} + \sum_j^Q \omega_j \epsilon_{t-j}$ where N is the number of risk factors. These components are estimated using linear regression and, because the error terms are auto-correlated, Newey-West correction is applied to assess the statistical significance of the coefficients (β_i).

Important information regarding hypothetical results

Hypothetical results: The information provided above reflects data for hypothetical portfolios based on the theoretical blending of the indicated benchmarks. It does not reflect the actual returns of any portfolio or strategy. For the applicable hypothetical portfolios, the assumption of constant benchmark weights has been made for modeling purposes and is unlikely to be realized. Results shown for blended portfolios are hypothetical, do not reflect actual investment results, and are not a guarantee of future results. Hypothetical results were developed with the benefit of hindsight and have inherent limitations. Hypothetical results do not reflect actual trading or the effect of material economic and market factors on the decision-making process. Results are based on recognized broad market indexes and would not reflect fees associated with an actively managed portfolio. Results have been adjusted to reflect the reinvestment of dividends and capital gains. Actual returns may differ significantly from the results shown above. It is not possible to invest in an index. Different time periods would yield different results.

[10] We use the 95% confidence interval to define the optimal lag length.

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