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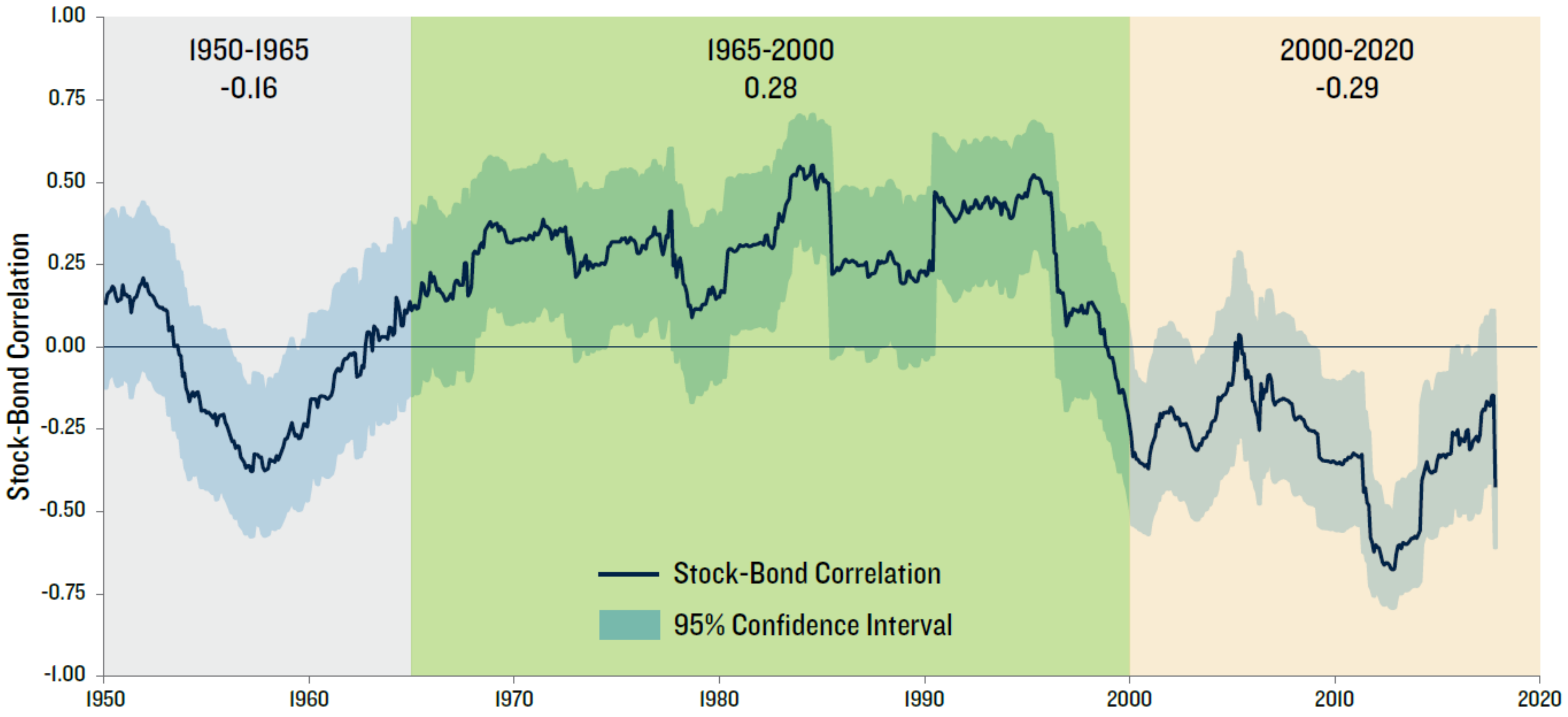
WEBINAR

STOCK-BOND CORRELATION: A GLOBAL PERSPECTIVE

JULY 2022

THE PURSUIT OF OUTPERFORMANCE

US Stock-Bond Correlation: Long and Stable Regimes



Note: 1m returns; 5y, centered, rolling correlation window; 1950-2020.
Source: DataStream, Federal Reserve Bank of St. Louis, FRED, Haver Analytics, NBER, Robert J. Shiller online data, and PGIM IAS. For illustrative purposes only.

Macroeconomic Drivers of Stock-Bond Correlation

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Macroeconomic Components

Volatility of risk-free rate changes ($\sigma(\Delta i)$): **High**

Correlation of growth & rate changes ($\rho(\%\Delta y, \Delta i)$): **Negative**

Correlation of changes in equity & bond risk premia ($\rho(\Delta ERP, \Delta BRP)$): **Positive**

Economic and Policy Drivers

Monetary policy: **Non-rules-based and Procyclical**

Fiscal policy: **Unsustainable**

Growth drivers: **Supply-side**

Past US Regimes

1965-2000

POSITIVE

Stock-Bond Correlation Regime

Macroeconomic Components

Volatility of risk-free rate changes ($\sigma(\Delta i)$): **Low**

Correlation of growth & rate changes ($\rho(\%\Delta y, \Delta i)$): **Positive**

Correlation of changes in equity & bond risk premia ($\rho(\Delta ERP, \Delta BRP)$): **Negative**

Economic and Policy Drivers

Monetary policy: **Rules-based and Countercyclical**

Fiscal policy: **Sustainable**

Growth drivers: **Demand-side**

Past US Regimes

1950-1965 & 2000-present

NEGATIVE

Stock-Bond Correlation Regime

Source: Shen, Junying and Weisberger, Noah, "US Stock-Bond Correlation: What are the Macroeconomic Drivers?" PGIM IAS, May 2021

Developed Market Stock-Bond Correlation: Synchronicity

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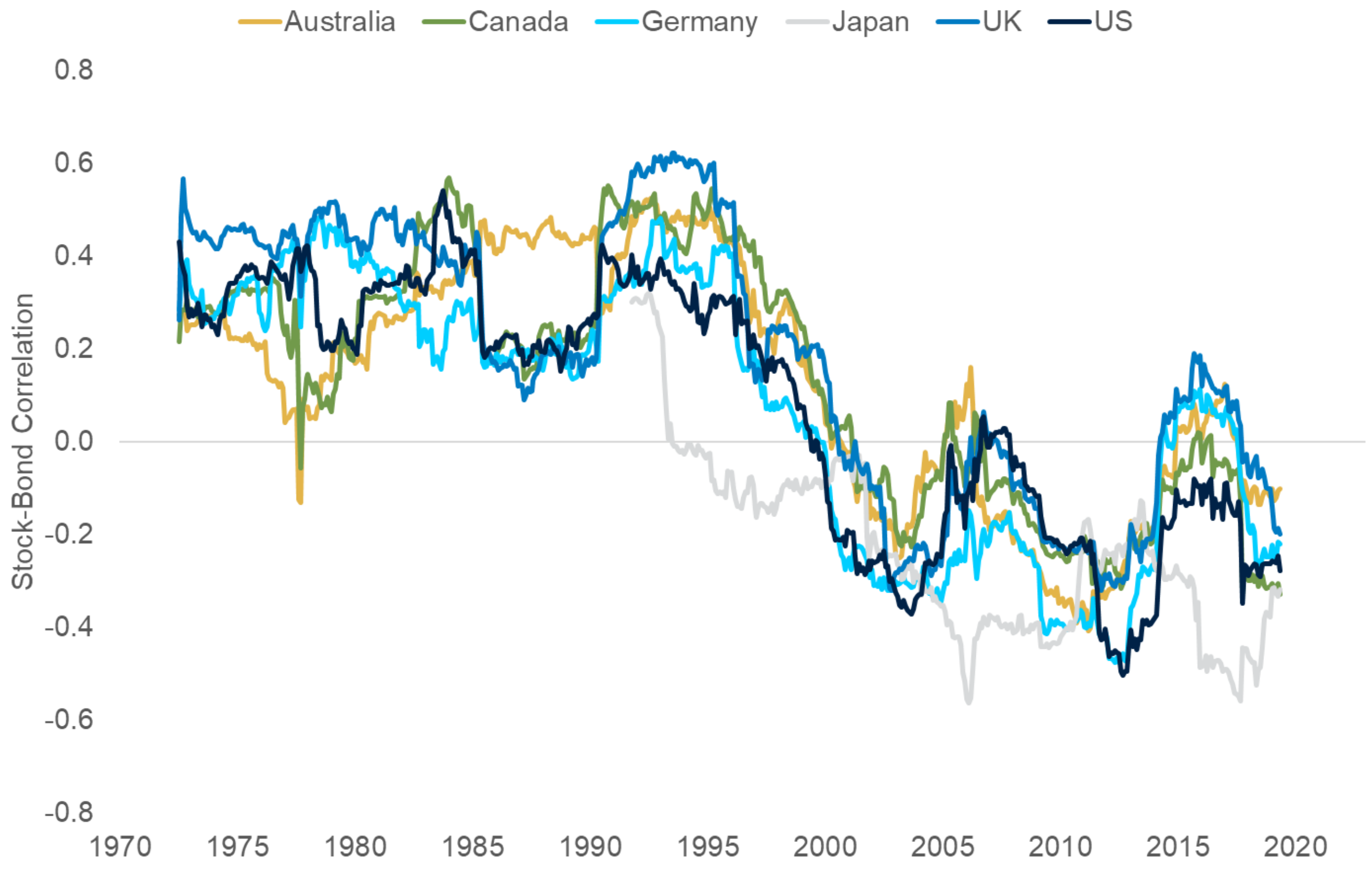
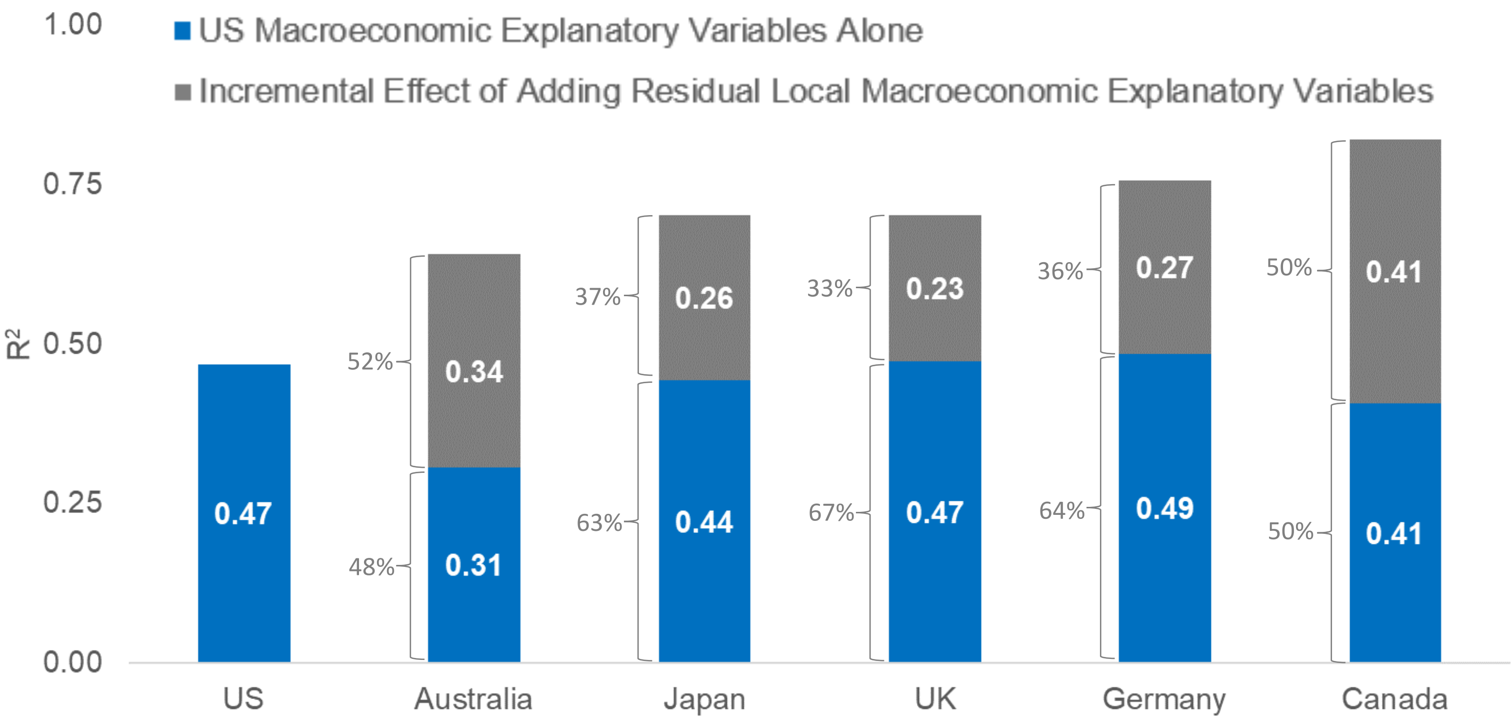


Note: MSCI Country Equity Local Currency Total Return Indices; Country Benchmark Long-Term Sovereign Bond Local Currency Total Return Indices; 1m returns; 5y, centered, rolling correlation window; Australia, Canada, Germany, Japan, UK, US; 1970-2021 (varies by country). Source: DataStream, Federal Reserve Bank of St. Louis, FRED, MSCI, and PGIM IAS. For illustrative purposes only.

Global vs. Local Macro Drivers of Stock-Bond Correlation

- US macro variables explain 2/3rds of the variation in stock-bond correlation
- Purely local macro variables explain the remaining 1/3rd



Source: DataStream, Federal Reserve Bank of St. Louis, FRED, Haver Analytics, MSCI, OECD, and PGIM IAS. For illustrative purposes only.

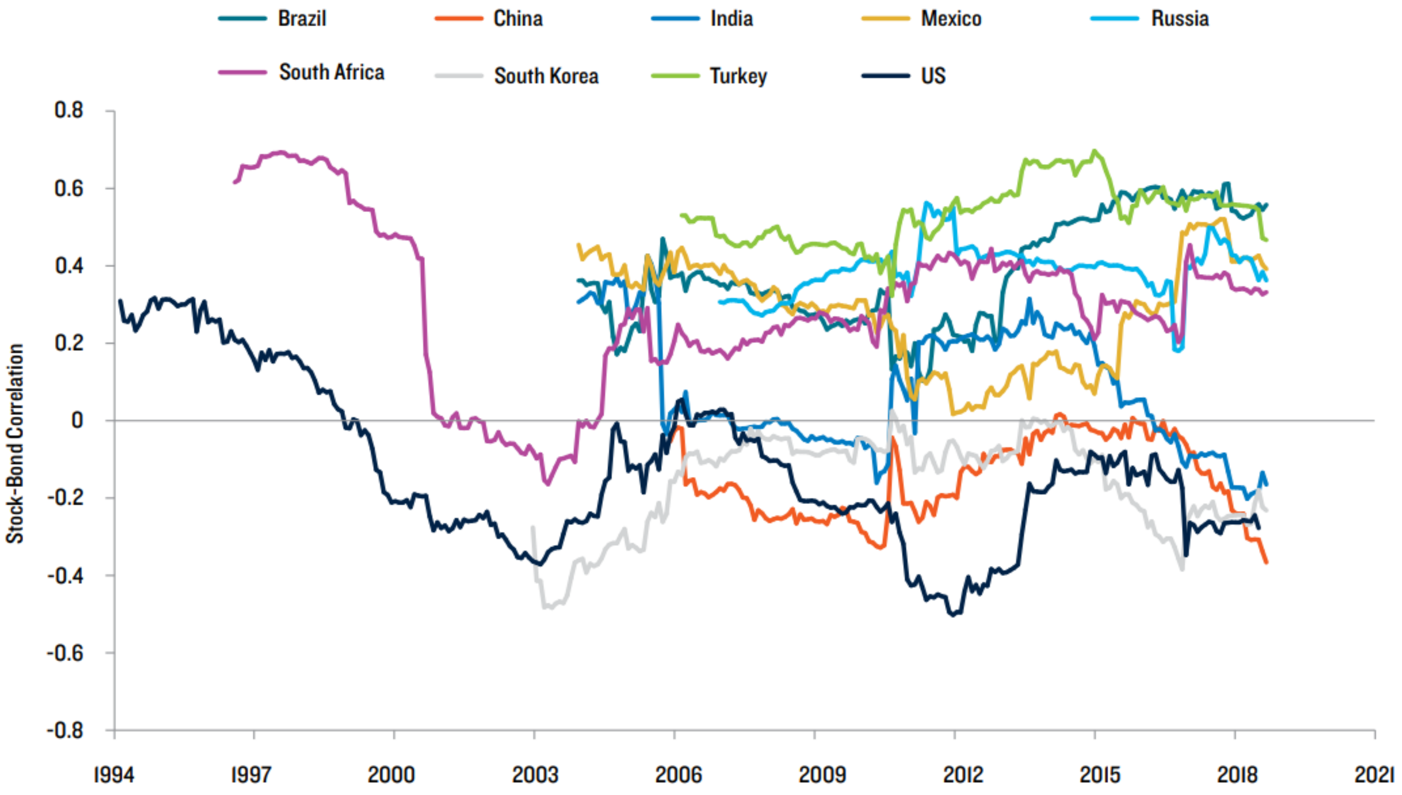
US Stock-Bond Correlation and Other Possible Hedges

Commodities may be able to provide an equity hedge when bonds do not, but not always and with significantly higher volatility

	Assets	Average Return (Annualized)	Volatility of Return (Annualized)	Average Correlation with US Stock	Average Correlation with US Stock when US Stock-US Bond Correlation > 0	Probability of Correlation with US Stock < 0 Conditional on US Stock-US Bond Correlation > 0)
		(1)	(2)	(3)	(4)	(5)
(1)	GSCI Crude Oil	11%	36%	0.12	-0.09	63%
(2)	GSCI Gold	7%	19%	-0.02	-0.05	62%
(3)	US Tbill 3M	5%	1%	-0.04	-0.05	52%
(4)	GSCI Energy	9%	32%	0.13	-0.05	49%
(5)	GSCI Commoditiy	9%	20%	0.13	0.02	41%
(6)	US Bond	6%	6%	0.08	0.28	0%
(7)	BB US Credit	8%	7%	0.31	0.44	0%
(8)	Russell 1000 Value	13%	15%	0.70	0.51	0%
(9)	MSCI EM	13%	22%	0.69	0.56	0%

Source: DataStream, Federal Reserve Bank of St. Louis, FRED, Haver Analytics, MSCI, and PGIM IAS. For illustrative purposes only.

EM Stock-Bond Correlation: Mostly Positive & Unrelated to the US



Note: MSCI Country Equity Local Currency Total Return Indices; US Benchmark Long-Term Sovereign Bond Local Currency Total Return Index; J.P. Morgan GBI-EM Country Local Currency Indices; Brazil, China, India, Mexico, Russia, South Africa, South Korea, Turkey; 1m returns; 5y, centered, rolling correlation; 1994-2021 (varies by country).

Source: DataStream, Federal Reserve Bank of St. Louis, FRED, J.P. Morgan, MSCI and PGIM IAS. For illustrative purposes only.

Correlation Regime Change: The Risk-Reward Tradeoff

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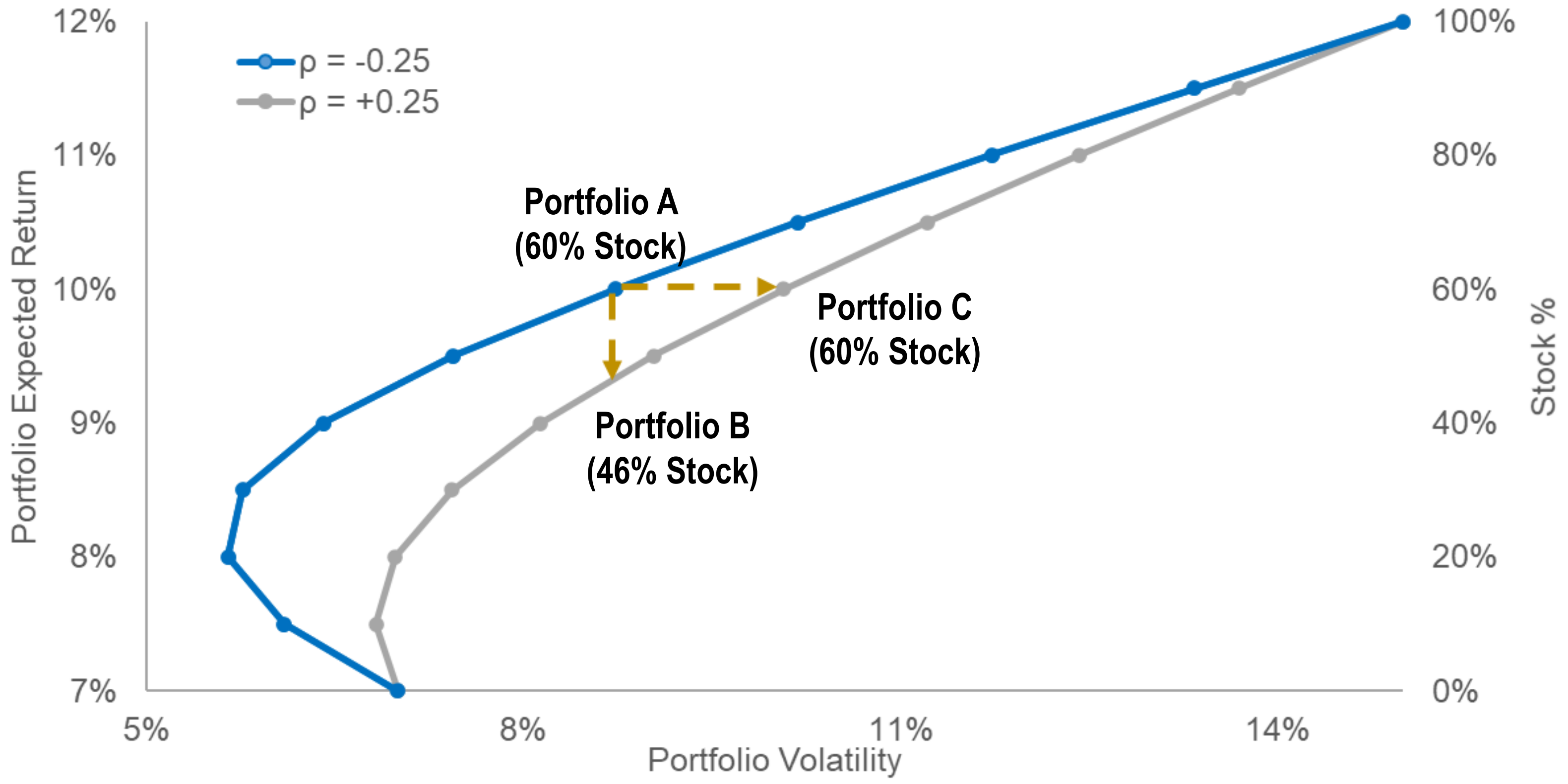
In response to a change in stock-bond correlation, a CIO can:

(1) Maintain their risk target and reduce their stock allocation (A to B)

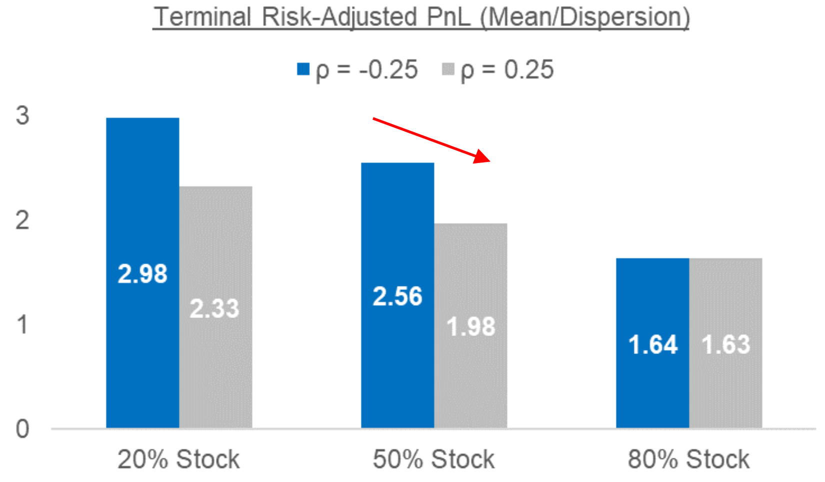
(2) Maintain their stock allocation and accept greater risk (A to C)

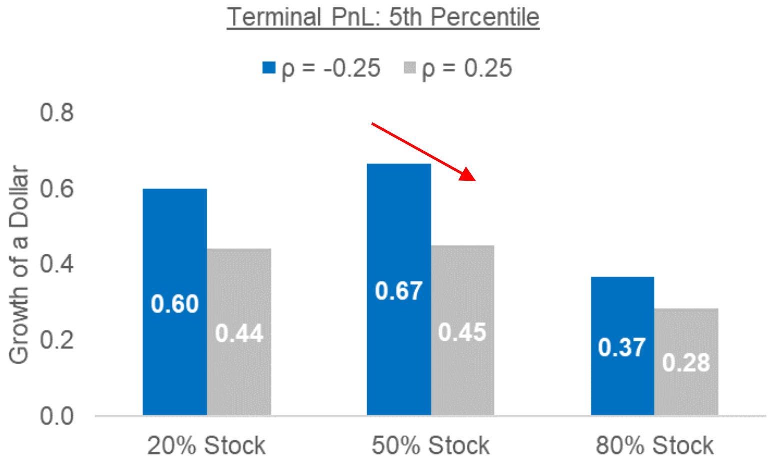


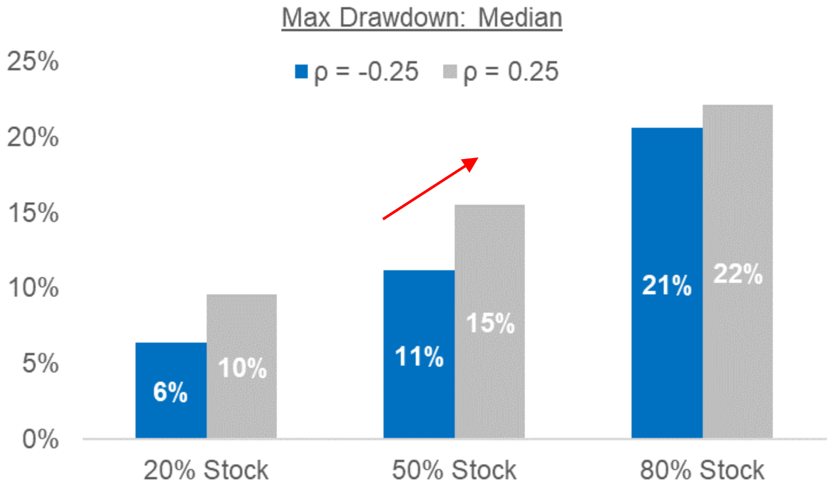
Note: Stock and bond returns are assumed to have annualized expected returns of 12%/y and 7%/y, and annualized volatilities of 15% and 7%, respectively, based on 1970-2022 historical data.
Source: PGIM IAS. For illustrative purposes only.

Correlation Regime Change: Long-term Portfolio Performance

- 10,000 simulations of 10y portfolio performance
- Monthly stock returns are drawn from their historical distribution (1970-2022) in 6m blocks
- Bonds are beta to stocks with an expected return of 7% and volatility of 7%
- Stock-bond correlation is either +0.25 or -0.25, with beta calibrated accordingly
- Portfolios are (costlessly) rebalanced monthly







Note: Risk-free rate is assumed to be 1%/y. Source: PGIM IAS. For illustrative purposes only.

A Global Perspective on Stock-Bond Correlation: 3 Lessons

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Lesson #1: Both US and local macro forces affect local stock-bond correlation. Increased risk of positive US stock-bond correlation, driven by US fiscal and monetary policy, would increase the risk of positive stock-bond correlation in other DMs too.

Lesson #2: In a positive correlation regime, neither US bonds nor DM bonds would be a reliable hedge for US stocks.

Lesson #3: Positive stock-bond correlation leads to worse expected portfolio performance, particularly in extreme environments. An agnostic approach – assuming zero correlation – mitigates the impact of being overly optimistic or pessimistic about future correlation.

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IAS 0719-100

CONTACT US

Bruce D. Phelps, PhD, CFA
Managing Director, Head of IAS
Email: bruce.phelps@pgim.com
Phone: +1 (973)367 6661

Noah Weisberger, PhD
Managing Director, IAS
Email: noah.weisberger@pgim.com
Phone: +1 (201) 207-6879

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