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THE PURSUIT OF OUTPERFORMANCE

Institutional Advisory & Solutions

US STOCK–BOND CORRELATION

What Are the Macroeconomic Drivers?

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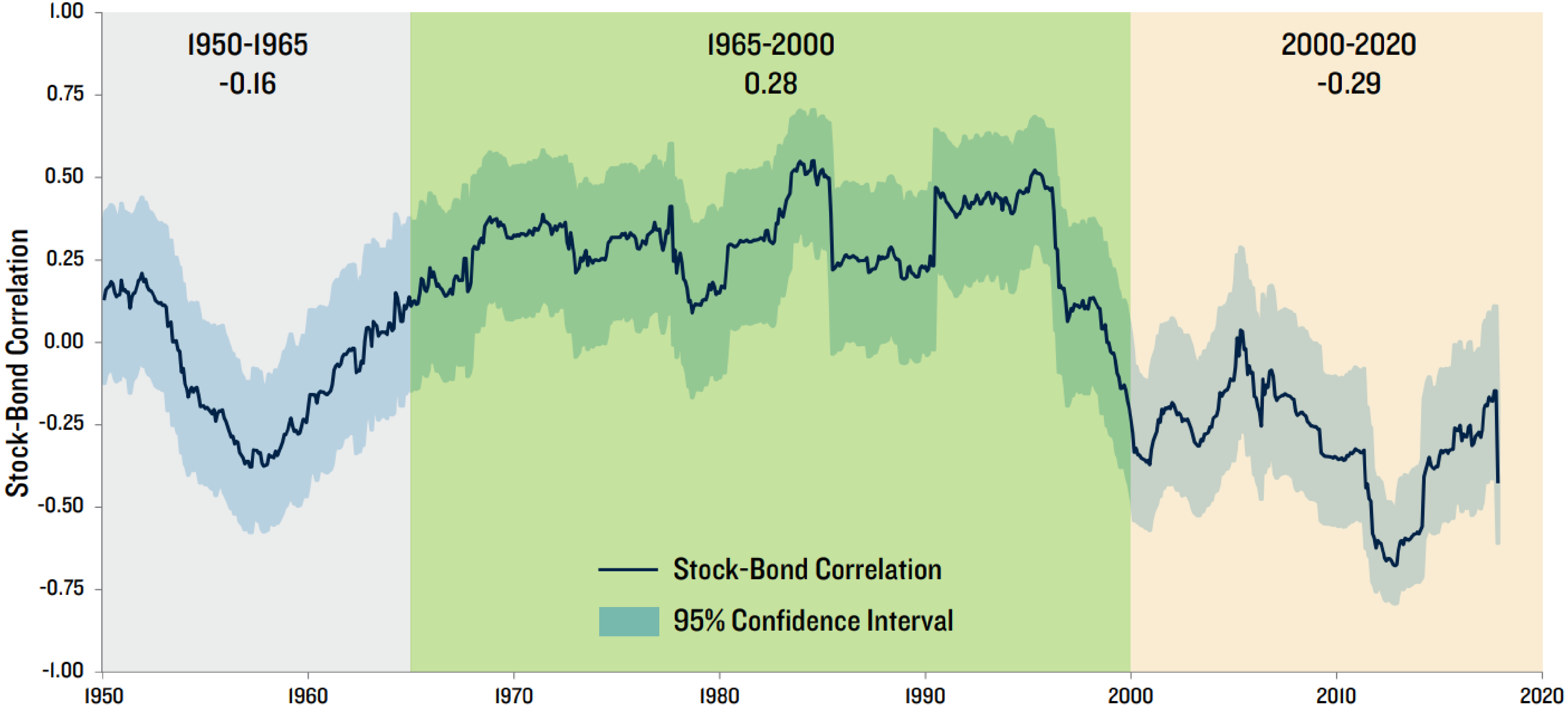
US Stock-Bond Correlation: Three Historical Regimes



Note: Stock-bond correlation calculated with 5y-centered, rolling window of monthly stock and bond total returns.
Source: DataStream, FRED, NBER, PGIM IAS, Robert J. Shiller online data. For illustrative purposes only.

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A Further Look at Historical Relationships

As multi-asset managers, we are also interested in the historical correlation between other assets, relative to equities, to consider other possible hedging assets:

- For example, during the period from 1985 to 1995, Commodities and Gold both exhibited negative correlation to equities at a time when stock and bond correlations were positive.

Correlation of Stocks vs:

Time Period	Bonds	Commodities	REITs	Gold
1970s*	0.23	0.21		0.06
1980-1985	0.50	0.29	0.66	0.35
1985-1990	0.25	-0.31	0.75	-0.35
1990-1995	0.49	-0.04	0.36	-0.24
1995-2000	0.13	0.09	0.22	0.00
2000-2005	-0.45	0.14	0.36	-0.04
2005-2010	-0.24	0.53	0.80	0.07
2010-2015	-0.44	0.48	0.58	0.13
2015-2020	-0.39	0.60	0.74	0.04

From 1970-2020.
Source: QMA.
For informational purposes only. The asset class returns are represented by the following indices: S&P 500 Index (stocks), Barclays U.S. Treasury Index (bonds), Bloomberg Commodity Index (commodities), Dow Jones US REIT Index (REITs), Gold Futures (gold). Capital market assumptions are subject to change. QMA's capital market assumptions (i.e., long-term risk and return expectations for each of the asset classes) are based on our analysis of long-term historical performance numbers, current market conditions, and fundamental and economic factors. There are no guarantees that these expectations will be met, and past performance is not a guarantee or reliable indicator of future results. Please see Important Information for disclosures regarding the information contained herein.

Stock-Bond Correlation, Macroeconomic Conditions, and Economic Policy Drivers

Macroeconomic Conditions

- High and variable risk-free rates
- High and variable inflation
- Negative growth-rates correlation
- Equity risk premium and bond risk premium move together

Economic and Policy Drivers

- Monetary surprises
- Unsustainable fiscal policy
- Interdependent fiscal and monetary policy
- Supply shocks

Past Regimes

- 1965-2000

POSITIVE

Stock-Bond Correlation Regime

Macroeconomic Conditions

- Low and stable risk-free rate
- Low and stable inflation
- Positive growth-rates correlation
- Equity risk premium and bond risk premium move apart

Economic and Policy Drivers

- Rules-based monetary policy
- Sustainable fiscal policy
- Independent fiscal and monetary policy
- Demand shock

Past Regimes

- 1950-1965 & 2000-present

NEGATIVE

Stock-Bond Correlation Regime

Source: PGIM IAS. For illustrative purposes only.

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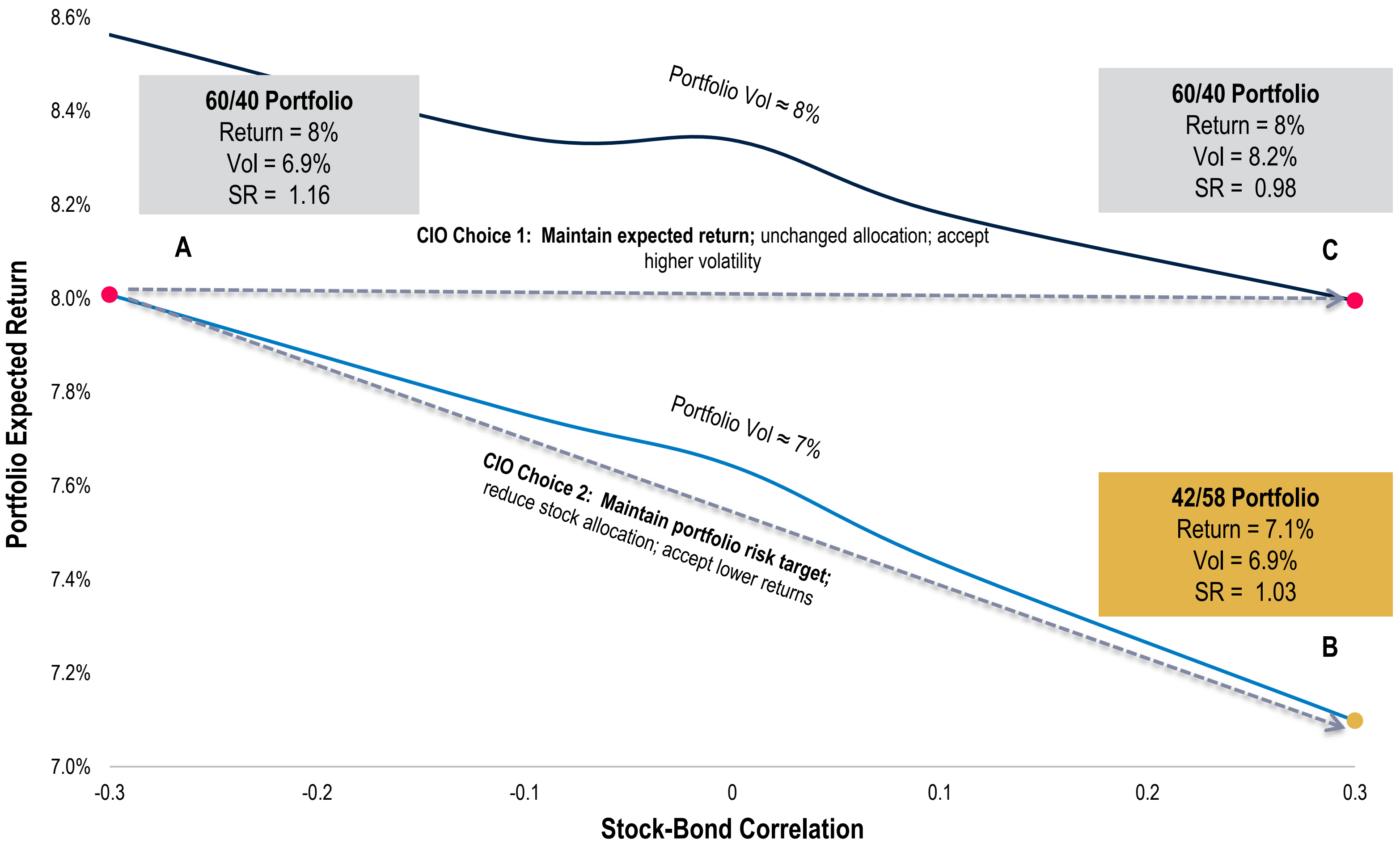
Stock-Bond Correlation & Portfolio Construction Tradeoffs



Note: Portfolio performance based on 1000 simulated monthly returns, with monthly rebalancing. Stock and bond returns are assumed to be jointly normal, with annualized expected returns of 10%/y and 5%/y, and annualized volatilities of 12% and 6%, respectively. Source: PGIM IAS. For illustrative purposes only.

QMA's CMAs Based on Potential Stock-Bond Correlation Scenarios

Scenario (A): Continued monetary policy independence; negative stock-bond correlation regime remains intact

- *Transparent policymaking keeps: interest rate volatility subdued; economic growth and interest rates positively correlated and risk premia driven by short-term, risk-on/risk-off, market dynamics rather than trending higher in tandem. Along this path, conditions for continued negative stock-bond correlation remain intact.*
- This would be consistent with our view in the current QMA CMA's with expectations for continued low inflation and a continuation of low policy rates by the Federal Reserve.

Scenario (B): Shifting Fed priorities and expansionary fiscal policy; a shift to positive stock-bond correlation

- *Greater policy coordination could lead to a shift to a negative correlation between economic growth and interest rates as the Fed tries to continually spur growth, not to react to it.*
- This scenario seems more plausible now than in the recent past given the historical level of fiscal stimulus in 2020 and 2021 accompanied by a Fed committed to low policy rates through 2023.

Scenario (C) Sustainability worries and an accommodative Fed; positive correlation in a challenging environment

- *A complicit Fed willing to sacrifice its inflation-fighting credibility would likely produce greater interest rate volatility and higher risk premia. These forces would likely lead to positive stock-bond correlation in the context of a much more challenging economic and market backdrop.*
- While a Fed departure from its hard won inflation fighting credibility seems like a low probability, there is of course historical precedent in the 1970's and early 1980's.

Source: PGIM IAS.
PGIM's Institutional Advisory & Solutions (IAS) team conducts bespoke, quantitative client research that focuses on strategic asset allocation, and portfolio and asset class analysis across both public and private markets.
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Building CMA's For Different Regimes of Stock/Bond Correlation

- To build sample portfolios for each of the potential scenarios presented by IAS, we modify our CMA assumptions for scenarios B and C, while maintaining our current forecasts for scenario A.
- All scenarios assume current initial conditions (i.e., low initial yields and valuation premia (discounts))

Annualized Nominal Return Assumptions

Assets/Assumptions	Scenario A, Current CMA's	Scenario B	Scenario C
Cash	0.46%	2.01%	4.56%
U.S. Equities	5.82%	5.66%	7.42%
U.S. Treasuries	1.83%	1.26%	0.65%
Commodities	1.32%	2.86%	5.41%
REITs	6.03%	6.85%	10.13%
Gold	4.01%	5.55%	8.10%
Expected Inflation	2.30%	4.00%	8.00%
Policy Rate in 10 years	0.91%	4.00%	9.10%
10 yr Yield in 10 Years	2.09%	4.64%	9.94%
Correlation/Risk Data	1980 - 2020	1978 - 2020	1978 - 1995

Source: QMA.
For informational purposes only. The asset class returns are represented by the following indices: S&P 500 Index (U.S. Equities), Barclays U.S. Treasury Index (U.S. Treasuries), Bloomberg Commodity Index (Commodities), Dow Jones US REIT Index (REITs), Gold Futures (Gold). Capital market assumptions are subject to change. QMA's capital market assumptions (i.e., long-term risk and return expectations for each of the asset classes) are based on our analysis of long-term historical performance numbers, current market conditions, and fundamental and economic factors. There are no guarantees that these expectations will be met, and past performance is not a guarantee or reliable indicator of future results. Please see Important Information for disclosures regarding the information contained herein.

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