

# RECOMMENDED ASSET ALLOCATION TARGETS

## SAN BERNARDINO COUNTY EMPLOYEES' RETIREMENT ASSOCIATION



**June 2019**

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

## OVERVIEW/RECOMMENDATION

**On an annual basis (and more frequently based on developments), NEPC spends a significant amount of time reviewing capital markets, including evolving capital market themes globally.**

**We publish intermediate and long term capital market projections for over 40 asset classes**

**Using these asset class forecasts, we then apply them to the client's current strategic targets as well as alternate mixes to develop a profile of potential returns and risks associated with each mix, allowing the Board to evaluate and determine if a change in strategic targets (as well as ranges and benchmarks) is warranted**

**At the March IC meeting, staff/NEPC recommended no change to the current asset allocation targets. Targets, Ranges, Benchmark recommendations are contained on next page**



# PROPOSED ASSET ALLOCATION POLICY & RANGES

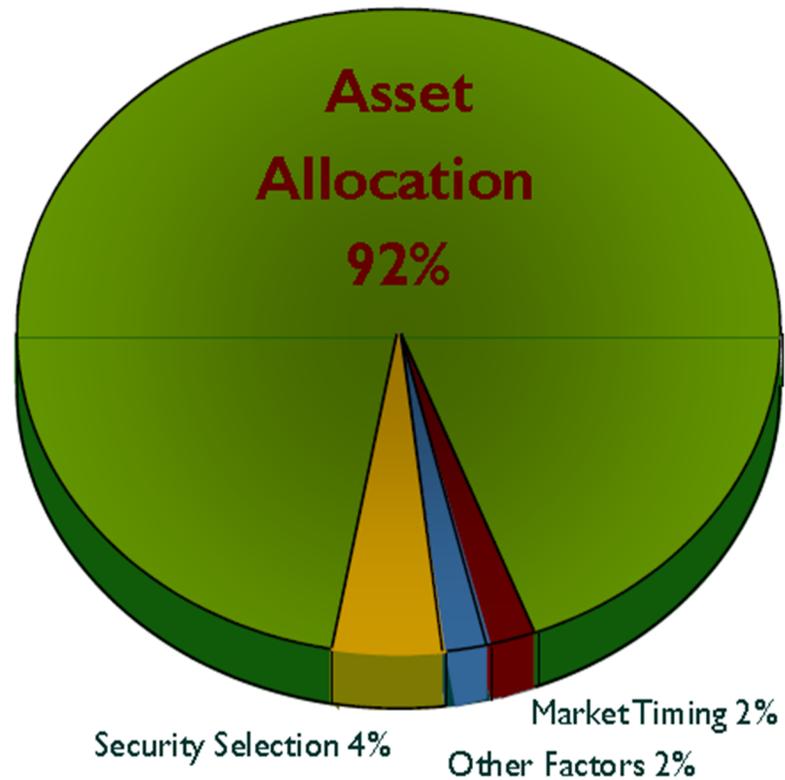
Asset Class	Target	Range	Benchmark
<b>Domestic Equities</b>			Russell 3000 Index
Passive Large Cap	6.00%	0% – 11%	
Passive Small Cap	2.00%	-3% – 7%	
Volatility	3.00%	0% – 8%	
L/S Equity	2.00%	0% – 7%	
<b>Subtotal</b>	<b>13.00%</b>	<b>8% – 18%</b>	
<b>International Equities</b>			MSCI ACWI ex USA Index
Developed Market	6.00%	1% – 11%	
Volatility	3.00%	0% – 8%	
Emerging Market Equity	6.00%	1% – 11%	
<b>Subtotal</b>	<b>15.00%</b>	<b>10% – 20%</b>	
<b>US Fixed Income</b>			Bloomberg Barclays US Aggregate Bond Index
Core	2.00%	-3% – 7%	
High Yield/Credit Strategies	13.00%	8% – 18%	
<b>Subtotal</b>	<b>15.00%</b>	<b>10% – 20%</b>	
<b>Global Fixed Income</b>			Bloomberg Barclays Global Aggregate Bond Index
International Core	1.00%	-4% – 6%	
International Credit	11.00%	6% – 16%	
Emerging Market Debt	8.00%	1% – 12%	
<b>Subtotal</b>	<b>20.00%</b>	<b>13% – 23%</b>	
<b>Real Estate</b>			NCREIF Property Index
Core	3.50%	0% – 5%	
Non-Core	3.50%	0% – 5%	
<b>Subtotal</b>	<b>7.00%</b>	<b>0% – 14%</b>	
<b>Real Assets</b>			67% Bloomberg Commodities Index 33% BBG US TIPS Index
Timber	2.00%	0% – 7%	
Commodities	2.00%	-1% – 7%	
Infrastructure	1.00%	0% – 6%	
<b>Subtotal</b>	<b>5.00%</b>	<b>0% – 10%</b>	
<b>Private Equity</b>	<b>16.00%</b>	<b>6% – 21%</b>	Russell 3000 Index
<b>Absolute Return</b>	<b>7.00%</b>	<b>0% – 12%</b>	Bloomberg Barclays US Aggregate Bond Index
Cash	2.00%	0% – 10%	91 Day T-Bill Index
<b>Total</b>	<b>100.00%</b>		



# 2019 SBCERA ASSET ALLOCATION PROCESS

# ASSET ALLOCATION: THE KEY INVESTMENT DECISION

## Determinants of Portfolio Performance



Source: *Determinants of Portfolio Performance II: An Update*, Brinson, et al, *Financial Analysts Journal*, May/June 1991, pp 40-48.

# 2019 SUMMARY OUTLOOK

## **Market dynamics shifted significantly in 2018, with Fed policy and US-China trade tensions disrupting many of our key market themes**

As a result we have removed Federal Reserve Gradualism, Extended US Economic Cycle, and Global Synchronized Growth as key themes, although in the near-term the Fed may have returned to gradualism

## **We believe we have entered a late-cycle market environment and the dynamics of such an environment will be a focal point for investors**

However, late-cycle does not mean end of cycle and equities can still offer lucrative returns, though are likely to be accompanied by additional volatility

## **The transition to a late-cycle is accompanied with a more risk-averse investment outlook as economic risks become more pronounced**

After years of low volatility and outsized equity returns, the market is likely to transition to a higher volatility regime, which offers more risk but also tactical opportunities

We recommend reducing lower quality credit exposure as higher default rates are a common aspect of late-cycle market dynamics



# SBCERA INVESTMENT OBJECTIVES

- **SBCERA investment objectives (should be stated in its Investment Policy Statement):**
  - To provide participants with required retirement benefits by earning returns sufficient to fund liabilities consistently
  - Manage assets on a total return basis
  - Exceed the assumed actuarial rate of return (7.25% currently)
  - Exceed the weighted index based on SBCERA's asset allocation policy and respective asset class component benchmarks
  - To set asset allocation policy in a manner that encompasses a strategic, long-term perspective of capital markets as well as the nature and structure of SBCERA's liabilities
  
- **Important Risks to the Plan:**
  - Volatility of returns/drawdown risk
  - Volatility of funded status
  - Volatility of contributions



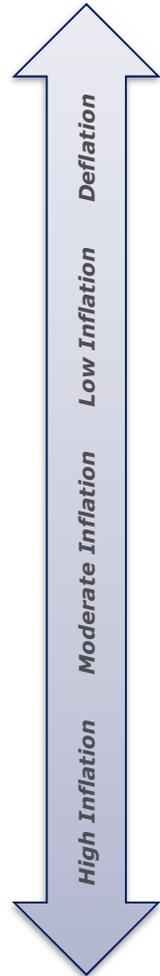
# ALLOWABLE ASSET CLASSES

<b>Capital Appreciation</b>	<b>Comment</b>
Domestic Equity	Included
International Equity	Included
Emerging Market Equity	Included
Private Equity	Included
<b>Capital Preservation</b>	
Domestic Core Fixed Income	Included
International Core Fixed Income	Included
Cash	Included
<b>Contractual Income</b>	
Domestic Credit Fixed Income	Included
International Credit Fixed Income	Included
Emerging Market Debt	Included
<b>Inflation Participation</b>	
Real Estate	Included
Timber	Included
Infrastructure & Energy	Included
Commodities	Included
<b>Absolute Return/Alpha</b>	
Absolute Return	Included

# ASSET ALLOCATION FRAMEWORK

NEPC utilizes a diversified range of asset classes to support the portfolio in a variety of economic conditions:

## Inflation Environment



**Role:** Nominal capital preservation  
**Pros:** Maintains value during economic weakness  
 Maintains value during periods of deflation and low inflation  
 Low volatility  
**Cons:** Limited long-term growth  
 Value eroded by inflation



**Role:** Long-term growth  
**Pros:** Expected to perform well in periods of rising growth and low-moderate inflation  
**Cons:** Higher volatility  
 Suffers during economic weakness  
 Suffers during periods of high inflation or deflation



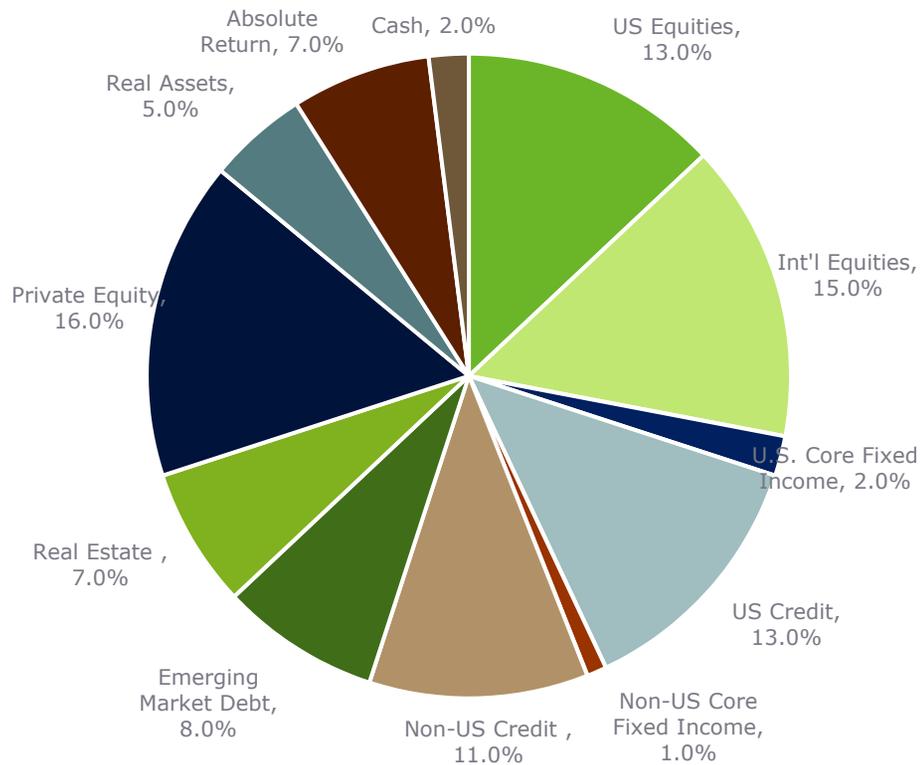
**Role:** Inflation protection  
**Pros:** Diversification Inflation hedge  
**Cons:** Moderate volatility  
 Moderate long-term growth  
 Underperforms in periods of deflation Sensitive to leverage



**Role:** Stable returns, low correlation and beta to growth, rates  
**Pros:** Add diversified source of alpha to core portfolio, generate positive returns in most environments  
**Cons:** Execution risk  
 Moderate long-term growth



# SBCERA POLICY ASSET ALLOCATION – USING NEPC’S 2019 ASSUMPTIONS



	5-7 Year		30 Year	
	2018	2019	2018	2019
<b>Expected Return</b>	7.6%	7.8%	8.3%	8.6%
<b>Expected Volatility Accounting</b>	11.6%	11%	11.6%	11%
<b>Sharpe Ratio</b>	0.48	0.39	0.50	0.42
<b>Sortino Ratio</b>	0.83	0.84	0.94	0.98

Probabilities using 2019 Assumptions	
Probability of 1-Year Return Under 0%	28.1%
Probability of 6-Year Return Under 0%	7.8%
Probability of 6-Year Return Under 7.25%	46.1%
Probability of 30-Year Return Under 7.25%	28.9%

# 2019 ASSET ALLOCATION EXPECTATIONS

	Current Target	Public 60/40	Public Fund >\$1B Median
<b>Cash</b>	<b>2%</b>	<b>0%</b>	<b>2%</b>
US Equities	13%	33%	27%
Int'l Equities (Unhedged)	15%	27%	23%
Private Equity	16%	0%	10%
<b>Total Equity</b>	<b>44%</b>	<b>60%</b>	<b>60%</b>
US Core Bonds	2%	40%	20%
Non-US Bonds	1%	0%	4%
US Credit*	13%	0%	0%
Non- US Credit*	11%	0%	0%
Emerging Market Debt	8%	0%	1%
<b>Total Fixed Income</b>	<b>35%</b>	<b>40%</b>	<b>25%</b>
Real Assets (Liquid)	0%	0%	2%
Core Real Estate	4%	0%	7%
Non-Core Real Estate*	4%	0%	0%
Private Real Assets - Energy/Metals	5%	0%	0%
<b>Total Real Assets</b>	<b>12%</b>	<b>0%</b>	<b>9%</b>
Absolute Return	7%	0%	4%

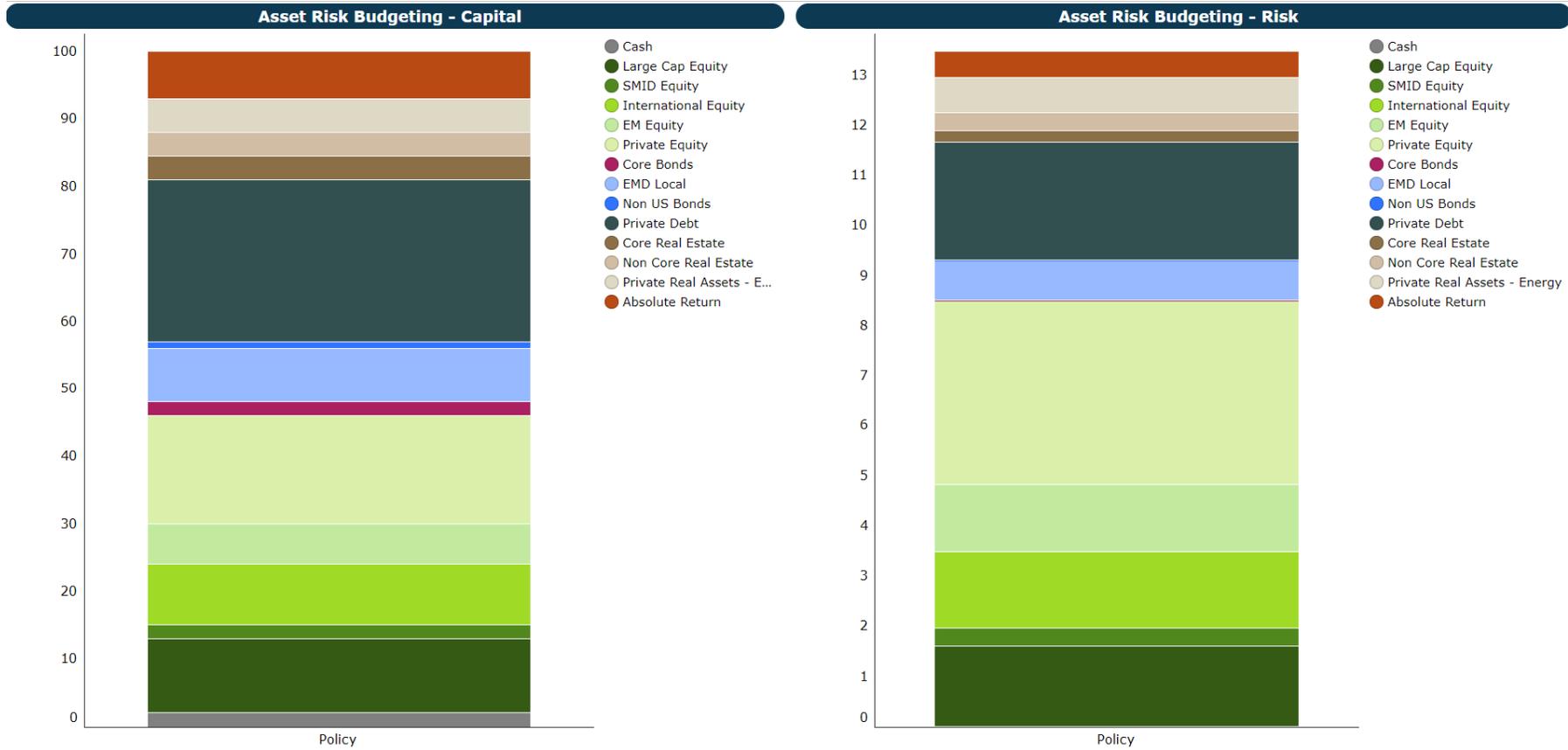
<b>Expected Return 5-7 yrs</b>	<b>7.8%</b>	<b>5.7%</b>	<b>6.3%</b>
<b>Expected Return 30 yrs</b>	<b>8.6%</b>	<b>7.0%</b>	<b>7.5%</b>
<b>Standard Dev Accounting</b>	<b>11.0%</b>	<b>10.9%</b>	<b>12.2%</b>
<b>Sharpe Ratio (5-7 years)</b>	<b>0.39</b>	<b>0.29</b>	<b>0.31</b>
<b>Sharpe Ratio (30 years)</b>	<b>0.42</b>	<b>0.36</b>	<b>0.37</b>

<b>Probability of 1-Year Return Under 0%</b>	<b>28.1%</b>	<b>30.1%</b>	<b>30.2%</b>
<b>Probability of 6-Year Return Under 0%</b>	<b>7.8%</b>	<b>10.1%</b>	<b>10.2%</b>
<b>Probability of 6-Year Return Under 7.25%</b>	<b>46.1%</b>	<b>63.5%</b>	<b>57.4%</b>
<b>Probability of 30-Year Return Under 7.25%</b>	<b>28.9%</b>	<b>55.2%</b>	<b>45.0%</b>

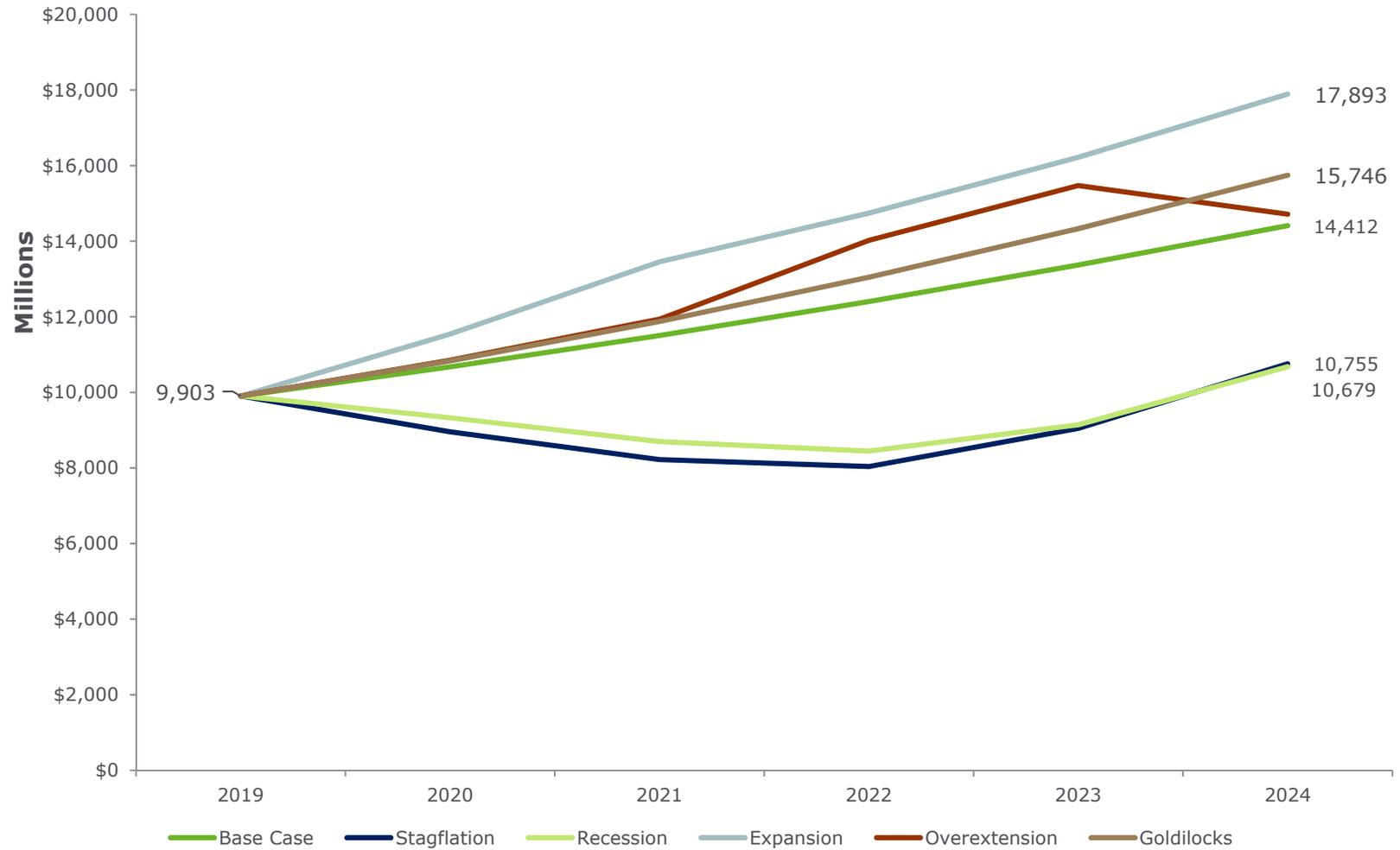
\* Modeled using private assets and therefore difficult to compare to median public fund. Median public fund assumes only core private real estate.



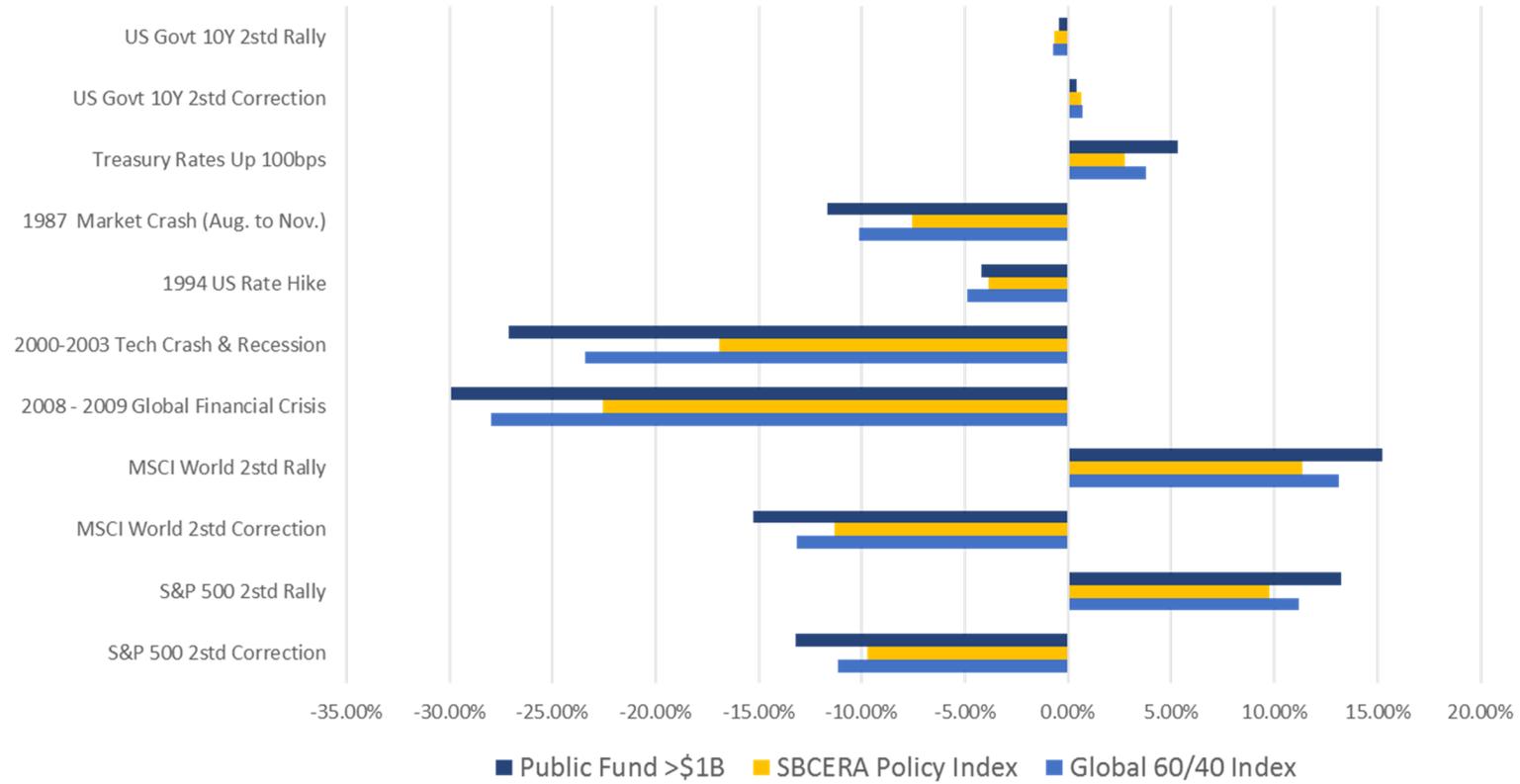
# SBCERA RISK BUDGETING ANALYSIS



# SBCERA SCENARIO ANALYSIS



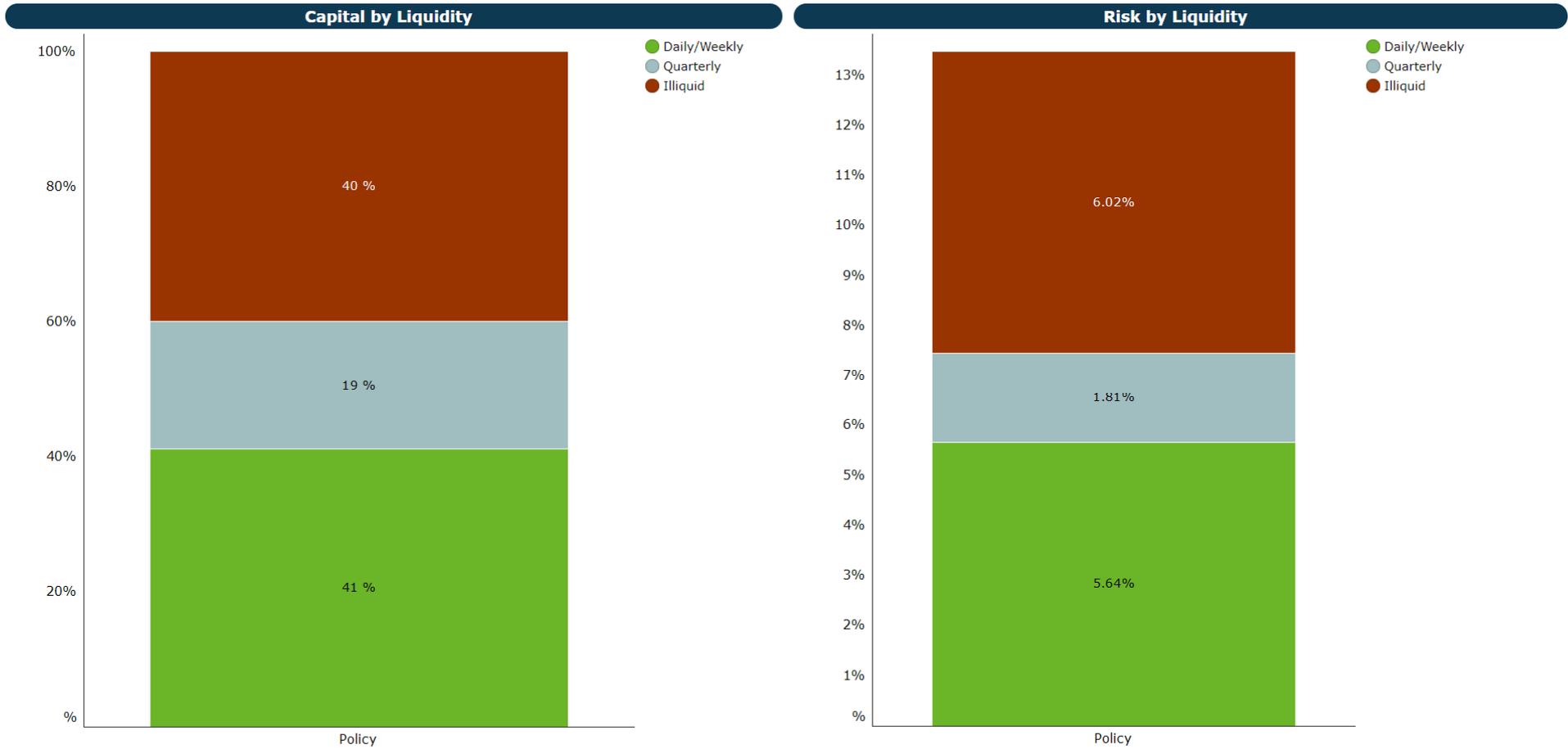
# RISK MANAGEMENT: HISTORICAL SCENARIO AND STRESS TESTING



# SCENARIO TESTING DEFINITIONS

- **BarraOne** combines the shocks you specify with the inherent relationships that exist in the Barra Integrated Model's covariance matrix. It then computes profit and loss under a scenario where those relationships continue to hold. For example, suppose you want to simulate the effect on your portfolio of a 15% rise in oil prices, even though your portfolio is not directly exposed to oil. Using the correlation embedded in the covariance matrix, BarraOne computes the likely co-movement of interest rates, equity markets, FX markets, and factor spreads conditional on oil (commodity) returns of +15%. All assets in the portfolio are revalued to determine P&L.
- **Treasury Rates Up/ Down** – Parallel shift of the US Treasury curve.
- **2 standard deviation rally/correction** - Tests the effect of extreme market movements.
- **1987 Market Crash (Aug. to Nov.)** - The U.S. stock market began to topple on October 14, 1987 after reaching a record high. It was triggered by reports of a larger trade deficit and the elimination of the tax benefits of financing mergers. The aggravating selling pressure in October 19 from confused and fearful investors and the failing portfolio insurers' models led to a substantial global market sell-off.
- **1994 US Rate Hike** - In combating inflation, the U.S. Federal Reserve raised its interest rate from 3.25% in February to 5.5% in November 1994.
- **2000-2003 Tech Crash & Recession** - Period of crisis and slowdown for technological firms due to a rapid jump in stock prices when a speculative technology bubble began to burst, triggering a sell-off of companies. The period includes a slowdown for internet companies that went out of business as the stock market plummeted further.
- **2008-2009 Global Financial Crisis** - Major financial crisis starting September 2008 with the failure of several large U.S.-based financial firms. Extended into 2009, when stock markets reached their lowest.

# SBCERA LIQUIDITY ANALYSIS



# 2019 ASSET CLASS ASSUMPTIONS

# 2019 ASSET CLASS OVERVIEW

## **NEPC asset class assumptions offer both an intermediate (5-7 years) and long term (30 years) forecast horizon**

November 30<sup>th</sup> replaced by December 31<sup>st</sup> market data for inputs to asset class models

## **Return expectations for credit asset classes are broadly higher relative to last year due to interest rate increases and wider credit spreads**

Despite the increase in return expectations, we encourage caution when investing in lower-quality credit exposure as we expect default rates to trend higher in the current late-cycle market environment

## **US equity return expectations increased relative to last year following a sizable correction in the fourth quarter of 2018**

## **Our outlook for international developed equities is less optimistic than prior years, resulting in a significantly lower 5-7 year return expectation**

## **We continue to refine and enhance our process where appropriate**

New asset class assumptions were added this year to provide greater differentiation in credit, including investment and speculative grade corporate ratings (AAA-CCC)

Private equity and private debt sub-strategies were added to offer a distinction among private market implementation options with different volatility and return profiles

Asset class correlation and volatility assumptions were adjusted to integrate private markets and new asset classes, to improve risk modeling and scenario analysis



# ASSUMPTION DEVELOPMENT

## Capital market assumptions are published for over 60 asset classes

Assumptions include 5-7 year and 30 year return forecasts, average annual volatility expectations, and correlations

## The 5-7 year forecast is designed to capture the return outlook for the current investment cycle

30 year return assumptions reflect a long-term outlook and are informed by the historical relationships among asset classes

## Assumptions are published annually in December and use market data as of November 30

For the first time, assumptions were updated as of December 31

Assumptions are developed by the Asset Allocation Committee and approved by the Partners Research Committee (PRC)

## Assumptions are developed with proprietary valuation models and rely on a core building block methodology

Asset Allocation Committee	
<b>September</b>	<p><b>Asset Allocation Committee Assumptions Kickoff</b></p> <p><b>Finalize List of New Asset Class Assumptions</b></p>
<b>October</b>	<p><b>Review Draft of Asset Class Return Assumptions</b></p> <p><b>Discuss Outlook with NEPC Research Beta Groups</b></p>
<b>November</b>	<p><b>Finalize Volatility and Correlation Assumptions</b></p> <p><b>Final Update of Asset Class Models (As of 11/30)</b></p>
<b>December</b>	<p><b>Review Model Output and Create Return Assumptions</b></p> <p><b>Present Draft to the PRC</b></p> <p><b>Publish Assumptions on December 14<sup>th</sup></b></p>



# BUILDING BLOCKS METHODOLOGY

**Forward-looking asset class models incorporate current and forecasted market and economic data to inform expected returns**

**Quantitative inputs combined with qualitative factors and investor sentiment (capital flows, etc.) drive the 5-7 year return outlook**

**Components are combined to capture core drivers of return across asset classes – forming the foundation of our building blocks framework**

**Building blocks will vary across equity, credit, and real assets**



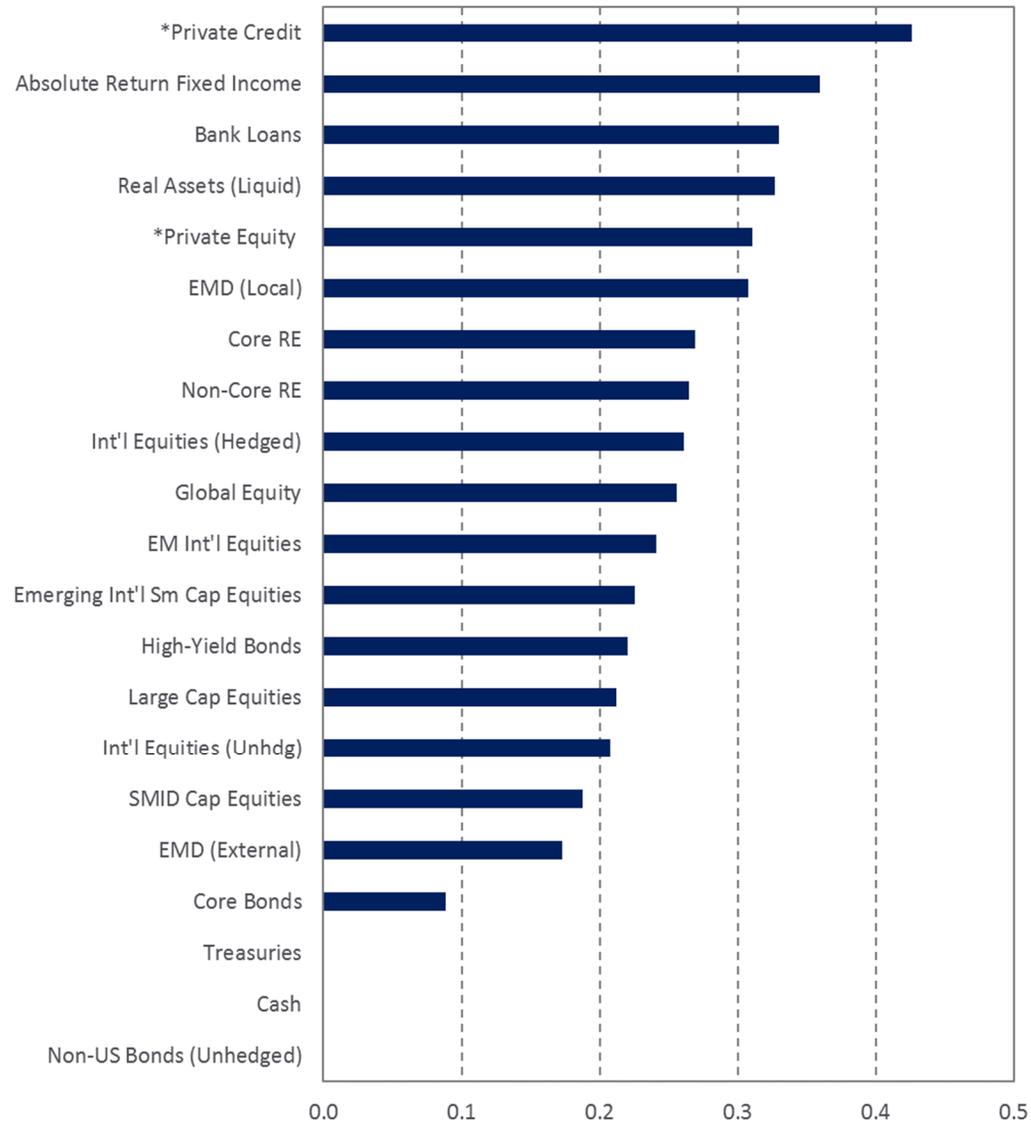
# CORE RETURN ASSUMPTIONS

	Asset Class	5-7 Year Return	Change 2019-2018	Volatility
	Cash	2.50%	<b>+0.50%</b>	1.00%
	US Inflation	2.25%	<b>-0.25%</b>	-
Equity	Large Cap Equities	6.00%	<b>+0.75%</b>	16.50%
	International Equities (Unhedged)	6.75%	<b>-0.75%</b>	20.50%
	Emerging International Equities	9.25%	<b>+0.25%</b>	28.00%
	<i>Private Equity*</i>	<i>10.01%</i>	<b><i>+2.01%</i></b>	<i>24.16%</i>
Rates/Credit	Treasuries	2.50%	<b>+0.25%</b>	5.50%
	<i>Core Bonds*</i>	<i>3.04%</i>	<b><i>+0.29%</i></b>	<i>6.10%</i>
	High Yield Bonds	5.25%	<b>+1.50%</b>	12.50%
	<i>Private Debt*</i>	<i>7.60%</i>	<b><i>+1.10%</i></b>	<i>11.97%</i>
Real Assets	Commodities	4.25%	<b>-0.50%</b>	19.00%
	Midstream Energy	8.25%	<b>+1.00%</b>	18.50%
	Non-Core Real Estate	7.00%	-	17.00%
	Core Real Estate	6.00%	<b>+0.25%</b>	13.00%
Multi-Asset	<i>US 60/40*</i>	<i>5.07%</i>	<b><i>+0.53%</i></b>	<i>10.45%</i>
	<i>Global 60/40*</i>	<i>5.08%</i>	<b><i>+0.17%</i></b>	<i>10.95%</i>
	<i>Absolute Return*</i>	<i>5.74%</i>	<b><i>-0.09%</i></b>	<i>8.15%</i>

\*Calculated as a blend of other asset classes – see page 39 for additional details



# 2019 5-7 YEAR FORECASTED SHARPE RATIOS



Source: NEPC  
 \*Unsmoothed volatilities  
 used for Private Equity and  
 Private Credit for  
 optimization purposes



# MACRO ASSUMPTIONS

# INFLATION OVERVIEW

## **Inflation is an integral component of our asset allocation assumptions**

Represents an essential building block for developing asset class returns

## **Inflation building blocks are model driven and informed by multiple sources for both the US and global asset classes**

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

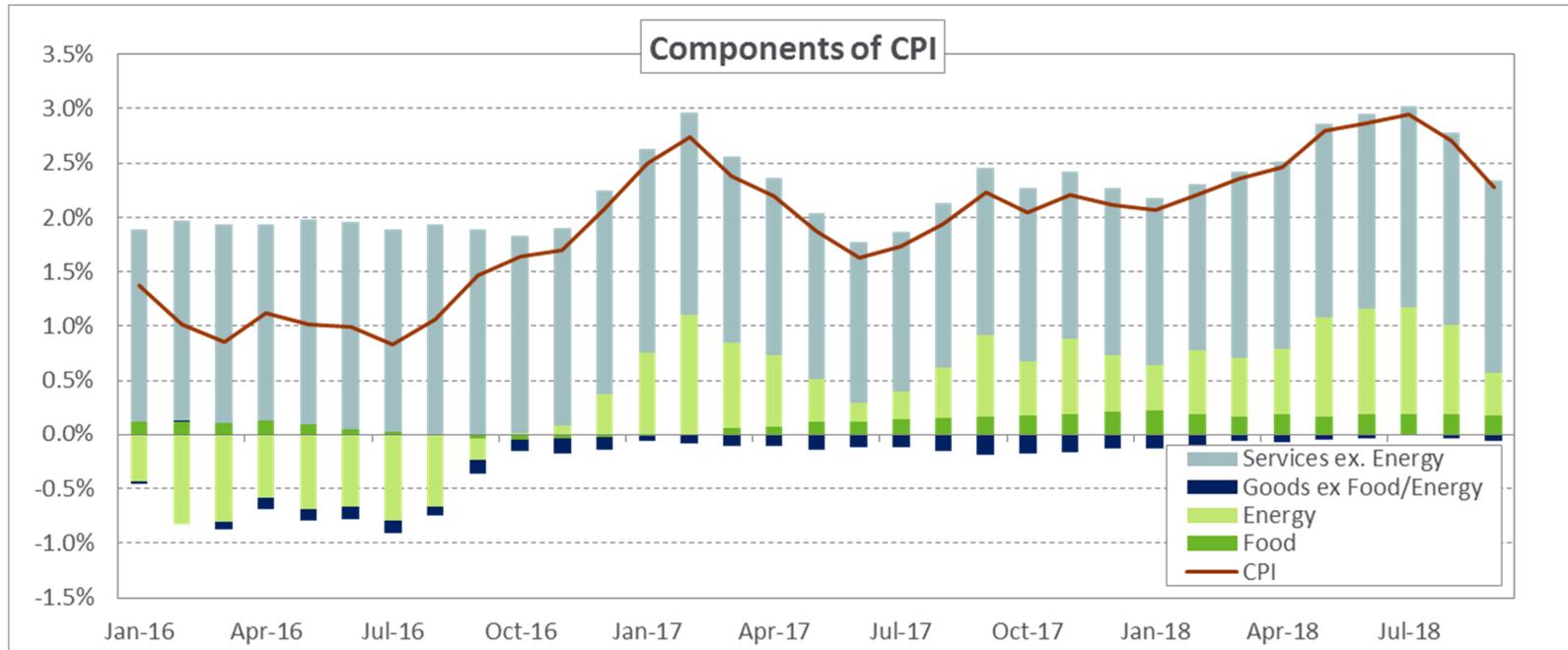
## **US inflation is based upon the TIPS breakeven inflation curve adjusted for expectations of economic activity, employment, and capacity levels**

## **Global inflation expectations are informed by consensus forecasts across countries along with implied inputs from global bond curves**

The 30 year global inflation forecast assumes purchase power parity holds across the globe and country specific inflation levels converge to a terminal value

<b>Region</b>	<b>5-7 Year Inflation Assumption</b>	<b>30-Year Inflation Assumption</b>
United States	2.25%	2.75%
Global	3.00%	3.25%

# US INFLATION



Source: Bloomberg, NEPC

## US inflation has increased, but has yet to materially accelerate despite strong economic growth and a tight labor market

Underlying inflation has risen with a modest increase in wages due to the tightening labor market but market-based inflation expectations have declined considerably this year

## A significant decline in energy prices in the latter half of 2018 has minimized overall price pressures

Energy is historically the most volatile component of CPI and a sustained decline in prices can cause inflation to remain muted

# GLOBAL INFLATION

## In most developed economies, core inflation has failed to reach or exceed central bank targets

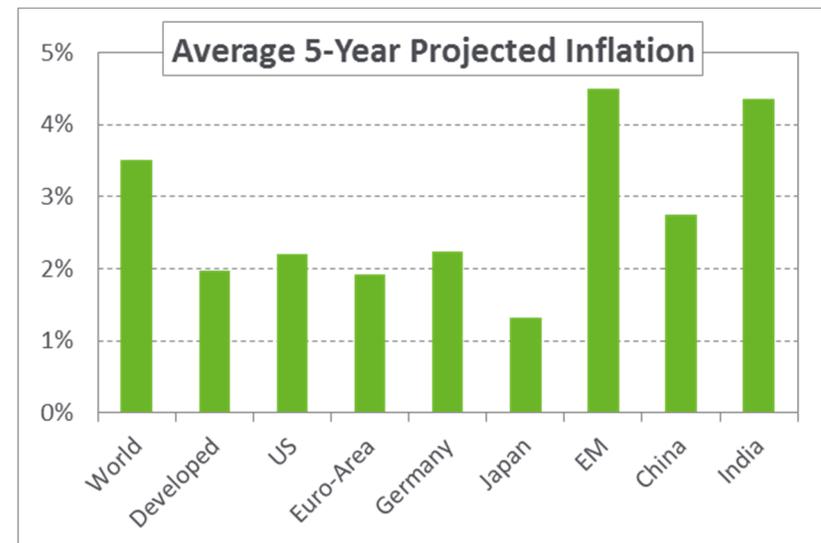
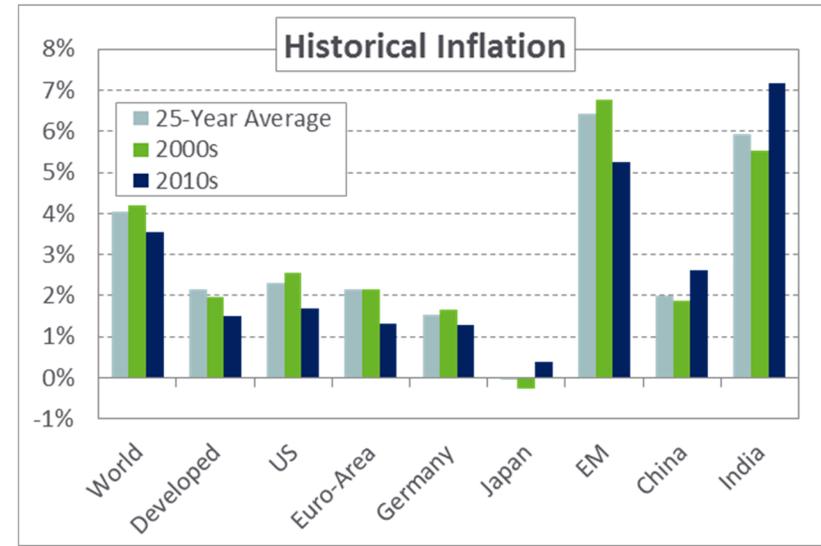
The European Central Bank is expected to end the expansion of its quantitative easing program at the end of the year despite a weakening economic outlook

Japan has been the only developed economy to drive inflation above historical levels, although still less than other countries

## Emerging market inflation remains significantly lower than long-term averages in most economies

Turkey and Argentina remain notable outliers as idiosyncratic risks and inconsistent monetary policy have fueled rising prices

Lower inflation is likely to give select countries room to ease monetary policy, as needed, to bolster economic growth



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

# US INTEREST RATE EXPECTATIONS

## Real yields moved materially higher relative to last year with continued Fed rate hikes and subdued inflation

The real yield curve flattened relative to last year, with an inversion at the 2 year point

Late-cycle expectations of growth and continued Fed rate hikes increase market forward-looking expectations

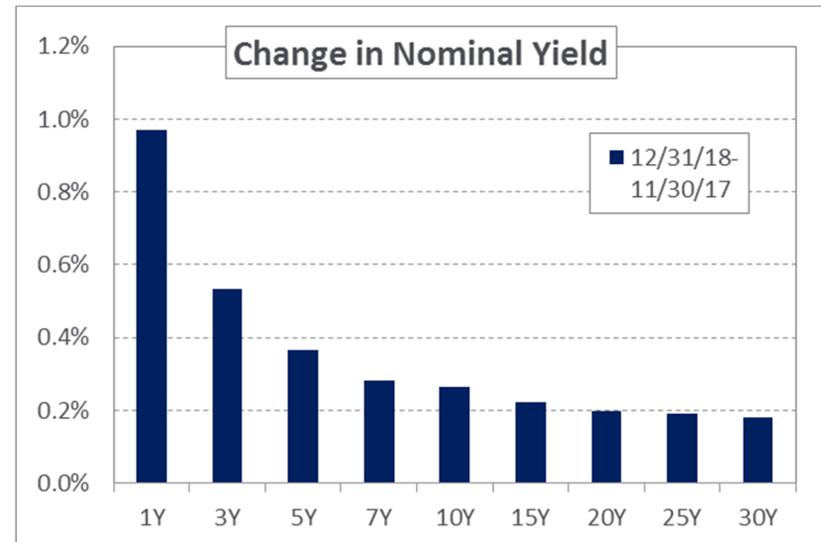
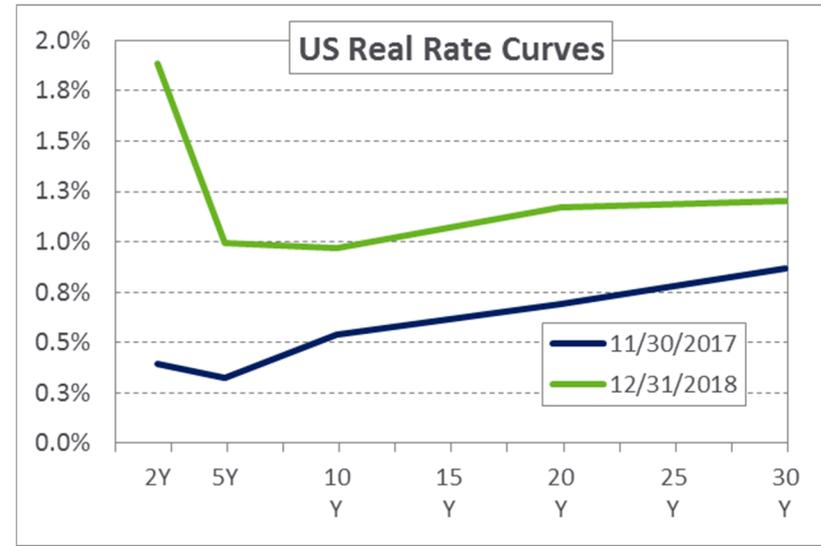
## Long-term yields continue to rise but remain low relative to history in the US

Low real rates depress the return outlook for risk assets over the long-term

The flatter nominal curve is likely to invert during the late cycle

## Uncertainty has surfaced surrounding the path of rates for 2019 and beyond

The Fed has recently expressed a willingness to slow the pace via a wait-and-see approach should material risks to the US economy develop



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

# GLOBAL INTEREST RATE EXPECTATIONS

**Government bond yields remain low across much of the developed world**

**European sovereign yields have increased relative to Germany due to political and economic concerns**

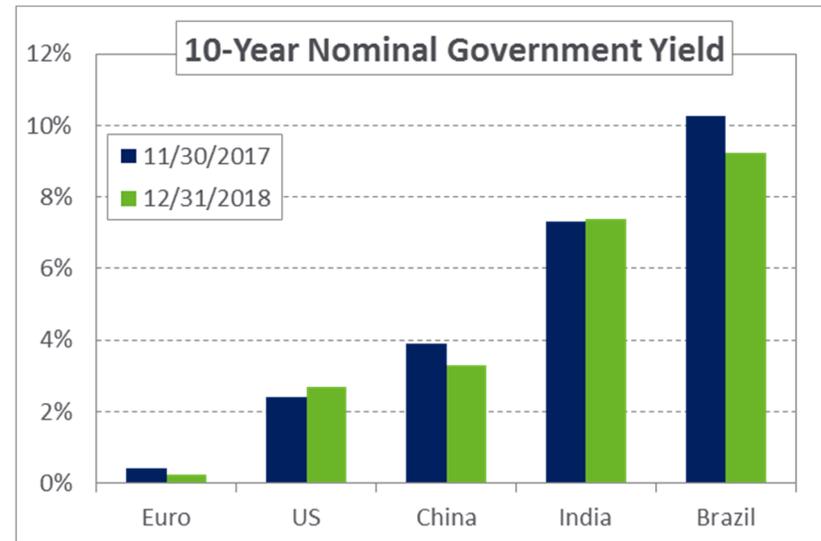
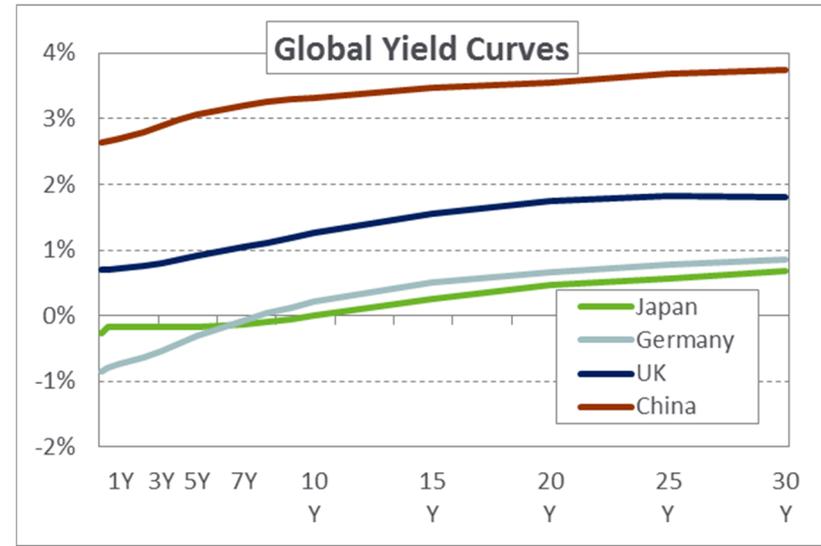
Ongoing political turmoil in the UK and budget concerns in Italy caused periphery yields to increase during the year

German bund yields are lower due to heightened demand for safe-haven assets in Europe

**Emerging market local interest rates are attractively priced as real yields remain elevated**

Emerging market yields continue to retain a healthy premia over developed world rates

Additionally, positive real rates provide a larger cushion for EM central banks to cut interest rates and ease monetary conditions



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



# EQUITY ASSUMPTIONS

# EQUITY: ASSUMPTIONS

Equity Building Blocks	
<b>Illiquidity Premium</b>	The additional return expected for investments carrying liquidity risk
<b>Valuation</b>	An input representing P/E multiple contraction or expansion relative to long-term trend
<b>Inflation</b>	Represents market-specific inflation derived from index country revenue contribution and region-specific forecasted inflation
<b>Real Earnings Growth</b>	Reflects market-specific real growth for each equity asset class as a weighted-average derived from index country revenue contribution and forecasted GDP growth
<b>Dividend Yield</b>	Informed by current income distributed to shareholders with adjustments made to reflect market conditions and trends

Asset Class	5-7 Year Return	Change 2019-2018
US Large Cap	6.00%	+0.75%
US Small/Mid-Cap	6.25%	+0.50%
US Micro Cap	7.25%	N/A
International (Unhedged)	6.75%	-0.75%
International Small Cap	7.25%	-0.50%
Emerging International	9.25%	+0.25%
Emerging Intl. Small Cap	9.50%	+0.25%
China Local	9.50%	N/A
Absolute Return – Long/Short	5.50%	-0.75%
<i>Global Equity</i>	6.99%	+0.11%
<i>Private Equity</i>	10.01%	+2.01%

# EQUITY: REAL EARNINGS GROWTH

## US growth accelerated relative to the rest of the world during 2018

Strong earnings growth fueled by corporate tax cuts helped support US equities

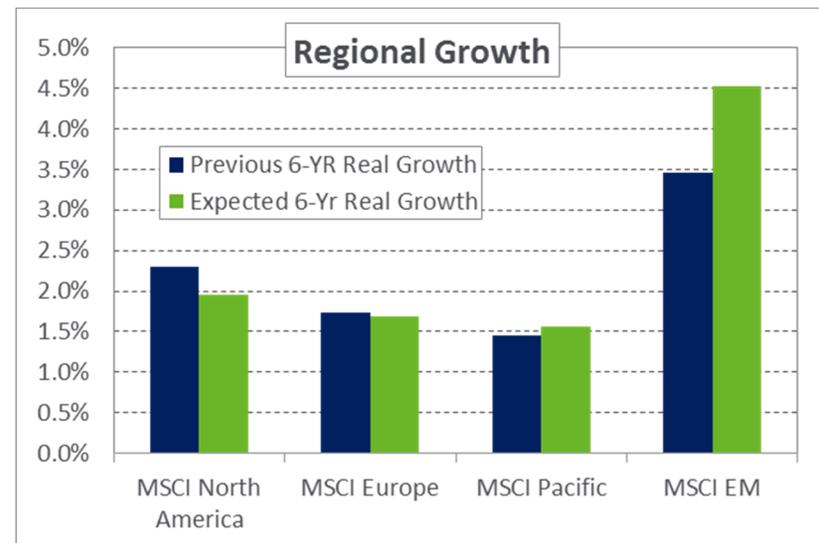
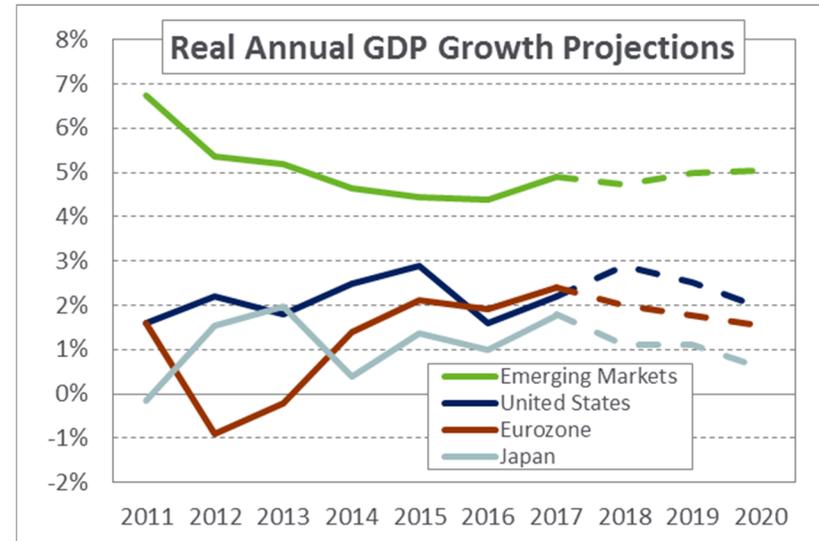
Additionally, fiscal stimulus and pre-purchases from China for tariffed goods fueled above-trend GDP growth

## Global trade tensions and political-economic concerns regarding Europe have led to a weaker growth outlook for international developed economies

## Strong economic growth is expected to continue in the emerging markets

However, China's real growth is expected to slow in future years as the country transitions to a consumption based model

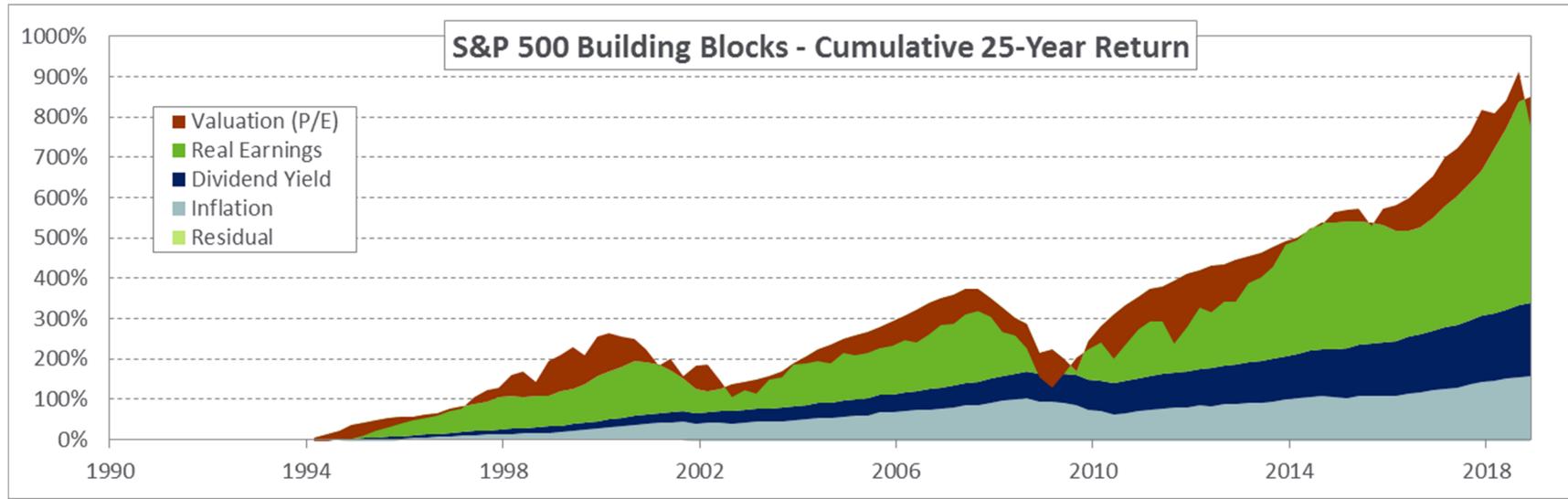
Ongoing reforms in southeast Asia and India are expected to boost investment, productivity, and per-capita growth



Source: (Top) Bloomberg, NEPC  
 Source: (Bottom) IMF, MSCI, Bloomberg, NEPC



# EQUITY: DIVIDEND YIELD

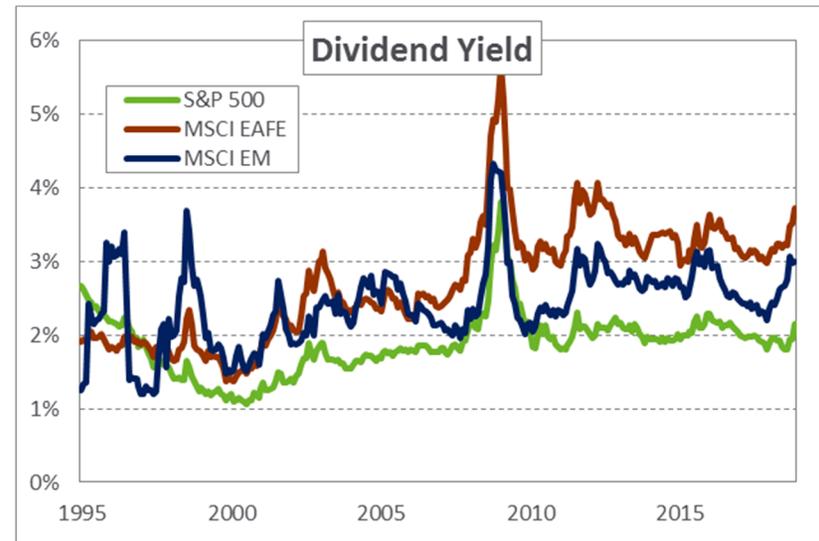


## Global dividend payouts hit record levels this year

Much of the growth came from emerging markets following years of declining dividend yields

Corporate tax cuts in the US helped increase dividend payout rates

## International and emerging markets continue to offer higher dividend yields relative to the US equity market



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



# EQUITY: VALUATION

## US equities were an outlier relative to global equities this year

US equities benefited from an extended US economic cycle and added fuel from the fiscal stimulus package

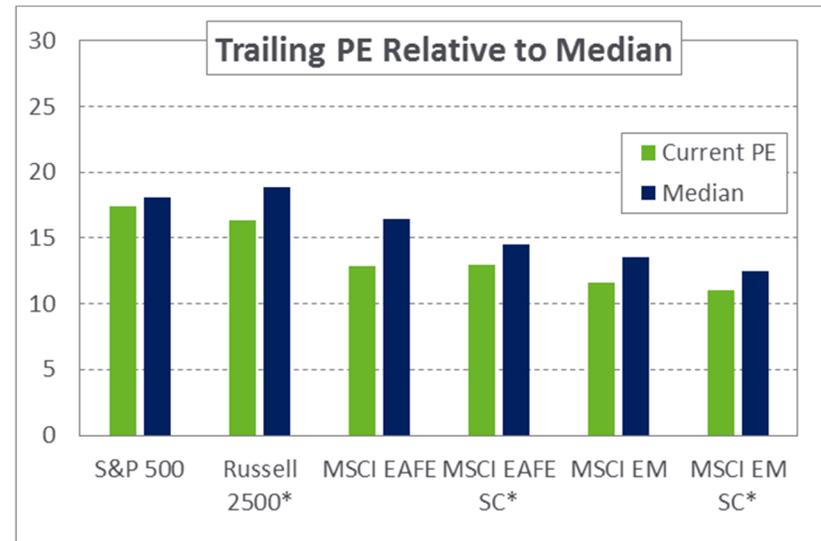
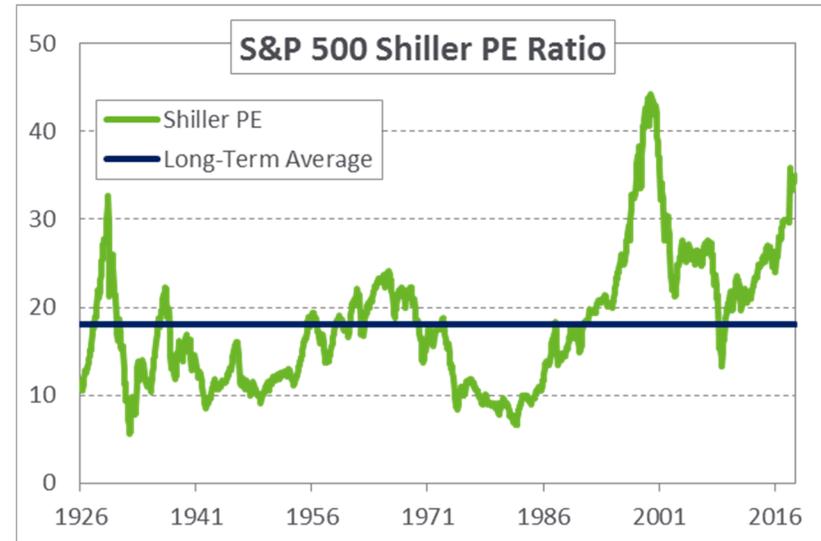
Strong earnings growth fueled by corporate tax cuts pushed valuations lower for large-cap US equities

Increased volatility in December resulting from fears of a global slowdown erased gains made throughout the year

## International and emerging market valuations fell despite strong earnings growth as price declines were fueled by negative sentiment and US-China trade tensions

## We anticipate the negative sentiment and macro concerns weighing on emerging markets to moderate

Attractive equity and currency valuations support an overweight to emerging markets due to the high total-return potential



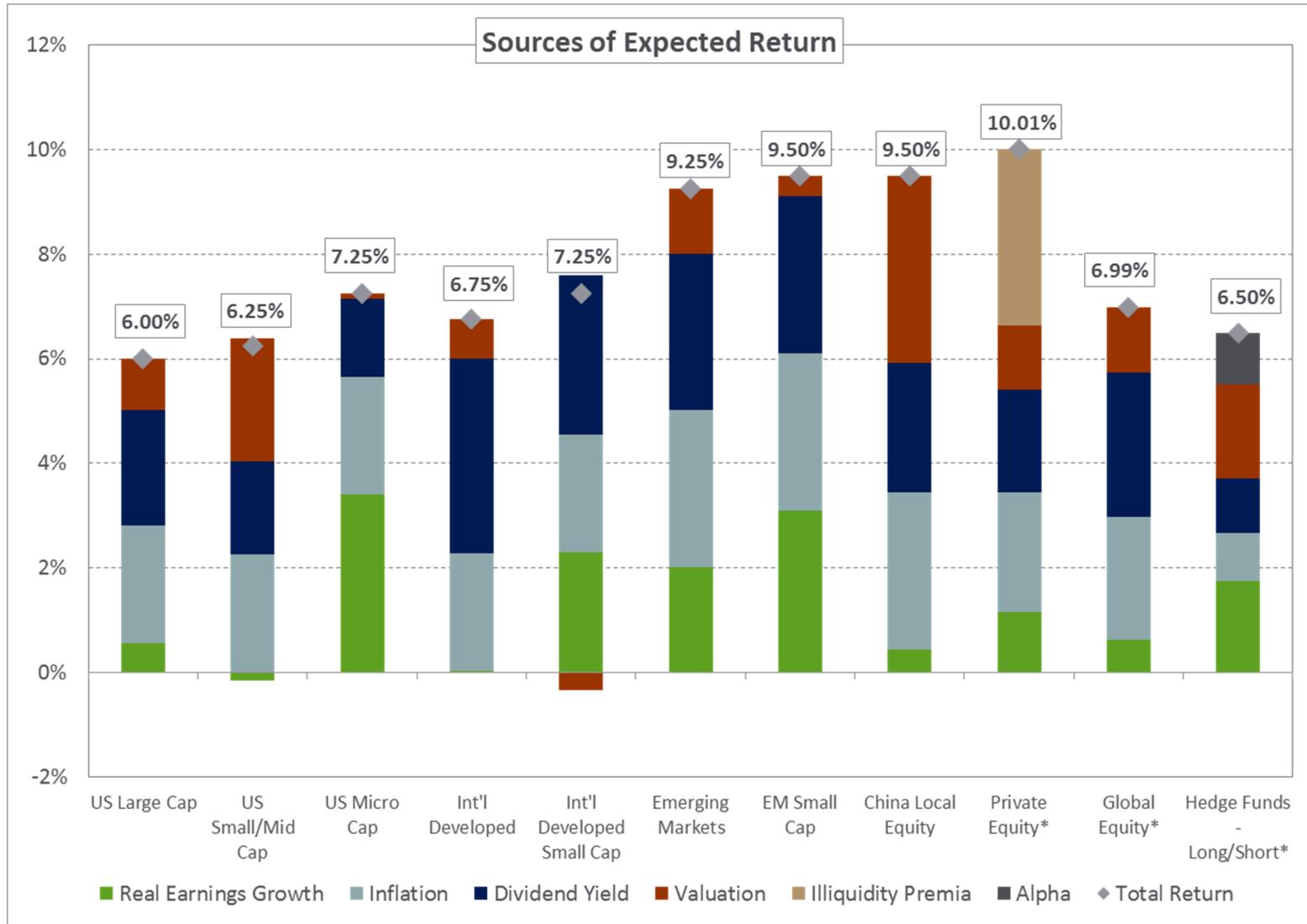
Source: (Top) S&P, Shiller, NEPC; long-term average beginning in 1926

Source: (Bottom) S&P, Russell, MSCI, Bloomberg, NEPC

\*Small cap indices use index positive-adjusted earnings



# EQUITY: BUILDING BLOCKS (5-7 YEARS)



Source: NEPC

\*Calculated as a blend of other classes – see page 39 for additional details



# RATES & CREDIT ASSUMPTIONS

# RATES & CREDIT: ASSUMPTIONS

Rate & Credit Building Blocks	
<b>Illiquidity Premium</b>	The additional return expected for investments carrying liquidity risk
<b>Government Rates Price Change</b>	The valuation change resulting from a change in the current yield curve to forecasted rates
<b>Spread Price Change</b>	The valuation change resulting from a change in credit spreads over the duration of the investment and highly sensitive to economic cycles
<b>Credit Deterioration</b>	The average loss for credit securities associated with an expected default cycle and recovery rates
<b>Credit Spread</b>	Additional yield premium provided by securities with credit risk
<b>Government Rates</b>	The yield attributed to sovereign bonds that do not have credit risk associated with their valuation

Asset Class	5-7 Year Return	Change 2019-2018
TIPS	3.00%	-0.25%
Treasuries	2.50%	+0.25%
Investment-Grade Corporate Credit	4.00%	+0.50%
MBS	2.75%	+0.25%
High-Yield Bonds	5.25%	+1.50%
Bank Loans	5.00%	+1.00%
EMD (External)	4.75%	+0.50%
EMD (Local Currency)	6.50%	+0.50%
Non-US Bonds (Unhedged)	0.75%	+0.25%
<i>Core Bonds</i>	<b>3.04%</b>	<b>+0.29%</b>
<i>Private Debt</i>	<b>7.60%</b>	<b>+1.10%</b>

# RATES & CREDIT: CREDIT SPREAD

## Credit spreads rose across investment and speculative grade debt relative to 2018's below average spread levels

The later stages of an economic cycle often see an increase in credit spreads as the probability of defaults trend upward

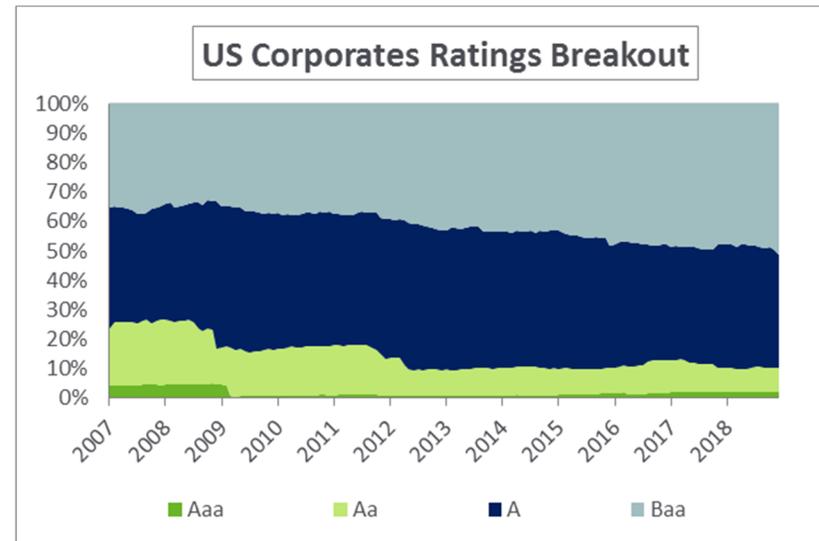
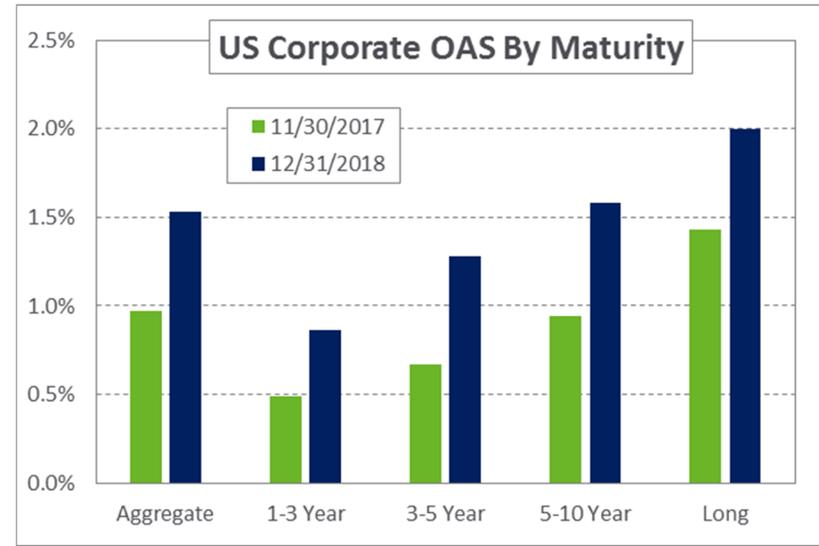
Lower-quality credit spreads increased most significantly during the year, partially due to the fall in the price of oil

## Higher credit spreads partially reflect the risk in investment grade credit

There are a record number of BBB-rated corporates – suggesting a greater risk of fallen angel downgrades

Corporate debt issuance has expanded rapidly in recent years with the majority of new debt rated BBB

As such, we advocate for a reduction in lower-quality credit that does not provide adequate compensation for the associated risk



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



# RATES & CREDIT: RATES PRICE CHANGE

**Government Rates Price Change: The change in the level of interest rates, shape of the curve, and roll down that impact the price of a bond**

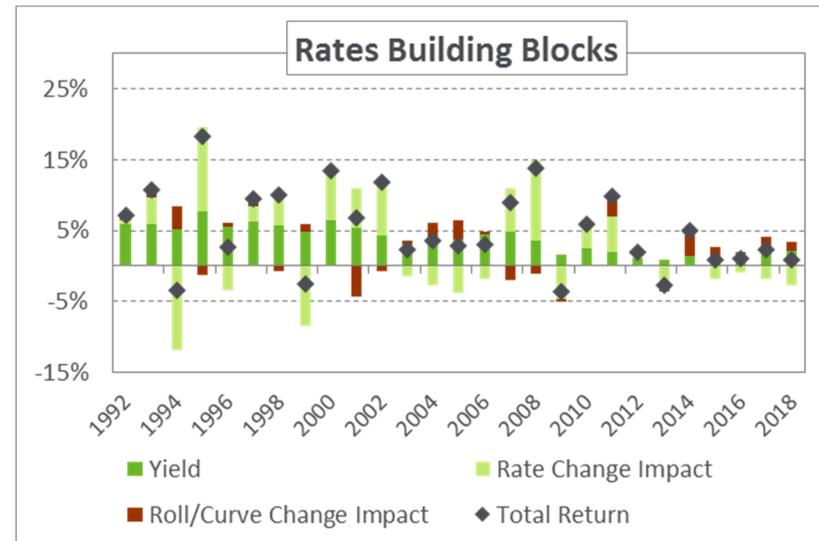
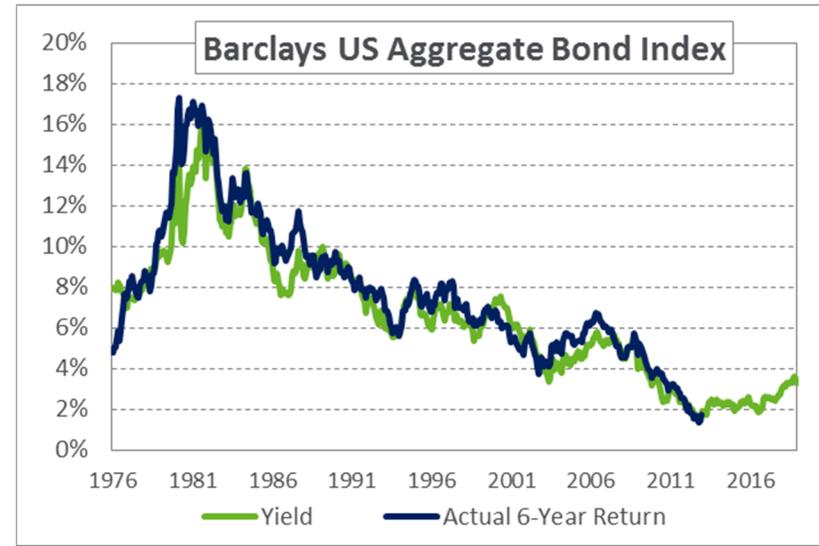
Roll down refers to the price change due to the aging of a bond along the yield curve

**The rate price change is a significant component of total return and expectations of higher rates can drag on future year returns**

The path of interest rates for each market is tied to both central bank actions and inflation expectations

**Roll down offers some relief to rising rates when yield curves are steep**

As the yield curve flattens the benefit of the roll down is muted, often pushing investors to shorter duration bonds



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



# RATES & CREDIT: SPREAD PRICE CHANGE

## Credit spreads broadly remain near historic medians

Above-average credit spreads are generally associated with a late-cycle environment as credit default risks increase

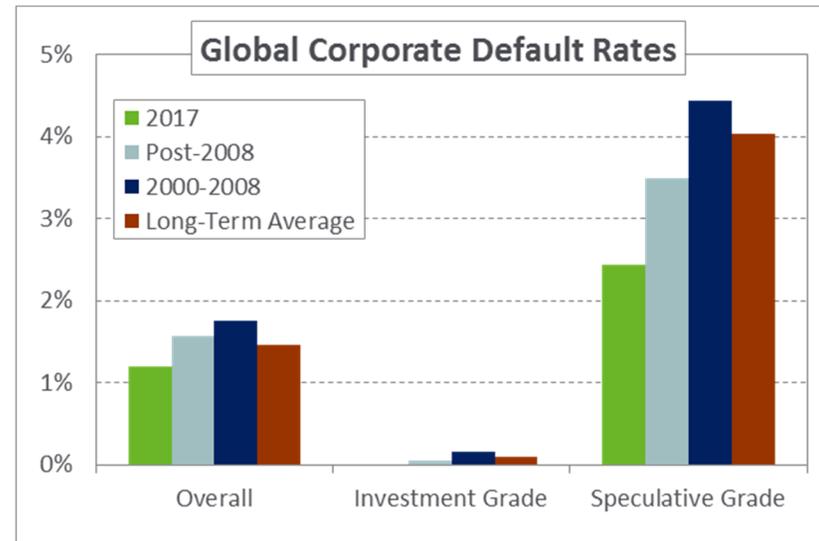
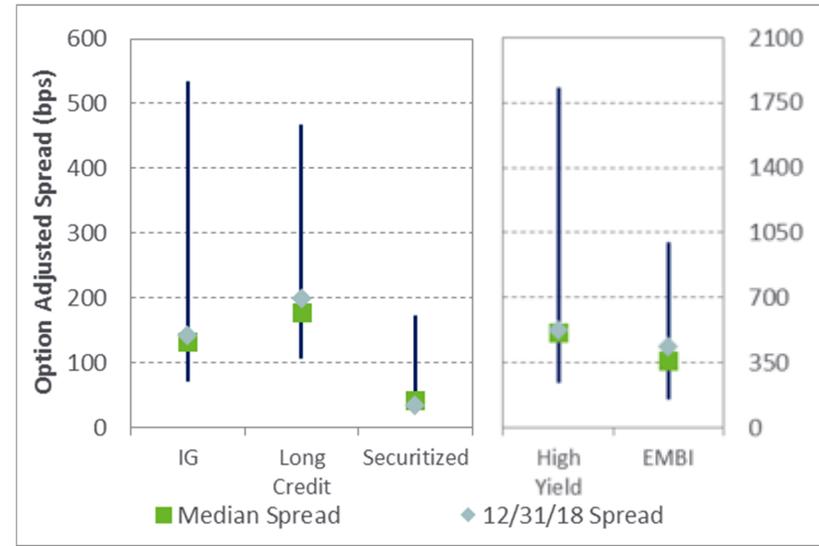
Despite the spread increase relative to 2018, we do not believe lower-quality credit exposure compensates investors for the risk relative to safer alternatives

## The number of defaults decreased last year to a three-year low despite residual stress from the energy sector and an uptick in retail defaults

## Higher expected default rates were incorporated in our building blocks

This can be attributed to the increase in lower-quality (BBB) credit as a percentage of the investment grade universe

This is also a reflection of the late cycle environment and the stress generally seen within the high yield market during these periods

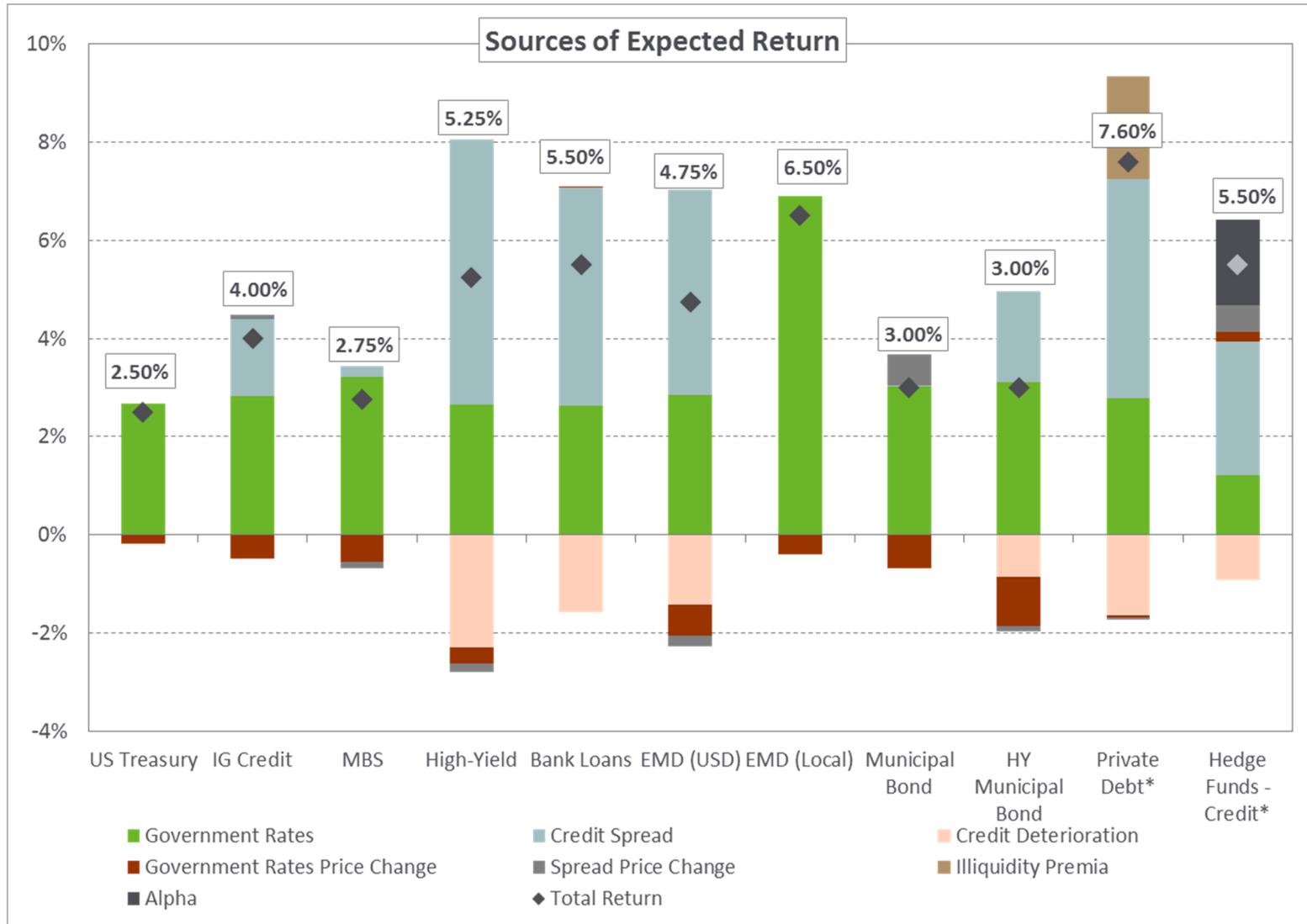


Source: (Top) JPM, Bloomberg, NEPC. As of 01/31/2000

Source: (Bottom) S&P, NEPC



# CREDIT: BUILDING BLOCKS (5-7 YEARS)

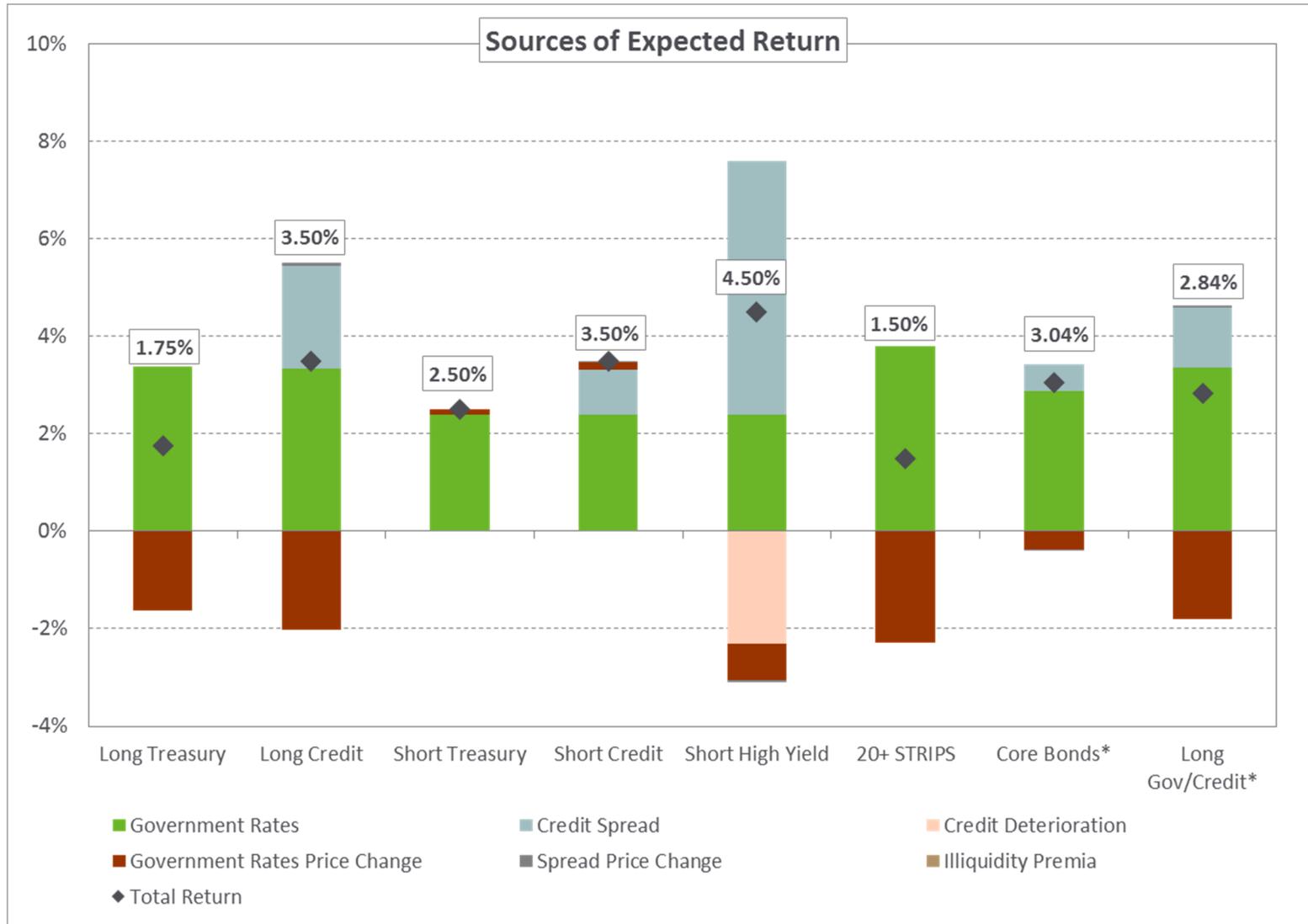


Source: NEPC

\*Calculated as a blend of other classes – see page 39 for additional details



# CREDIT: BUILDING BLOCKS (5-7 YEARS)



Source: NEPC

\*Calculated as a blend of other classes – see page 39 for additional details



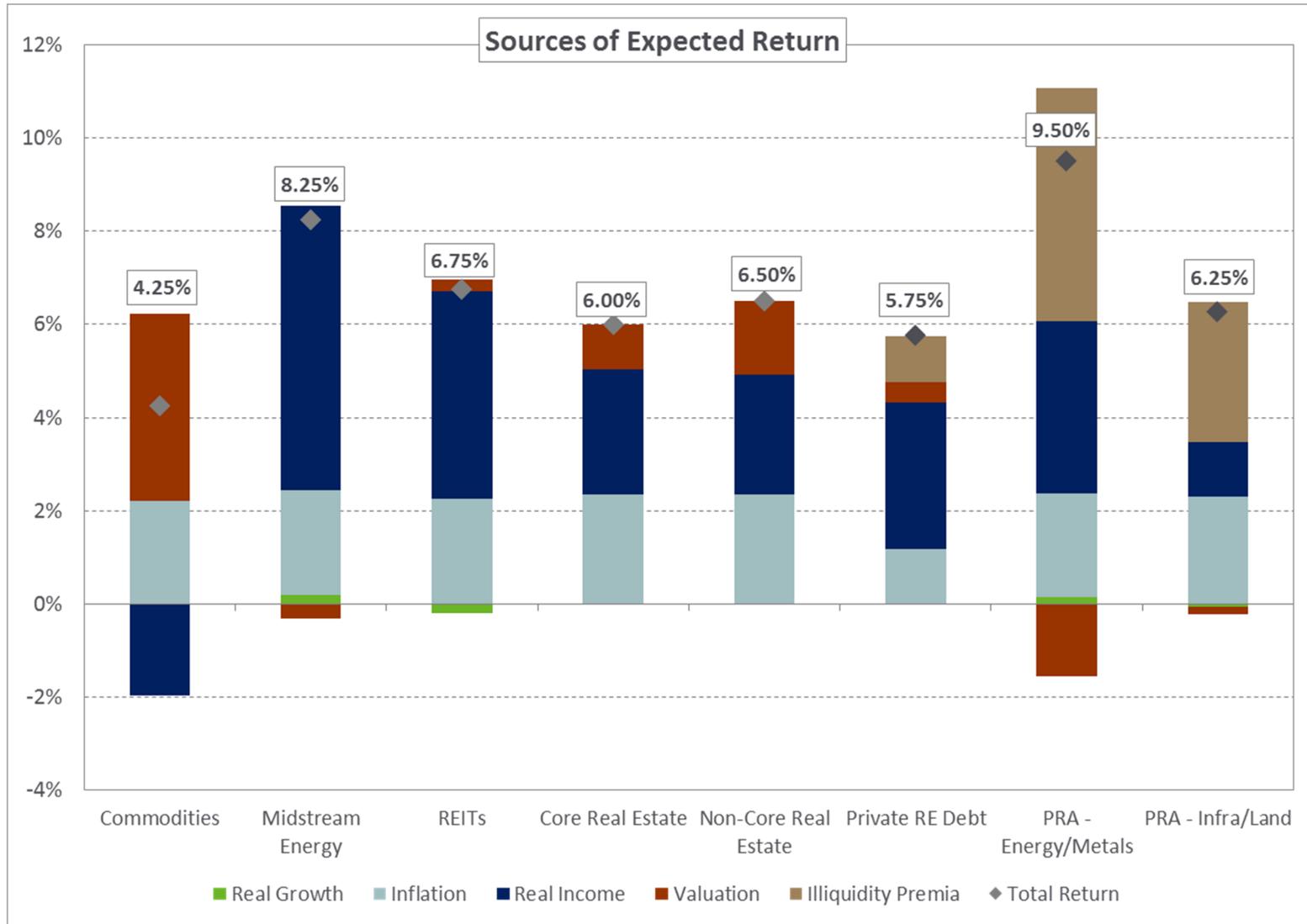
# REAL ASSETS ASSUMPTIONS

# REAL ASSETS: ASSUMPTIONS

Real Assets Building Blocks	
<b>Illiquidity Premium</b>	The additional return expected for investments carrying liquidity risk
<b>Valuation</b>	The expected change in price of the underlying asset reverting to a long-term real average or terminal value assumption
<b>Inflation</b>	Incorporates the inflation paths as defined by TIPS breakeven expectations and NEPC expected inflation assumptions
<b>Real Earnings Growth</b>	Reflects market-specific real growth for each equity asset class as a weighted-average derived from index country revenue contribution and forecasted GDP growth
<b>Real Income</b>	Represents the inflation-adjusted income produced by the underlying tangible or physical asset

Asset Class	5-7 Year Return	Change 2019-2018
Commodities	4.25%	-0.50%
Midstream Energy	8.25%	+1.00%
Core Real Estate	6.00%	+0.25%
Non-Core Real Estate	7.00%	-
Private RE Debt	5.75%	N/A
Private Real Assets: Energy/Metals	9.50%	+1.50%
Private Real Assets: Infrastructure/Land	6.25%	+0.25%

# REAL ASSETS: BUILDING BLOCKS (5-7 YEARS)



Source: NEPC



# PRIVATE EQUITY EXPECTATIONS

NEPC, LLC

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# PRIVATE EQUITY METHODOLOGY

**In previous years, private equity assumptions were constructed using betas to public market assumptions with an added illiquidity premia**

**For 2019, sub-strategies were incorporated to offer a distinction among private equity implementation options with different risk/return profiles**

The sub-strategies were constructed using the same build-up methodology using public market betas and an illiquidity premia based on historical returns analysis relative to appropriate public market equivalents

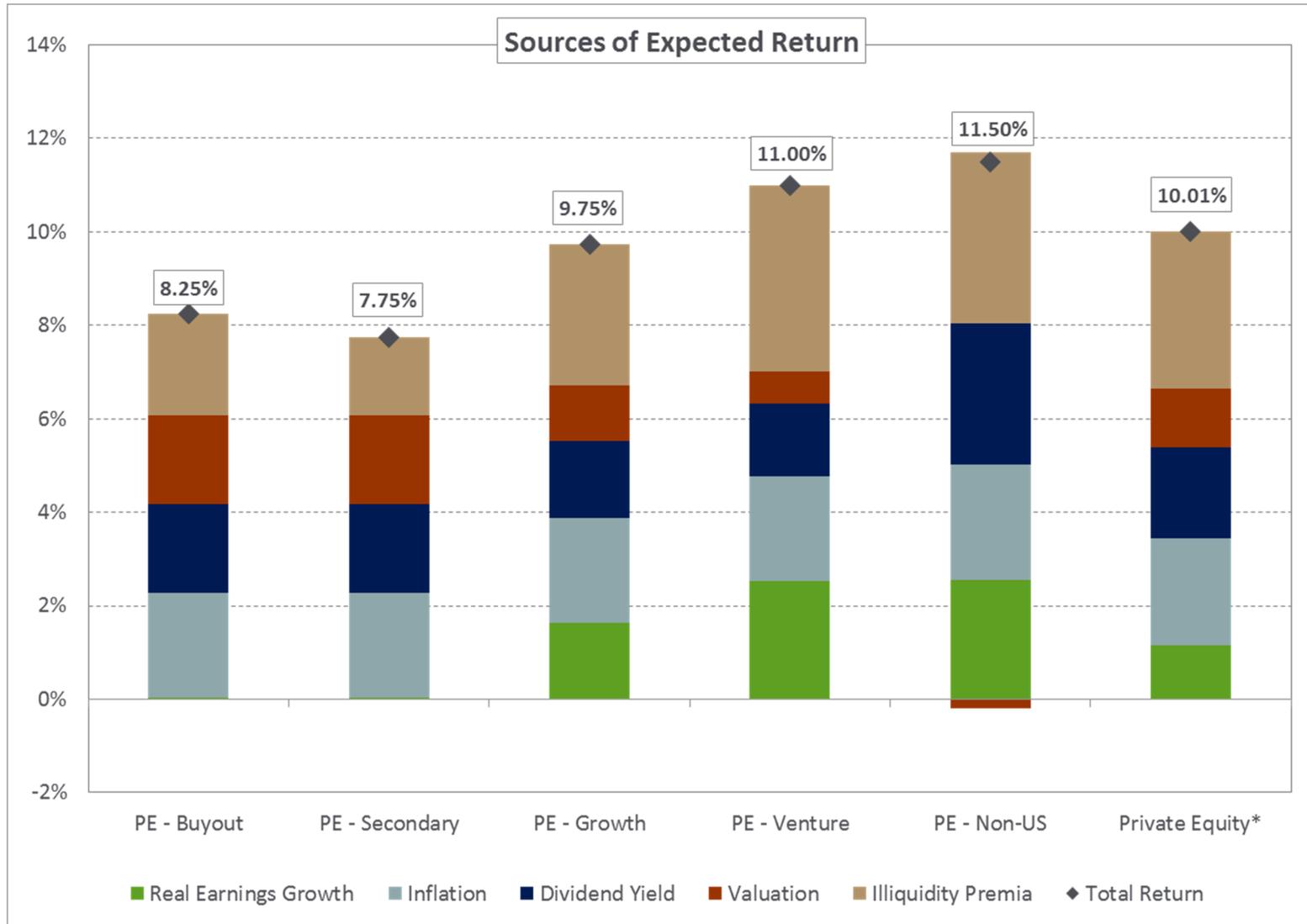
**The composite Private Equity line items are derived from a custom blend of sub-strategies**

Private Equity: 34% Buyout, 34% Growth, 15 % Non-US, 8.5% Secondaries, 8.5% Venture

**The methodology change generally resulted in higher return expectations from incorporating the granularity of the sub-strategies and including a non-US component**



# PRIVATE EQUITY: BUILDING BLOCKS (5-7 YEARS)



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



# APPENDIX

NEPC, LLC

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## 2019 5-7 YEAR RETURN FORECASTS

<b>Geometric Expected Return</b>			
<b>Asset Class</b>	<b>2019</b>	<b>2018</b>	<b>2019-2018</b>
Cash	2.50%	2.00%	+0.50%
Large Cap Equities	6.00%	5.25%	+0.75%
Small/Mid Cap Equities	6.25%	5.75%	+0.50%
Int'l Equities (Unhedged)	6.75%	7.50%	-0.75%
Int'l Sm Cap Equities (Unhedged)	7.25%	7.75%	-0.50%
Emerging Int'l Equities	9.25%	9.00%	+0.25%
Emerging Int'l Sm Cap Equities	9.50%	9.25%	+0.25%
Absolute Return - Long/Short	5.50%	6.25%	-0.75%
TIPS	3.00%	3.25%	-0.25%
Treasuries	2.50%	2.25%	+0.25%
IG Corp Credit	4.00%	3.50%	+0.50%
MBS	2.75%	2.50%	+0.25%
High-Yield Bonds	5.25%	3.75%	+1.50%
Bank Loans	5.50%	4.50%	+1.00%
EMD (External)	4.75%	4.25%	+0.50%
EMD (Local Currency)	6.50%	6.00%	+0.50%

# 2019 5-7 YEAR RETURN FORECASTS

<b>Geometric Expected Return</b>			
<b>Asset Class</b>	<b>2019</b>	<b>2018</b>	<b>2019-2018</b>
Long Treasuries	1.75%	2.00%	-0.25%
Commodities	4.25%	4.75%	-0.50%
Midstream Energy	8.25%	7.25%	+1.00%
Core Real Estate	6.00%	5.75%	+0.25%
Non-Core Real Estate	7.00%	7.00%	-
Private RE Debt	5.75%	N/A	N/A
Private Real Assets - Energy/Metals	9.50%	8.00%	+1.50%
Private Real Assets - Infra/Land	6.25%	6.00%	+0.25%
Absolute Return - Macro	6.00%	6.25%	-0.25%
<i>Global Equity*</i>	6.99%	6.88%	+0.11%
<i>Private Equity*</i>	10.01%	8.00%	+2.01%
<i>Core Bonds*</i>	3.04%	2.75%	+0.29%
<i>Private Debt*</i>	7.60%	6.50%	+1.10%
<i>Long Govt/Credit*</i>	2.84%	3.26%	-0.42%
<i>Absolute Return*</i>	5.74%	5.83%	-0.09%

\*Multi-asset assumptions derived from the sum of underlying equity, credit, and real asset building blocks - see page 39 for additional detail.



# 2019 VOLATILITY FORECASTS

Volatility			
Asset Class	2019	2018	2019-2018
Cash	1.00%	1.00%	-
Large Cap Equities	16.50%	17.50%	-1.00%
Small/Mid Cap Equities	20.00%	21.00%	-1.00%
Int'l Equities (Unhedged)	20.50%	21.00%	-0.50%
Int'l Sm Cap Equities (Unhedged)	22.00%	22.00%	-
Emerging Int'l Equities	28.00%	28.00%	-
Emerging Int'l Sm Cap Equities	31.00%	31.00%	-
Absolute Return - Long/Short	11.00%	11.00%	-
TIPS	6.50%	6.50%	-
Treasuries	5.50%	5.50%	-
IG Corp Credit	7.50%	7.50%	-
MBS	7.00%	7.00%	-
High-Yield Bonds	12.50%	13.00%	-0.50%
Bank Loans	9.00%	9.00%	-
EMD (External)	13.00%	13.00%	-
EMD (Local Currency)	13.00%	13.00%	-
Absolute Return - Credit	9.50%	9.50%	-

# 2019 VOLATILITY FORECASTS

Volatility			
Asset Class	2019	2018	2019-2018
Long Treasuries	12.00%	12.00%	-
Long Credit	12.00%	12.00%	-
IG CLO	7.50%	N/A	N/A
HY CLO	11.00%	N/A	N/A
Commodities	19.00%	19.00%	-
Midstream Energy	18.50%	19.00%	-0.50%
Core Real Estate	13.00%	13.00%	-
Non-Core Real Estate	17.00%	17.00%	-
Private RE Debt	11.00%	N/A	N/A
Private Real Assets - Energy/Metals	21.00%	21.00%	-
Private Real Assets - Infra/Land	12.00%	12.00%	-
Absolute Return - Macro	9.50%	9.50%	-
<i>Global Equity*</i>	<i>17.57%</i>	<i>18.22%</i>	<i>-0.65%</i>
<i>Private Equity*</i>	<i>24.16%</i>	<i>23.00%</i>	<i>+1.16%</i>
<i>Core Bonds*</i>	<i>6.10%</i>	<i>5.99%</i>	<i>+0.11%</i>
<i>Private Debt*</i>	<i>11.97%</i>	<i>13.00%</i>	<i>-1.03%</i>
<i>Long Gov/Credit*</i>	<i>11.26%</i>	<i>11.25%</i>	<i>+0.01%</i>
<i>Absolute Return*</i>	<i>8.15%</i>	<i>9.07%</i>	<i>-0.92%</i>

\*Multi-asset assumptions derived from the sum of underlying equity, credit, and real asset building blocks - see page 39 for additional detail.



# 2019 30 YEAR RETURN FORECASTS

<b>Geometric Expected Return</b>			
<b>Asset Class</b>	<b>2019</b>	<b>2018</b>	<b>2019-2018</b>
Cash	3.00%	2.75%	+0.25%
Large Cap Equities	7.50%	7.50%	-
Small/Mid Cap Equities	7.75%	7.75%	-
Int'l Equities (Unhedged)	7.75%	7.75%	-
Int'l Sm Cap Equities (Unhedged)	8.00%	8.00%	-
Emerging Int'l Equities	9.25%	9.25%	-
Emerging Int'l Sm Cap Equities	9.50%	9.50%	-
Absolute Return - Long/Short	6.50%	7.25%	-0.75%
TIPS	4.00%	3.75%	+0.25%
Treasuries	3.75%	3.25%	+0.50%
IG Corp Credit	5.75%	4.75%	+1.00%
MBS	3.75%	3.25%	+0.50%
High-Yield Bonds	6.50%	5.50%	+1.00%
Bank Loans	5.50%	5.50%	-
EMD (External)	6.25%	5.00%	+1.25%
EMD (Local Currency)	6.75%	6.50%	+0.25%
Absolute Return - Credit	6.75%	5.25%	+1.50%

# 2019 30 YEAR RETURN FORECASTS

<b>Geometric Expected Return</b>			
<b>Asset Class</b>	<b>2019</b>	<b>2018</b>	<b>2019-2018</b>
Long Treasuries	3.75%	3.50%	+0.25%
Long Credit	6.00%	5.25%	+0.75%
IG CLO	4.50%	N/A	N/A
HY CLO	6.25%	N/A	N/A
Commodities	5.50%	5.50%	-
Midstream Energy	7.50%	7.50%	-
Core Real Estate	6.25%	6.50%	-0.25%
Non-Core Real Estate	7.25%	7.50%	-0.25%
Private RE Debt	6.25%	N/A	N/A
Private Real Assets - Energy/Metals	9.50%	7.75%	+1.75%
Private Real Assets - Infra/Land	7.00%	6.25%	+0.75%
Absolute Return - Macro	6.50%	6.25%	+0.25%
<i>Global Equity*</i>	<i>8.18%</i>	<i>8.24%</i>	<i>-0.06%</i>
<i>Private Equity*</i>	<i>11.15%</i>	<i>9.50%</i>	<i>+1.65%</i>
<i>Core Bonds*</i>	<i>4.37%</i>	<i>3.75%</i>	<i>+0.62%</i>
<i>Private Debt*</i>	<i>8.11%</i>	<i>7.50%</i>	<i>+0.61%</i>
<i>Long Gov/Credit*</i>	<i>5.14%</i>	<i>4.62%</i>	<i>+0.52%</i>
<i>Absolute Return*</i>	<i>6.76%</i>	<i>6.34%</i>	<i>+0.42%</i>

\*Multi-asset assumptions derived from the sum of underlying equity, credit, and real asset building blocks - see page 39 for additional detail.



# 2019 PROJECTED CORRELATIONS

Asset Class	Cash	Large Cap Equities	Small/Mid Cap Equities	Int'l Equities (Unhedged)	Global Equity	Private Equity	Core Bonds	Private Debt	Real Estate	Private Real Assets	GTS/Risk Parity
Cash	1.00	0.02	-0.03	-0.03	0.02	-0.01	0.20	-0.05	-0.06	0.00	0.05
Large Cap Equities	0.02	1.00	0.86	0.77	0.93	0.90	0.11	0.59	0.44	0.48	0.83
Small/Mid Cap Equities	-0.03	0.86	1.00	0.72	0.88	0.96	0.02	0.67	0.49	0.55	0.78
Int'l Equities (Unhedged)	-0.03	0.77	0.72	1.00	0.92	0.79	-0.02	0.54	0.39	0.39	0.72
Global Equity	0.02	0.93	0.88	0.92	1.00	0.93	0.05	0.65	0.47	0.50	0.85
Private Equity	-0.01	0.90	0.96	0.79	0.93	1.00	0.05	0.70	0.50	0.54	0.82
Core Bonds	0.20	0.11	0.02	-0.02	0.05	0.05	1.00	0.08	0.15	0.10	0.19
Private Debt	-0.05	0.59	0.67	0.54	0.65	0.70	0.08	1.00	0.62	0.52	0.76
Real Estate	-0.06	0.44	0.49	0.39	0.47	0.50	0.15	0.62	1.00	0.45	0.55
Private Real Assets	0.00	0.48	0.55	0.39	0.50	0.54	0.10	0.52	0.45	1.00	0.57
GTS/Risk Parity	0.05	0.83	0.78	0.72	0.85	0.82	0.19	0.76	0.55	0.57	1.00

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**Past performance is no guarantee of future results.**

**The goal of this report is to provide a basis for substantiating asset allocation recommendations. The opinions presented herein represent the good faith views of NEPC as of the date of this report and are subject to change at any time.**

**Information on market indices was provided by sources external to NEPC. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained within.**

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