2019 Q2 CAPITAL MARKET ASSUMPTIONS

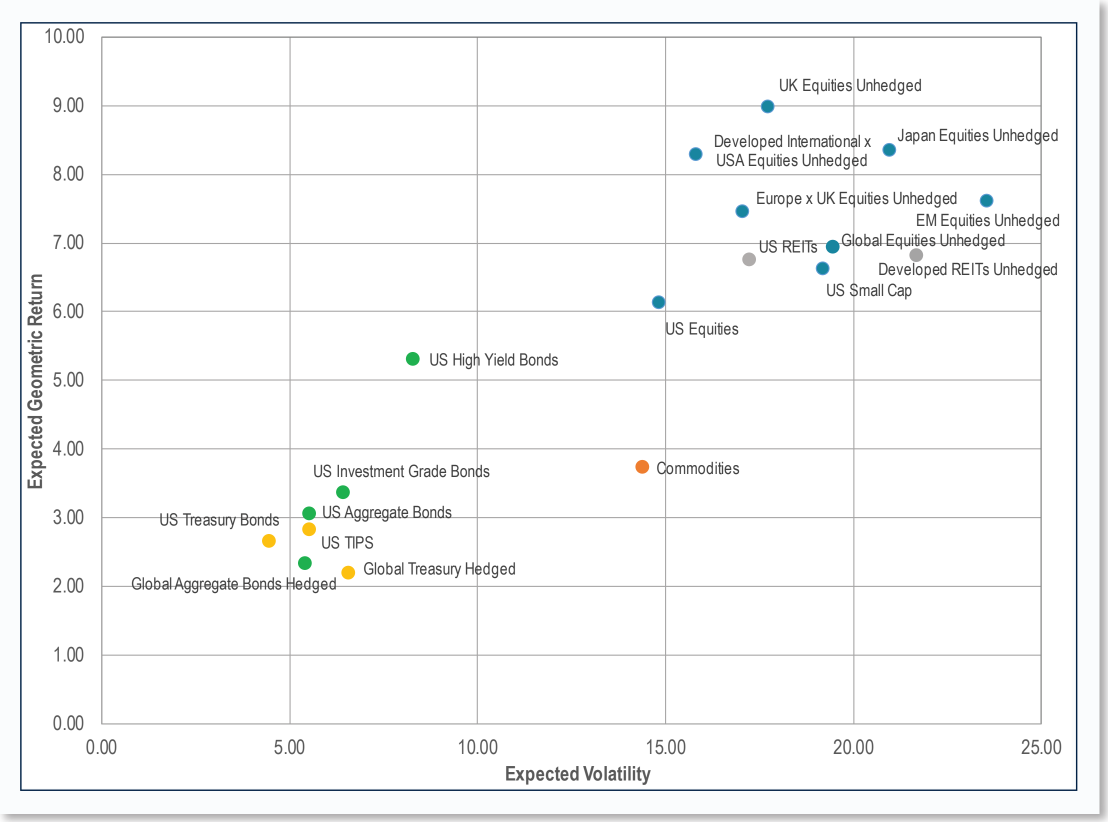
For Professional investors only. Not for use with the public.
All investments involve risk, including the possible loss of capital.

2019 Q2 Capital Market Assumptions

Summary

Global Economic Outlook: We expect real economic growth in the developed economies to continue to moderate over the next decade, as it has for the last 30 years. Growth of the developed labor force is limited by domestic demographics, with no assumption for a significant offset from improved productivity growth. Inflation in developed markets, in contrast, is anticipated to increase modestly over the next 10 years, relative to the low rates of inflation observed since the onset of the global financial crisis of 2008. We expect real economic growth and inflation in emerging markets to advance at higher annualized rates. Younger populations and higher rates of return on capital in emerging markets are driving higher rates of nominal economic output compared to developed market peers.

Equities: Our 10-year annualized nominal return forecast for global equities is 6.9%, compared to 7.9% at the end of 2018, which reflects richer valuations at the end of the first quarter coincident with global equities[1] advancing 12.2% to open the year. Our long-term return forecast for US equities is somewhat lower, at 6.1%. Developed market equities outside the US are forecast at 8.3%, a differential largely accounted for by lower historical valuation ratios outside the US. Our long-run forecast for emerging market equities is 7.6%, with higher rates of nominal economic growth offset somewhat by comparably lower expected income returns than in developed markets and a negative expected valuation adjustment.



Source: QMA as of 3/31/2019.

[1] As measured by the MSCI ACWI Net Total Return Index.

Fixed Income: After falling sharply to close 2018, global sovereign interest rates declined further in the first quarter of 2019, resulting in a reduction in long-run forecast returns for fixed income investments generally from the end of 2018. With a very low starting point for initial income returns, our long-run forecast for unhedged global aggregate bonds is 1.3%, declining from a 2% forecast at the end of 2018. Our long-run forecast for US aggregate bonds is 3.1%, consistent with higher initial yields in the US. Over the next 10 years we expect the US central bank's policy rate to average approximately 2.8%, approximately 0.4% higher than the current policy rate. Outside the US, developed market central banks are forecast to modestly increase policy rates, as some policy normalization is expected. In US credit markets, we are forecasting modest upward adjustments in average spread levels over the next 10 years, contributing to expected returns of 3.4% and 5.3% for US investment grade and high yield bonds, respectively.

Real Assets: Real assets are broadly defined to include asset classes that have physical properties or returns that are highly correlated with inflation. We include commodities, REITs and TIPS as real assets in our Capital Market Assumptions (CMAs). Our 10-year expectation is that returns for each of these asset classes will exceed the forecast rate of US inflation.

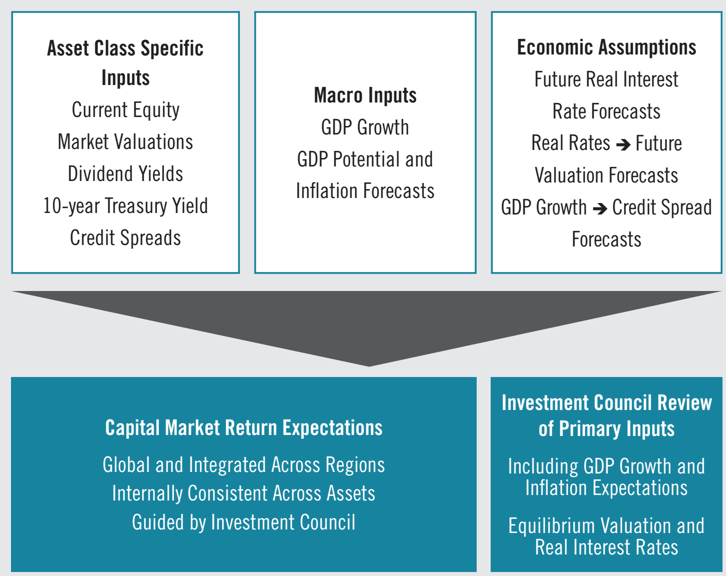
Currency and Currency Hedging Returns: Over the next 10 years we are forecasting a modest decline of the US dollar relative to developed market peers, ranging from an annualized forecast gain of 0.1% for the euro to a forecast annual appreciation of 0.9% for the Japanese yen. Emerging market currencies, in contrast, are expected to depreciate against the US dollar over the next 10 years. With short-term interest rates expected to be higher in the US over the long term than in other developed markets, long-term currency hedging returns in developed markets are forecast to be positive for US investors.

Overview

QMA's CMAs underpin the long-run outlook for strategic allocations in our individual strategies and multi-asset portfolios. They are the product of a highly systematic process for generating consistent projections across the capital markets.

CMAs provide 10-year forward-looking expectations for the most widely held equity, fixed income and non-traditional asset classes, measuring both return and risk. We update our views each quarter. Our investment professionals begin with evolving asset class fundamentals and macroeconomic assumptions at the country level. For each asset class, we decompose local return expectations into three broad categories: income, growth and valuation adjustment. We also forecast relative currency adjustments for investors in different domiciles to allow for conversion to hedged or unhedged returns. Our core building blocks and final forecasts are reviewed at their component levels by an investment council of our most senior investment professionals.

Capital Market Assumptions Framework



Shown for illustrative purposes only.
Source: QMA.

Global Economic Outlook

Forward-looking views for economic growth and inflation are some of the most critical building blocks for our CMAs. We currently compile these for 16 nations. Based on our forecasts, real economic growth in the developed economies over the next 10 years is expected to continue to moderate, as it has for the last three decades. The growth of the labor force is limited by domestic demographics, with no assumption for a significant offset from improved productivity growth. We expect economic growth in developed economies to be led by Australia and other countries with younger populations and more liberal immigration policies. Growth is expected to be slowest in Japan and parts of Western Europe where the labor force is expected to contract further over the next decade. We anticipate inflation in developed markets to increase modestly over the next decade relative to the last, ranging from a forecast 2.5% annual rate in Australia to a low of 1.4% in Japan. In emerging markets, rates of real economic growth and inflation are expected to exceed those in developed markets. We expect growth and inflation to average 4.4% and 2.9%, respectively, driven by emerging markets' younger populations and higher rates of return on capital.

Global Fixed Income Markets

Long-term fixed income forecasts begin with our view of 10-year forward policy rates for each of the major developed market central banks. We derive expected policy rates for each central bank jurisdiction as a function of current and future equilibrium real interest rates, the expected GDP output gap over the next 10 years[2] and the expected rate of inflation. For the US, policy rates over the next 10 years are expected to average about 0.4% higher than the 2.4% policy rate prevailing at the end of the first quarter of 2019, given the forward view of inflation and growth relative to potential, which advanced modestly from the end of 2018. This follows a period of approximately 2.3% in interest rate increases initiated by the Federal Reserve beginning in December 2015 and concluding in December 2018. Other developed market central banks are expected to raise rates, on average, consistent with forecast inflation rising closer to central bank targets over the next 10 years.

Interest Rates

Country	Current Short-Term Interest Rate	Forecast Short-Term Interest Rate
United States	2.38	2.79
United Kingdom	0.80	1.67
Eurozone	-0.31	1.51
Japan	-0.17	1.44
Australia	1.39	2.47
Canada	1.67	2.06

Source: Bloomberg, QMA, as of 3/31/2019.

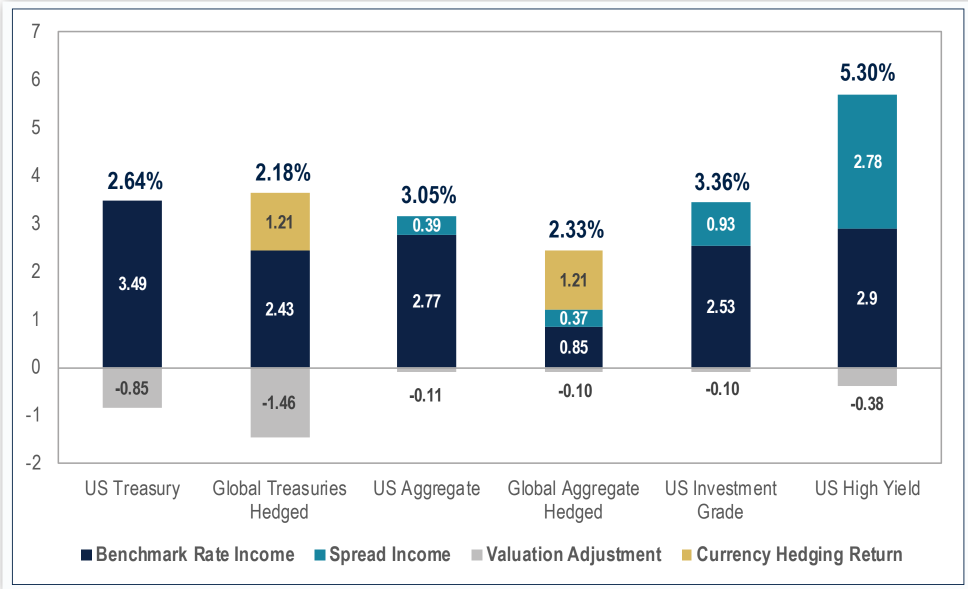
For longer maturity government bond returns, we forecast each country's expected long-term slope to define a term structure of yields across their respective government yield curves. The forecast slope for each country is a function of forecast and potential real economic growth and will evolve countercyclically. When economic growth is forecast below potential, the slope of the yield curve is expected to be steeper (early cycle), whereas if growth is forecast to be closer to, or above potential (late cycle), the yield curve is forecast to be flatter.

Our bond return forecasts are largely predicated on income and valuation factors. At a given maturity point, the forecast income return for a government bond will consist of the average expected coupon yield over the forecast horizon, as well as proceeds from bonds maturing to lower yields. Changes in yield at a given maturity point over the forecast horizon will determine the necessary valuation adjustment. If yields are forecast to rise (fall) over the next 10 years, the valuation adjustment will be negative (positive).

After a decline in US 10-year yields of 0.7% over the last two quarters, yields for the US Treasury Index are expected to rise modestly over the next 10 years, resulting in a negative valuation adjustment and an expected return of 2.6%, a decline of 0.9% from the end of 2018. Developed market government bonds outside the US are forecast to return less over the next decade, given lower initial yields and a negative valuation adjustment as yields are expected to rise over the forecast horizon. Long-run returns in global treasuries for a US investor are forecast at 1.3% on an unhedged basis and 2.2% on a hedged basis, given future forecast short-term interest rate differentials.

[2] GDP weighted Eurozone country average for European Central Bank.

Decomposition of Fixed Income Return Forecasts



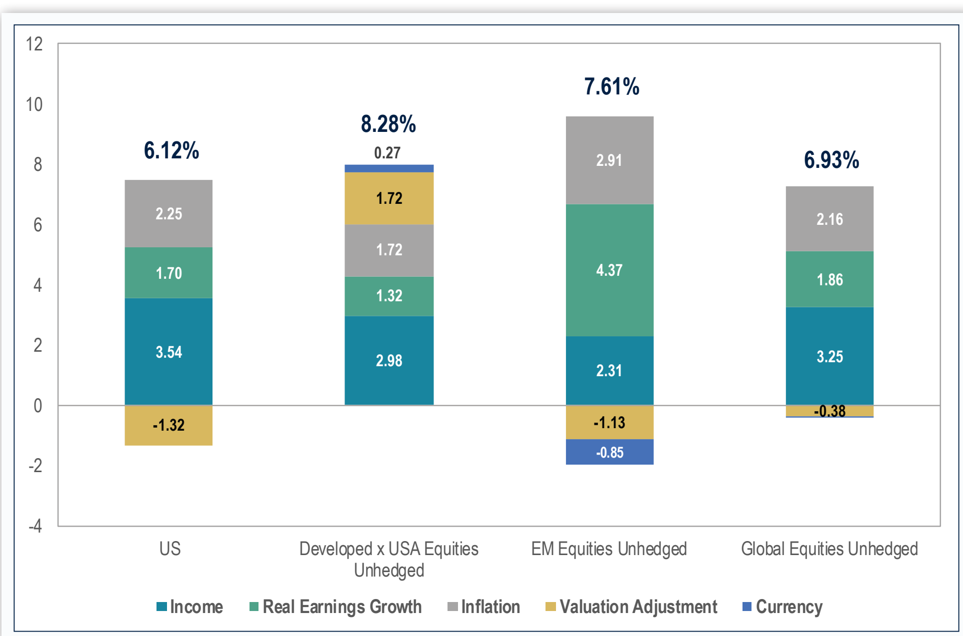
Source: QMA as of 3/31/2019.

Our long-term forecast for US aggregate bonds is 3%, which includes an expected spread return of 0.4%. Our forecast for hedged global aggregate bonds from a US investor perspective is 2.3%, given similar assumptions for credit spreads and defaults, as well as the aforementioned lower starting levels for underlying government yields outside the US. For both US investment grade and high yield bonds, spreads at the end of the first quarter of 2019 are judged to be somewhat lower than expected averages for the next 10 years, after notable declines in the first quarter. Long-run returns for US investment grade and high yield bonds are expected to be 3.4% and 5.3%, respectively.

We calculate the expected returns for fixed income credit indices to include any additional income expected from an average credit spread yield over comparable government bonds, adjusted for expected default and downgrade losses over the forecast horizon. We then calculate the valuation adjustment for expected changes in spreads.

Global Equity Markets

Decomposition of Global Equity Return Forecasts



Source: QMA as of 3/31/2019.

All of our long-term asset class forecasts, including equities, are based on income, growth, and valuation considerations.

Consistent with historical precedent and assuming the continuation of current dividend taxation regimes, the US equity market has a large share of expected income returns coming from buybacks equal to about 1.6% in our long-term forecasts. Outside of the US, the expected impact of net share issuance on long-term income returns is anticipated to be a modest drag of 0.3%. For emerging markets, an expected drag on income returns from net share issuance is forecast at 0.8%.

> To build the income component of our long-term equity forecasts, we calculate each country's expected income contribution, based on current and future anticipated levels of dividend yield, as well as the expected returns attributable to anticipated buyback activity (positive) or net positive share issuance (negative).

For the growth component of our equity return forecasts, long-term nominal earnings growth for each equity market is expected to approximate the growth in nominal GDP for each country. We calculate this as the combined annualized rate of expected inflation plus real GDP growth. Our 10-year forecast for US real annualized GDP growth is 1.7%, with 2.3% for inflation, translating to an earnings growth component of 4%. For developed markets outside the US, our 10-year expectation for real GDP growth is 1.3%, while inflation is expected to average 1.7%, providing nominal earnings growth of 3.0%, a decline of 0.2% from the end of 2018.

For emerging markets, higher nominal GDP growth relative to developed markets is expected to result in long-run nominal earnings growth of 7.3%.

The significant advance in global equities in the first quarter of 2019, taking the MSCI ACWI to a year-to-date gain of better than 12%, has resulted in a negative adjustment in expected returns for global equities in general. Among developed markets, however, only the US has a negative expected long-term valuation adjustment -- 1.3% per year -- attributable to historically elevated valuation ratios. Developed equities outside the US, in contrast, are expected to benefit by 1.7% annually, given what are still relatively cheap historical valuation ratios. Emerging markets equity returns are forecast to be 1.1% per year lower on negative valuation adjustments.

Real Assets

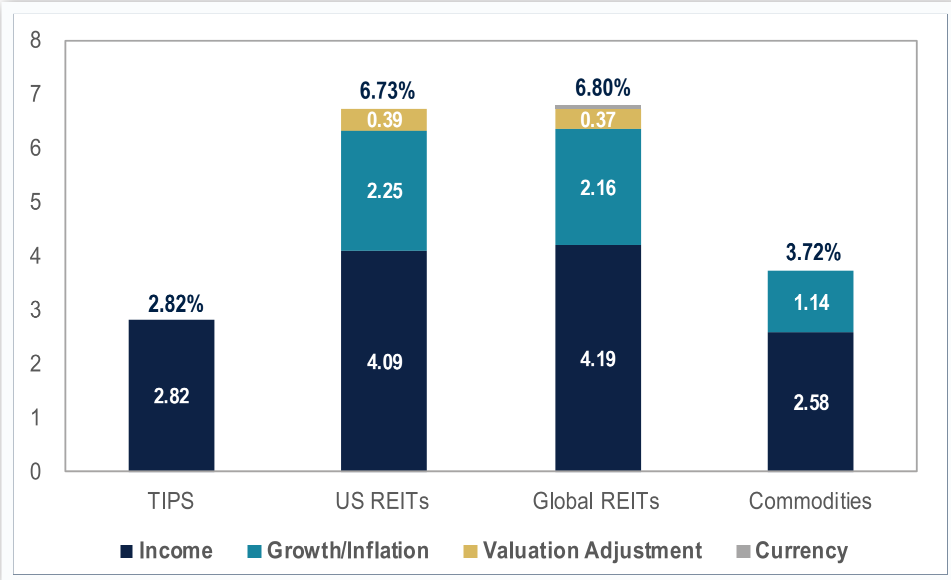
We include commodities, REITs and TIPS as real assets in our Capital Market Assumptions. Our 10-year expectation is that the returns for each of these asset classes will exceed the forecast rate of US inflation.

For US TIPS, we assume that expected inflation and break-even inflation converge over time, implying that the inflation risk premia and liquidity risk premia in TIPS offset each other. Under these assumptions we forecast a long-term return from TIPS of 2.8%, which is slightly above the expected return to US Treasuries, given the slightly higher duration of US TIPS. This US TIPS forecast is a decline of 0.9% from the end of 2018, on a greater estimated negative valuation adjustment from higher future long-term real interest rates.

Despite better than 10% returns in the first quarter of 2019, valuations for both US and Global REITs are still judged to be inexpensive relative to longer-term expectations, resulting in an expected positive valuation adjustment of 0.4% for both US and Global REITs, after adjusting for lower future dividend yields. Our long-run forecast for both US and Global REITs is 6.8%. This is a decline from a forecast return greater than 8% for both US and Global REITS at the end of 2018, when valuation adjustments contributed even more positively to expected returns.

Our long-run expected return for commodities is 3.7%, reflecting a return on cash of 2.6% (assuming investment through liquid futures) and a growth premium of 1.1%, consistent with historical spot returns over cash. This forecast is a 0.3% increase from the end of 2018, primarily attributable to an increase in the expected return to cash.

Decomposition of Real Asset Return Forecasts



Source: QMA as of 3/31/2019.

Currency and Currency Hedging Returns

Our long-term return forecasts for currency and currency hedging are based on our forward views of local relative price levels and short term policy rates. These views allow us to provide our long-term forecasts for a range of domiciles outside the US. Over the next 10 years, we are forecasting the US dollar to decline modestly relative to developed market peers, ranging from an annualized forecast gain of 0.1% for the euro to a forecast annual appreciation of 0.9% for the Japanese yen. Emerging market currencies, in contrast, are expected to depreciate against the US dollar over the next 10 years. With short-term interest rates expected to be higher over the long term in the US than in other developed markets, long-term currency hedging returns in developed markets are forecast to be positive for US investors.

QMA Q2 2019 10-Year Capital Market Assumptions

Asset	Expected Geometric Return	Expected Arithmetic Return	Expected Volatility	Expected Sharpe Ratio
Cash	2.58	--	--	--
US Treasury Bonds	2.64	2.74	4.48	0.04
Global Treasury Bonds Hedged	2.18	2.40	6.58	-0.03
US Aggregate Bonds	3.05	3.21	5.56	0.11
Global Aggregate Bonds Hedged	2.33	2.48	5.43	-0.02
US Investment Grade Bonds	3.36	3.57	6.43	0.15
US High Yields Bonds	5.30	5.65	8.31	0.37
US TIPS	2.82	2.97	5.55	0.07
US Equities	6.12	7.23	14.83	0.31
US Small Cap	6.62	8.47	19.20	0.31
UK Equities Unhedged	8.98	10.55	17.73	0.45
Europe x UK Equities Unhedged	7.46	8.91	17.06	0.37
Japan Equities Unhedged	8.35	10.54	20.97	0.38
Developed International x USA Equities Unhedged	8.28	9.53	15.82	0.44
EM Equities Unhedged	7.61	10.38	23.55	0.33
Global Equities Unhedged	6.93	8.82	19.47	0.32
US REITs	6.75	8.23	17.25	0.33
Developed REITs Unhedged	6.81	9.17	21.70	0.30
Commodities	3.73	4.77	14.40	0.15

Source: QMA as of 3/31/2019.

Important Information

Authors

Marco Aiolfi, PhD, Portfolio Manager,
Director of Systematic Multi-Asset Strategies

Yesim Tokat-Acikel, PhD, Portfolio Manager,
Director of Multi-Asset Research

Lorne Johnson, PhD, Portfolio Manager,
Director of Institutional Solutions

About QMA

QMA began managing multi-asset portfolios for institutional investors in 1975. Today, we manage systematic quantitative equity and global multi-asset strategies as part of PGIM, the global investment management businesses of Prudential Financial, Inc. Our time-tested processes, based on academic, economic and behavioral foundations, serve a global client base with $122 billion in assets under management as of 3/31/2019.

For More Information

To learn more about QMA's global multi-asset solution strategies, please contact Lorne Johnson, PhD, Portfolio Manager and Director of Institutional Solutions, at lorne.johnson@qma.com or 973.367.4470.