

# POSITIVE STOCK-BOND CORRELATION

## Prospects & Portfolio Construction Implications

March 2024

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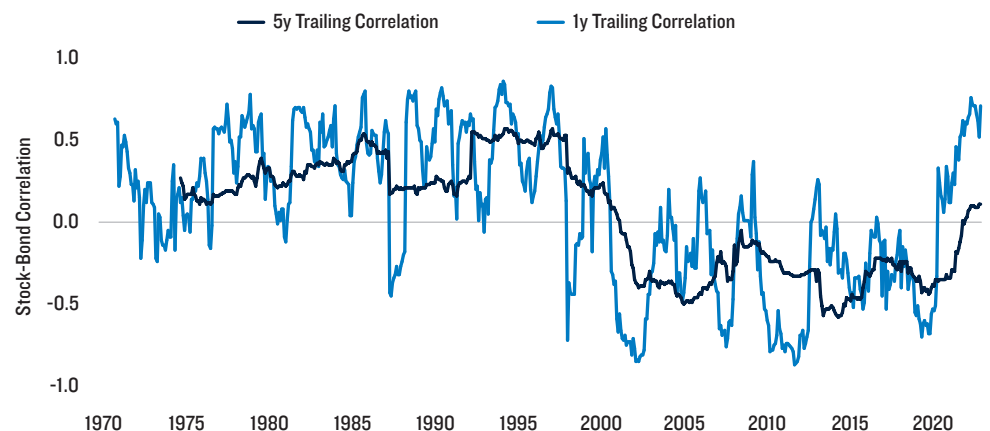
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As part of PGIM IAS’s ongoing research on strategic portfolio construction, we have explored the macro drivers, global linkages, and portfolio construction implications of stock-bond correlation in a series of papers dating back to 2021.

Over this time span, we have seen US stock-bond correlation shift from negative to positive, a change that has also occurred across the developed market complex. Along the way, we have had numerous client conversations about the causes and consequences of this change in correlation regime, focused on what it means for asset allocation.

This paper builds on our previous research and addresses what elements of the current economic landscape we think ought to be top of mind for CIOs, asset allocators and risk managers in assessing prospects for stock-bond correlation. We also review the portfolio construction implications of positive correlation and what current stock and bond valuations may mean for forward performance.

**Figure 1: US Stock-Bond Correlation (1970-2023)**



Note: Trailing 5y & 1y rolling correlations of 1m % change in S&P 500 Total Return Index and 1m % change in US 10y Treasury Constant Maturity Total Return Index. Source: Haver Analytics, Standard & Poor’s, US Treasury and PGIM IAS. For illustrative purposes only.

US stock and bond prices have moved in tandem for more than 2y, declining sharply in 2022 and then rebounding together in 2023. These synchronized moves have pushed stock-bond correlation into positive territory, a clear change in regime after more than 20y of negative correlation (Figure 1).

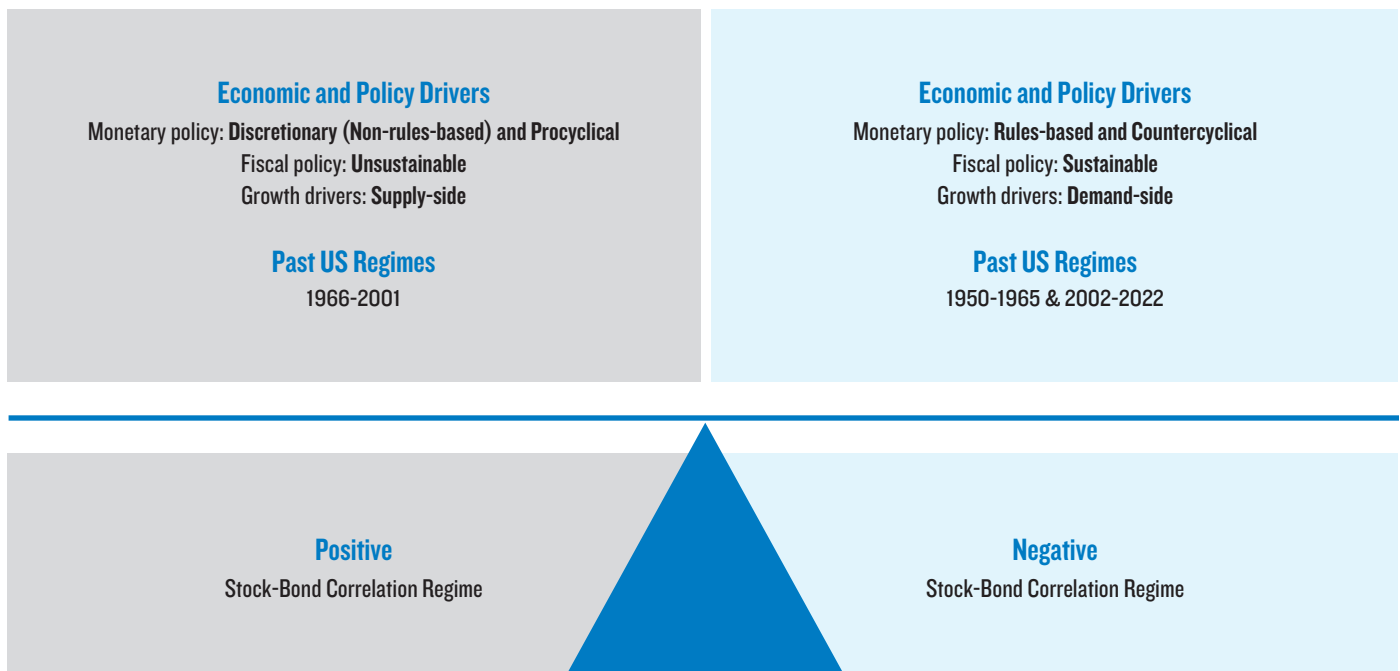
Correlation regimes tend to be long-lived and driven by the prevailing macroeconomic backdrop. Fiscal policy sustainability concerns, monetary policy uncertainty, and the supply-driven nature of recent economic fluctuations have helped push correlation into positive territory. If these forces become entrenched, positive stock-bond correlation could persist, as it did from 1970 to 2001.

A sustained positive stock-bond correlation regime would be a new investing environment for many market participants. Given the unfamiliar landscape and claims to the contrary, it is worth emphasizing that even when correlation is positive and bonds no longer hedge equity risk, *the optimal allocation to bonds remains little changed, with bonds continuing to play a critical role in the construction of a balanced portfolio*. Indeed, over the last 50y, a balanced portfolio of stocks and bonds has performed about as well in positive correlation environments as in negative ones. Moreover, the current narrow valuation gap between stocks and bonds is consistent with future bond risk-adjusted outperformance relative to stocks, underscoring the importance of bonds in a balanced portfolio.<sup>1</sup>

## Economic Environment Supportive of a Positive Stock-Bond Correlation Regime

As we have explored in previous work, both in the US and also in other developed markets, the economic conditions that support positive stock-bond correlation include: (1) fiscal sustainability concerns, (2) discretionary and procyclical monetary policy (*i.e.*, the Fed eases (tightens) to increase (slow) growth and inflation), (3) supply-side drivers of economic activity and (4) interest rate uncertainty (Figure 2). Currently, these forces all seem to be in play (in varying degrees) and could potentially support a sustained period of positive stock-bond correlation.

**Figure 2: Economic and Policy Drivers of US Stock-Bond Correlation**



Source: *US Stock-Bond Correlation: What Are the Macroeconomic Drivers?* PGIM IAS, May 2021. For illustrative purposes only.

1 See *Higher Bond Yields & the Fed Model – Implications for Future Stock-Bond Relative Returns*, PGIM IAS, November 2023.

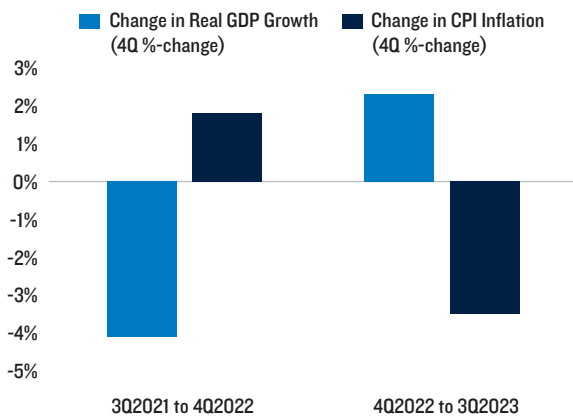
# 1. Supply-side Drivers of Economic Activity

- Supply shocks support positive stock-bond correlation.** “Supply shocks,” either positive or negative, push inflation and economic growth in *opposite directions* and, by extension, push stocks and bonds in the *same direction* which leads to *positive* stock-bond correlation. A negative supply shock causes higher inflation which means higher interest rates and *lower bond prices* – and lower growth which means *lower stock prices*. A positive supply shock does the opposite, lowering inflation and raising growth, leading to lower interest rates, *higher bond prices* and *higher stock prices*. Over the last few years, we have observed this pattern. Inflation and growth have moved in opposite directions (Figure 3), evidence that changes in aggregate supply have been driving the US economy and pushing US stock-bond correlation into positive territory.
- Supply chain pressures have first intensified and then relaxed.** Supply-side shifts – first negative, then positive – have largely driven inflation over the last several years supporting positive stock-bond correlation. Global supply chain disruptions in 2022 were a *negative* “supply shock,” boosting inflation (Figure 4), slowing growth, and dampening both stock and bond prices. The subsequent easing of those bottlenecks has been a *positive* “supply shock;” inflation has cooled, growth has picked up and stocks and bonds have rebounded together.
- Fiscal policy and productivity.** An increase in productivity that makes room for faster economic growth without causing price pressures is another type of favorable supply shock that supports positive stock-bond correlation. Recent fiscal policy initiatives (*e.g.*, the Infrastructure Investment and Jobs Act, the Inflation Reduction Act, and the CHIPS and Science Act) are aimed at increasing the US capital stock and its productive capacity. These programs are gaining traction, with manufacturing construction spending more-than doubling since 2021 which should, arguably, help improve economy-wide productivity, leading to stronger economic growth without stoking inflation. This would be yet another *favorable* “supply shock” that supports positive stock-bond correlation. Although it is still too early to decisively determine if this is, indeed, so, productivity jumped in 2H2023 amid speculation that AI and other technologies could support further productivity gains.

## Keys to the Forward Outlook for Correlation:

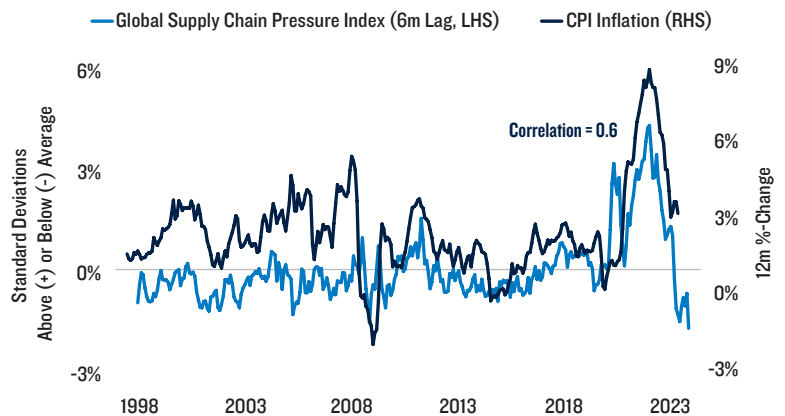
Supply-side developments have, in large part, driven inflation dynamics for the last several years. The waxing and waning of global supply chain pressures helped to push correlation into positive territory but the impact of supply chain issues may fade as more typical business cycle dynamics prevail going forward. That said, supply shocks – owing to geopolitical risks, say, and running through energy markets – ought to remain on the radar screen as a potential driver of positive stock-bond correlation. In addition, the recent uptick in productivity and prospects for new technologies to extend that trend would boost GDP growth, keep inflationary pressures at bay, and support positive stock-bond correlation as well.

**Figure 3: Real GDP Growth and CPI Inflation (3Q2021-3Q2023)**



Source: Bureau of Economic Analysis, Bureau of Labor Statistics, Haver Analytics and PGIM IAS. For illustrative purposes only.

**Figure 4: Lagged Global Supply Chain Pressure Index and CPI Inflation (1998-2023)**



Note: The Global Supply Chain Pressure Index tracks the state of global supply chains. Source: Bureau of Labor Statistics, Haver Analytics, Federal Reserve Bank of New York Applied Macroeconomics and Econometrics Center (AMEC) and PGIM IAS. For illustrative purposes only.

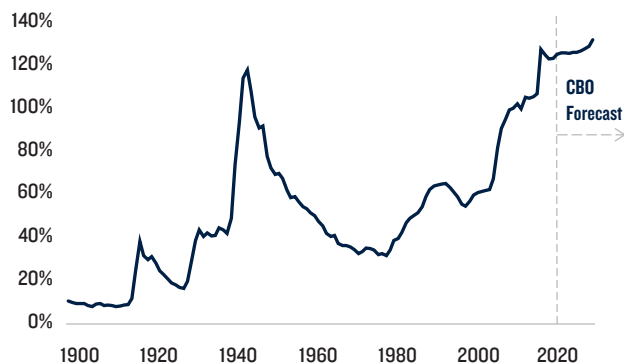
## 2. Fiscal Sustainability Concerns

- Fiscal risks and positive stock-bond correlation.** There is a link between fiscal worries and stock-bond correlation. Fiscal sustainability worries lead to the perception that government debt is riskier, pushing up interest rates which, in turn, slows economic growth. Higher interest rates and slower growth translate into lower bond prices, lower stock prices, and positive stock-bond correlation.
- US debt levels continue to climb.** While recent fiscal spending may boost near-term growth and future productivity (as discussed above), it has also pushed public debt to more than 120% of GDP and put it on a path to rise above 130% in the coming decade (Figure 5). For now, sustainability concerns are contained as the average interest rate on US debt (defined as net interest payments as a percentage of net debt) stands at about 2.5% (according to the CBO), which is still below nominal GDP growth (which continues to run above 6%). The gap between the average interest rate on debt and economic growth, denoted “ $r-g$ ,” is a marker of a country’s ability to grow its way out of debt. For now, growth is outpacing interest rates,  $r-g$  is still negative, and sustainability worries are contained (Figure 6). But this gap is expected to narrow, which could intensify sustainability concerns especially if growth slows more than expected due to, say, a recession. This could fuel a self-fulfilling feedback loop of fiscal worry – pushing interest rates up, slowing growth further, narrowing the  $r-g$  gap, leading to even more intense fiscal worries and so on.

### Keys to the Forward Outlook for Correlation:

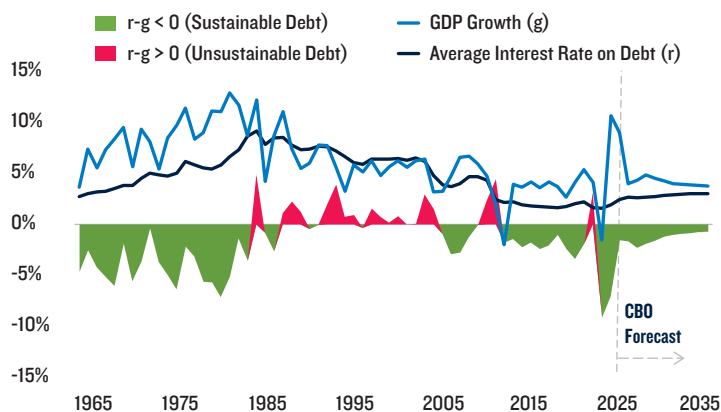
Fiscal sustainability concerns tend to put upward pressure on interest rates and downward pressure on economic growth, which translates into positive stock-bond correlation. Despite a long post-COVID expansion, US debt-to-GDP is elevated and is poised to continue its climb. Given the current political climate, there seems to be little will to address these issues in the near term, with fiscal worries likely to extend and continue to provide support for positive stock-bond correlation. It has been several decades since investors have had to put US fiscal policy near the top of their list of concerns – perhaps not since the early Reagan years. But that seems to be the current direction of travel, with the UK’s recent experience a cautionary tale of how rapidly such worries can intensify.

**Figure 5: US Debt-to-GDP Ratio (Actual and Projected, 1900-2033)**



Source: CBO, Haver Analytics, Office of Management and Budget, US Treasury and PGIM IAS. For illustrative purposes only.

**Figure 6: Average Interest Rate on US Debt, Nominal GDP Growth and the “ $r-g$ ” Gap (Actual and Projected, 1962-2033)**



Note: The average interest rate is government interest expense as a percent of debt. Source: CBO, Nominal US Debt to GDP Ratio and PGIM IAS. For illustrative purposes only.

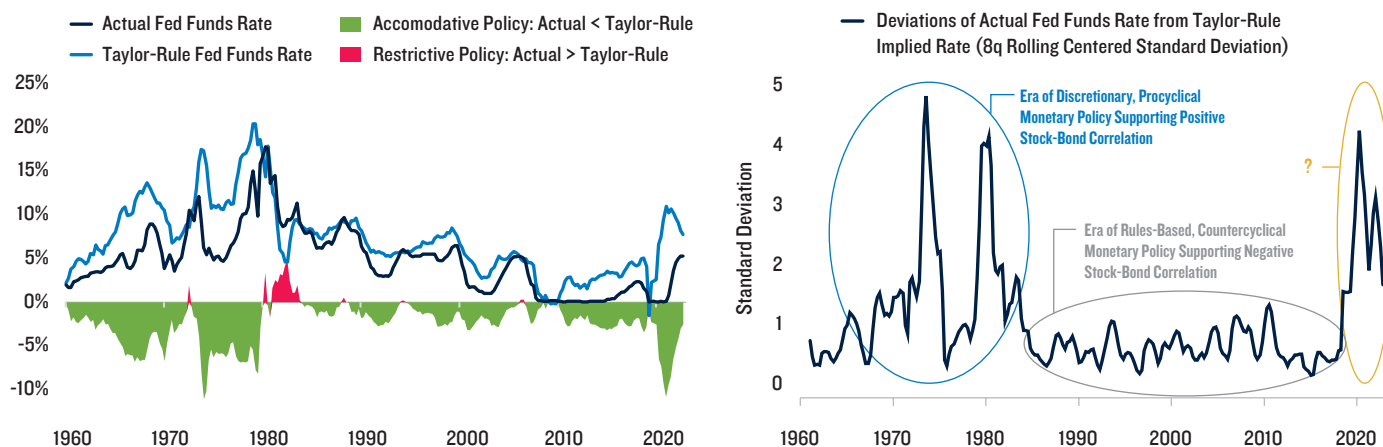
### 3. Discretionary Fed Policymaking and Positive Correlation

- **The 1970s: Discretionary monetary policy and positive stock-bond correlation.** Positive stock-bond correlation can also be linked to the *discretionary* nature of monetary policy in the 1970s and early 1980s. Fed policy decisions of that era were not systematically related to economic growth and inflation and often surprised the markets. Rate hikes tended to lower growth, pushing bond prices and stock prices down together, and rate cuts tended to boost growth, pushing bond prices and stock prices up together, in both cases supporting positive stock-bond correlation.
- **Discretionary policy vs. rules-based policy.** To illustrate the discretionary nature of monetary policy, we compare the *actual* fed funds rates to counterfactual *rules-based* rates, which is what fed funds rates would be if they were simply a (positive) function of economic growth and inflation (Figure 7, left panel). In the early 1970s, actual Fed policy rates were more accommodative than what rules-based policy rates would have been; indeed, histories of that time suggest that the Fed was not fully committed to ending inflation and often chose to relax policy when fighting inflation became too (politically and economically) costly. This changed with the ascension of Chairman Paul Volcker in the late 1970s. To quash inflation, establish credibility, and as a corrective to a decade of easy money, Fed policy remained discretionary but now by being overly *restrictive* relative to rules-based rates.
- **Twenty years of rules-based policy and negative correlation.** Beginning in the late 1990s, monetary policy settled into a *rules-based* regime. Monetary policy makers seem to have been reacting almost algorithmically to economic conditions – raising rates when the economy was heating up (pushing bond prices down as stocks were going up) and cutting rates when the economy was cooling (pushing bond prices up as stock prices were falling), leading to negative stock-bond correlation. This shift is plain to see when looking at *deviations* of actual policy rates from rules-based rates, which were elevated in the 1970s and 1980s and then shifted sharply lower as monetary policy transitioned from a discretionary regime to a rules-based regime (Figure 7, right panel).
- **Policy has turned discretionary and seemingly accommodative again (despite rate hikes).** Discretionary monetary policy, with its potential to be too accommodative or too restrictive, can lend support to positive stock-bond correlation. Over the last 2+ years, actual fed funds rates have once again deviated from rules-based rates, evidence that monetary policy has turned more discretionary and arguably, more accommodative (despite the sharpest hiking cycle on record). A sustained shift toward the accommodative and discretionary monetary policy of the 1970s ought to be on CIOs’ radar screens and would support positive stock-bond correlation.

#### Keys to the Forward Outlook for Correlation:

Despite a sharp hiking cycle, economic growth and the labor market remain robust. As such, when compared to rules-based measures of Fed policy, actual fed funds rates appear accommodative. Moreover, over the last several years, actual policy rates have deviated significantly from rules-based rates in a way that is reminiscent of the discretionary monetary policy environment of the 1970s – an era of entrenched positive correlation. Looking ahead, elevated debt levels and a growing interest expense burden may constrain Fed independence and reinforce discretionary policy making, which would, in our estimation, continue to support positive stock-bond correlation.

Figure 7: Actual vs. Taylor-Rule Implied Fed Funds Rate: Levels and Deviations (1960-2023)



Note: The Taylor-rule implied fed funds rate is the appropriate fed funds rate as determined by the output gap and deviations of inflation from trend, assuming a 2% inflation target, 2% potential real GDP growth and realized core PCE inflation. This implies that for every 1% rise in inflation or in the output gap the fed funds rate should increase 0.5%. Source: Bureau of Economic Analysis, Federal Reserve Board, Haver Analytics and PGIM IAS. For illustrative purposes only.

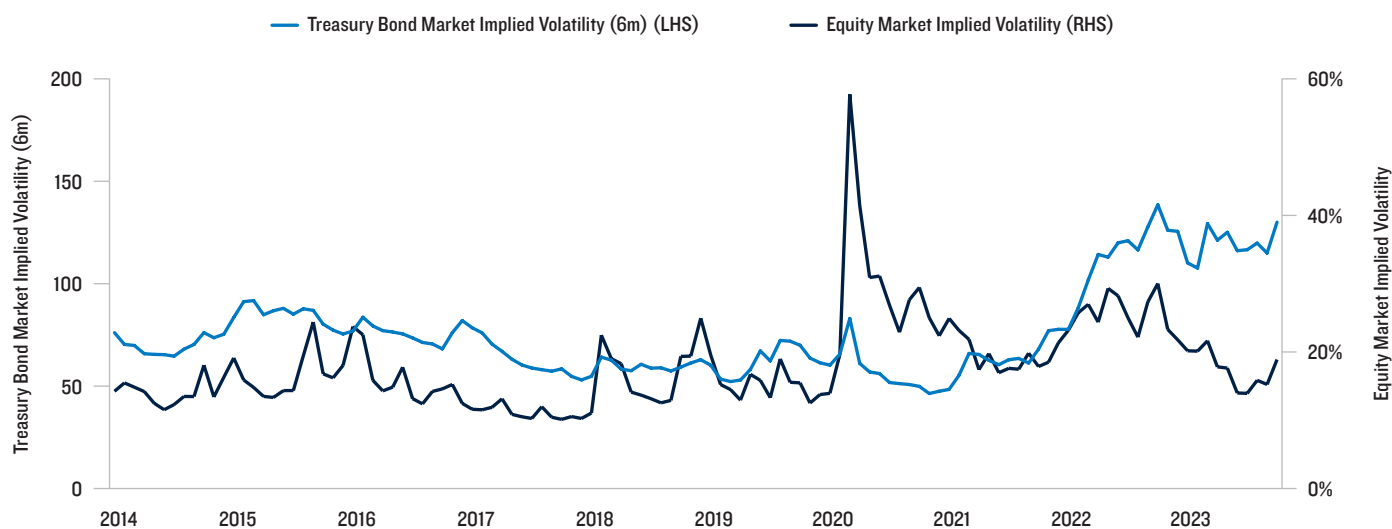
## 4. Fiscal and Monetary Policy Concerns Boost Interest Rate Uncertainty

Owing in part to fiscal sustainability concerns and a shift in monetary policy regime (as discussed above), rate market volatility is back at post-GFC highs, in stark contrast to equity market volatility which is back to pre-COVID lows (Figure 8). Apart from confirming that current fiscal and monetary policy settings are making investors jittery, elevated rate volatility can contribute to the shift in stock-bond correlation from negative to positive.<sup>2</sup> We estimate that increased interest rate volatility has added about 0.05 points to the 0.31-point increase in stock-bond correlation (which currently stands at +0.06, up from -0.25 in 3Q2021).

### Keys to the Forward Outlook for Correlation:

The current conduct of fiscal and monetary policy has led to an increase in interest rate uncertainty, pushing rate volatility to multi-year highs (in contrast to other measures of uncertainty). To the extent that fiscal sustainability and Fed independence and discretionary policymaking remain on the minds of investors, interest rate uncertainty may remain elevated too. This has direct implications for stock-bond correlation as short-term interest rate volatility is an input into our models of stock-bond correlation. Indeed, elevated interest rate volatility is responsible for a good deal of the uptick in stock-bond correlation and its shift from negative to positive.

**Figure 8: Implied Equity Market and Treasury Market Volatility (2014-2023)**



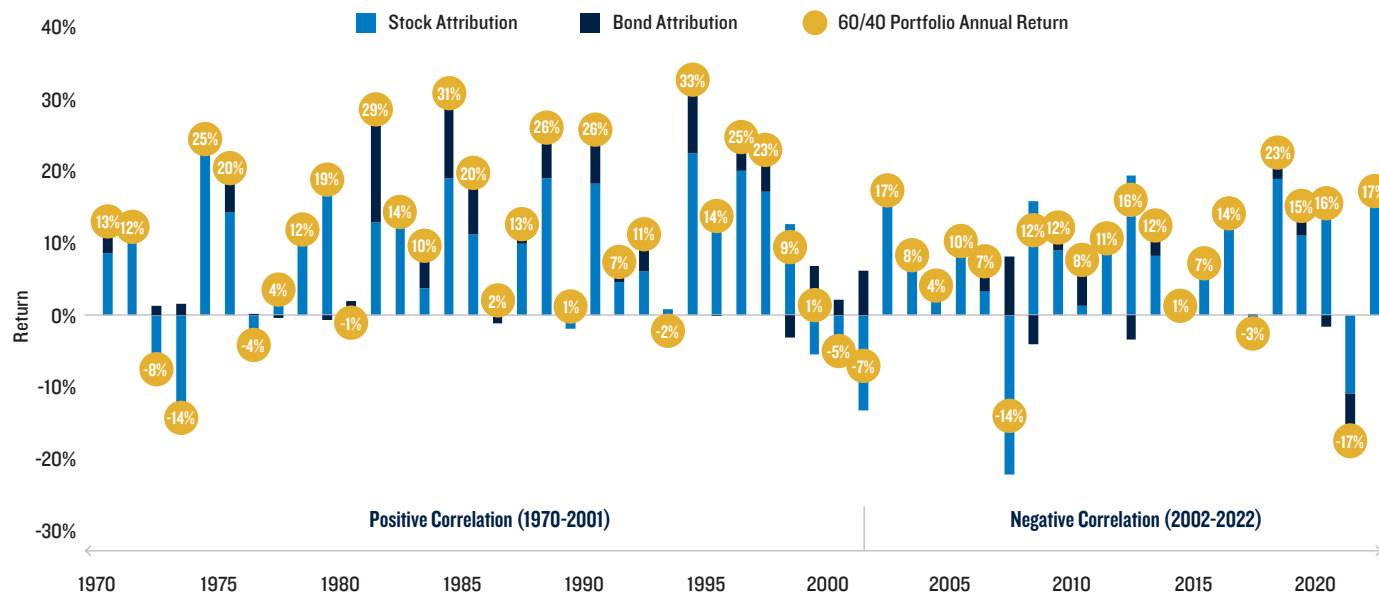
Note: Equity market volatility is the CBOE Equity Market Implied Volatility Index (i.e., VIX Index). Treasury market volatility is the Bank of America Merrill Lynch Treasury Bond Implied 6m Option Volatility Index (i.e., MOVE Index). Source: CBOE, Bank of America Merrill Lynch, Haver Analytics and PGIM IAS. For illustrative purposes only.

<sup>2</sup> See *Stock-Bond Correlation: A Global Perspective*, PGIM IAS, June 2022.

## Portfolio Implications of Persistent Positive Correlation

The venerable 60/40 portfolio had a record bad year in 2022, falling 17% as correlation turned positive; stocks fell 18% and bonds fell 16% (Figure 9). While painful, it is important not to learn the wrong lessons from that *annus horribilis*. We cannot emphasize enough that positive correlation, in and of itself, did not *cause* dismal portfolio performance – indeed, 2023 was a strong year for the 60/40 portfolio *despite* the prevailing positive correlation regime. Both history and theory point to the enduring value of a balanced portfolio regardless of correlation regime, with little to suggest that periods of positive stock-bond correlation are particularly challenging for multi-asset investing.

Figure 9: 60/40 Portfolio Annual Return, with Attribution to Stocks and Bonds (1970-2023)

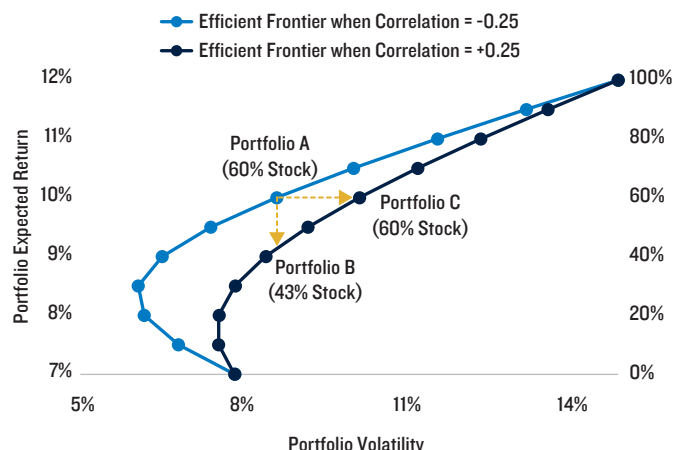


Note: Annual %-change in end-of-period S&P 500 Total Return Index, annual %-change in end-of-period US 10y Treasury Constant Maturity Total Return Index and annual %-change in costlessly, annually rebalanced 60/40 portfolio of stocks (S&P 500 Total Return Index) and bonds (US 10y Treasury Constant Maturity Total Return Index). Source: Haver Analytics, Standard & Poor's, US Treasury and PGIM IAS. For illustrative purposes only.

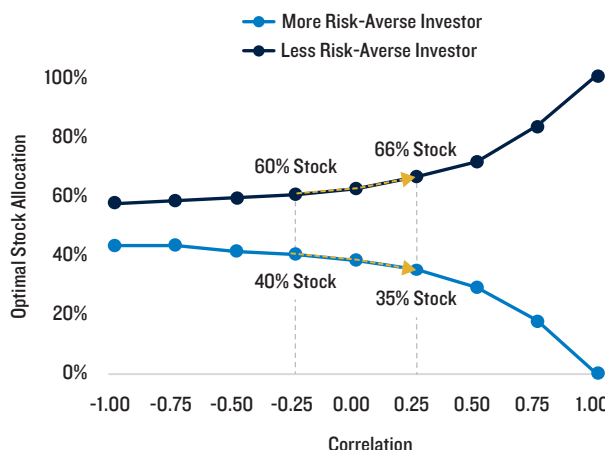
In that context, we would remind investors of the following:

1. **Positive correlation changes the efficient frontier, shifting it inward ...** A change in correlation from negative to positive (*keeping all other capital market assumptions fixed*) shifts the efficient frontier inward, making some risk-reward pairs unattainable (Figure 10). Investors face the choice of maintaining their return target but with more volatility, maintaining their volatility target but with lower expected returns, or something in between. Assuming no change in allocation (*and no change in other capital market assumptions*), when correlation is positive: portfolio volatility increases, risk-adjusted returns decline, the dispersion of terminal wealth increases, and portfolio drawdowns are deeper.
2. **...but of course, both stocks and bonds still belong in a balanced portfolio, without much change in optimal weight.** As long as stocks and bonds are not *perfectly* correlated, both belong in an investor's diversified portfolio. But with what weights? The optimal allocation to stocks and bonds changes very little in response to a shift in correlation from negative to positive (Figure 11, assuming mean-variance optimization and that only correlation changes but not any other capital market assumptions). A risk averse investor, say one for whom a 40/60 portfolio is optimal when correlation is negative, will *reduce* their allocation to stocks when correlation turns positive, de-risking the overall portfolio which is now more volatile. However, a less risk-averse investor, say one for whom the traditional 60/40 portfolio is optimal when correlation is negative, will *increase* their exposure to stocks when correlation turns positive. The increase in (the portfolio's) expected return due to a higher allocation to stocks is large enough and the increase in portfolio volatility due to a change in correlation is small enough that the incremental "reward" for owning a bit more stock offsets the incremental "risk" from the shift to positive correlation. But above and beyond the specifics, optimal asset weights do not react dramatically to positive correlation, changing by about 5 percentage points in response to a change in correlation from, say, -0.25 to +0.25 (which is from the bottom end of the 1970-2023 range to the top).

**Figure 10: Efficient Frontier, Stock-Bond Correlation, and the Risk-Reward Tradeoff**



**Figure 11: Optimal Stock Allocation as a Function of Assumed Stock-Bond Correlation**



Note: The efficient frontier is the set of portfolios that offer the highest return for a level of risk or the lowest risk for a level of return. Capital market assumptions are based on the 1970-2022 (annualized) mean and volatility of 1m %-changes in the S&P 500 Total Return Index (12% and 15%, respectively) and in the US 10y Treasury Constant Maturity Total Return Index (7% and 8%, respectively). Negative correlation is assumed to be -0.25 and positive correlation is assumed to be +0.25. Portfolio weights are determined by mean-variance optimization, with a risk aversion coefficient of 12 for the more risk-averse investor and 5.3 for the less risk-averse investor. Source: Haver Analytics, Standard & Poor's, US Treasury and PGIM IAS. For illustrative purposes only.

3. **Bonds still provide a tail hedge to steep stock declines.** Positive correlation between stock and bond returns means that when one asset class experiences above (below) average returns it is likely – depending on the strength of the correlation – that the other asset class will as well. Positive correlation does not imply that both asset classes will experience simultaneous declines, despite the 2022 experience (Figure 12). In fact, over the last 50y and *when correlation is positive*:

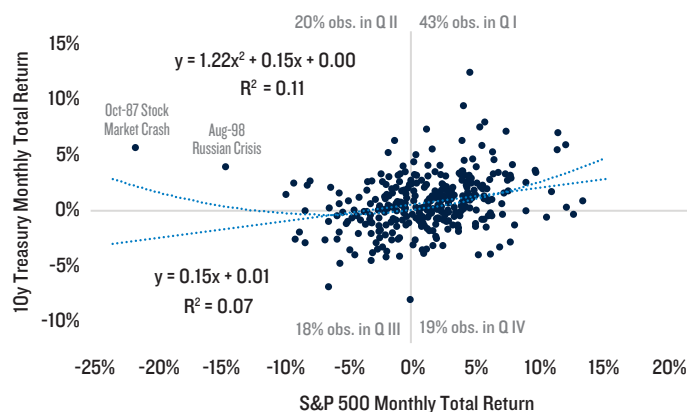
- Stocks and bonds are far more likely to climb in tandem on a 12m basis (67% of the time) than to decline in tandem (3% of the time).
- Stocks and bonds still frequently hedge each other. Their returns have opposite signs 30% of the time (*i.e.*, 13% + 17%, as shown in Figure 12).
- When stocks do decline, bonds tend to go up far more frequently (*i.e.*, 85% of the time = 17% ÷ (17%+3%)) than down. This 85% figure is about the same regardless of correlation regime!
- Even when correlation was positive, during extreme equity declines, like Black Monday (1987) and the Russian Crisis (1998), bonds rallied, asserting their tail-hedging characteristics, irrespective of correlation regime (Figure 13).

**Figure 12: Sign of Stock and Bond Returns by Correlation Regime (1970-2023)**

Stock & Bond Return Signs	Positive Regime	Negative Regime	All
Stock Return>0, Bond Return>0	67%	53%	60%
Stock Return>0, Bond Return<0	13%	26%	19%
Stock Return<0, Bond Return>0	17%	18%	17%
Stock Return<0, Bond Return<0	3%	4%	3%

Note: Stock return is trailing 12m %-change in S&P 500 Total Return Index; bond return is trailing 12m %-change in US 10y Treasury Constant Maturity Total Return Index. Source: Haver Analytics, Standard & Poor's, US Treasury and PGIM IAS. For illustrative purposes only.

**Figure 13: Stock Returns vs. Bond Returns when Correlation is Positive (1970-2001)**



Note: Correlation regime determined by the sign of trailing, rolling 5y correlation between 1m stock and bond returns. Source: Haver Analytics, Standard & Poor's, US Treasury and PGIM IAS. For illustrative purposes only.



4. **Over the last 50y, 60/40 portfolio returns are higher when correlation is positive...** *Historically*, looking back over the last 50y, stock and bond returns change when correlation regimes change – but perhaps in surprising ways, especially considering the unusual 2022 experience. Average stock and bond returns are *higher when correlation is positive* vs. when correlation is negative (on both a real and nominal basis, Figure 14).<sup>3</sup> Consequently, 60/40 portfolio returns have been higher in positive correlation regimes.
5. **...but risk-adjusted returns have been a bit worse, owing to higher risk-free rates and positive correlation.** On a *risk-adjusted basis*, the 60/40 portfolio's performance has been a bit worse when correlation has been positive. Despite higher average returns, the 60/40 portfolio's Sharpe ratio declines from 0.6 in negative correlation regimes to 0.4 in positive regimes. This is due to two factors. First, average *excess* stock and bond returns (*i.e.*, relative to 3m LIBOR) are a bit worse when correlation is positive than when it is negative, lowering the average excess return of the 60/40 portfolio to 4.1% (from 5.4% when correlation is negative). Second, *portfolio* volatility is higher when correlation is positive *vs.* when correlation negative (10.8% *vs.* 8.9%). Although stock and bond volatilities are about the same regardless of correlation regime, the 2 percentage point increase in *portfolio* volatility is due to the loss of the volatility-reducing *automatic* hedge when correlation switched from negative to positive.
6. **Currently, the valuation gap between stocks and bonds also argues for keeping bonds in the portfolio.** The recent increase in bond yields relative to post-COVID lows has narrowed the valuation gap between stocks and bonds – measured as the difference between the cyclically adjusted S&P 500 earnings yield and the real 10y Treasury yield (*i.e.*, the “Fed Model”, Figure 15). The current valuation gap (1.1% as of September 2023) has, in the past, been associated with bonds outperforming stocks in terms of long-term future *risk-adjusted* returns regardless of the correlation regime (Figure 16). From a portfolio construction perspective, expectations that bonds may outperform stocks on a risk-adjusted basis in the long-term – given the *current* valuation gap – serve to strengthen the argument that bonds are likely to continue to play an important role in a balanced portfolio.<sup>4</sup>

**Figure 14: Annualized Stock, Bond and 60/40 Portfolio Performance by Correlation Regime (1970-2022)**

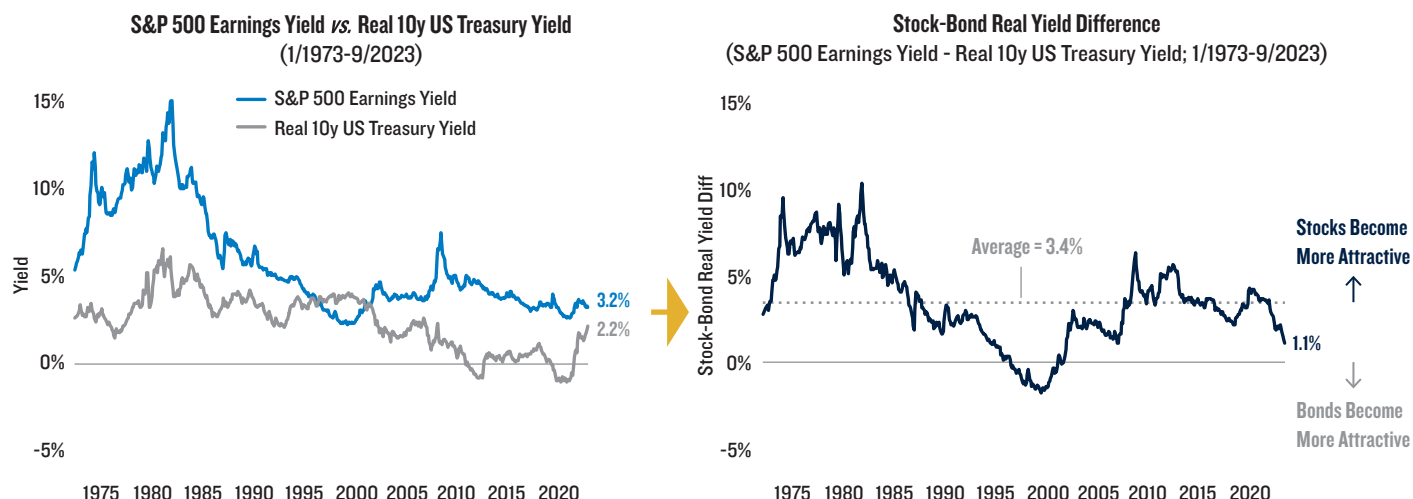
Return Type	Asset	Stocks		Bonds		60/40 Portfolio	
	Correlation Regime	Positive (1/1970-12/2001)	Negative (1/2002-12/2022)	Positive (1/1970-12/2001)	Negative (1/2002-12/2022)	Positive (1/1970-12/2001)	Negative (1/2002-12/2022)
Nominal	Average Return	13.7%	9.3%	9.2%	3.6%	11.9%	7.0%
	Avg. Excess Return	6.0%	7.7%	1.4%	2.0%	4.1%	5.4%
	Volatility	15.6%	15.2%	8.5%	7.7%	10.8%	8.9%
	Sharpe Ratio	0.4	0.5	0.2	0.3	0.4	0.6
Real	Average Return	8.4%	6.6%	4.0%	1.1%	6.6%	4.4%
	Volatility	15.8%	15.2%	8.8%	8.1%	11.0%	9.1%
	Sharpe Ratio	0.4	0.5	0.2	0.2	0.4	0.6

Note: Stock return is 1m %-change in S&P 500 Total Return Index; bond return is 1m %-change in US 10y Treasury Constant Maturity Total Return Index; portfolio return 1m %-change in a costlessly and monthly rebalanced 60/40 portfolio of stocks and bonds; excess returns are calculated relative to the average monthly LIBOR rate; correlation regime is determined by the sign of trailing 5y correlation between stock and bond returns. Real returns are calculated by subtracting the 1m CPI inflation rate from nominal returns. Source: Haver Analytics, Standard & Poor's, US Treasury and PGIM IAS. For illustrative purposes only.

<sup>3</sup> Arguably, positively correlated assets ought to have higher expected returns than negatively correlated assets *because* they are riskier.

<sup>4</sup> See *Higher Bond Yields & the Fed Model – Implications for Future Stock-Bond Relative Returns*, PGIM IAS, November 2023.

**Figure 15: Stock-Bond Real Yield Difference (1973-2023)**



Note: S&P 500 earnings yield is the inverse of the Cyclically Adjusted Price-Earnings Ratio (CAPE Ratio); for 1/2003-9/2023 the real 10y Treasury yield is derived by subtracting the 10y Treasury breakeven inflation rate from the nominal 10y Treasury yield. For earlier periods (i.e., 1/1973-12/2002), we use real 10y Treasury yield estimates from Barclays. All numbers (except for Barclays data) are averages of business days within a month. Source: Barclays, Datastream, Federal Reserve Bank of St. Louis, FRED, Haver Analytics, Robert Shiller, S&P, US Treasury and PGIM IAS. Provided for illustrative purposes only.

**Figure 16: Future Stock-Bond Relative Risk-Adjusted Return Associated with Stock-Bond Valuation Gap (1973-2023)**

Correlation Regime	Start Date	End Date	R <sup>2</sup>	Future Mean/Vol Ratio Difference Associated with the Valuation Gap
Positive	1/1970	12/2001	31%	-0.17
Negative	1/2002	12/2022	91%	-0.25
Full History	1/1970	10/2023	23%	-0.07

Note: Positive (negative) future mean/vol ratio difference means stocks outperforming (underperforming) bonds in the future. S&P 500 earnings yield is the inverse of the Cyclically Adjusted Price-Earnings Ratio (CAPE Ratio); for 1/2003-9/2023 the real 10y Treasury yield is derived by subtracting the 10y Treasury breakeven inflation rate from the nominal 10y Treasury yield. For earlier periods (i.e., 1/1973-12/2002), we use real 10y Treasury yield estimates from Barclays. All numbers (except for Barclays data) are averages of business days within a month. Source: Barclays, Datastream, Federal Reserve Bank of St. Louis, FRED, Haver Analytics, Robert Shiller, S&P, US Treasury and PGIM IAS. For illustrative purposes only.

### Ongoing Monitoring of Stock-Bond Correlation and its Macro Drivers:

Prevailing US stock-bond correlation has recently shifted from negative to positive. If history is a guide, the new regime could well persist for years, if not decades. In our estimation, prospects for persistently positive stock-bond correlation relate to big picture economic and policy issues such as fiscal sustainability, monetary policy discretion and independence, interest rate uncertainty, productivity trends, and supply-chain disruptions. We will continue to monitor and comment on developments here as they are central to asset allocation and strategic portfolio construction. To provide our clients with the ability to monitor stock-bond correlation and its macroeconomic drivers in real time, and to model the impact of correlation on portfolio construction and performance, we have developed an online interactive toolkit that can be accessed here:

**PGIM IAS CIO Interactive Portfolio Construction Toolkit.**

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- To Roll or Not to Roll (Forward): LP NAV Estimation for Private Equity and Real Estate (*November 2023*)
- Higher Bond Yields & The Fed Model: Implications for Future Stock-Bond Relative Returns (*November 2023*)
- What to Expect When Expecting a Recession: Lessons from Europe and the UK (*July 2023*)
- What to Expect When Expecting a Recession: A CIO's Guide to Interpreting the Probability of Recession (*June 2023*)
- Private *vs.* Public Investment Strategies: Reported and Real-World Performance (*May 2023*)
- Is There a Need for a Chief Liquidity Officer? (*January 2023*)
- Building Portfolios with Infrastructure: Performance, Cash Flows & Portfolio Allocation (*November 2022*)
- Portfolio Implications of a Positive Stock-Bond Correlation World (*November 2022*)
- Measuring the Value of a Portfolio Liquidity Line (*September 2022*)
- Stock-Bond Correlation: A Global Perspective (*June 2022*)
- Super Funds & Master Trusts in a World of Member Switching, Early Release Schemes & Climate Calamities (*March 2022*)
- The Rebalancing Conundrum: Private Equity Valuations and Market Dislocations (*December 2021*)
- A Rising Private Asset Class: Core+ Real Estate Debt (*July 2021*)
- Harnessing the Potential of Private Assets: A Framework For Institutional Portfolio Construction (*June 2021*)
- US Stock–Bond Correlation: What Are the Macroeconomic Drivers? (*May 2021*)
- Equity Portfolio Manager Active Risk and Information Ratio: How Does the Reward Vary with Active Risk? (*November 2020*)
- Building and Maintaining a Desired Exposure to Private Markets – Commitment Pacing, Cash Flow Modeling, and Beyond (*November 2020*)
- Next-Generation Commodity Benchmarks: RASA Benchmarks Designed to Align with CIO Investment Objectives (*November 2020*)
- Modeling Private Investment Cash Flows with Market-Sensitive Periodic Growth (*October 2020*)
- Riders in the Storm: How Volatility Events Affect Private Asset Class Performance (*June 2020*)
- The Probability of Recession: A Critique of a New Forecasting Technique (*June 2020*)
- What's in Your Real Asset Portfolio? (*May 2020*)
- Measuring the Value of LP Fund-Selection Skill (*April 2020*)
- Building a Better Portfolio: Balancing Performance and Liquidity (*joint with GIC Singapore – April 2020*)
- What is the Optimal Number of Equity Managers? A CIO Toolkit for Manager Allocation (*February 2020*)
- Institutional Gold! (*November 2019*)
- A Fair Comparison Framework: Risk and Return in Private & Public Investments (*October 2019*)
- Asset Allocation for “End-State” Portfolios (*September 2019*)
- The Diversity of Real Assets: Portfolio Construction for Institutional Investors (*April 2019*)
- The Tradeoff Between Liquidity and Performance: Private Assets in Institutional Portfolios (*January 2019*)
- Emerging Market Equity Benchmarks for Japanese Investors: Countries, Sectors or Styles? (*October 2018*)
- Forecasting Long-Term Equity Returns: A Comparison of Popular Methodologies (*September 2018*)
- What Can the Markets Tell Us about Future Economic Growth? (*September 2018*)
- How to Measure the Value of Adding a Cross-Sector Manager (*September 2018*)
- Anchor to Windward: Aligning Absolute Return Objectives (*May 2018*)
- When the Dust Flies: How Volatility Events Affect Asset Class Performance (*April 2018*)
- Asset Allocation with Illiquid Private Assets (*February 2018*)
- The Impact of Market Conditions on Active Equity Management (*March 2017*)

### Sample Bespoke Client Projects

- How to design a commodity benchmark aligned with a DB plan's objectives?
- Will my equity managers perform as expected in the next downturn?
- How should we allocate capital across our equity managers?

### Case Studies

- Cenland Corporation (I) —The CIO and the Closing of the DB Plan (*December 2019*)
- Cenland Corporation (II) — The CIO and the Freezing of the DB Plan (*December 2020*)
- Cenland Corporation (III) – The CIO and the Transition to DC (*December 2021*)

### The Differential

- Read the latest issue of the IAS magazine, *The Differential*, and past issues at [pgim.com/IAS/differential-newsletter](http://pgim.com/IAS/differential-newsletter).



# THE PURSUIT OF OUTPERFORMANCE

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20240319-3458189