# NEPC STRATEGIC OUTLOOK

# 12/31/2020 ASSET CLASS ASSUMPTIONS

**February 2021**

**NEPC Research**

BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

# ASSET CLASS ASSUMPTIONS

# INTRODUCTION

# ASSET CLASS ASSUMPTIONS OVERVIEW

**NEPC's capital market assumptions are available each quarter and currently reflect 12/31/20 market data**

**Asset class returns reflect a wide range of outcomes related to the pandemic's economic impact**

**Maintain a dedicated safe-haven allocation to serve as a source of liquidity and to provide downside protection**

**Consider higher strategic equity targets as the long-term return differential relative to fixed income is wide**

**NEPC's Key Market Theme of *Permanent Interventions* sustains elevated valuations and lift our return outlook**

# ASSUMPTION DEVELOPMENT

**Assumptions are published for over 70 asset classes**

NEPC publishes 10- and 30-year return forecasts

**Based on data as of 12/31/20**

Assumptions are developed with NEPC valuations models and rely on a building block approach

**The 10-year return outlook is intended to support strategic asset allocation analysis**

**30-year return assumptions are used for actuarial inputs and long-term planning**

| Asset Allocation Process |
|---|
| Finalize list of new asset classes |
| Calculate asset class volatility and correlation assumptions |
| Set model terminal values, growth and inflation inputs |
| Models updated at quarter-end |
| Review model outputs and produce return assumptions |
| Assumptions released on the 15th calendar day after quarter-end |

NEPC

# BUILDING BLOCKS METHODOLOGY

**Asset models reflect current and forecasted market data to inform expected returns**

**Systematic inputs are paired with a long-term trend rate path for terminal values**

**Model inputs are aggregated to capture key return drivers for each asset class**

**Building block inputs will differ for equity, fixed income, and real assets**

# CORE GEOMETRIC RETURN ASSUMPTIONS

| | Asset Class | 10-Year Return | 30-Year Return | Volatility |
|---|---|---|---|---|
| | Cash | 0.8% | 1.9% | 0.6% |
| | US Inflation | 2.0% | 2.2% | - |
| Equity | US Large-Cap Equity | 5.4% | 6.3% | 16.6% |
| Equity | Non-US Developed Equity | 5.9% | 6.5% | 19.7% |
| Equity | Emerging Market Equity | 7.5% | 8.4% | 28.7% |
| Equity | *Global Equity** | *6.2%* | *7.0%* | *18.1%* |
| Equity | *Private Equity** | *9.3%* | *10.1%* | *24.8%* |
| Fixed Income | US Treasury Bond | 0.9% | 2.0% | 5.3% |
| Fixed Income | *US Aggregate Bond** | *1.4%* | *2.7%* | *5.7%* |
| Fixed Income | US TIPS | 1.0% | 2.1% | 5.8% |
| Fixed Income | US High Yield Corporate Bond | 2.9% | 5.0% | 11.5% |
| Fixed Income | *Private Debt** | *6.1%* | *7.5%* | *11.9%* |
| Real Assets | Commodity Futures | 0.9% | 3.3% | 18.5% |
| Real Assets | US REIT | 5.5% | 6.7% | 21.4% |
| Real Assets | Gold | 2.9% | 3.7% | 16.4% |
| Real Assets | Core Real Estate | 4.4% | 5.6% | 15.0% |
| Real Assets | Private Real Assets - Infrastructure | 5.4% | 6.6% | 12.5% |
| Multi-Asset | *60% S&P 500 & 40% US Aggregate* | *4.1%* | 5.1% | *10.3%* |
| Multi-Asset | *60% MSCI ACWI & 40% US Aggregate* | *4.6%* | 5.6% | *11.1%* |
| Multi-Asset | *Hedge Fund** | *4.0%* | 5.2% | *8.7%* |

*Calculated as a blend of other asset classes

# MPERS
# ASSET ALLOCATION ASSUMPTIONS

NEPC, LLC

# 2021 MPERS ASSET ALLOCATION ASSUMPTIONS

| Asset Allocation | 60/40 | Policy | 20% Leverage |
|---|---|---|---|
| Global Equity | 60.0%* | 40.0%* | 48.0%* |
| Private Equity | | 10.0% | 12.0% |
| **Total Equity** | **60%** | **50%** | **60%** |
| TIPS | | 5.0% | 6.0% |
| Core Bonds | 40.0% | 10.0% | 12.0% |
| Long Govt/Credit | | 7.5% | 9.0% |
| Private Debt | | 7.5% | 9.0% |
| **Total Fixed Income** | **40%** | **30%** | **36%** |
| Private Real Assets | | 10.0% | 12.0% |
| Core Real Estate | | 10.0% | 12.0% |
| **Total Real Assets** | | **20%** | **24%** |
| US Leverage Cost | | 0.0% | -20.0% |
| **Total Cash** | | **0%** | **-20%** |

| | | | |
|---|---|---|---|
| ***Expected Return 10 years*** | **4.53%** | **5.80%** | **6.57%** |
| ***Expected Return 30 years*** | **5.52%** | **6.81%** | **7.59%** |
| ***Standard Dev*** | **10.61%** | **12.11%** | **14.49%** |
| ***Sharpe Ratio (10 years)*** | **0.35** | **0.41** | **0.40** |
| ***Sharpe Ratio (30 years)*** | **0.34** | **0.41** | **0.39** |

* Policy Targets: 40% Global Equity = 32.5% Global Equity/5% Hedged Equity(L/S) /2.5% Midstream Energy

# MPERS’ MIXES: 2020 vs. 2021 ASSUMPTIONS

| | Asset Allocation | | |
|---|---|---|---|
| **Asset Class** | **60/40** | **Policy** | **20% Leverage** |
| Global Equity | 60.0%* | 40.0%* | 48.0%* |
| Private Equity | | 10.0% | 12.0% |
| **Total Equity** | **60%** | **50%** | **60%** |
| TIPS | | 5.0% | 6.0% |
| Core Bonds | 40.0% | 10.0% | 12.0% |
| Long Govt/Credit | | 7.5% | 9.0% |
| Private Debt | | 7.5% | 9.0% |
| **Total Fixed Income** | **40%** | **30%** | **36%** |
| Private Real Assets | | 10.0% | 12.0% |
| Core Real Estate | | 10.0% | 12.0% |
| **Total Real Assets** | | **20%** | **24%** |
| US Leverage Cost | | 0.0% | -20% |
| **Total Cash** | | **0%** | **-20%** |

| 10 Year Return Assumptions | | | |
|---|---|---|---|
| **Asset Class** | **2020** | **2021** | **\|▲\|** |
| Global Equity | 6.1% | 6.0% | -0.1% |
| Private Equity | 9.4% | 9.3% | -0.1% |
| | | | |
| TIPS | 2.2% | 1.0% | -1.2% |
| Core Bonds | 2.5% | 1.4% | -1.1% |
| Long Govt/Credit | 2.8% | 1.7% | -1.1% |
| Private Debt | 6.7% | 6.1% | -0.6% |
| | | | |
| Private Real Assets | 7.5% | 6.7% | -0.8% |
| Core Real Estate | 5.2% | 4.4% | -0.8% |
| | | | |
| US Leverage Cost | 2.1% | 1.2% | -0.9% |
| | | | |

| | 2020 | | | 2021 | | |
|---|---|---|---|---|---|---|
| | **60/40** | **Policy** | **20% Leverage** | **60/40** | **Policy** | **20% Leverage** |
| ***Expected Return 10 Yr*** | **5.0%** | **6.3%** | **7.0%** | **4.5%** | **5.8%** | **6.6%** |
| ***Expected Return 30 Yr*** | **6.1%** | **7.3%** | **8.1%** | **5.5%** | **6.8%** | **7.6%** |
| ***Standard Deviation*** | **10.3%** | **11.5%** | **13.9%** | **10.6%** | **12.1%** | **14.5%** |
| ***Sharpe Ratio (10 Yr)*** | **0.31** | **0.39** | **0.37** | **0.35** | **0.41** | **0.40** |

* Policy Targets: 40% Global Equity = 32.5% Global Equity/5% Hedged Equity(L/S) /2.5% Midstream Energy

# MACRO ASSUMPTIONS

# INFLATION OVERVIEW

**Inflation is an essential building block for developing asset class return assumptions**

**Inflation assumptions are model-driven and informed by multiple inputs for both the US and global assets**

- Includes forecasts from international organizations (e.g. IMF), local consumer and producer price indices, global interest rate curves, and break-even inflation expectations

**NEPC's US inflation expectation continues to reflect minimal expected inflation pressures over the long-term**

- We anticipate near-term volatility in our inflation assumptions as market-based inflation expectations discount the full range of economic scenarios associated with the pandemic and response

| Region | 10-Year Inflation Assumption | 30-Year Inflation Assumption |
|---|---|---|
| United States | 2.0% | 2.2% |

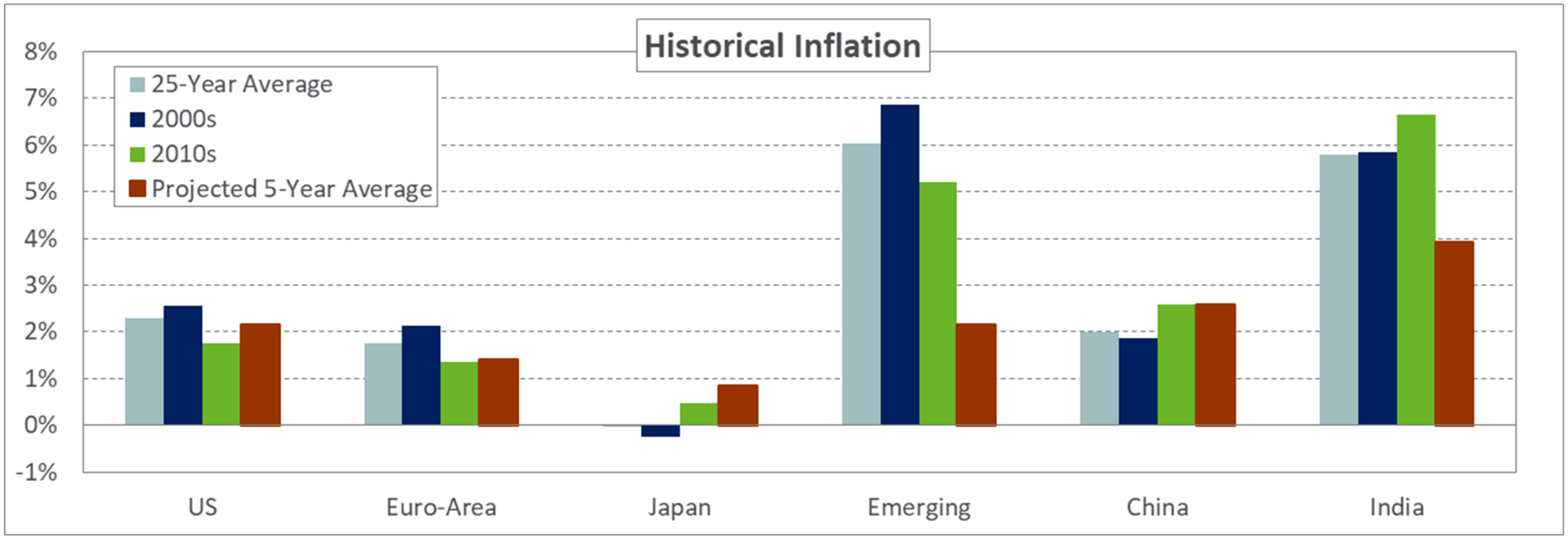
# GLOBAL INFLATION

## Core inflation remains well below central bank targets

COVID-19, globalization, aging demographics, and deflationary technology trends are inflation headwinds influencing markets

Global inflation break-even expectations suggest inflation will be near current levels for the long-term

## Emerging market inflation remains above the developed world, but is significantly lower than long-term averages




Source: IMF, FactSet, NEPC

# US CASH EXPECTATIONS

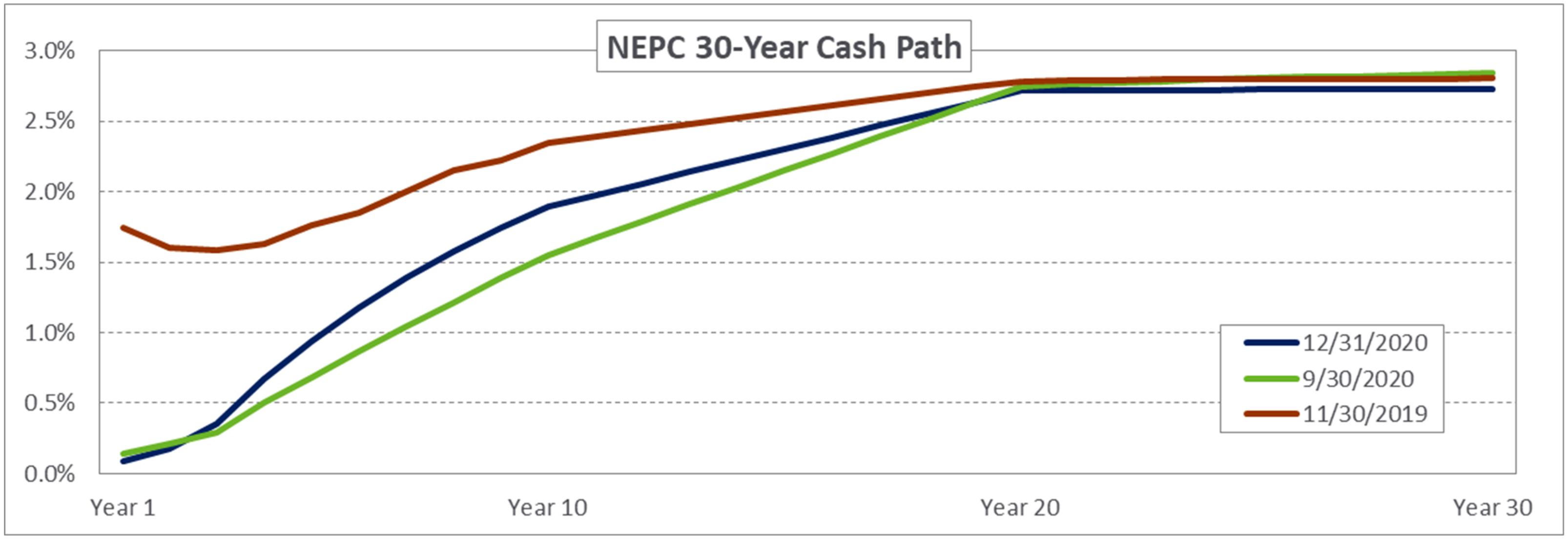
## Cash is a foundational input for all asset class returns

The assumption is a direct building block input and is a relative value factor (cash + risk premia) in long-term return projections

## Cash assumptions reflect inflation and real interest rates

## US nominal rates are near historic lows for NEPC forecasts

Market expectations of suppressed real rates and minimal inflation create a slow trending path for cash to reach NEPC's long-term target




Source: Bloomberg, FactSet, NEPC

# GLOBAL INTEREST RATE EXPECTATIONS

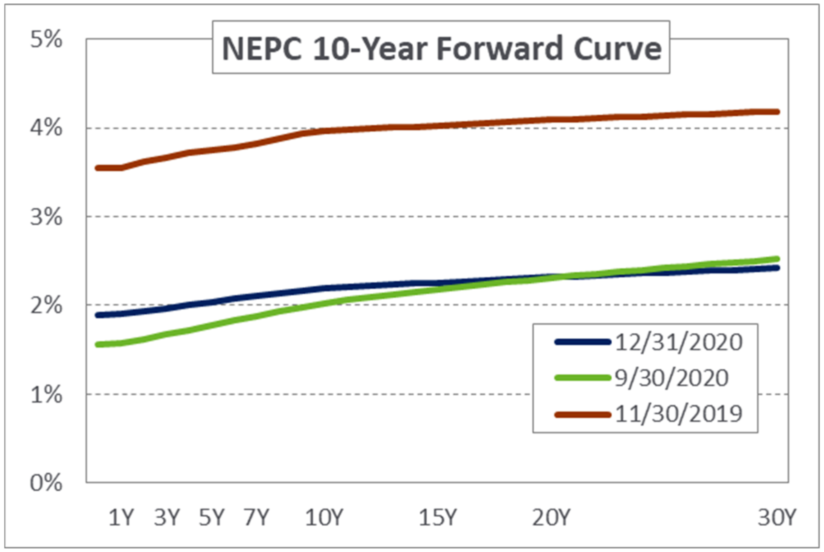
**Negative real yields reflect central bank intervention**

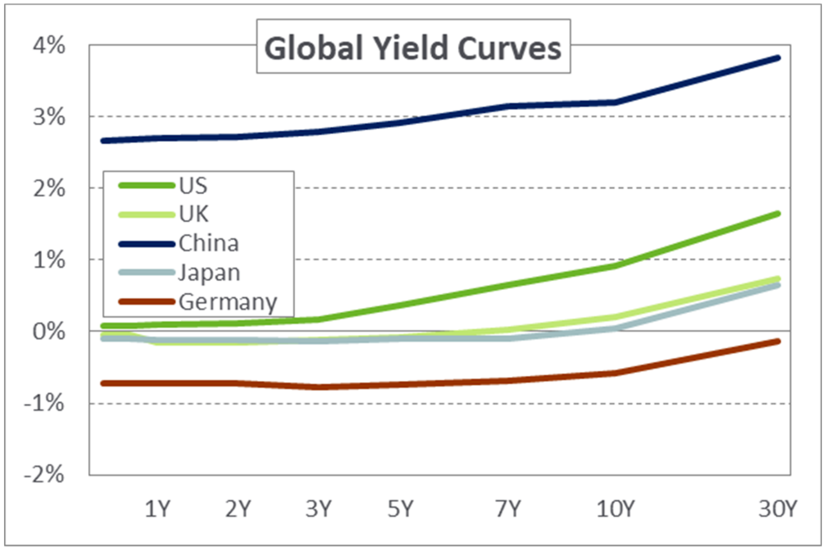
Low real rates depress returns for all assets in the long-term

**The Fed's easy policy and low inflation suppress long term yield forecasts**

**The outlook for Japan and Europe bonds are poor due to negative nominal yields**

**Emerging market interest rates are higher relative to the developed world**




Source: (Top) FactSet, NEPC
Source: (Bottom) FactSet, NEPC

# EQUITY ASSUMPTIONS

# EQUITY ASSUMPTIONS OVERVIEW

**Equity return assumptions reflect the influence of our Permanent Interventions Key Market Theme**

**Discounting future earnings with lower interest rates supports higher equity valuation multiples over time**

- Price-to-earnings and profit margin terminal values have been adjusted higher

**Consider higher strategic equity targets as the long-term return differential relative to fixed income is wide**

**We recommend that strategic asset allocation targets for emerging market equity reflect an overweight**

- The return assumption for emerging equity is highest among public equity and we encourage sourcing from EAFE exposure

**NEPC encourages a modest strategic bias to small-cap relative to exposure in the MSCI ACWI IMI**

# EQUITY: ASSUMPTIONS

| Equity Building Blocks | |
|---|---|
| **Illiquidity Premium** | The return expected for investments with illiquidity risk |
| **Valuation** | Represents P/E multiple contraction or expansion relative to long-term trend |
| **Inflation** | Market-specific inflation based on country revenue and region-specific inflation |
| **Real Earnings Growth** | Market-specific real growth based on a weighted-average derived from country revenue contribution and GDP growth |
| **Dividend Yield** | Income distributed to shareholders adjusted to reflect market trends |

| Asset Class | 10-Year Return | Year-over-Year Change |
|---|---|---|
| US Large-Cap Equity | 5.4% | +0.4% |
| US Small/Mid-Cap Equity | 5.7% | +0.2% |
| US Microcap Equity | 6.6% | -0.4% |
| Non-US Developed Equity | 5.9% | -0.1% |
| Non-US Developed Small-Cap Equity | 6.1% | -0.3% |
| Emerging Market Equity | 7.5% | -1.5% |
| Emerging Market Small-Cap Equity | 8.1% | -1.1% |
| China Equity | 7.0% | -1.8% |
| Hedge Fund - Equity | 4.0% | -0.8% |
| *Global Equity** | *6.2%* | - |
| *Private Equity** | *9.3%* | -0.1% |

Source: NEPC
*Calculated as a blend of other asset classes

# EQUITY: REAL EARNINGS GROWTH

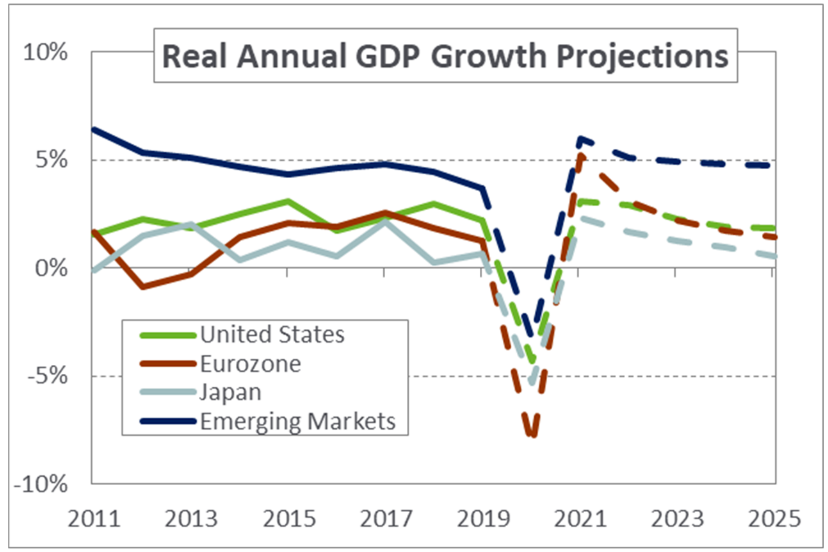
**Global growth rates reflect the concerns of COVID-19 and US-China trade tensions**

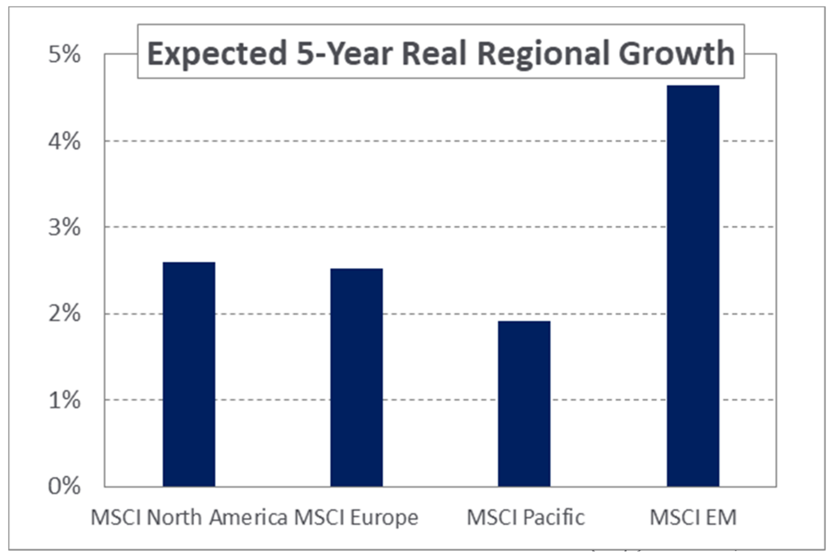
**Regions more reliant on EM for revenue generation are forecasted to enjoy higher real earnings growth**

Non-US stocks benefit from a greater portion of revenue from EM than US stocks

**Small-caps have elevated long-term targets for real earnings growth relative to large-cap equities**

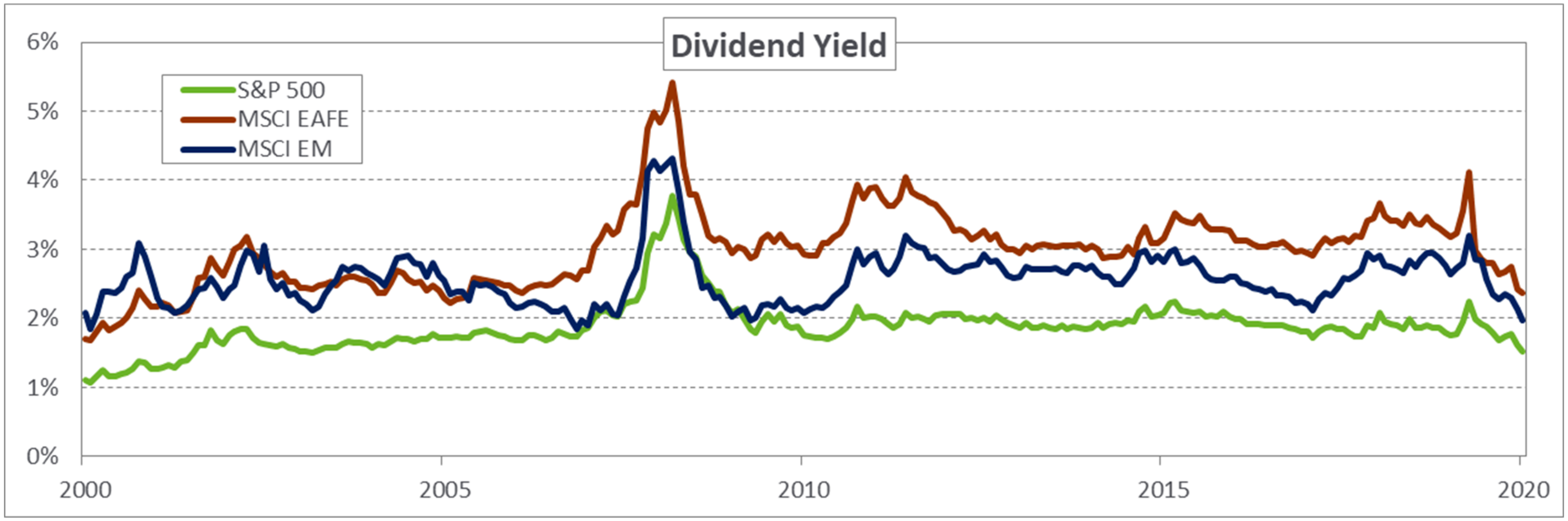
This suggests a forward-looking risk premium for small- & mid-caps over large-cap




Source: (Bottom) IMF, MSCI, FactSet, NEPC

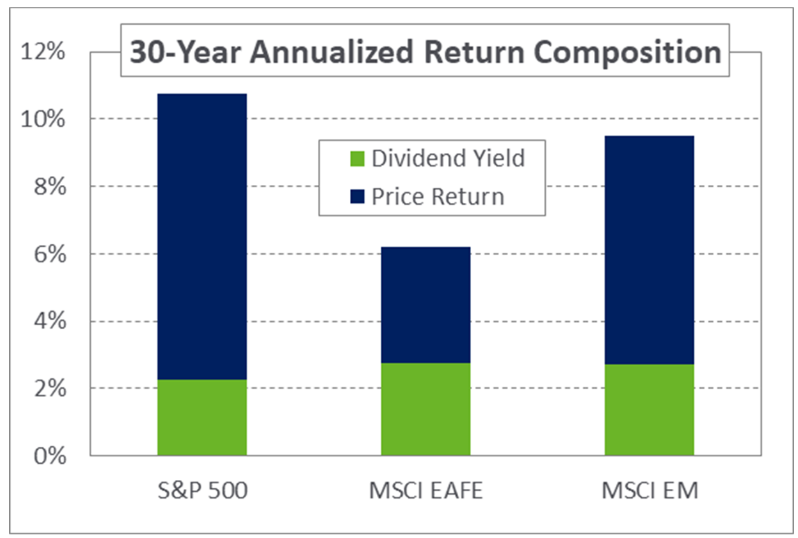
# EQUITY: DIVIDEND YIELD




**The 20 year terminal value estimate for the S&P 500 dividend yield is 2.50%**

**Non-US stocks offer higher dividend yields relative to the US over the long-term**

Terminal value dividend yield inputs for MSCI EM and EAFE are 2.5% and 3.0%




Source: (Top) S&P, MSCI, FactSet, NEPC
Source: (Bottom) S&P, MSCI, FactSet, NEPC

# EQUITY: VALUATION

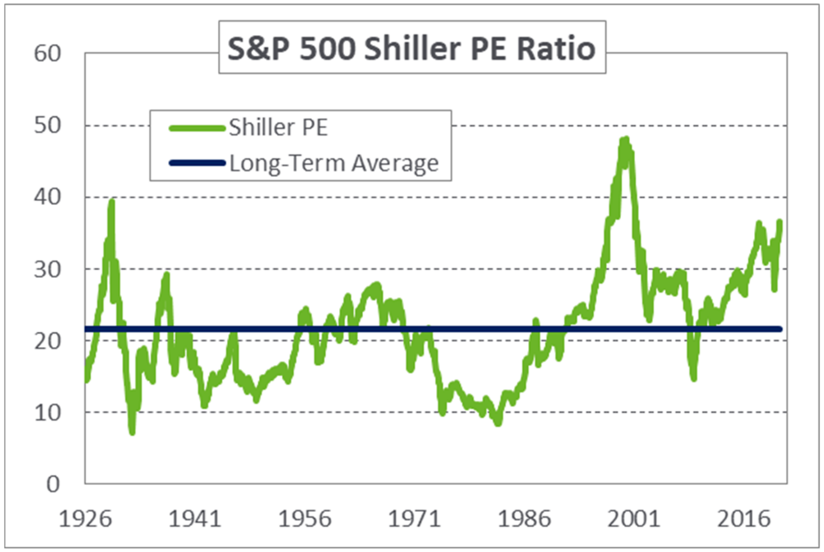
**US large-cap stocks appear overvalued relative to long-term averages**

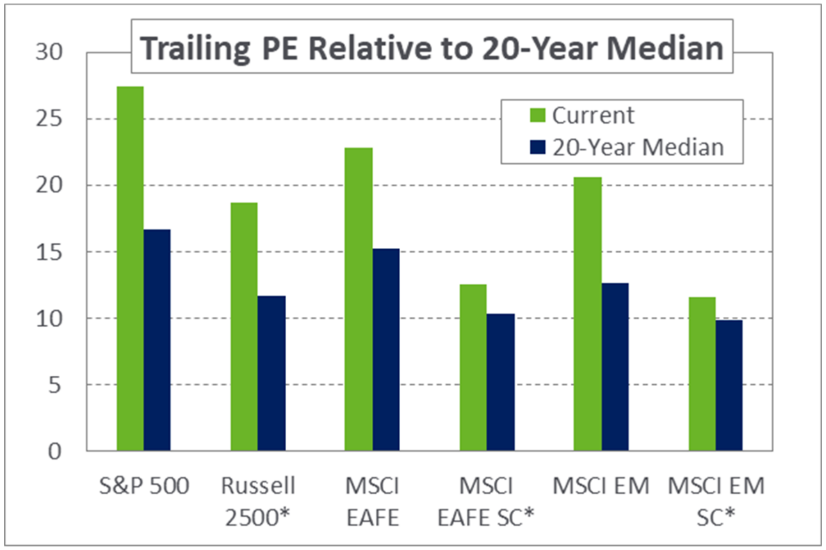
Yet low interest rates and inflation can support higher P/E levels

**P/E terminal value inputs are higher for the US and reflect easy Fed policy and low interest rates levels**

EAFE P/E levels reflect a less constructive market outlook

**Emerging market equities offer an attractive total return opportunity relative to developed markets**

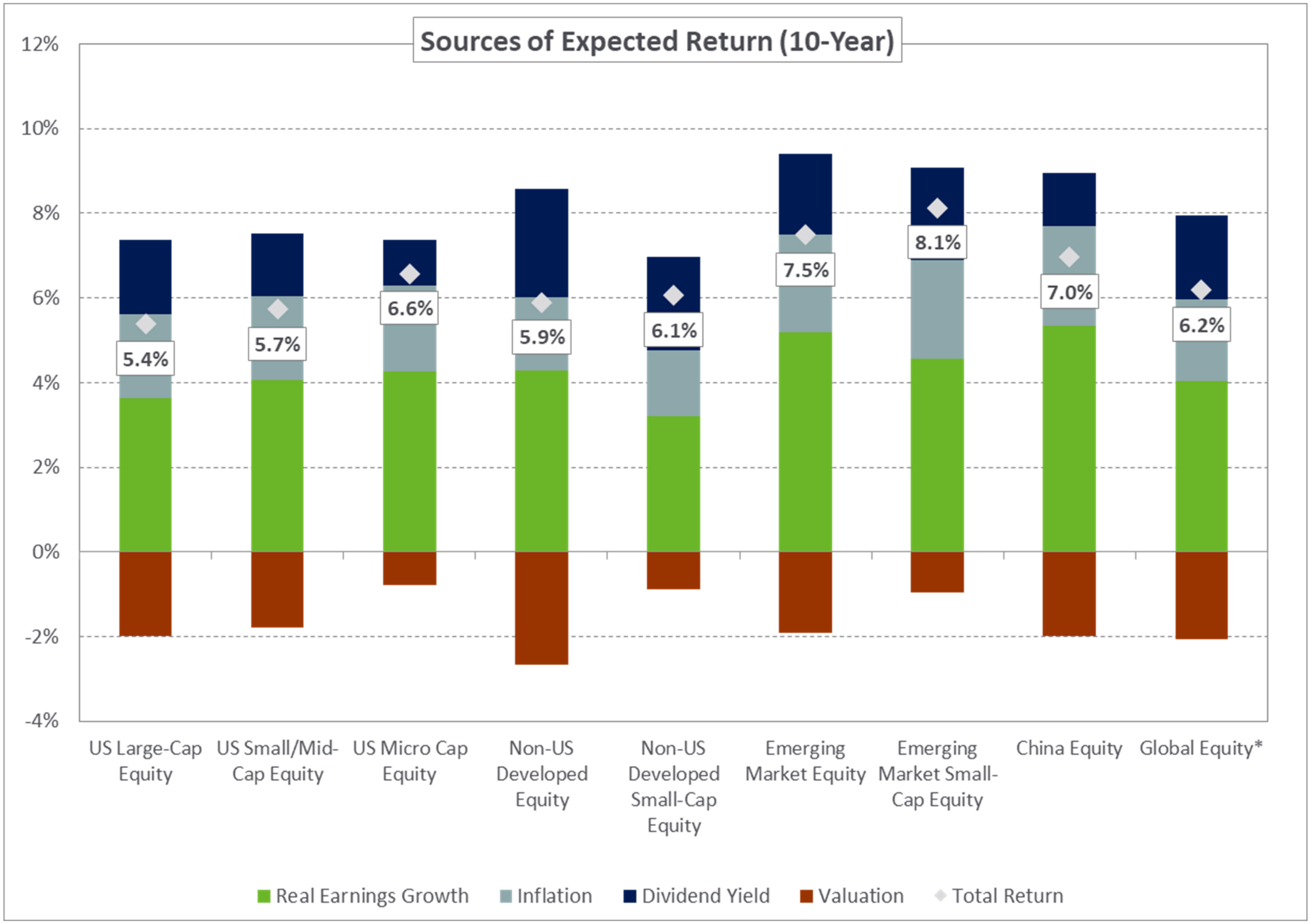



Source: (Top) S&P, Shiller, NEPC; long-term average beginning in 1926

Source: (Bottom) S&P, Russell, MSCI, FactSet, NEPC; *Small cap indices valuations based on EV/EBITDA multiples; MSCI EM Small Cap median calculated since 3/31/2003

# EQUITY: BUILDING BLOCKS




Source: NEPC
*Calculated as a blend of other classes

# FIXED INCOME ASSUMPTIONS

# FIXED INCOME ASSUMPTIONS OVERVIEW

## Fixed income return assumptions are lower with market movements in interest rates and credit spreads

## While return assumptions are low for safe-haven assets, we continue to endorse a dedicated Treasury allocation

We recommend a strategic blend of 50% US Treasuries and 50% TIPS for total return focused investors

## Safe-haven instruments may differ by investor

The fixed income profile and duration should reflect risk objectives, liability/commitment structure, and desire for capital efficiency

## Return-seeking credit investments look to earn income and exploit shifts in credit spreads and market cycles

We believe a strategic blend of 50% high yield, 25% levered loans, and 25% blended EMD offers an improved beta profile for return-seeking credit relative to US high yield

# FIXED INCOME: ASSUMPTIONS

| Fixed Income Building Blocks | |
|---|---|
| **Illiquidity Premium** | The return expected for investments with illiquidity risk |
| **Government Rates Price Change** | Valuation change due to shifts in the current yield curve to forecasted rates |
| **Credit Deterioration** | The average loss for credit assets due to defaults and recovery rates |
| **Spread Price Change** | Valuation change due to shifts in credit spreads over the duration of the investment |
| **Credit Spread** | Yield premium provided by securities with credit risk |
| **Government Rates** | The yield attributed to sovereign bonds that do not have credit risk |

| Asset Class | 10-Year Return | Year-over-Year Change |
|---|---|---|
| US TIPS | 1.0% | -1.2% |
| US Treasury Bond | 0.9% | -1.0% |
| US Corporate Bond | 2.2% | -1.2% |
| US Mortgage-Backed Securities | 1.2% | -1.3% |
| US High Yield Corporate Bond | 2.9% | -1.2% |
| US Leveraged Loan | 3.9% | -0.9% |
| Emerging Market External Debt | 3.0% | -1.1% |
| Emerging Market Local Currency Debt | 5.0% | -0.4% |
| Non-US Government Bond | 0.6% | +0.4% |
| US Municipal Bond (1-10 Year) | 1.1% | -0.8% |
| US High Yield Municipal Bond | 2.8% | -0.4% |
| Hedge Fund - Credit | 3.9% | -0.9% |
| *US Aggregate Bond** | *1.4%* | -1.1% |
| *Private Debt** | *6.1%* | -0.6% |

Source: NEPC
*Calculated as a blend of other asset classes

# FIXED INCOME: CREDIT SPREADS

**Credit spreads are broadly below long-term medians**

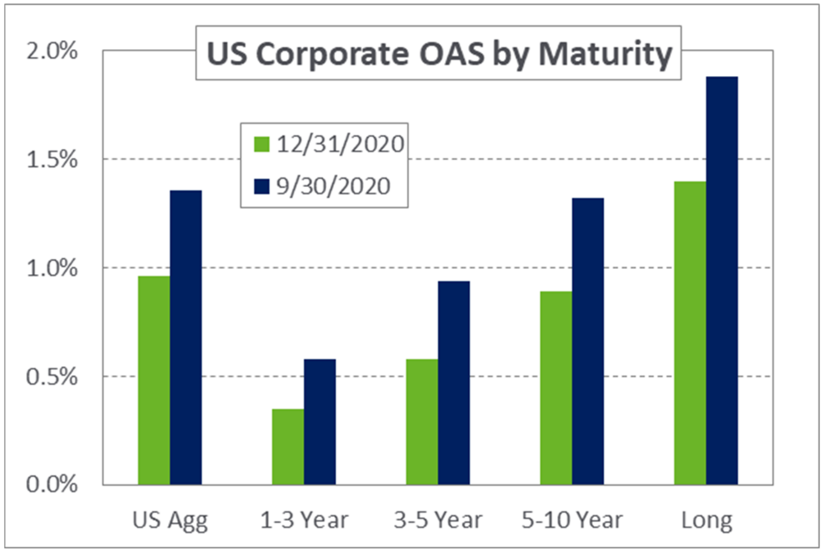
Spreads tightened in the last quarter across credit qualities

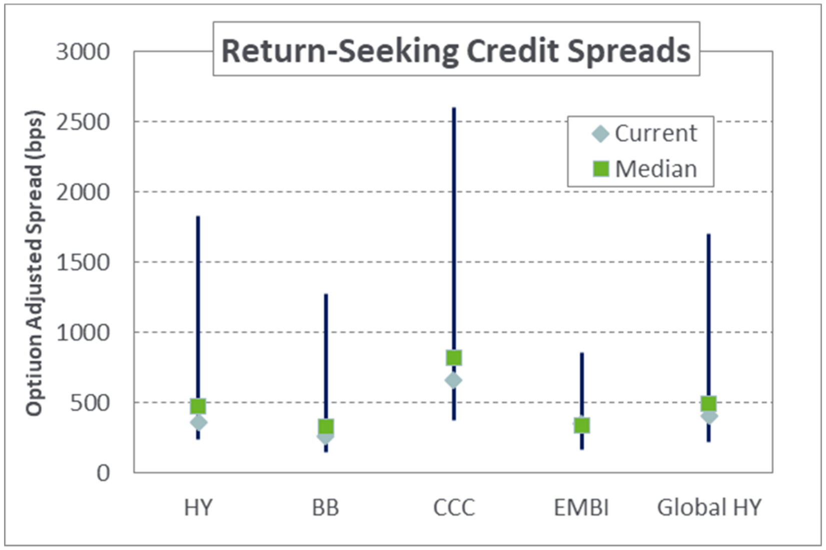
**Lower spread levels reduce future return expectations**

**Credit spread assumptions reflect potential disruption**

With a record number of BBB rated corporates, fallen angel downgrades are a greater risk

**Default and recovery rates assumptions are based on long-term history**




Source: (Top) Barclays, FactSet, NEPC

Source: (Bottom) Barclays, JPM, FactSet, NEPC; as of 12/31/2000

# FIXED INCOME: RATES PRICE CHANGE

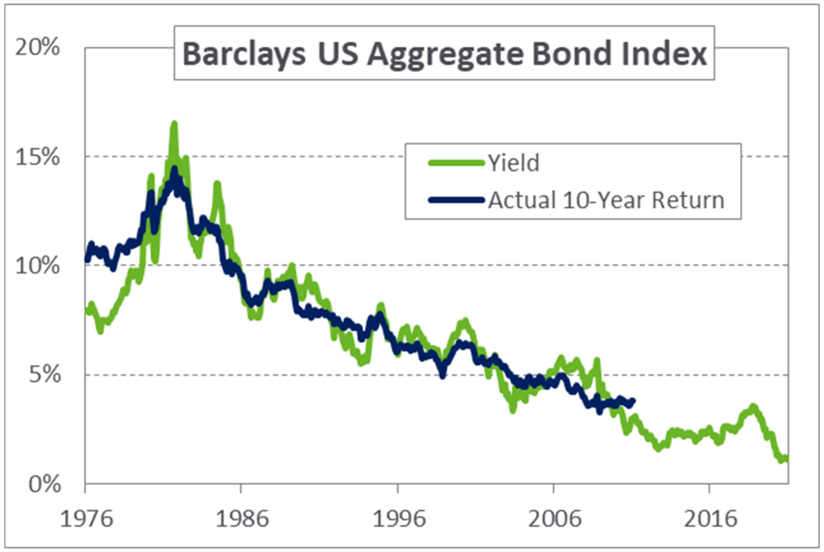
**Rates price change reflects shifts in interest rates, the yield curve, and roll down**

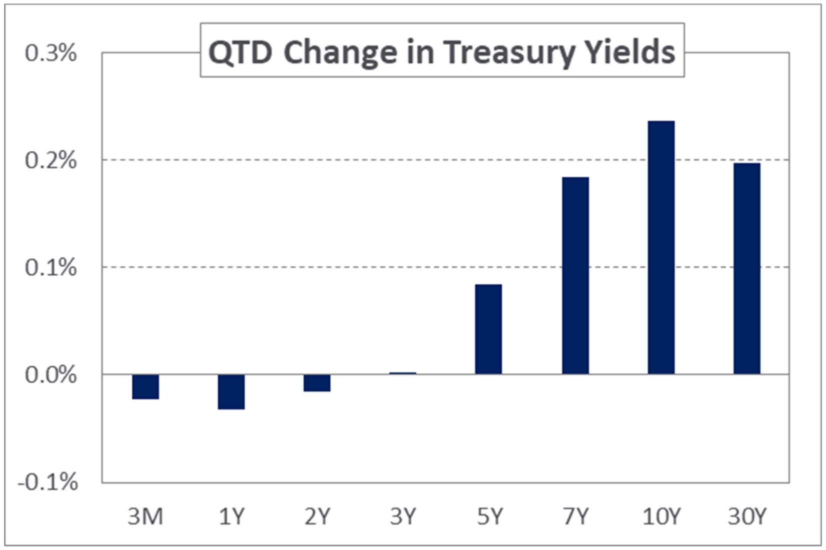
Roll down refers to the price change due to the aging of a bond along the yield curve

**Rates price change is a big component of total return**

Interest rate increases are a headwind to future returns

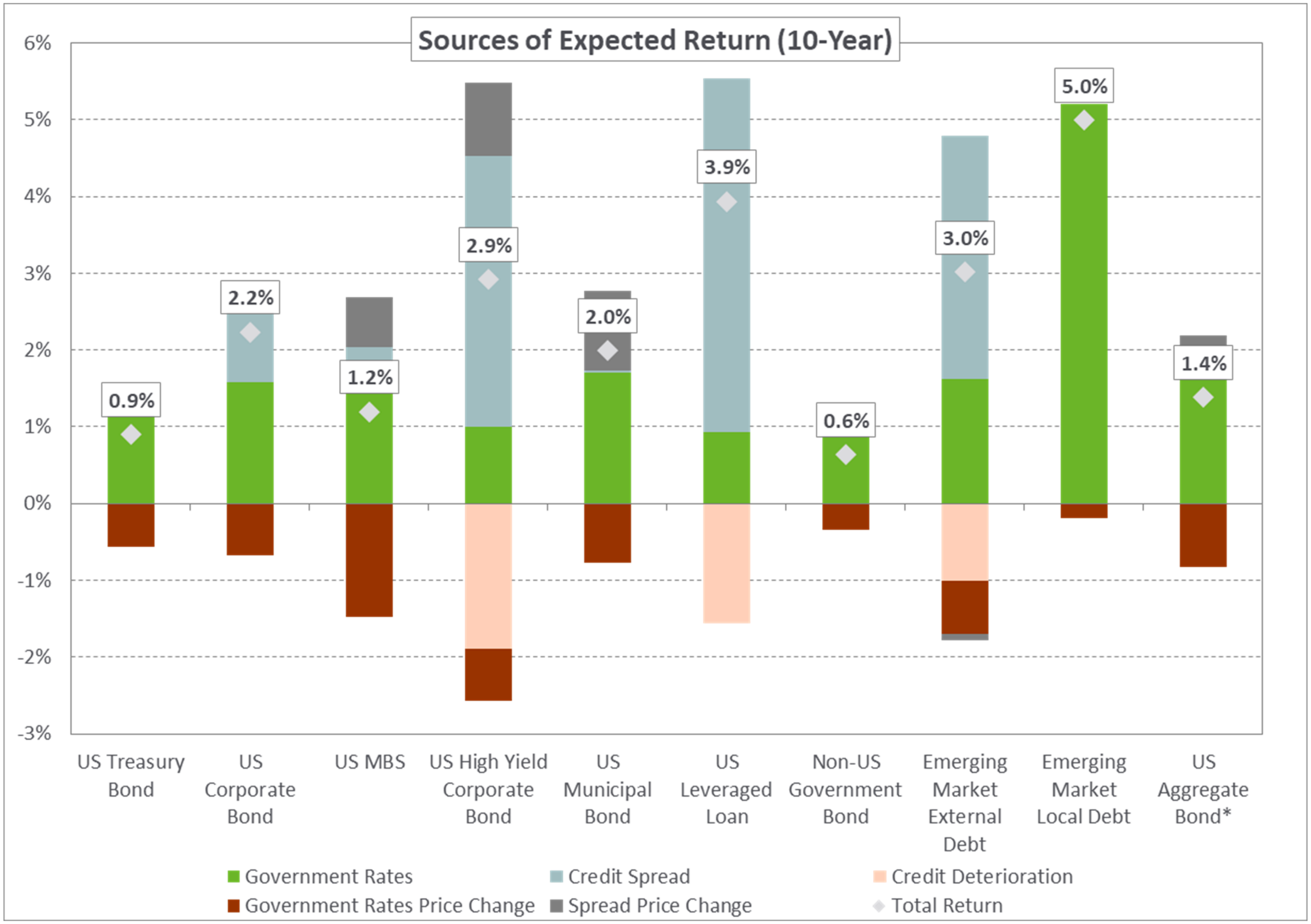
**Roll down offers relief for rising rates when the yield curve is steep**



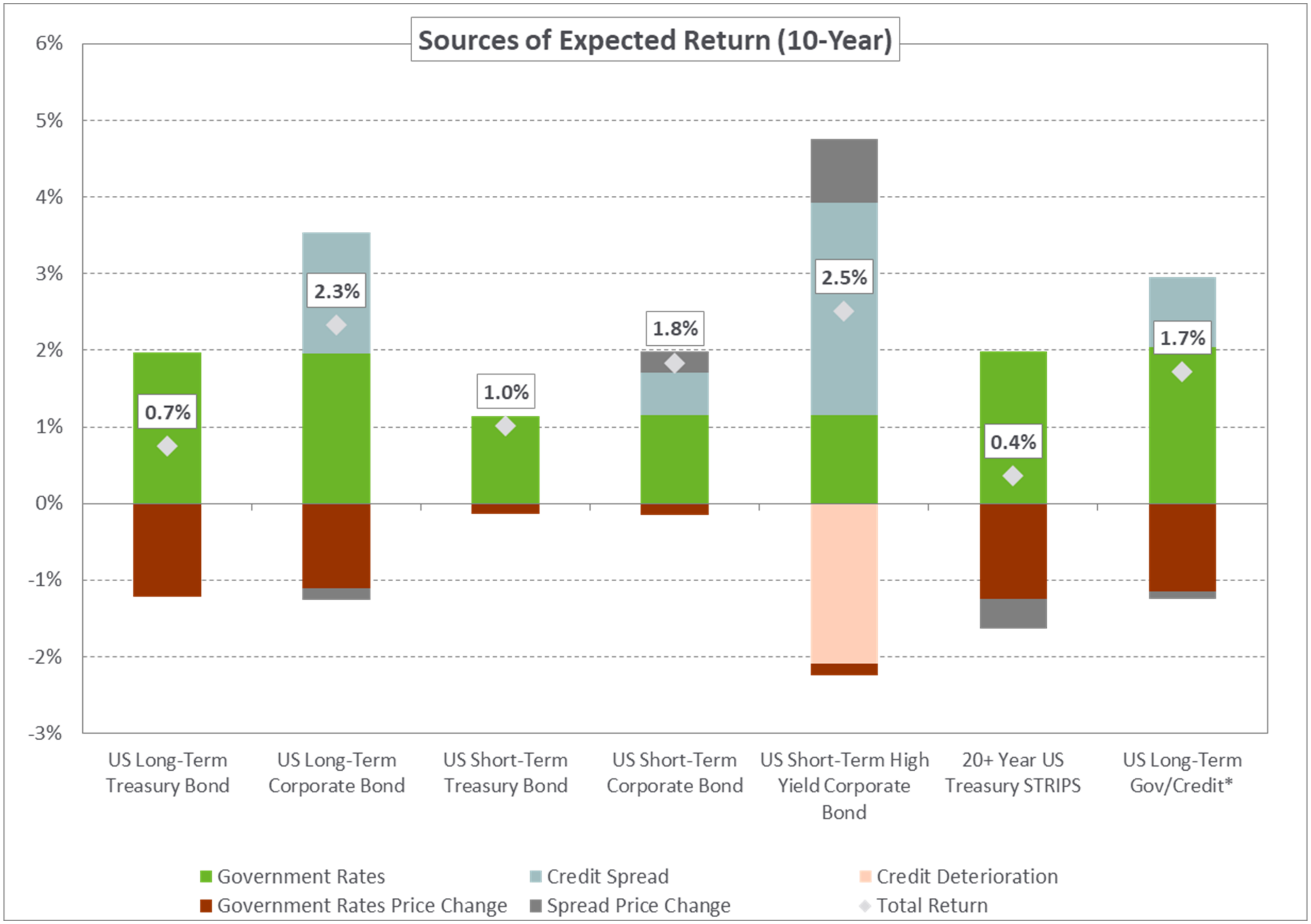

Source: (Top) Barclays, FactSet, NEPC
Source: (Bottom) FactSet, NEPC

# FIXED INCOME: BUILDING BLOCKS




Source: NEPC
*Calculated as a blend of other classes

# FIXED INCOME: BUILDING BLOCKS




Source: NEPC
*Calculated as a blend of other classes

# REAL ASSET ASSUMPTIONS

# REAL ASSET ASSUMPTIONS OVERVIEW

**The strategic outlook for real assets reflects a high level of uncertainty due to subdued inflation expectations**

Real assets offer a meaningful portfolio diversification benefit, but are exposed to a wide range of potential inflation scenarios

**Real assets exhibit different betas to inflation and each asset class is exposed to various economic factors**

Diversification and correlation benefits are helpful to a portfolio but must be carefully considered relative to the expected risk premium

**Inflation-sensitivity and portfolio objectives influence an investor's strategic allocation to real assets**

We encourage investors to remove commodity futures from strategic allocation targets due to persistent negative roll yield

**Strategic targets to Gold should be carefully weighed relative to the long-term macroeconomic environment**

Gold exposure can be a challenge to investor risk-tolerance given its volatility profile and lack of a consistent risk premium

# REAL ASSET: ASSUMPTIONS

| Real Assets Building Blocks | |
|---|---|
| **Illiquidity Premium** | The return expected for investments with illiquidity risk |
| **Valuation** | The change in price of the asset moving to a terminal value or real average level |
| **Inflation** | Based on the inflation paths as defined by TIPS breakeven and NEPC assumptions |
| **Growth** | Market-specific real growth based on a weighted-average derived from country revenue contribution and GDP growth |
| **Real Income** | The inflation-adjusted income produced by the underlying tangible or physical asset |

| Asset Class | 10-Year Return | Year-over-Year Change |
|---|---|---|
| Commodity Futures | 0.9% | -3.1% |
| Midstream Energy | 7.4% | - |
| US REIT | 5.5% | +0.1% |
| Global Infrastructure Equity | 5.9% | +0.6% |
| Global Natural Resources Equity | 6.7% | -0.6% |
| Gold | 2.9% | N/A |
| Core Real Estate | 4.4% | -0.8% |
| Non-Core Real Estate | 5.5% | -0.9% |
| Private Debt - Real Estate | 4.1% | -0.9% |
| Private Real Assets - Natural Resources | 8.0% | -1.1% |
| Private Real Assets - Infrastructure | 5.4% | -0.5% |

Source: NEPC
*Calculated as a blend of other asset classes

# REAL ASSET: REAL INCOME

## Equity-Like: Real income is inflation-adjusted dividend

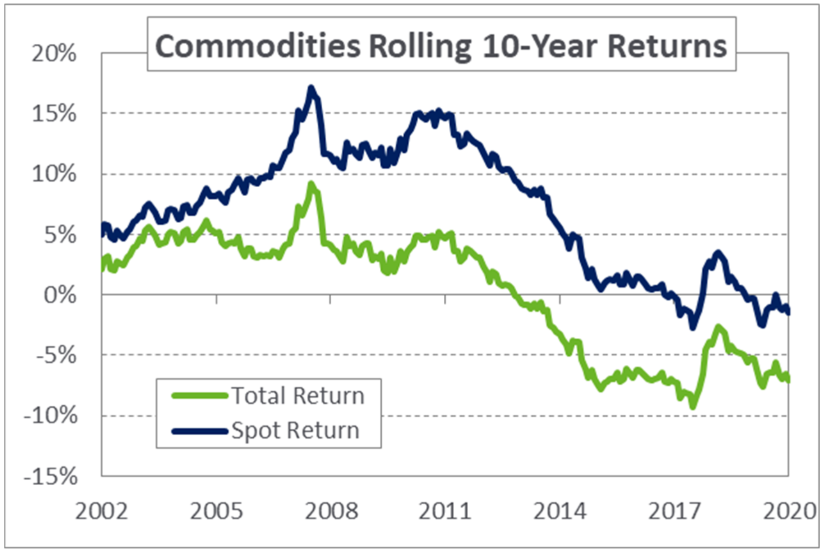
Includes public infrastructure, REITS, midstream energy, and natural resource equity

## Real Estate: Real income is net operating income

NOI growth exhibits a cyclical economic pattern

## Commodities: Real income includes collateral return

Collateral is based on a cash proxy over the time horizon




| Real Assets Yields | 9/30/20 | 12/31/20 |
|---|---|---|
| Midstream Energy | 9.9% | 7.9% |
| Core Real Estate | 4.4% | 4.3% |
| US REIT | 4.1% | 3.8% |
| Global REIT | 4.8% | 4.3% |
| Global Infrastructure Equity | 4.1% | 3.1% |
| Global Natural Resources Equity | 4.5% | 3.5% |
| US 10-Yr Breakeven Inflation | 1.6% | 2.0% |
| Commodity Index Roll Yield* | -6.7% | -0.1% |

Source: (Top) Bloomberg, FactSet, NEPC

Source: (Bottom) NCREIF, Alerian, NAREIT, S&P, FactSet, NEPC

*Commodity Index Roll Yield represents a proprietary calculation methodology

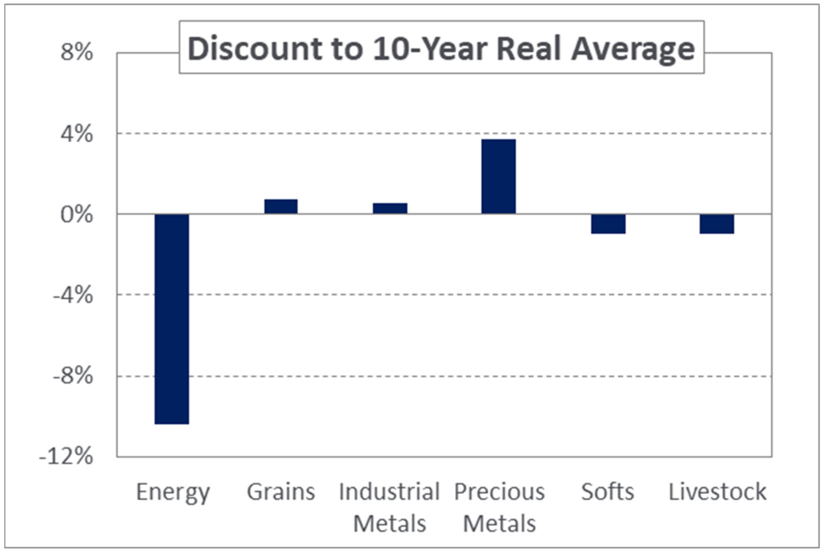
# REAL ASSET: VALUATION

**Commodity valuations are based on the long-term real average of spot prices**

- Energy commodity prices are trading below their long-term real averages

**Valuation assumptions for other real assets are based on various valuation inputs**

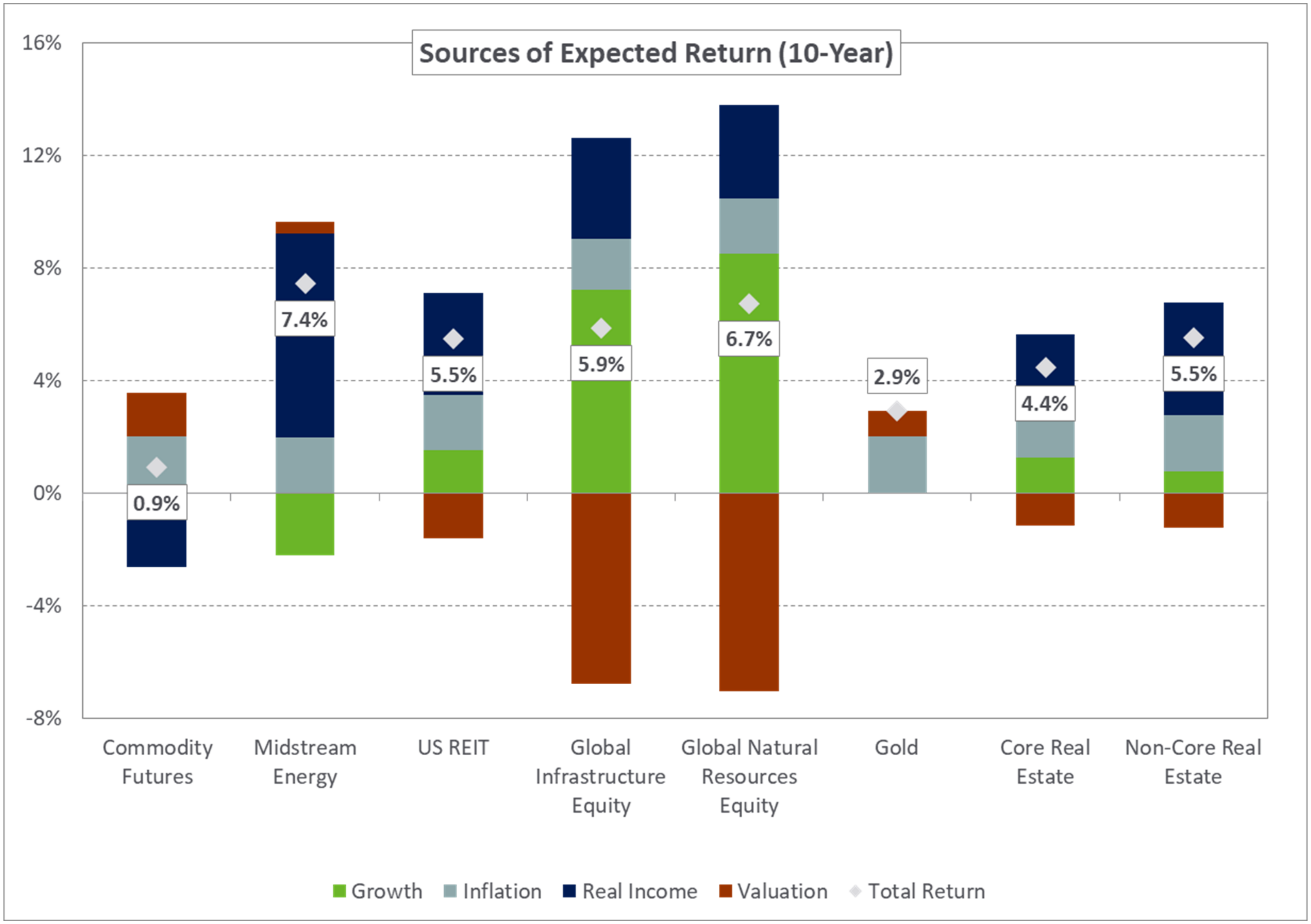
- Cap rates are used for core real estate and price-to-cash flow from operations is used for midstream energy





Source: (Top) FactSet, NEPC
Source: (Bottom) FactSet, NEPC

# REAL ASSET: BUILDING BLOCKS




Source: NEPC

# ALTERNATIVES

NEPC, LLC

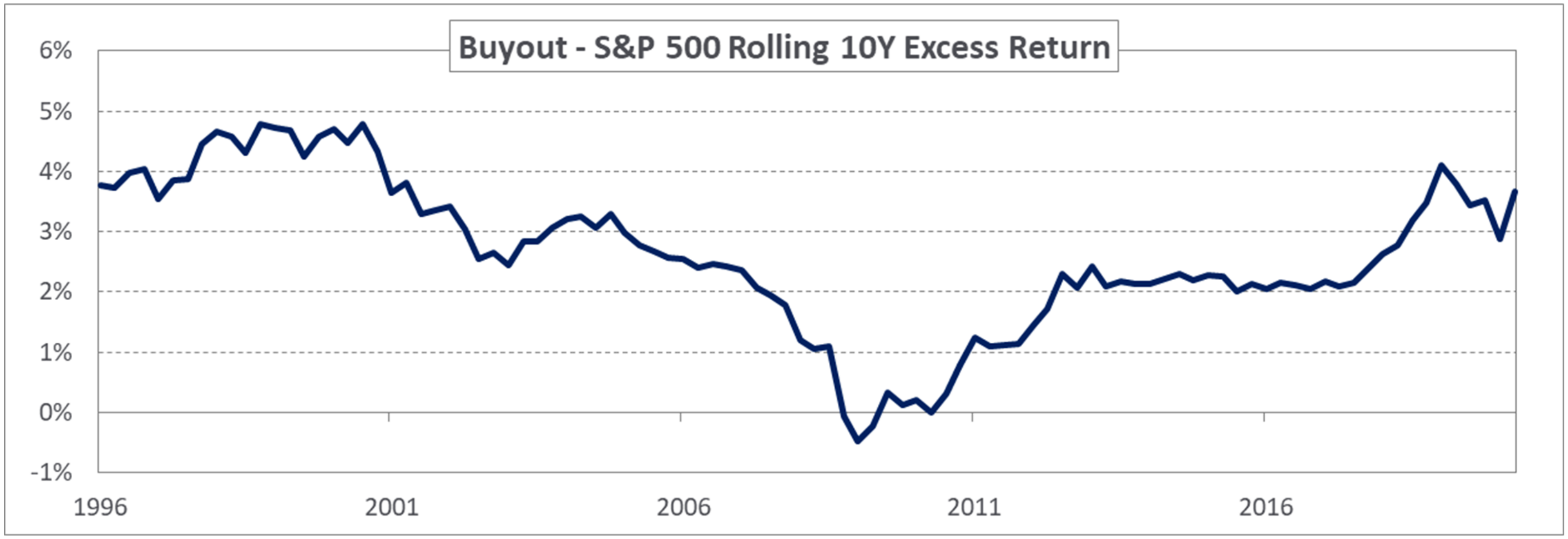
# ALTERNATIVES METHODOLOGY

## Private market assumptions are constructed from betas to public markets with an added illiquidity premia

Historically, the observed illiquidity premium has been a significant component driving private market returns

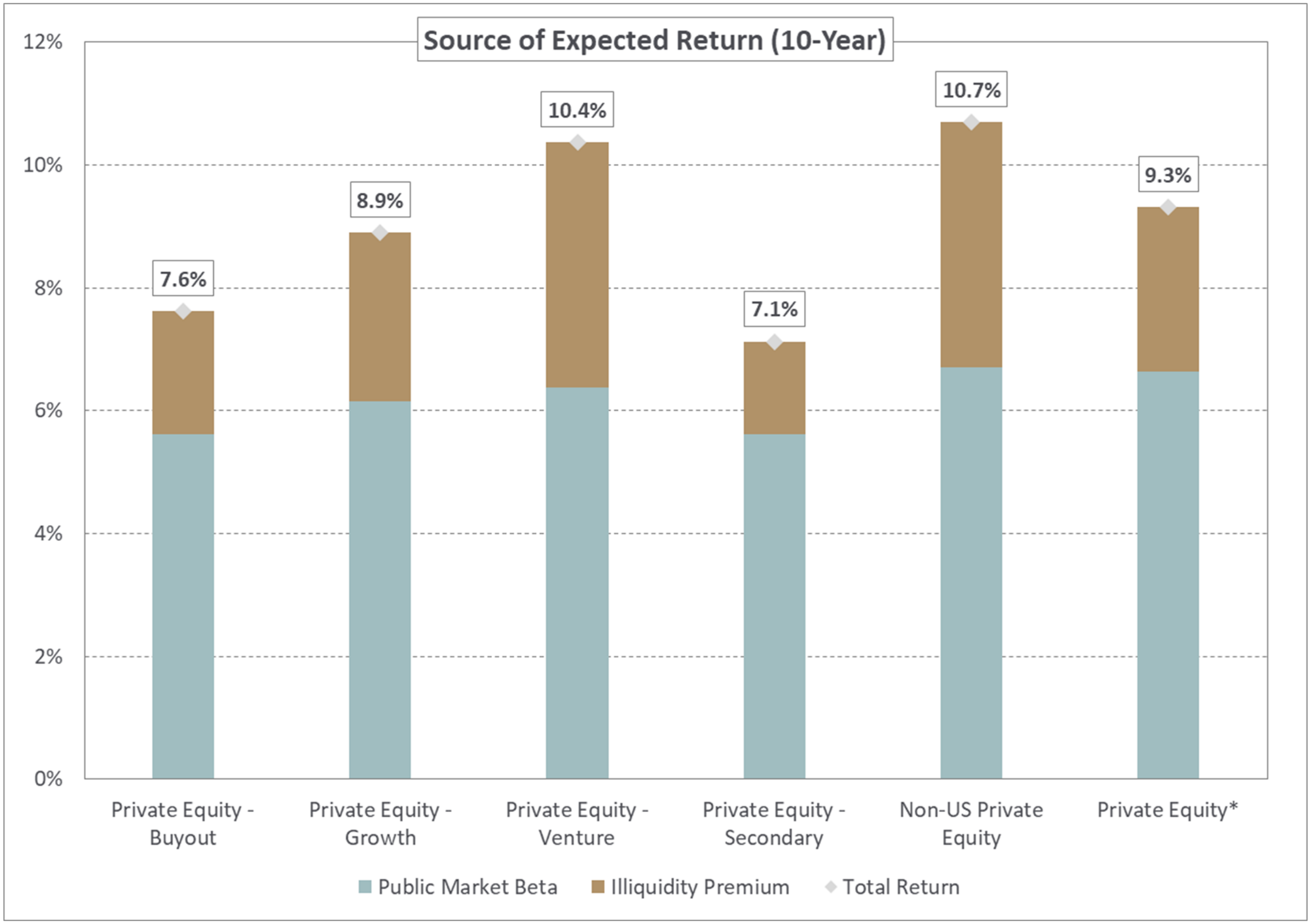
## Hedge fund assumptions are constructed from betas to public markets with an added alpha assumption

Alpha based on historical manager universe performance relative to a market-based benchmark




Source: Thomson One, S&P, FactSet

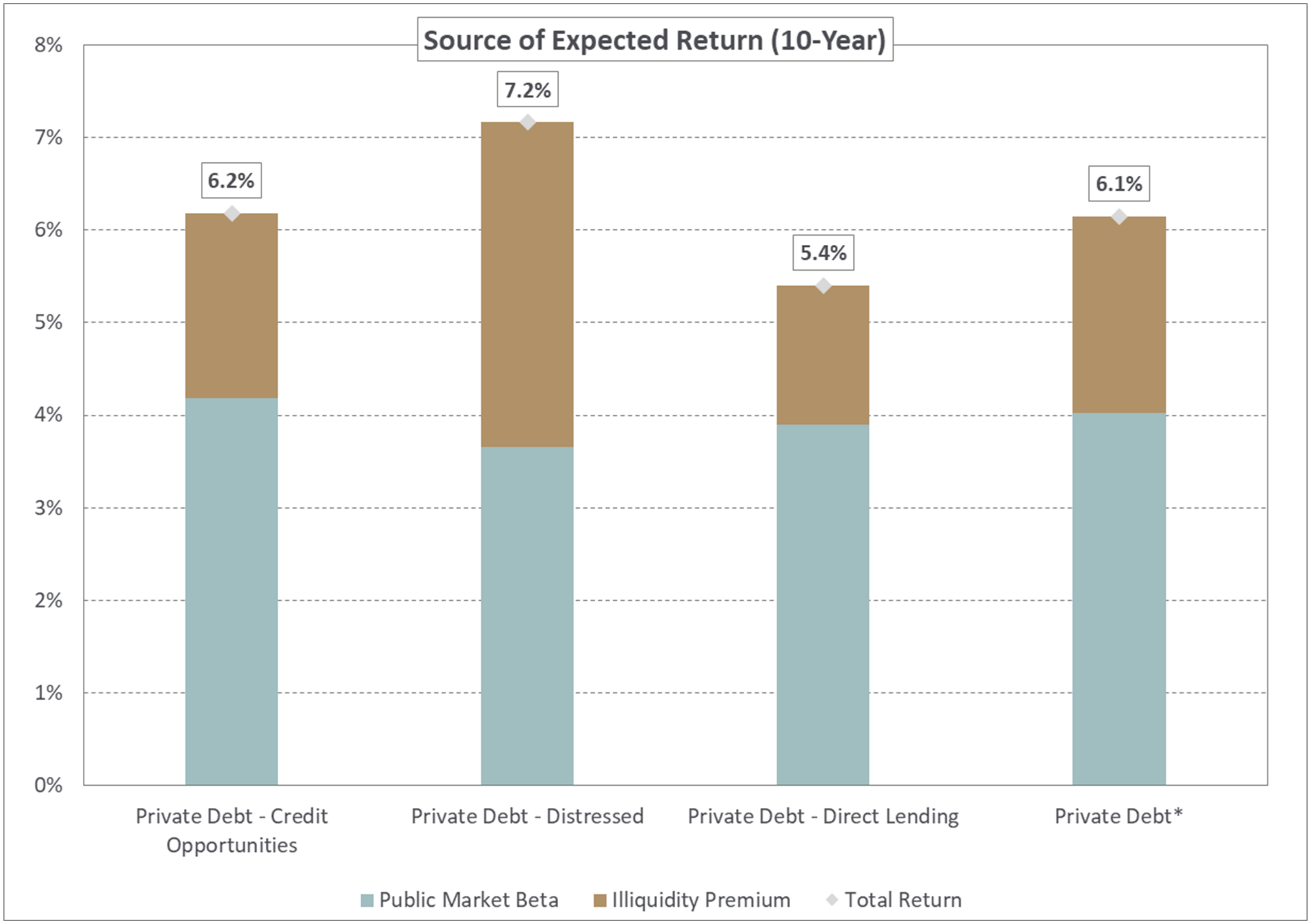
# PRIVATE EQUITY BUILDING BLOCKS




Source: NEPC

*Private Equity is a derived composite of 34% US Buyout, 34% US Growth, 8.5% US Secondary, 8.5% US Venture, 15% Non-US PE

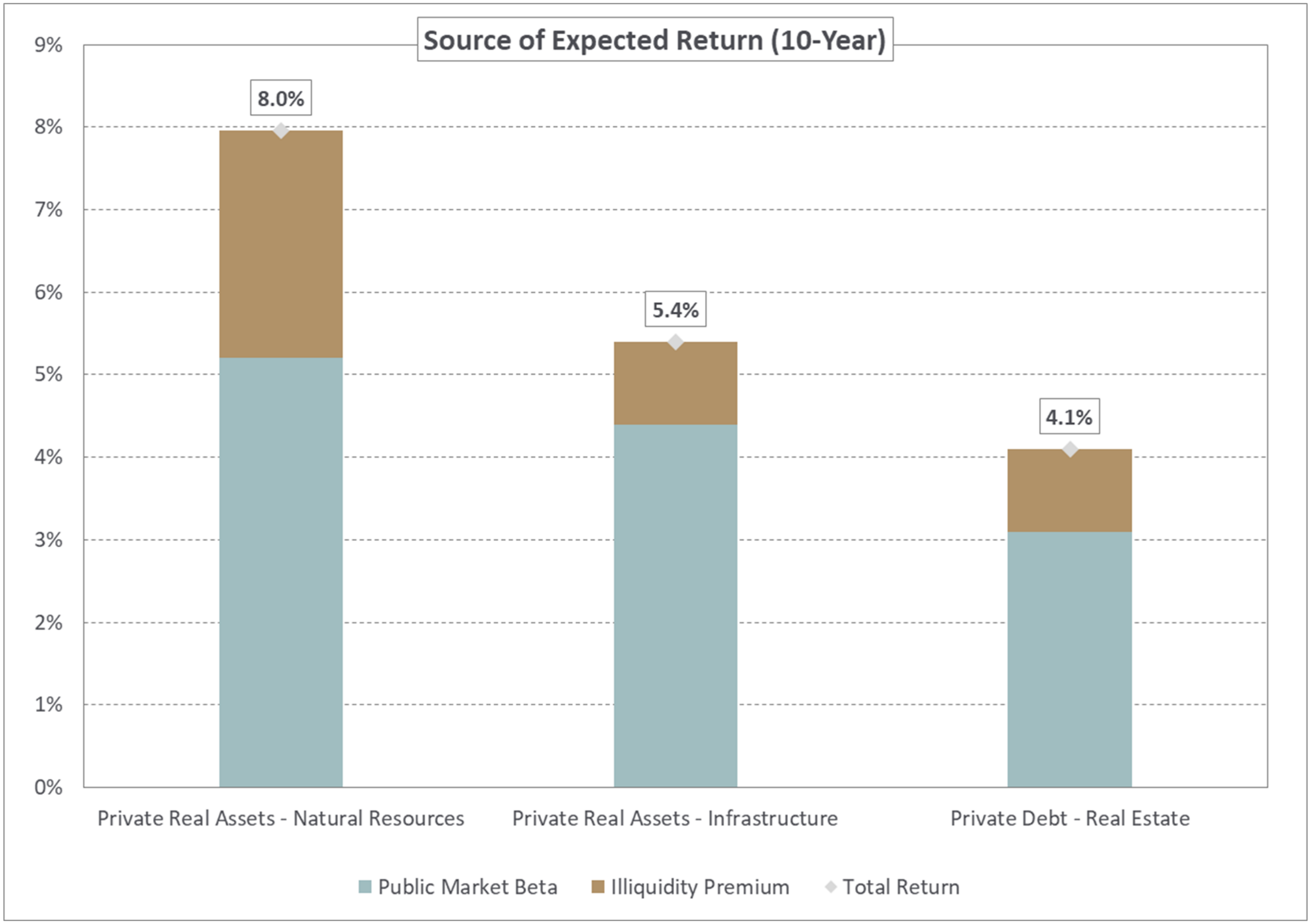
# PRIVATE DEBT BUILDING BLOCKS




Source: NEPC

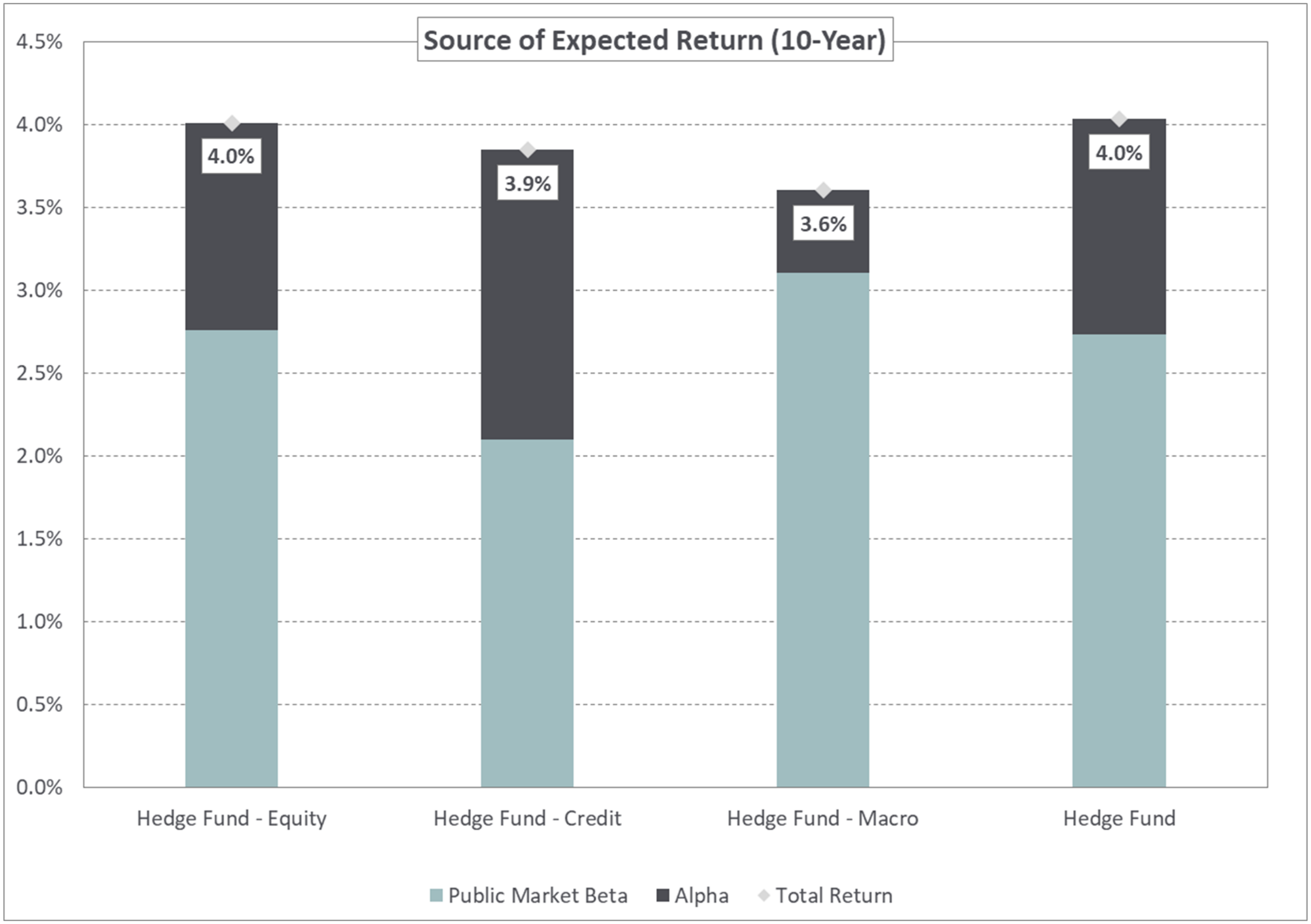
*Private Debt is a derived composite of 25% Mezzanine, 25% Distressed, 50% Direct Lending

# PRIVATE REAL ASSET BUILDING BLOCKS




Source: NEPC

# HEDGE FUND BUILDING BLOCKS




Source: NEPC
*Hedge Funds is a derived composite of 40% Long/Short, 40% Credit, 20% Macro

# APPENDIX

# 12/31/20 CAPITAL MARKET ASSUMPTIONS

| | Asset Class | 10-Year Return | 30-Year Return | Standard Deviation |
|---|---|---|---|---|
| MACRO | **Inflation** | 2.0% | 2.2% | — |
| | **Cash** | 0.8% | 1.9% | 0.6% |
| | **US Leverage Cost** | 1.2% | 2.2% | 0.7% |
| | **Non-US Cash** | 0.0% | 1.1% | 0.6% |
| EQUITY | **US Large-Cap Equity** | 5.4% | 6.3% | 16.6% |
| | **US Small/Mid-Cap Equity** | 5.7% | 6.6% | 20.7% |
| | **Non-US Developed Equity** | 5.9% | 6.5% | 19.7% |
| | **Non-US Developed Equity (USD Hedge)** | 6.1% | 6.7% | 17.7% |
| | **Non-US Developed Small-Cap Equity** | 6.1% | 6.8% | 22.5% |
| | **Emerging Market Equity** | 7.5% | 8.4% | 28.7% |
| | **Emerging Market Small-Cap Equity** | 8.1% | 8.6% | 31.5% |
| | ***Global Equity**** | *6.2%* | *7.0%* | *18.0%* |
| | **Hedge Fund – Equity** | 4.0% | 5.0% | 11.5% |
| | **Private Equity – Buyout** | 7.6% | 8.5% | 18.5% |
| | **Private Equity – Growth** | 8.9% | 9.8% | 31.0% |
| | **Private Equity – Venture** | 10.4% | 10.7% | 45.0% |
| | **Private Equity – Secondary** | 7.1% | 8.0% | 19.5% |
| | **Non-US Private Equity** | 10.7% | 10.7% | 32.0% |
| | ***Private Equity**** | *9.3%* | *10.1%* | *24.8%* |
| | **China Equity** | 7.0% | 7.8% | 29.5% |
| | **US Microcap Equity** | 6.6% | 7.4% | 25.0% |

# 12/31/20 CAPITAL MARKET ASSUMPTIONS

| | Asset Class | 10-Year Return | 30-Year Return | Standard Deviation |
|---|---|---|---|---|
| CREDIT | **US TIPS** | 1.0% | 2.1% | 5.8% |
| | **US Treasury Bond** | 0.9% | 2.0% | 5.3% |
| | **US Corporate Bond** | 2.2% | 3.7% | 7.3% |
| | **US Mortgage-Backed Securities** | 1.2% | 2.3% | 6.5% |
| | ***US Aggregate Bond**** | *1.4%* | *2.7%* | *5.7%* |
| | **US High Yield Corporate Bond** | 2.9% | 5.0% | 11.5% |
| | **US Leveraged Loan** | 3.9% | 4.8% | 9.2% |
| | **Emerging Market External Debt** | 3.0% | 4.5% | 13.0% |
| | **Emerging Market Local Currency Debt** | 5.0% | 5.1% | 13.0% |
| | **Non-US Government Bond** | 0.6% | 1.7% | 9.5% |
| | **Non-US Government Bond (USD Hedge)** | 0.8% | 1.9% | 3.9% |
| | ***Global Government Bond**** | *0.7%* | *1.8%* | *7.9%* |
| | ***Global Government Bond (USD Hedge)**** | *0.9%* | *2.0%* | *4.0%* |
| | **Non-US Inflation-Linked Bond (USD Hedge)** | 0.1% | 1.1% | 5.9% |
| | ***Diversified Fixed Income**** | *3.0%* | *4.3%* | *7.9%* |
| | ***Global Multi-Sector Fixed Income**** | *3.0%* | *4.3%* | *7.9%* |
| | ***Absolute Return Fixed Income**** | *2.5%* | *4.0%* | *6.0%* |
| | **US Municipal Bond** | 2.0% | 2.3% | 6.0% |
| | **US Municipal Bond (1-10 Year)** | 1.1% | 1.9% | 4.5% |
| | **US High Yield Municipal Bond** | 2.8% | 3.9% | 12.0% |
| | **Hedge Fund - Credit** | 3.9% | 5.3% | 10.4% |
| | **Private Debt - Credit Opportunities** | 6.2% | 7.0% | 14.0% |
| | **Private Debt – Distressed** | 7.2% | 7.8% | 14.0% |
| | **Private Debt - Direct Lending** | 5.4% | 7.4% | 11.5% |
| | ***Private Debt**** | *6.1%* | *7.5%* | *11.9%* |

# 12/31/20 CAPITAL MARKET ASSUMPTIONS

| | Asset Class | 10-Year Return | 30-Year Return | Standard Deviation |
|---|---|---|---|---|
| CREDIT | US Short-Term TIPS (1-3 Year) | 1.1% | 2.0% | 3.2% |
| | US Short-Term Treasury Bond (1-3 Year) | 1.0% | 2.0% | 2.1% |
| | US Short-Term Corporate Bond (1-3 Year) | 1.8% | 3.7% | 3.0% |
| | US Short-Term High Yield Corporate Bond (1-3 Year) | 2.5% | 3.5% | 8.6% |
| | US Intermediate-Term TIPS (3-10 Year) | 1.0% | 2.1% | 5.4% |
| | US Intermediate-Term Treasury Bond (3-10 Year) | 0.9% | 2.1% | 5.4% |
| | US Intermediate-Term Corporate Bond (3-10 Year) | 2.3% | 3.8% | 7.6% |
| | US Long-Term Treasury Bond (10-30 Year) | 0.7% | 1.9% | 11.5% |
| | US Long-Term TIPS (10-30 Year) | 1.0% | 2.0% | 10.9% |
| | US Long-Term Corporate Bond (10-30 Year) | 2.3% | 3.8% | 11.5% |
| | 20+ Year US Treasury STRIPS | 0.4% | 1.7% | 21.2% |
| | *US Long-Term Government/Credit** | 1.7% | 3.1% | 10.6% |
| | US Corporate Bond - AAA | 1.5% | 2.8% | 5.9% |
| | US Corporate Bond – AA | 1.6% | 2.9% | 5.9% |
| | US Corporate Bond – A | 1.9% | 3.3% | 7.2% |
| | US Corporate Bond – BBB | 2.5% | 3.9% | 8.0% |
| | US Corporate Bond – BB | 3.9% | 5.6% | 9.9% |
| | US Corporate Bond – B | 3.0% | 4.9% | 12.1% |
| | US Corporate Bond - CCC/Below | -3.4% | -0.8% | 21.7% |
| | US Securitized Bond | 1.8% | 3.1% | 9.0% |
| | US Collateralized Loan Obligation | 2.3% | 3.3% | 7.5% |
| | US High Yield Securitized Bond | 2.3% | 4.5% | 11.0% |
| | US High Yield Collateralized Loan Obligation | 4.6% | 5.7% | 11.0% |
| | US Taxable Municipal Bond | 2.5% | 3.9% | 7.5% |
| | 10 Year US Treasury Bond | 0.9% | 2.3% | 7.4% |
| | 10 Year Non-US Government Bond (USD Hedge) | -0.1% | 1.1% | 5.1% |

# 12/31/20 CAPITAL MARKET ASSUMPTIONS

| | Asset Class | 10-Year Return | 30-Year Return | Standard Deviation |
|---|---|---|---|---|
| REAL ASSETS | **Commodity Futures** | 0.9% | 3.3% | 18.5% |
| | **Midstream Energy** | 7.4% | 7.3% | 27.0% |
| | ***Public Real Assets (Multi-Asset)**** | *4.4%* | *5.6%* | *14.2%* |
| | **US REIT** | 5.5% | 6.7% | 21.4% |
| | **Global Infrastructure Equity** | 5.9% | 6.6% | 20.4% |
| | **Global Natural Resources Equity** | 6.7% | 7.0% | 22.8% |
| | **Gold** | 2.9% | 3.7% | 16.4% |
| | **Core Real Estate** | 4.4% | 5.6% | 15.0% |
| | **Non-Core Real Estate** | 5.5% | 7.0% | 21.0% |
| | **Private Debt - Real Estate** | 4.1% | 5.2% | 11.0% |
| | **Private Real Assets - Natural Resources** | 8.0% | 8.5% | 32.0% |
| | **Private Real Assets – Infrastructure** | 5.4% | 6.6% | 12.5% |
| MULTI-ASSET | **Hedge Fund – Macro** | 3.6% | 4.7% | 9.2% |
| | ***Hedge Fund**** | *4.0%* | *5.2%* | *8.7%* |
| | ***60% S&P 500 & 40% US Aggregate Bond**** | *4.1%* | *5.1%* | *10.3%* |
| | ***60% MSCI ACWI & 40% US Aggregate Bond**** | *4.6%* | *5.6%* | *11.1%* |

# PRIVATE MARKETS COMPOSITES

## Assumed public market beta composites for private market return assumptions are detailed below:

### Private Equity:

Private Equity – Buyout: 25% US Large Cap, 75% US Small/Mid Cap

Private Equity – Secondary: 25% US Large Cap, 75% US Small/Mid Cap

Private Equity – Growth: 50% US Small/Mid Cap, 50% US Microcap

Private Equity – Venture: 25% US Small/Mid Cap, 75% US Microcap

Private Equity – Non-US: 70% International Small Cap, 30% Emerging Small Cap

*PE Composite: 34% Buyout, 34% Growth, 15 % Non-US, 8.5% Secondary, 8.5% Venture*

### Private Debt:

Private Debt – Direct Lending: 100% Bank Loans

Private Debt – Distressed: 20% US Small/Mid Cap, 60% US High Yield, 20% Bank Loans

Private Debt – Credit Opportunities: 34% US SMID Cap, 33% US High Yield, 33% Bank Loans

*Private Debt Composite: 50% Direct Lending, 25% Credit Opportunities, 25% Distressed*

### Private Real Assets:

Private Real Assets – Natural Resources: 30% Comm., 35% Midstream, 35% Public Resource Equity

Private Real Assets - Infrastructure: 30% Commodities, 70% Public Infrastructure

Private Real Estate Debt: 50% CMBS, 50% Core Real Estate

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