NEPC, LLC

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NEPC 2015 Outlook

Assumptions and Actions for Clients

January, 2015

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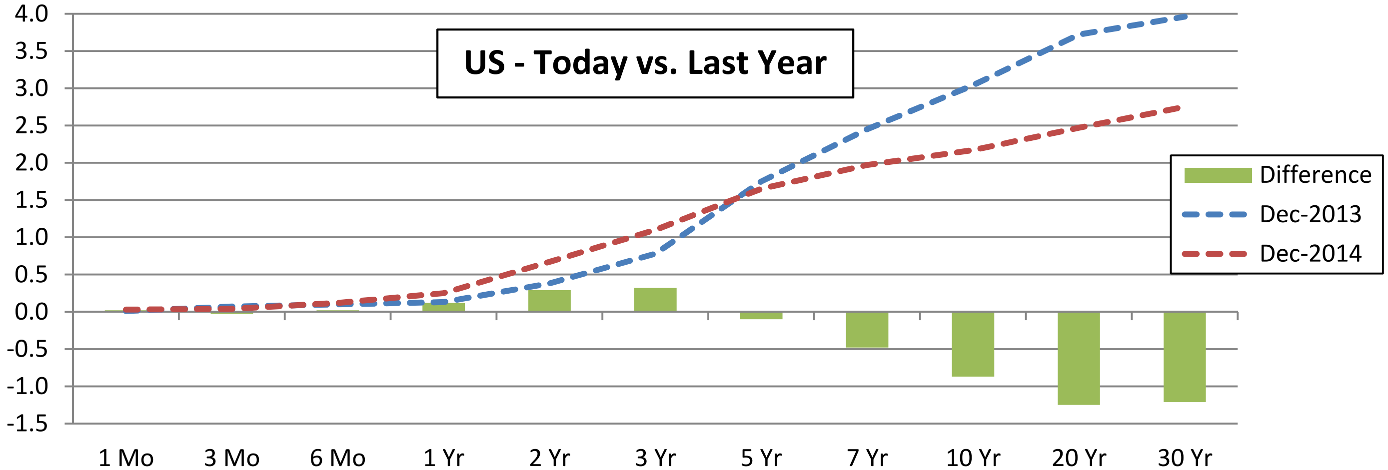
Executive Summary

- **The target asset allocation for the Massachusetts's Pension Reserves Investment Management Board ("PRIM") remains appropriately diversified and reflective of market opportunities**
  - Potential changes include rebalancing from long-term Treasuries given the exceptional recent performance



- **NEPC's 2015 asset class assumptions are generally lower than 2014**
  - PRIM's expected returns drop by ~25 bps versus 2014

- **PRIM should investigate potential strategies and their applicability to the portfolio**
  - Hedging some of the developed market currency exposure within its non U.S. equity portfolio on a strategic basis
  - Allowing for minimal leverage at the portfolio level can improve potential risk-adjusted returns and allow for a better risk balance within the portfolio

NEPC 2015 Observations and Actions

Context for 2015 Assumptions

- **Since the crisis, we expected and experienced a range of outcomes**
  – Great uncertainty was a dominant theme over the last 6 years
- **Burned by losses and illiquidity, many institutions exercised caution**
  – Participate smartly in upside with dislocated credit markets but mitigate potential downside by diversifying growth risk away from long-only equity
- **Unconventional global monetary policies were unfamiliar & untested**
  – Diverse underlying economic conditions across regions complicated the issue
- **Politics, both national and "geo", have proven to be a challenge**
  – "Fiscal cliff", debt ceiling, socio-economic divide
  – European "dis-union", austerity measures, periphery unemployment
  – Japan's lost (two plus) decade(s), Abenomics
  – Unpredictable state actors such as Russia, Iran, North Korea, etc.
- **Markets have forged ahead with cautious optimism tied to improving US economic conditions and continued easy global monetary policy**
  – Still a large range of outcomes
  – Complacency is fertile ground for volatility and loss
  – Tilt towards fundamental strength as US recovers
  – Maintain diversification (economic hedges) to mitigate tail risk

NEPC 2015 Capital Market Observations

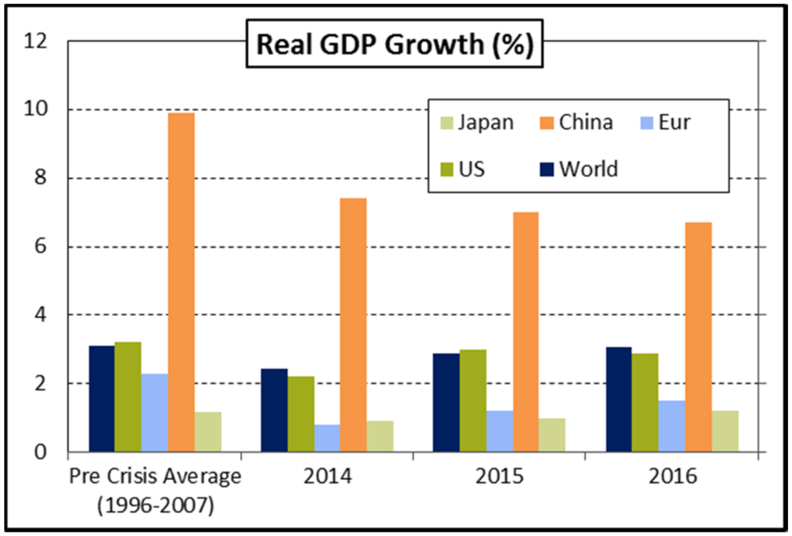
- **Protracted bull market, slow growth, and low interest rates persist**
  - Cautious optimism for US economy, but length and strength of rally warrants inquiry
  - Negative real interest rates have supported elevated valuations and low volatility
  - Investor complacency, coupled with lower liquidity, may leave market more vulnerable
- **Global monetary policies and capital markets continue to diverge**
  - The US successfully navigated the end of quantitative easing in 2014, while Europe pondered and Japan pursued further aggressive monetary policy
  - Regional equity market valuation divergence grew as US P/E ratios expanded
- **The US economy shows strength relative to other developed markets**
  - Improving labor markets, increasing confidence, and expected rise in interest rates are supportive of a stronger dollar, which has been a headwind for foreign exposures
  - Meaningful structural reform and continued aggressive monetary policy are required in Europe & Japan to propel assets higher
- **Fed rate hikes are on the horizon but markets expect a slow pace**
  - High US growth may spur accelerated hike, decoupling rates from market expectations
  - Fed tightening is a first step in a multi-year policy normalization process
- **Emerging Market fatigue tangible; low valuations cannot be ignored**
  - Short- and medium-term challenges camouflage long-term economic growth prospects
  - Plummeting energy prices have potential to create challenges for certain economies

NEPC 2015 General Actions for Clients

- **Confirm alignment of portfolio positioning with long-term objectives**
  - Recognize investment program's tolerance to withstand short-term volatility
  - Some traditional approaches, such as core bonds, suboptimal in current environment
- **Balance desire for increased return with recognition of downside risks**
  - Barbell portfolio risk with defensive allocations to withstand range of outcomes
  - Shift judiciously across and within asset classes
    - Stretched liquid credit markets make equities relatively more attractive
    - Recognize potential for non-US developed markets to react to QE programs, both continued (Bank of Japan) and potential (European Central Bank)
- **Evaluate impact of expected US dollar strength on non-US allocations**
  - Consider strategic developed market currency hedging program to mitigate risk
  - Scrutinize allocation to and implementation within emerging markets
    - Attractive fundamentals and secular trends warrant market weight at a minimum
    - Challenging country specific conditions support pursuit of bold active management
- **Remain committed to high conviction active manager exposures**
  - Passive trends and market complacency may ignite dormant alpha opportunities
  - Use non-traditional strategies with reduced constraints across markets to capitalize
    - Global equity, tactical credit strategies, GAA, liquid alternative beta, global macro
- **Seek niche private strategies to mitigate challenge of high valuations**
  - Energy, European Real Estate, sector-focused growth equity, Asia-focused managers and select direct lending markets all provide compelling opportunities

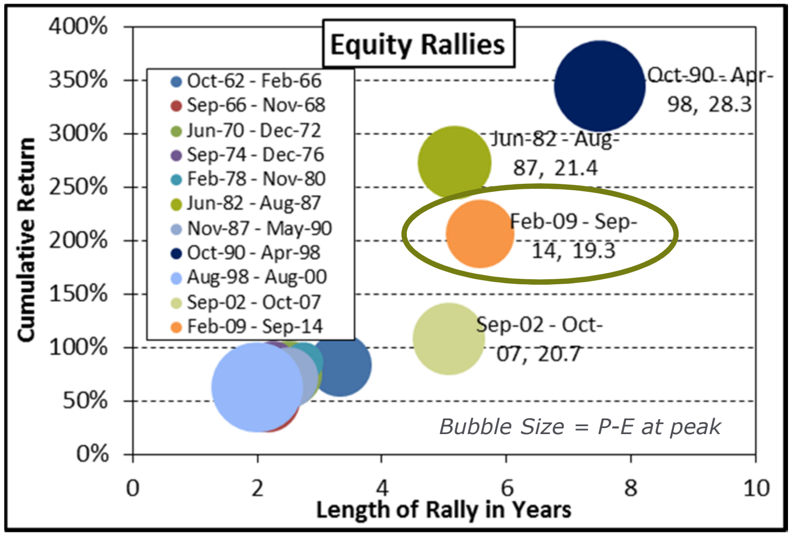
5-7 Year Returns Commensurate with Growth; Near-Term Strength Can Persist

- **Global growth forecasts low but approaching pre-crisis levels with less reliance on China**
  - Absolute figures projected to improve for the US and World
  - Europe joins Japan as a drag on global growth
  - China expectations compress but remain quite high



Source: Bloomberg as of 11/30

- **S&P rally unlikely to persist for another 5-7 years**
  - Low-for-longer interest rates may provide near term support for higher valuations
  - Tepid growth levels challenge ability to extend outsized returns over this horizon as stimulus wanes
  - While perceived tail-ends of bull markets can be false signs, the current length and magnitude is only outpaced by '82-'87 and '90-'98



Source: Bloomberg and Shiller Data as of 9/30

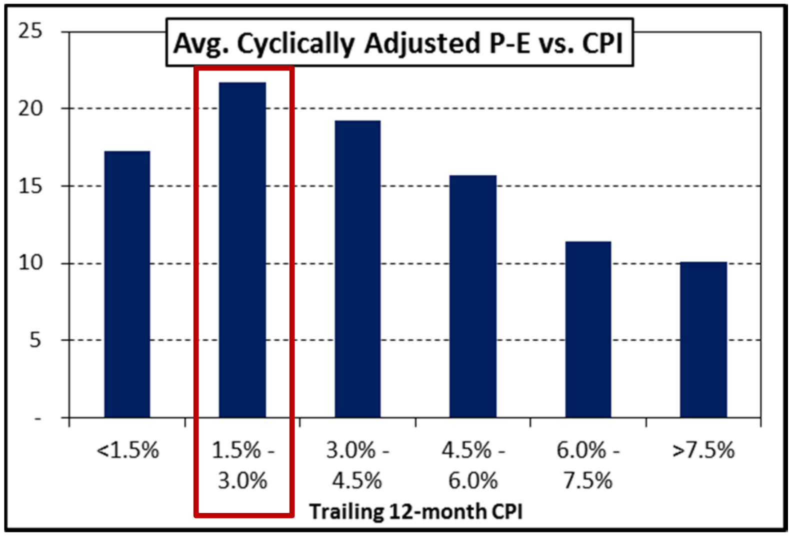
Certain Conditions Promote Further Short-Term Optimism

- **While strong performance across most risky asset markets may appear "long in the tooth", certain conditions may provide underpinning for further strength**

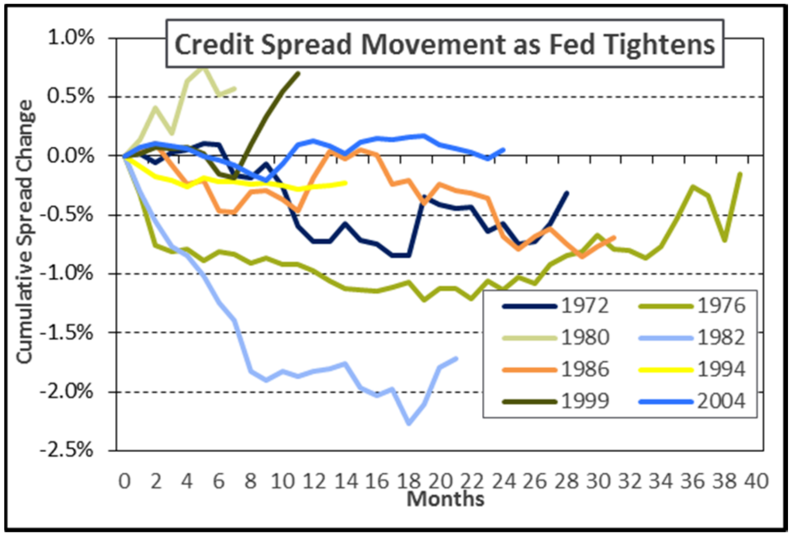
- **Low rate/inflation periods generally support higher valuations**
  - Lower discount rate for valuing future cash flows
  - Equities appear more attractive relative to low yielding fixed income

- **Risk assets, particularly credit, have historically withstood initial impact of rate hikes**
  - Transmission of slowing economic activity through higher rates takes time to impact credit quality

- **These conditions may continue in the short-term but unlikely to continue over 5-7 year horizon**

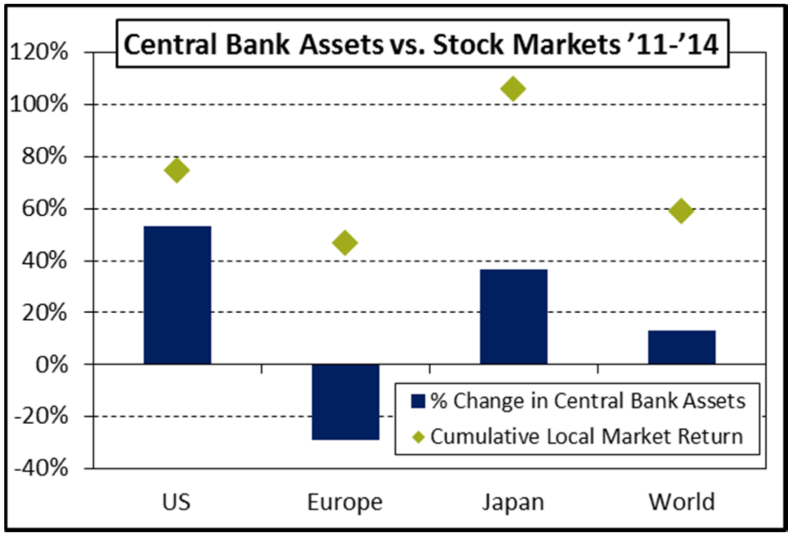


Source: Bloomberg and Shiller Data as of 11/30



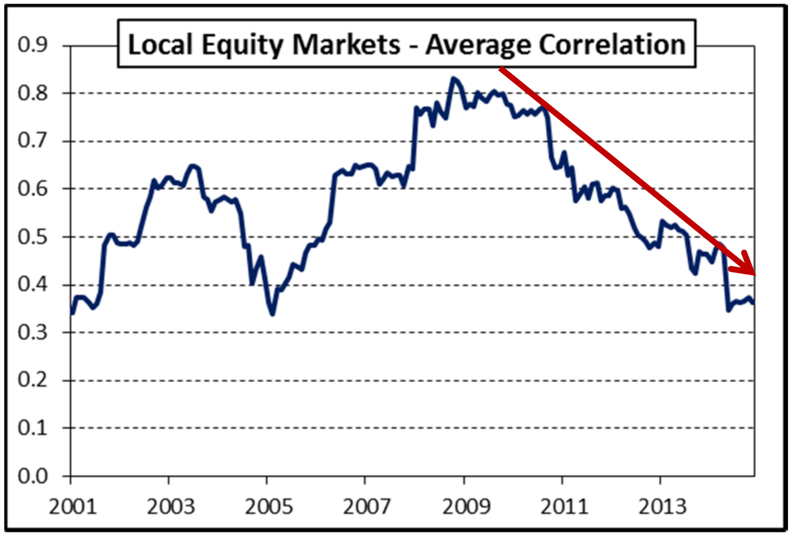
Source: Bloomberg as of 11/30

- **Central bank stimulus has been a key driver of market returns**
  - Post crisis monetary policy was first highly stimulative, waned in 2010-2011, then resumed unevenly
  - Greater stimulus led to strong ***local*** market returns
  - Continued stimulus in Japan and Europe should be incorporated into outlook but hedging developed market currency exposure is prudent



Source: Bloomberg as of 11/30

- **Policy responses have been key driver of capital market results**
  - Distinct economic environments across countries leads to differentiation in market returns
  - Evolving monetary policies continue to diverge and likely lead to more independent capital market outcomes among countries



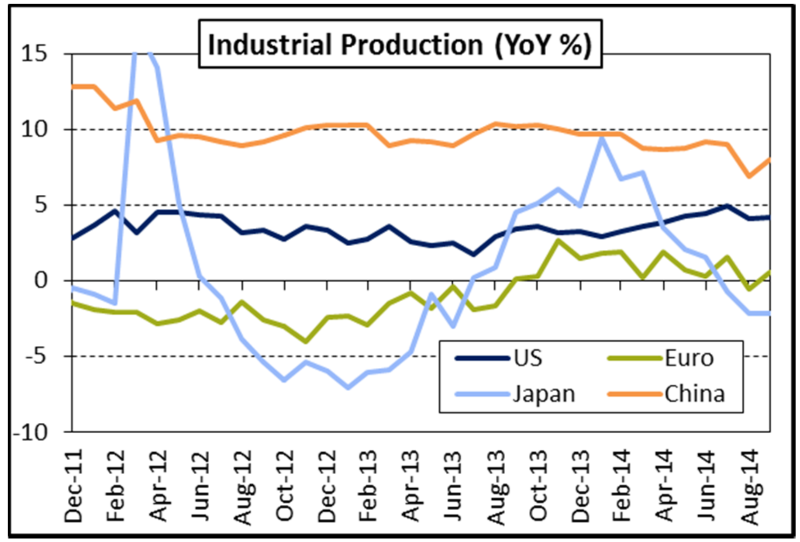
Source: Bloomberg as of 11/30 - Local indices consist of Australia, Europe, UK, Emerging Markets, Japan, New Zealand, US, and Canada

Conditions Present for Elevated Growth in US; Challenges Abroad

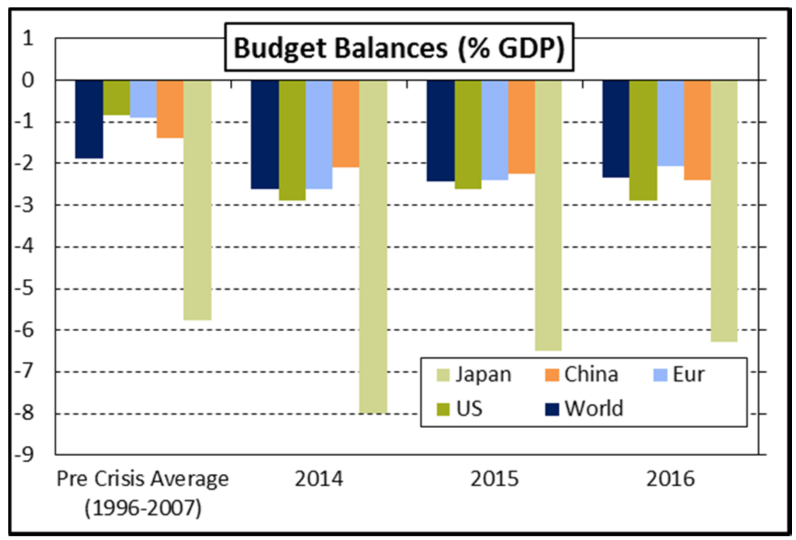
- **Fundamental growth prospects more attractive in US and China than Europe and Japan**
  - China continues to remain elevated
  - Euro zone may benefit from recent decline in the Euro and Oil

- **Confidence has improved in US due to a variety of factors**
  - Improved job market, decline in oil and low inflation

- **Fiscal situation is diverse but all major players remain more simulative than recent history**
  - Japan attacking deflation from all angles; heightened fiscal spending in conjunction with monetary stimulus
  - Europe, notably, expected to further shrink deficits
    - Driven by Germany (not shown) which projects a surplus
  - European policy makers may need to do more



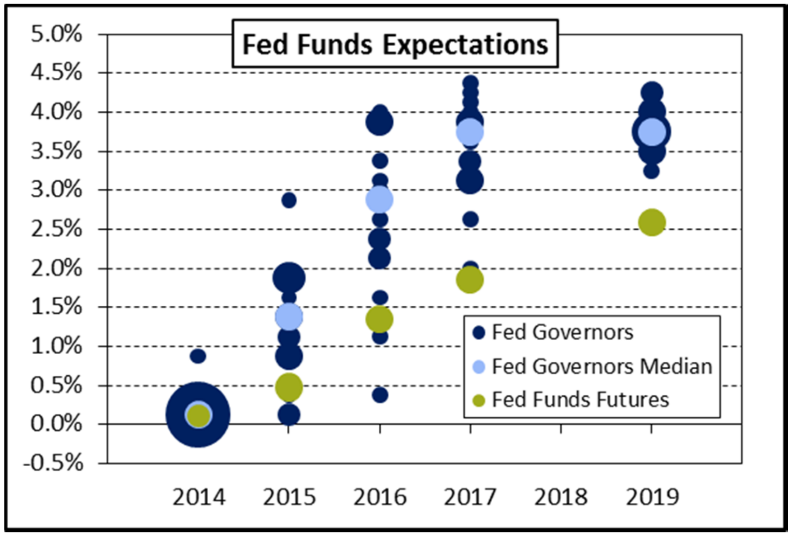
Source: Bloomberg as of 11/30



Source: Bloomberg as of 11/30

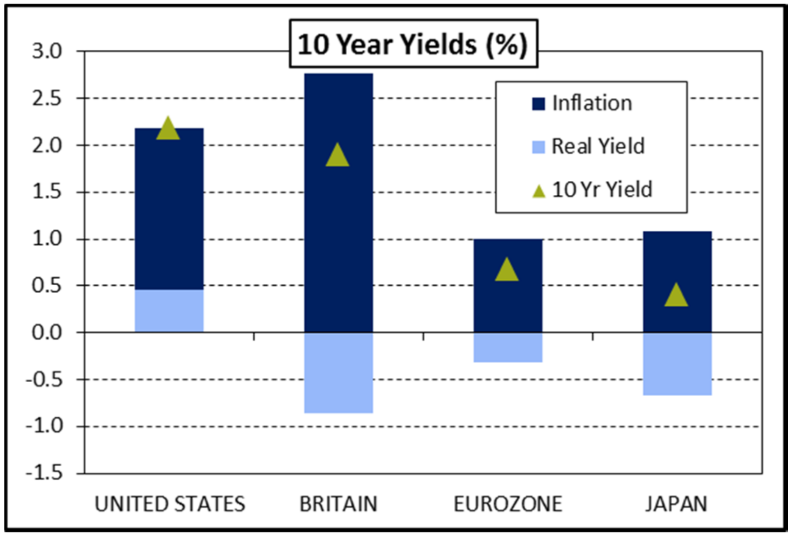
Fed Rate Hikes Expected in 2015; Timing and Pace Are Uncertain

- **Fed governors (blue dots) project higher rates over the next few years**
  - Market expectations (green dots) are less ambitious with reality likely in-between
  - Upside surprise to pace or level of interest rates supportive of higher USD; negative for US risk assets



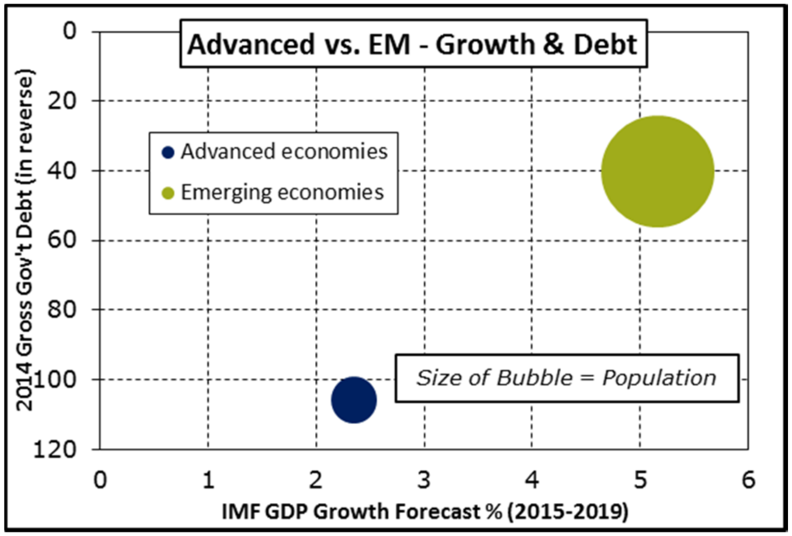
Source: Bloomberg and Federal Open Market Committee as of 11/30

- **Low real rates suppressed by central banks, squeeze expectations for future returns**
  - UK, Europe & Japan all with negative 10 year real yields
  - US bonds look relatively attractive in this context
  - Real rates moving lower toward peers is bullish for risk assets
  - Long-term normalized monetary policy could reverse the trend

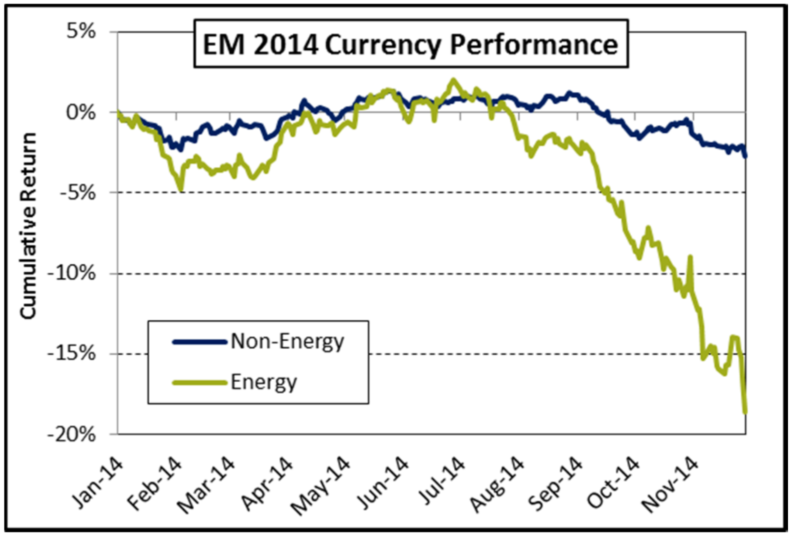


Source: Bloomberg as of 11/30

- **Emerging markets have higher growth and lower debt levels vs. developed markets**
  - Near term risks are present as both China and commodity cycle slows
  - Strong dollar will hurt some currencies but will also aid exporters, helping EM growth
- **Local currency debt offers a compelling yield but paired with heightened volatility**
- **Both exogenous and internal factors can drive major shifts across countries**
  - Drop in energy prices in 2014 is a recent structural shift that will have a major impact on certain countries
  - Venezuela, Nigeria, Russia and several frontier countries



Source: IMF as of 10/31



Source: Bloomberg as of 11/30

PRIM Portfolio Analysis

2015 vs. 2014 5-7 Year Asset Class Assumptions

	PRIM Target	2014 Expected 5-7 Yr. Return	2015 Expected 5-7 Yr. Return	Difference
Cash	0%	1.50%	1.75%	0.25%
Large Cap Equities	14.5%	6.25%	6.00%	-0.25%
Small/Mid Cap Equities	3.5%	6.25%	6.00%	-0.25%
Int'l Equities	16%	7.25%	7.00%	-0.25%
Emerging Int'l Equities	6%	9.50%	9.00%	-0.50%
Global Equity	**40%**			
Core Bonds	0%	2.53%	2.30%	-0.23%
20+ Yr. Treasury STRIPS[2]	10%	3.00%	2.50%	-0.50%
15-Yr. Duration Treasuries[3]	0%	2.81%	2.36%	-0.45%
TIPS	3%	2.50%	2.25%	-0.25%
Core Fixed Income	**13%**			
High-Yield Bonds	1.5%	4.50%	4.00%	-0.50%
Bank Loans	1.5%	5.00%	4.50%	-0.50%
EMD (External)	1%	5.00%	4.50%	-0.50%
EMD (Local Currency)	2%	5.75%	5.50%	-0.25%
Private Debt	4%	8.00%	7.50%	-0.50%
Value-Added Fixed Income	**10%**			
Private Equity	**10%**	8.75%	8.50%	-0.25%
Real Estate	**10%**	6.25%	6.50%	0.25%
Timberland[4]	**4%**	6.38%	6.63%	0.25%
Hedge Funds	**9%**	5.50%	5.75%	0.25%
Portfolio Completion[5]	**4%**	5.53%	5.52%	-0.01%
Expected Return 5-7 Yr.	***6.8%***	***7.1%***	***6.8%***	***-0.25%***
Expected Return 30 Yr.	***7.9%***	***8.2%***	***7.9%***	***-0.25%***
Stnd. Deviation of Asset Return	***12.5%***	***12.9%***	***12.5%***	***-0.38%***
Sharpe Ratio	***0.41***	***0.43***	***0.41***	***-0.02***

2: For 20+ Yr. Treasury STRIPS portfolio, the risk/return assumptions are modeled as a 20 Yr. LDI strategy

3: For the 15 Yr. Duration Treasuries portfolio, the risk/return assumptions are modeled as 81% Long Treasuries and 19% Treasuries

4: The Timberland portfolio is modeled as 50% Commodities and 50% Private Real Assets (Illiquid)

5: For the Portfolio Completion strategies, the risk/return assumptions are modeled as 50% Hedge Fund (Credit) and 50% GAA

Asset Allocation Mixes for PRIM

	Current Allocation[1]	PRIM Target	Mix A	Mix B	2014 Expected 5-7 Yr. Return	2015 Expected 5-7 Yr. Return	Difference
Large Cap Equities	15.8%	14.5%	14.5%	14.5%	6.25%	6.00%	-0.25%
Small/Mid Cap Equities	4.0%	3.5%	3.5%	3.5%	6.25%	6.00%	-0.25%
Int'l Equities	16%	16%	16%	16%	7.25%	7.00%	-0.25%
Emerging Int'l Equities	7%	6%	6%	6%	9.50%	9.00%	-0.50%
Global Equity	**43%**	**40%**	**40%**	**40%**			
Core Bonds	4%	0%	3%	0%	2.53%	2.30%	-0.23%
20+ Yr. Treasury STRIPS[2]	8%	10%	7%	0%	3.00%	2.50%	-0.50%
15-Yr. Duration Treasuries[3]	0%	0%	0%	10%	2.81%	2.36%	-0.45%
TIPS	3%	3%	3%	3%	2.50%	2.25%	-0.25%
Core Fixed Income	**15%**	**13%**	**13%**	**13%**			
High-Yield Bonds	1.5%	1.5%	1.5%	1.5%	4.50%	4.00%	-0.50%
Bank Loans	1.5%	1.5%	1.5%	1.5%	5.00%	4.50%	-0.50%
EMD (External)	1%	1%	1%	1%	5.00%	4.50%	-0.50%
EMD (Local Currency)	2%	2%	2%	2%	5.75%	5.50%	-0.25%
Private Debt	2%	4%	4%	4%	8.00%	7.50%	-0.50%
Value-Added Fixed Income	**8%**	**10%**	**10%**	**10%**			
Private Equity	**11%**	**10%**	**10%**	**10%**	8.75%	8.50%	-0.25%
Real Estate	**9%**	**10%**	**10%**	**10%**	6.25%	6.50%	0.25%
Timberland[4]	**4%**	**4%**	**4%**	**4%**	6.38%	6.63%	0.25%
Hedge Funds	**9%**	**9%**	**9%**	**9%**	5.50%	5.75%	0.25%
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Expected Return 30 Yr.	***7.9%***	***7.9%***	***7.9%***	***7.9%***	***8.2%***	***7.9%***	***-0.25%***
Stnd. Deviation of Asset Return	***12.6%***	***12.5%***	***12.6%***	***12.5%***	***12.9%***	***12.5%***	***-0.38%***
Sharpe Ratio	***0.40***	***0.41***	***0.40***	***0.40***	***0.43***	***0.41***	***-0.02***

1: The current allocation is as of Nov. 30, 2014

2: For 20+ Yr. Treasury STRIPS portfolio, the risk/return assumptions are modeled as a 20 Yr. LDI strategy

3: For the 15 Yr. Duration Treasuries portfolio, the risk/return assumptions are modeled as 81% Long Treasuries and 19% Treasuries

4: The Timberland portfolio is modeled as 50% Commodities and 50% Private Real Assets (Illiquid)

5: For the Portfolio Completion strategies, the risk/return assumptions are modeled as 50% Hedge Fund (Credit) and 50% GAA

Appendix

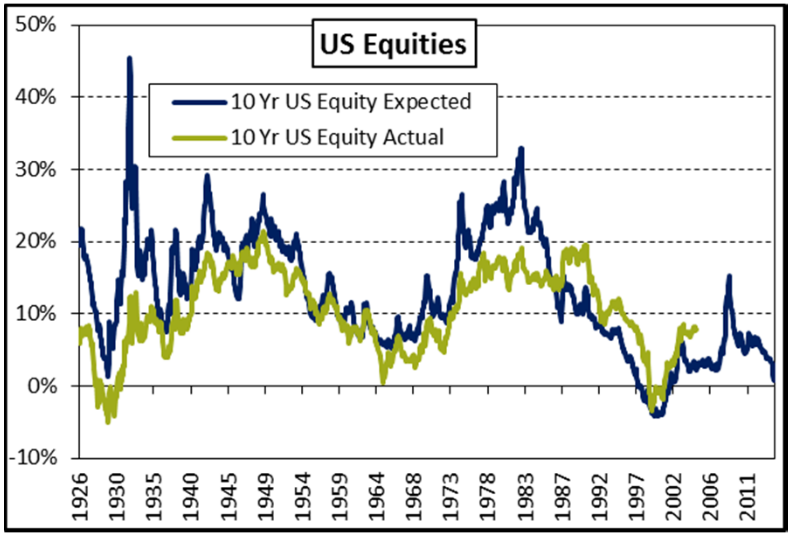
2015 Actions In Detail

Long-term Objectives Unchanged Amidst a Dramatically Changed World

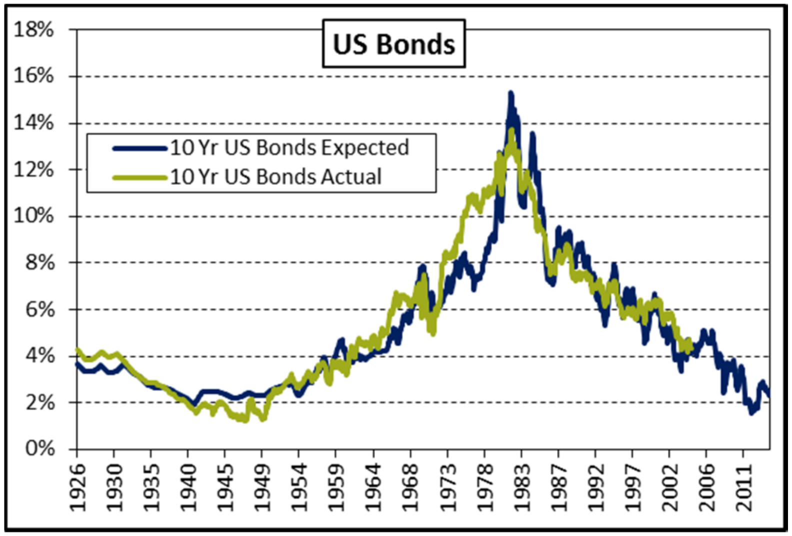
- **Investors must adjust to changing global market environment to meet return objectives**
  - Financialization of markets, secular decline in risk free rates, central bank driven financial repression

- **Low return world creates challenges that investors must address in order to effectively meet and exceed long-term objectives**
  - Take more risk
  - Take risk more efficiently
  - Increase funding/contributions

- **Traditional approaches will likely be challenged**
  - Particularly true of strategies reliant on index construction independent of investor objectives



Source: Shiller Data, Morningstar Direct, NEPC as of 11/30

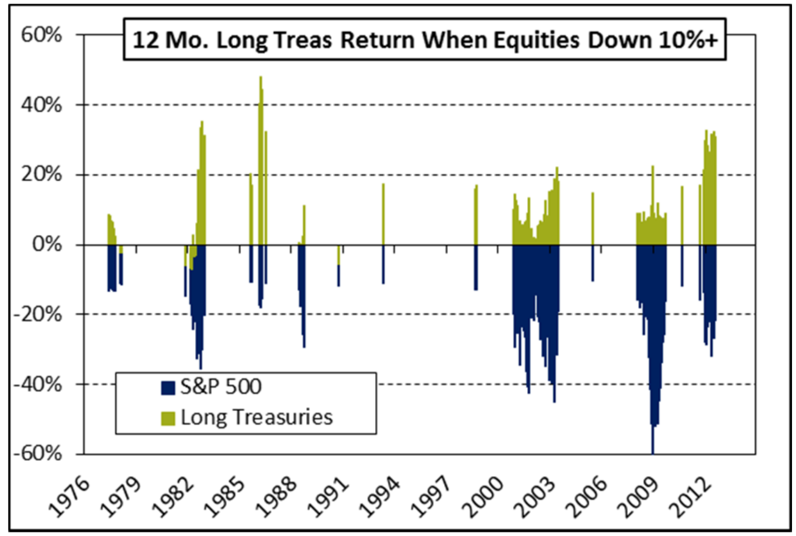


Source: Shiller Data, Morningstar Direct, NEPC as of 11/30

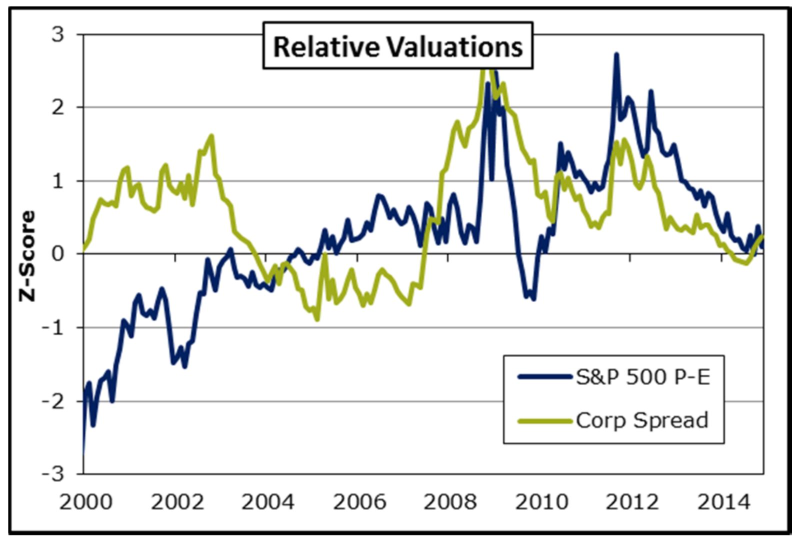
Portfolio Allocations Can Support Higher Risk Balanced by Economic Hedges

- **Consider Long Treasuries to balance structural shift to unconstrained fixed income strategies**
  - Risk parity can provide efficient allocation to sovereign debt and inflation hedges

- **While return outlook remains low relative to history, valuations remain relatively reasonable**
  - Limited undervalued assets but also few exceptionally rich markets
  - Credit attractiveness has dissipated
  - Liquidity constraints in credit is a risk factor not fully incorporated in spread metrics
  - Marginal risk dollar can be implemented in a risk balanced context – equities plus defensive assets



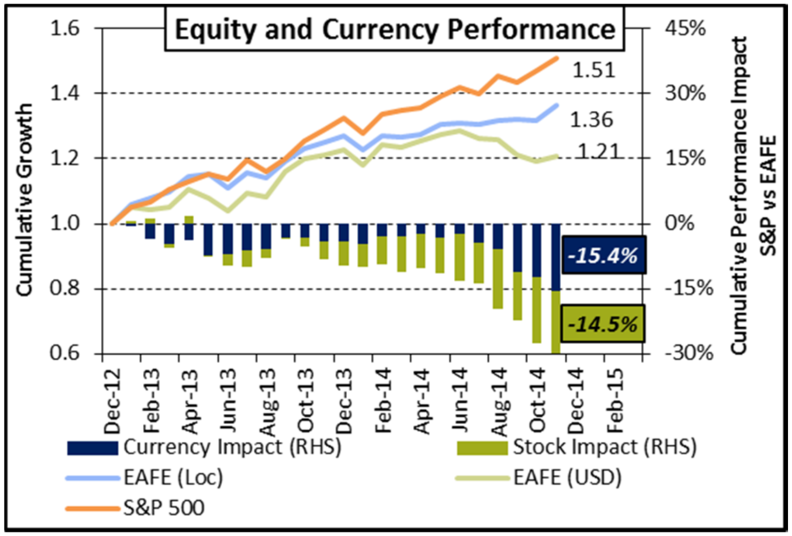
*Source: Bloomberg, NEPC as of 11/30 *Returns over cash*



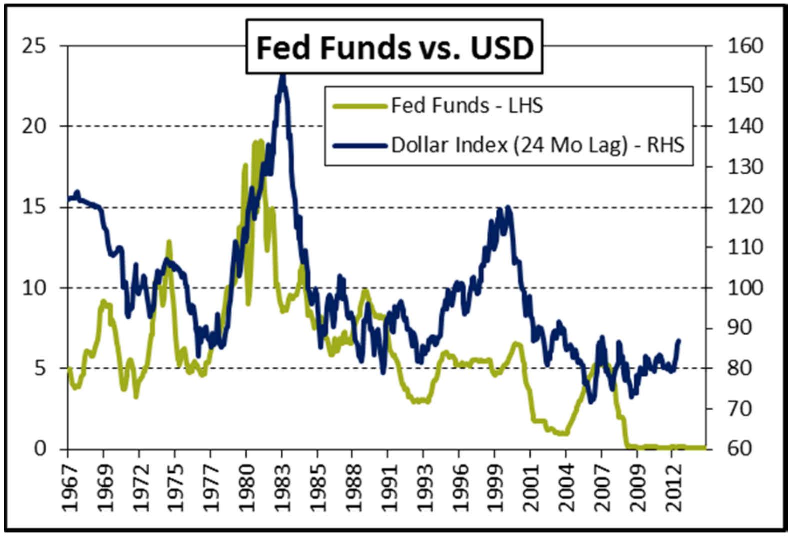
Source: Bloomberg, NEPC as of 11/30
**Calculation history since 6/30/1989*

Strength in the US Dollar has Implications for Non-US Markets

- **Currency has been a detractor for US investors allocating abroad over last 2-3 years**
  - Half of recent underperformance is driven by currency
- **Hedging a portion of develop market currency risk a key theme in coming years**
  - Yen and Euro denominated issues make up roughly 50% of MSCI EAFE
- **Dollar strength not necessarily relegated to the recent past**
  - History shows the dollar tends to rally two years after Fed Funds hikes

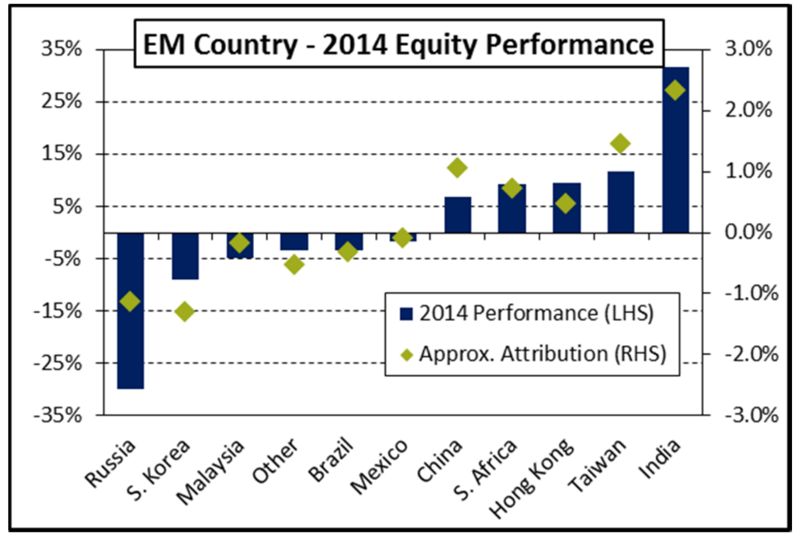


Source: Bloomberg, NEPC as of 11/30



Source: Bloomberg 11/30

- **Divergences across countries are likely to continue**
  - Reduced regional constraints provide more fertile ground for alpha in liquid markets
- **Transmission of divergences and imbalances likely to vary**
  - Benefitting unconstrained strategies able to trade across currencies, rates, equities, and commodities
- **Review unconstrained/ alternative mandates and confirm fees reflect skill and complexity**
  - Hedge funds broadly deliver higher Sharpe Ratio despite lower total return
  - Low return/zero cash means high management fee becomes a higher proportional hurdle of total return
- **Fees must align with conviction in alpha generation ability as well as uniqueness of strategy**



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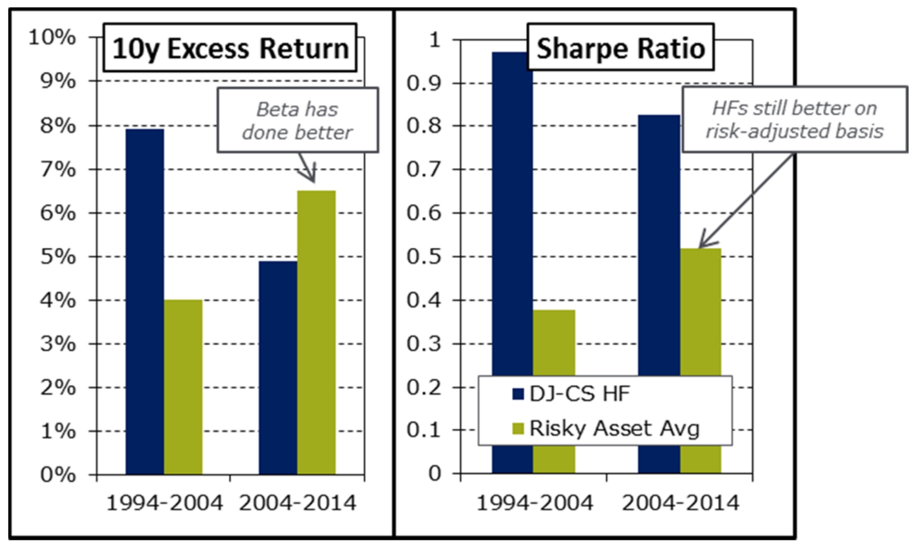


Source: Bloomberg, NEPC as of 11/30
Excess return shown over cash

NEPC 2015 Asset Class Assumptions

- **Combination of historical data and forward looking analysis**
  - Expected returns based on current market pricing and forward looking estimates
  - Volatility based on history, while recognizing current uncertainty
  - Correlations based on a mix of history and current trend
- **Historical data is used to frame current market environment as well as to compare to similar historical periods**
  - Historical index returns, volatility, correlations, valuations, and yields
- **Forward-looking analysis is based on current market pricing and a building blocks approach**
  - Return equals yield + changes in price (valuation, defaults, etc.)
  - Use of key economic observations (inflation, real growth, dividends, etc.)
  - Structural themes (supply and demand imbalances, capital flows, etc.)
- **Assumptions prepared by Asset Allocation Committee**
  - Asset Allocation team plus members of various consulting practice groups meet throughout Q4 to develop themes and assumptions
  - Public markets, hedge funds and private markets teams provide market insights
- **Assumptions and Actions reviewed and approved by Partners Research Committee**

Themes for 2015 Asset Class Assumptions

- **5-7 year return expectations lower relative to prior year**
  - Broadly expected return outlook remains subdued
  - Strong performance of domestic equity markets leads to reduction in expectations
  - Lower yields relative to prior year reduce bond market forecasts
  - Decrease in expectations for credit markets reflect normalization of default rates
  - Hedge Fund expectations increased due to anticipation of greater divergences across and within global markets
  - Private asset class adjustments mirror changes in liquid risky asset classes
- **30-year returns have similar themes to 5-7 year forecasts**
  - Yield decreases flow through to longer-term returns in fixed income
  - Equity markets reduced modestly
- **Volatility expectations reduced incrementally in certain asset classes**
  - Real Estate and Private Debt reductions echo more normalized asset class environment
  - Volatility increased for unhedged asset classes to reflect central bank divergences

Changes To Assumption Development

- **We continue to refine and enhance our process where appropriate**
  - Changes are evolutionary rather than revolutionary
    - Global Inflation-Linked Bonds now represent a USD hedged exposure
- **Improved modeling of Real Estate to more accurately reflect the underlying economic and market fundamentals**
  - Refined model sensitivity to changes in occupancy rates, supply, and new construction
  - Enhanced Cap Rate assumption to better reflect forward Treasury rates and spreads
- **Added Real Estate Investment Trust (REITs)**
  - Recognizing the unique role of REITs within a broad real estate allocation
- **Refined Emerging Market Debt Local Currency forecast model to better reflect underlying country forward rates**
  - Developed improved local yield curve forecast for major EM countries
  - Accounts for the significant exposure of a select number of countries in the index
- **Further refined term premium adjustment in fixed income model**
  - Accounts for the higher risk of longer dated maturities
- **Enhanced Risk Parity portfolio construction with the addition of a global cash and LIBOR assumption to reflect global leverage rates**
  - Divergence in expected global cash rates between the US and develop world necessitated the change to reflect implicit leverage costs

Inflation

- **Inflation is an integral component of our asset allocation assumptions**
  - An essential building block for projecting returns in stocks, bonds, and commodities
- **There are several measures of inflation used to inform our view, all with some type of shortcomings**
  - Global forecasts, local consumer and producer price indices, TIPS break-even inflation
- **Institutional investment pools will experience asset inflation globally, encompassing both developed and emerging countries**
  - We use a 3% global inflation projection over the next 5-7 years
    - Akin to assuming purchasing power parity holds across markets
  - Can be different from inflation experienced in local country liabilities or spending needs
    - For example our expectation of US CPI is 2.25% over 5-7 years
- **Muted credit growth leaves inflation expectations unchanged in the near term, pressure for higher long-term inflation continues to build**
  - Money supply (M2) continued to expand in 2014 while velocity remains depressed
  - Global monetary policy likely to remain simulative in 2015
- **Given increasing long-term inflation pressures, a modestly higher inflation assumption (3.25%) is used for determining 30 year return expectations**

2015 5-to-7 Year Return Forecasts

Geometric Expected Return			
Asset Class	**2014**	**2015**	**2015-2014**
Cash	1.50%	1.75%	0.25%
Treasuries	2.00%	1.75%	-0.25%
IG Corp Credit	3.50%	3.25%	-0.25%
MBS	2.25%	2.00%	-0.25%
*Core Bonds**	*2.53%*	*2.30%*	*-0.23%*
TIPS	2.50%	2.25%	-0.25%
High-Yield Bonds	4.50%	4.00%	-0.50%
Bank Loans	5.00%	4.50%	-0.50%
Global Bonds (Unhedged)	1.25%	1.00%	-0.25%
Global Bonds (Hedged)	1.38%	1.17%	-0.21%
EMD External	5.00%	4.50%	-0.50%
EMD Local Currency	5.75%	5.50%	-0.25%
Large Cap Equities	6.25%	6.00%	-0.25%
Small/Mid Cap Equities	6.25%	6.00%	-0.25%
Int'l Equities (Unhedged)	7.25%	7.00%	-0.25%
Int'l Equities (Hedged)	7.50%	7.50%	0.00%
Emerging Int'l Equities	9.50%	9.00%	-0.50%
Private Equity	8.75%	8.50%	-0.25%
Private Debt	8.00%	7.50%	-0.50%
Private Real Assets	7.75%	8.00%	0.25%
Real Estate	6.25%	6.50%	0.25%
Commodities	5.00%	5.25%	0.25%
Hedge Funds	5.50%	5.75%	0.25%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

2015 30-Year Return Forecasts

Geometric Expected Return			
Asset Class	**2014**	**2015**	**2015-2014**
Cash	3.75%	3.25%	-0.50%
Treasuries	4.00%	3.50%	-0.50%
IG Corp Credit	5.25%	4.75%	-0.50%
MBS	4.25%	3.75%	-0.50%
*Core Bonds**	*4.40%*	*3.98%*	*-0.42%*
TIPS	4.50%	4.00%	-0.50%
High-Yield Bonds	6.00%	5.75%	-0.25%
Bank Loans	6.25%	6.00%	-0.25%
Global Bonds (Unhedged)	3.00%	2.25%	-0.75%
Global Bonds (Hedged)	3.13%	2.42%	-0.71%
EMD External	7.00%	6.00%	-1.00%
EMD Local Currency	7.25%	6.75%	-0.50%
Large Cap Equities	7.75%	7.50%	-0.25%
Small/Mid Cap Equities	8.00%	7.75%	-0.25%
Int'l Equities (Unhedged)	8.25%	8.00%	-0.25%
Int'l Equities (Hedged)	8.50%	8.49%	-0.01%
Emerging Int'l Equities	9.50%	9.25%	-0.25%
Private Equity	9.75%	9.50%	-0.25%
Private Debt	8.25%	8.00%	-0.25%
Private Real Assets	7.75%	7.75%	0.00%
Real Estate	6.50%	6.50%	0.00%
Commodities	6.00%	5.75%	-0.25%
Hedge Funds	7.00%	6.75%	-0.25%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

2015 Volatility Forecasts

Volatility			
Asset Class	**2014**	**2015**	**2015-2014**
Cash	1.00%	1.00%	
Treasuries	6.00%	5.50%	-0.50%
IG Corp Credit	7.50%	7.50%	
MBS	7.00%	7.00%	
*Core Bonds**	*6.32%*	*6.03%*	*-0.29%*
TIPS	7.50%	7.50%	
High-Yield Bonds	13.00%	13.00%	
Bank Loans	8.00%	8.00%	
Global Bonds (Unhedged)	8.50%	9.00%	0.50%
Global Bonds (Hedged)	5.00%	5.00%	
EMD External	12.00%	12.00%	
EMD Local Currency	15.00%	15.00%	
Large Cap Equities	17.50%	17.50%	
Small/Mid Cap Equities	21.00%	21.00%	
Int'l Equities (Unhedged)	20.50%	21.00%	0.50%
Int'l Equities (Hedged)	18.50%	17.50%	-1.00%
Emerging Int'l Equities	26.00%	26.00%	
Private Equity	27.00%	27.00%	
Private Debt	19.00%	17.00%	-2.00%
Private Real Assets	23.00%	23.00%	
Real Estate	17.00%	15.00%	-2.00%
Commodities	18.00%	18.00%	
Hedge Funds	9.00%	9.00%	

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

2015 Correlation Assumption

2015 v. 2014 Assumption

Asset Class	Cash	Treas	Credit	MBS	TIPS	HY	EMD (Ext)	EMD (Loc)	Large Cap	Sm/ Mid	Intl Eq	Intl Eq (H)	EM Eq	Priv Eq	Priv Debt	Priv Real	Real Estate	Cmdy	Hedge Funds	Long Treas	Bank Loans
Cash	0.00																				
Treasuries	0.00	0.00																			
IG Corp Credit	0.00	-0.10	0.00																		
MBS	0.00	0.00	-0.05	0.00																	
TIPS	0.00	-0.10	0.00	0.00	0.00																
High-Yield Bonds	0.00	-0.10	0.00	0.00	0.00	0.00															
EMD (External)	0.00	-0.05	0.00	0.00	0.00	-0.05	0.00														
EMD (Local Currency)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00													
Large Cap Equities	-0.15	-0.15	-0.10	-0.05	0.00	-0.05	-0.05	0.00	0.00												
Small/Mid Cap Equities	-0.10	-0.10	0.10	0.05	0.00	0.00	0.00	0.00	0.00	0.00											
Int'l Equities (Unhedged)	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.05	0.00	0.00	0.00										
Int'l Equities (Hedged)	0.10	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	-0.05	0.00									
Emerging Int'l Equities	0.00	0.00	0.00	0.00	0.00	0.15	-0.05	0.00	0.00	0.00	0.00	0.00	0.00								
Private Equity	-0.10	-0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	-0.05	0.00	0.00	0.00	0.00							
Private Debt	0.00	-0.10	0.00	0.00	0.00	0.00	-0.05	0.00	-0.05	-0.10	0.15	0.15	0.15	0.00	0.00						
Private Real Assets	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
Real Estate (Core)	0.00	0.00	0.10	0.10	0.10	0.15	0.10	0.20	0.05	0.15	0.05	0.10	0.15	0.15	0.15	0.00	0.00				
Commodities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Hedge Funds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
Long Treasuries (STRIPS)	-0.05	0.00	0.00	0.00	-0.10	0.00	0.15	0.05	-0.05	0.00	0.05	0.00	0.00	0.00	-0.10	0.00	0.00	-0.05	0.00	0.00	
Bank Loans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

2015 Assumptions

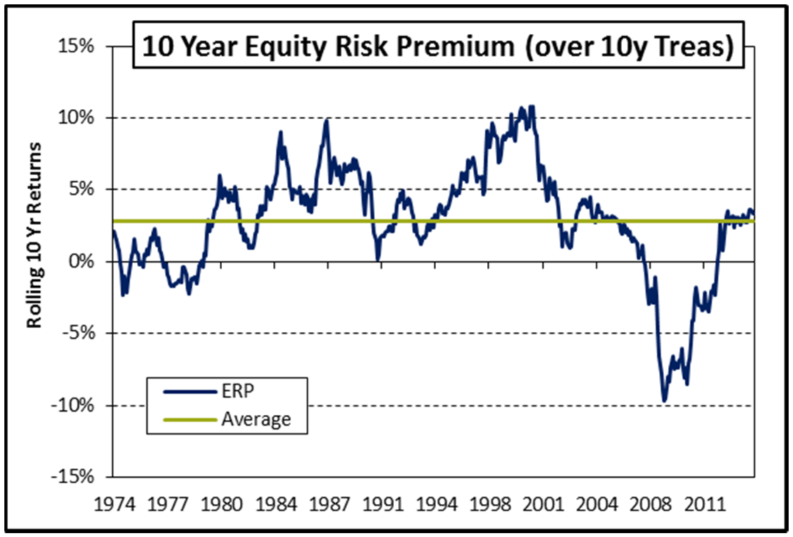
Asset Class	Cash	Treas	Credit	MBS	TIPS	HY	EMD (Ext)	EMD (Loc)	Large Cap	Sm/ Mid	Intl Eq	Intl Eq (H)	EM Eq	Priv Eq	Priv Debt	Priv Real	Real Estate	Cmdy	Hedge Funds	Long Treas	Bank Loans
Cash	1.00																				
Treasuries	0.20	1.00																			
IG Corp Credit	0.10	0.65	1.00																		
MBS	0.25	0.90	0.75	1.00																	
TIPS	0.00	0.65	0.60	0.70	1.00																
High-Yield Bonds	-0.05	0.20	0.55	0.30	0.20	1.00															
EMD (External)	0.05	0.35	0.65	0.35	0.30	0.60	1.00														
EMD (Local Currency)	0.05	0.30	0.60	0.25	0.25	0.60	0.80	1.00													
Large Cap Equities	-0.10	-0.10	0.45	0.10	0.00	0.65	0.55	0.65	1.00												
Small/Mid Cap Equities	-0.15	-0.15	0.45	0.10	-0.10	0.70	0.55	0.60	0.90	1.00											
Int'l Equities (Unhedged)	-0.10	0.00	0.30	0.05	-0.05	0.65	0.60	0.70	0.70	0.60	1.00										
Int'l Equities (Hedged)	0.00	0.00	0.30	0.05	-0.05	0.65	0.60	0.65	0.75	0.65	0.85	1.00									
Emerging Int'l Equities	-0.10	-0.10	0.25	-0.10	-0.10	0.70	0.70	0.80	0.60	0.65	0.70	0.70	1.00								
Private Equity	-0.20	-0.15	0.30	0.10	-0.10	0.60	0.35	0.40	0.70	0.75	0.60	0.65	0.45	1.00							
Private Debt	0.00	-0.35	0.15	-0.15	-0.10	0.65	0.50	0.60	0.60	0.65	0.75	0.75	0.80	0.65	1.00						
Private Real Assets	0.15	-0.20	0.05	-0.15	0.00	0.40	0.40	0.40	0.55	0.60	0.50	0.50	0.50	0.65	0.60	1.00					
Real Estate (Core)	0.25	-0.05	0.15	0.05	0.10	0.25	0.20	0.30	0.40	0.40	0.35	0.40	0.30	0.50	0.40	0.40	1.00				
Commodities	0.10	-0.10	0.10	-0.10	0.30	0.20	0.35	0.45	0.30	0.30	0.35	0.35	0.40	0.25	0.30	0.45	0.30	1.00			
Hedge Funds	0.00	-0.20	0.35	-0.15	0.20	0.60	0.55	0.60	0.60	0.65	0.70	0.65	0.70	0.75	0.80	0.65	0.25	0.50	1.00		
Long Treasuries (STRIPS)	-0.05	0.80	0.55	0.65	0.50	0.25	0.35	0.30	-0.05	-0.10	-0.05	-0.10	-0.20	-0.20	-0.30	-0.20	-0.10	-0.05	-0.25	1.00	
Bank Loans	0.00	-0.35	0.10	-0.20	-0.05	0.65	0.25	0.25	0.50	0.55	0.50	0.50	0.50	0.55	0.70	0.50	0.20	0.40	0.60	-0.20	1.00

Asset Class Development

Assumption Development – US Large Cap Equity

- **Sources of Return**
  - Valuation
  - Earnings growth
    - Adjusted for changes in margin
  - Dividend yield
  - Inflation

Return Source	Starting Value	Expected Forecast Values	Return Contribution
Real Earnings Growth	2.5%	2.5%	-
Profit Margin Adjustment		-1.5%	1.0%
Dividend Yield	1.9%	2.0%	2.0%
Inflation	3.0%	3.0%	3.0%
Valuation & Other*	17	17	-
		Total Expected Return	6.00%

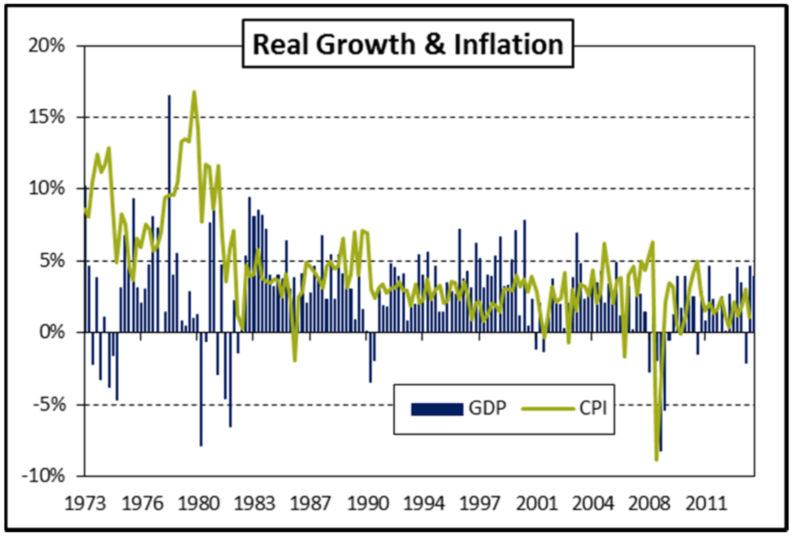


- **Equity Risk Premium over 10 year Treasury is volatile**
  - Long-term average of 2.8%
  - Stock and bond forecasts imply an Equity Risk Premium of 4.0%
  - While above relative to the long-term average, almost 40% of observations exceed this level over the last 50 years
- **Low interest rates still supportive of an elevated equity risk premium**

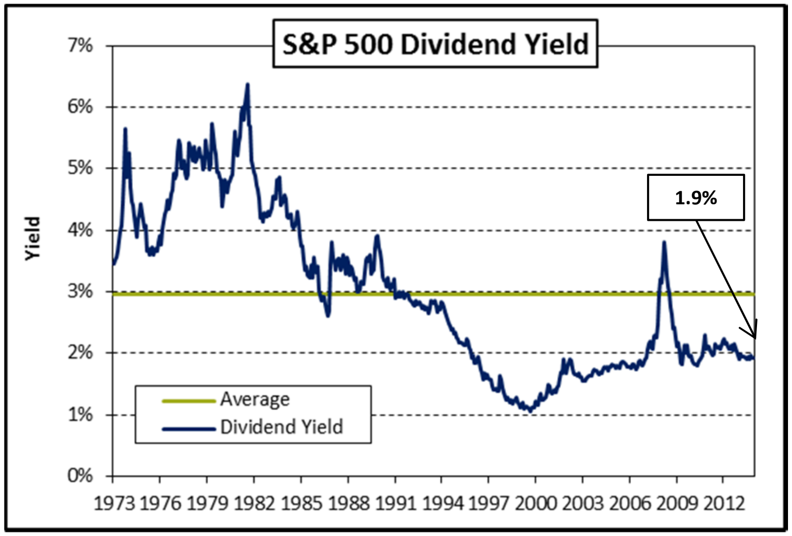
Source: Morningstar Direct as of 11/30

** - Valuation & Other incorporates adjustment for P-E ratios as well as other factors such as rounding, geometric compounding, etc.*

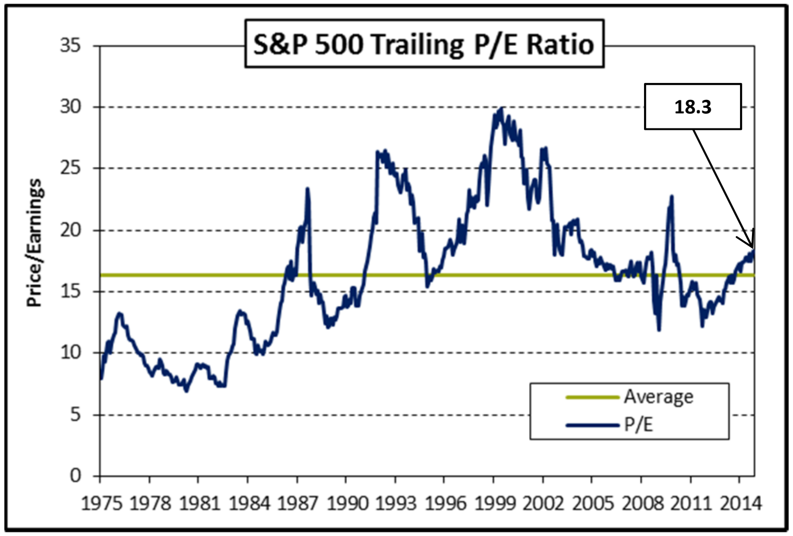
US Large Cap Equity Building Blocks



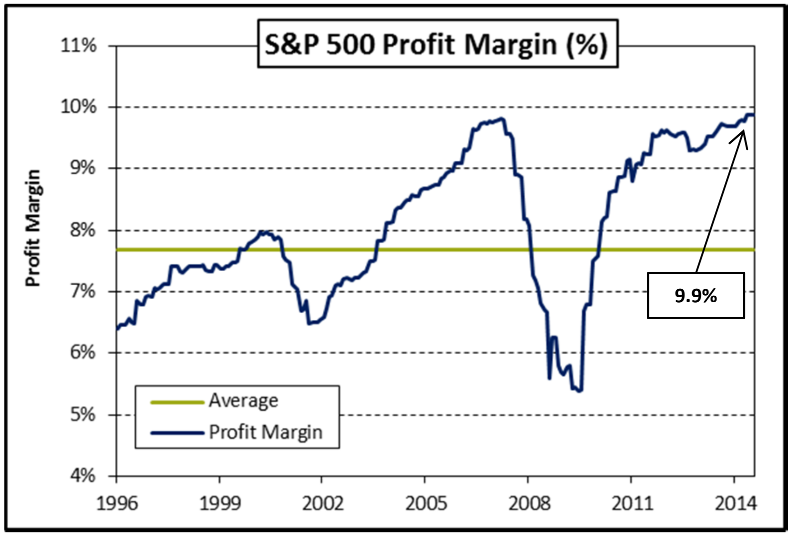
Source: Bloomberg as of 11/30



Source: Bloomberg as of 11/30



Source: Bloomberg as of 11/30



Source: Bloomberg as of 11/30

Assumption Development – International Equities

- **Developed Markets**
  - Low growth prospects
    - Earnings and margins remain subdued
  - Potential of ECB action to provide a growth catalyst
  - Higher dividend yields
  - *100 bps premium over US*

Return Source	Starting Value	Expected Forecast Values	Return Contribution
Real Earnings Growth	2.0%	2.0%	-
Profit Margin Adjustment		0.5%	2.5%
Dividend Yield	3.3%	3.0%	3.0%
Inflation	3.0%	3.0%	3.0%
Valuation & Other*	15.5	14	-1.5%
		Total Expected Return	7.0%

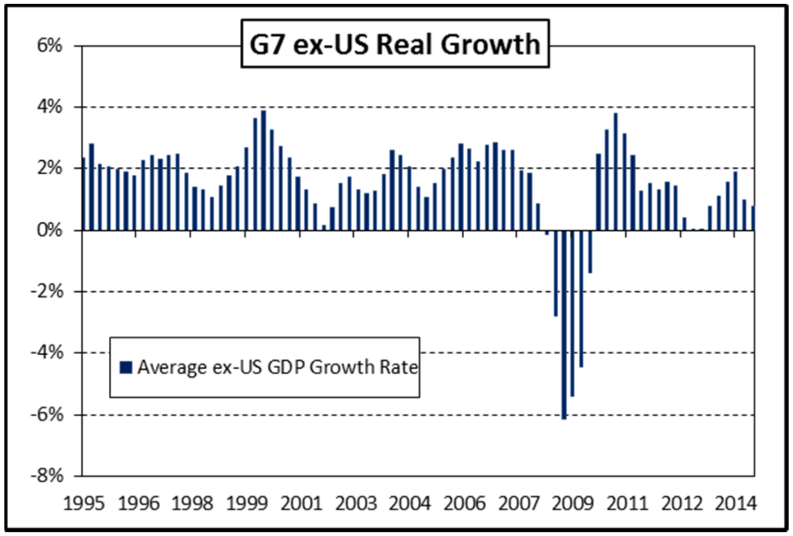
- **Emerging Markets**
  - Valuations track long-term average
  - Growth differential is less but remains well above developed world
  - Conditions and challenges highly varied across regions and countries
  - *300 bps premium over US*
  - *200 bps premium over Intl Developed*

Return Source	Starting Value	Expected Forecast Values	Return Contribution
Real Earnings Growth	3.5%	3.5%	-
Profit Margin Adjustment		-	3.5%
Dividend Yield	2.6%	2.5%	2.5%
Inflation	3.0%	3.0%	3.0%
Valuation & Other*	12	12	0.0%
		Total Expected Return	9.0%

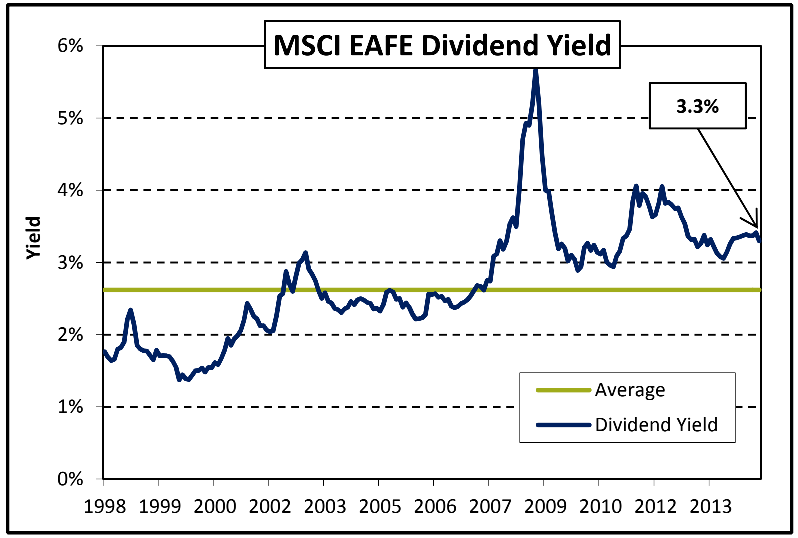
Source: Bloomberg, NEPC

** - Valuation & Other incorporates adjustment for P-E ratios as well as other factors such as rounding, geometric compounding, etc.*

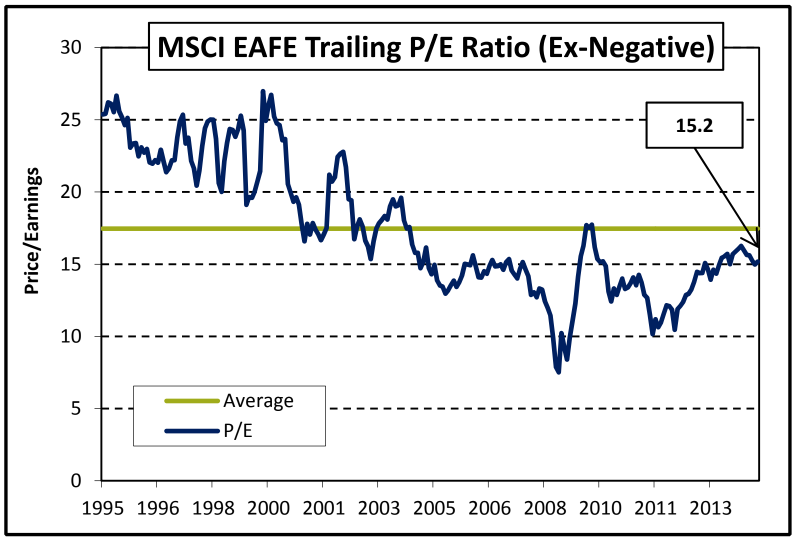
International Developed Equity Building Blocks



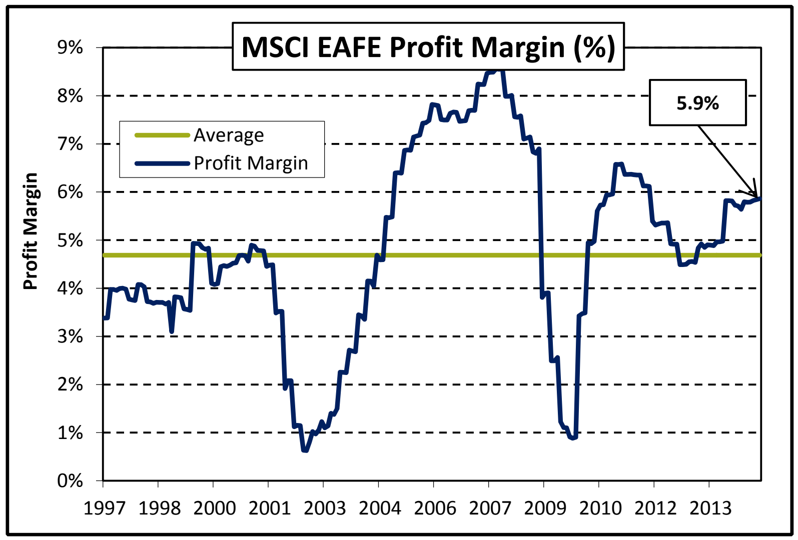
Source: OECD, NEPC as of 11/30



Source: Bloomberg as of 11/30

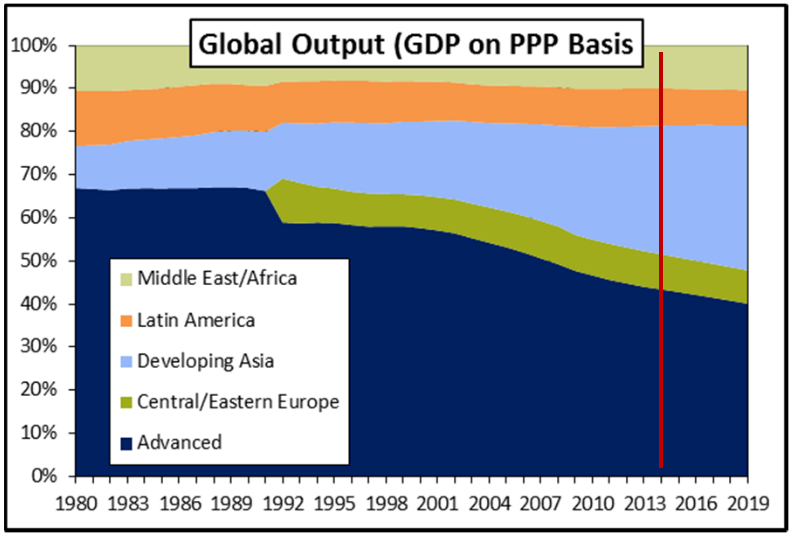


Source: Bloomberg as of 11/30

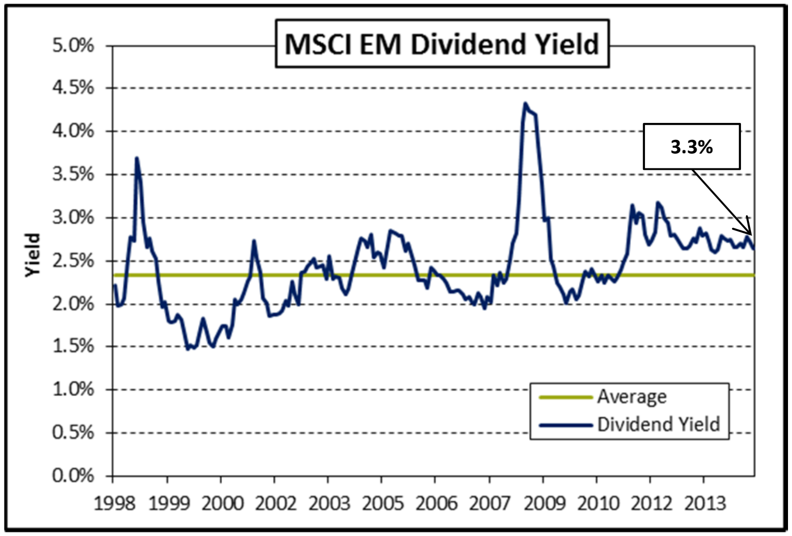


Source: Bloomberg as of 11/30

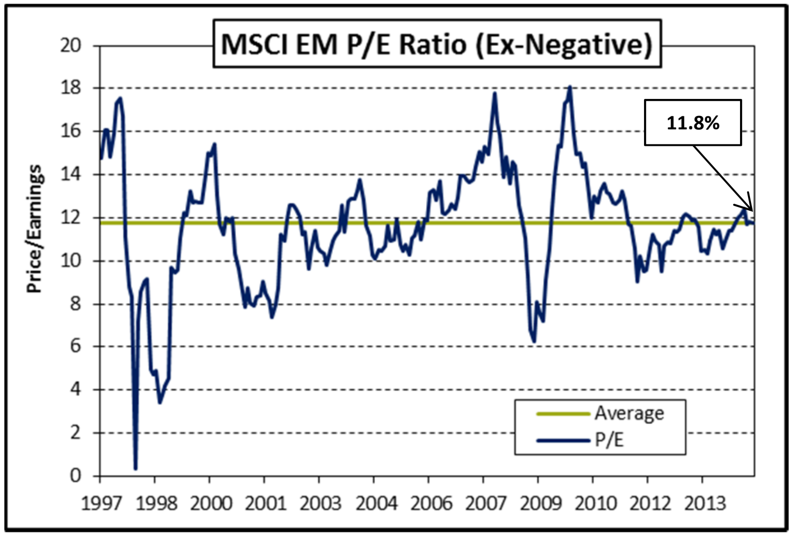
Emerging Equity Building Blocks



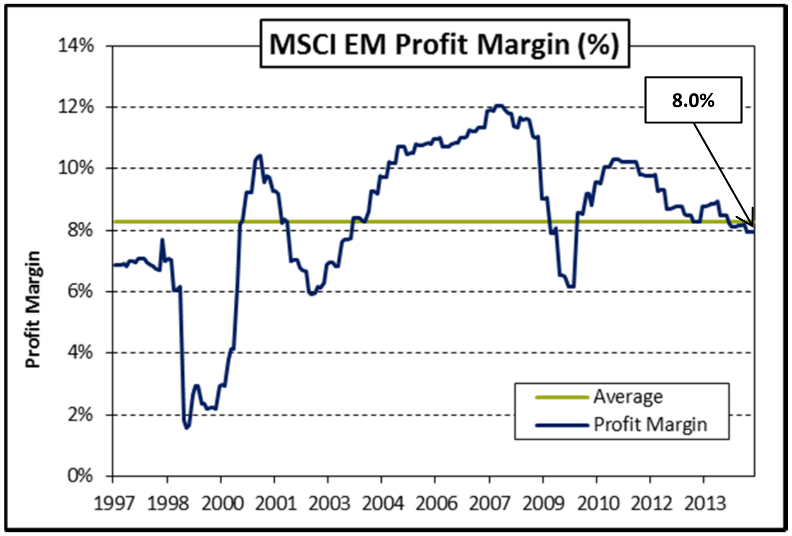
Source: IMF as of 10/31



Source: Bloomberg as of 11/30

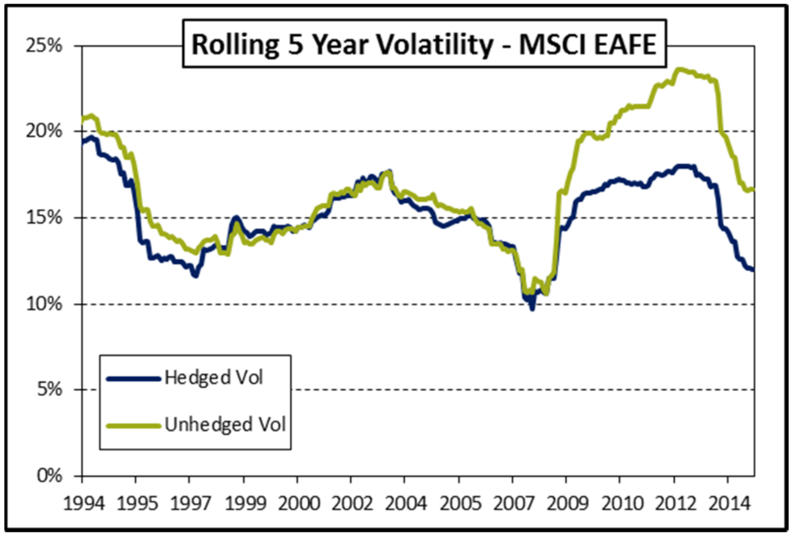


Source: Bloomberg as of 11/30

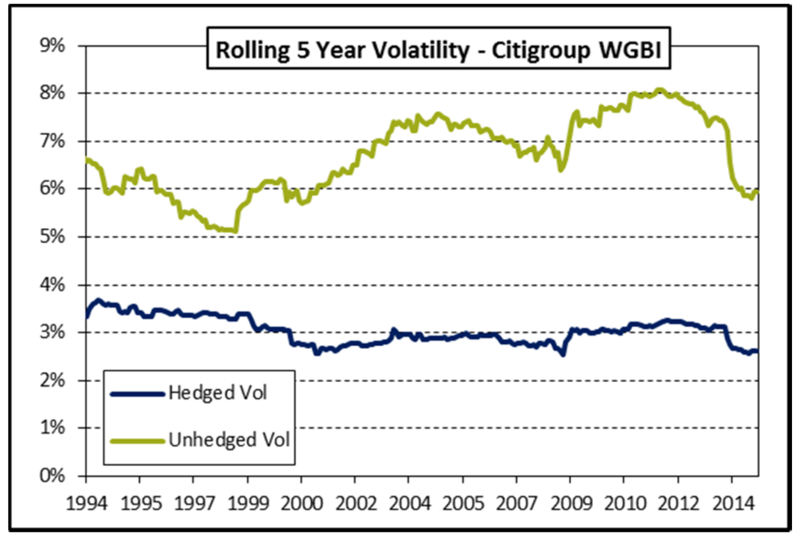


Source: Bloomberg as of 11/30

Currency Hedged Asset Class Assumptions



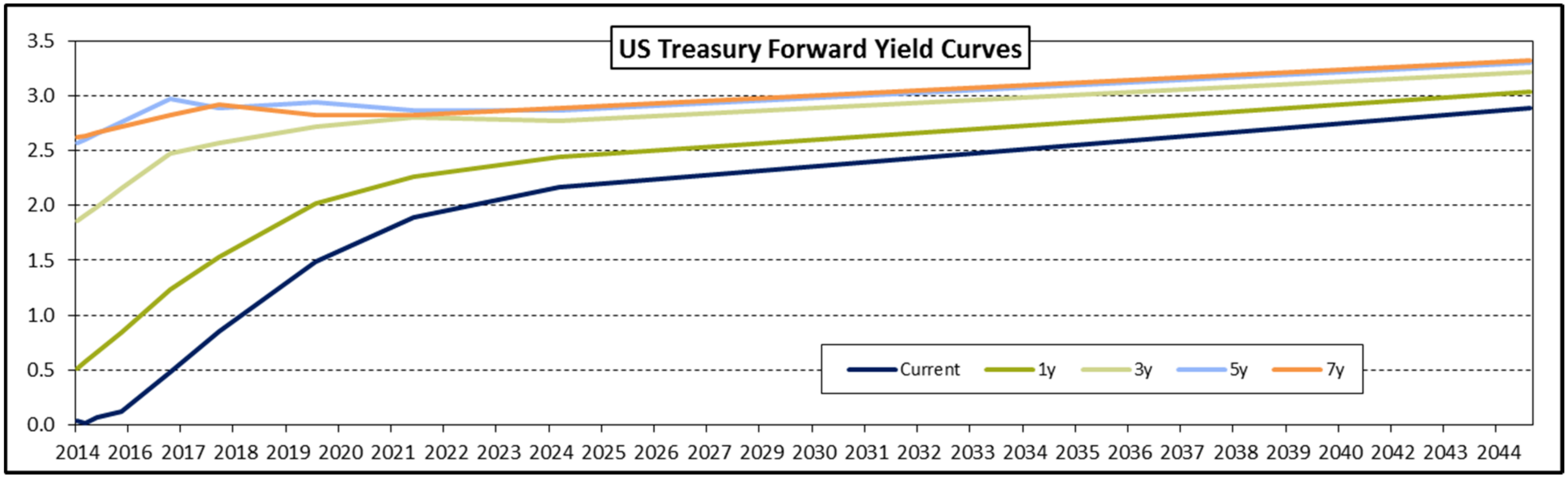
Source: Bloomberg as of 11/30



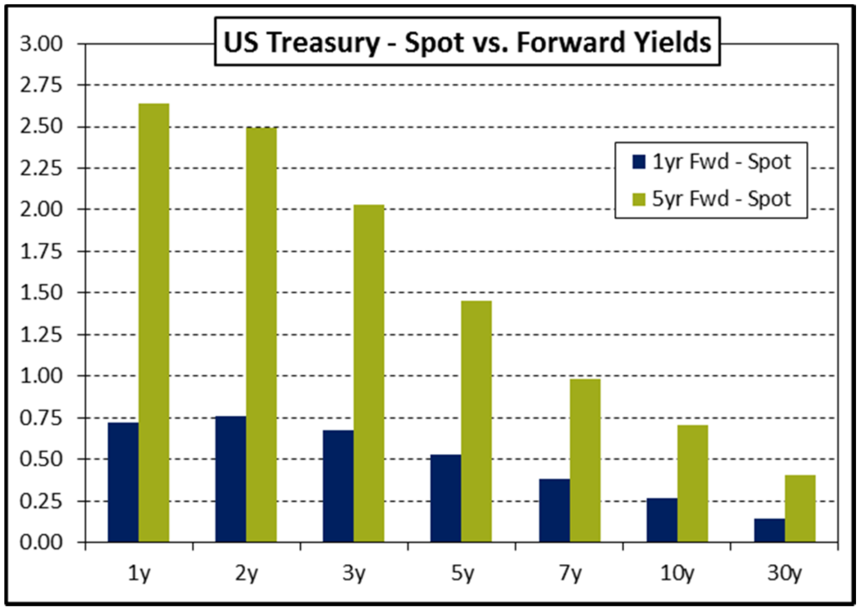
Source: Bloomberg as of 11/30

- **Developed market currency risk historically has been a source of volatility and provides limited diversification benefits**
  - We use similar arithmetic returns (net of hedging costs) with lower expected volatility for hedged asset class based on relative risk contribution from currency exposure
- **Volatility differential (or currency impact on volatility) has increased over last five years**
  - Most notably in MSCI EAFE
- **Developed currency exposure has largely been an uncompensated risk over the last 25 years**
  - Investors could benefit from hedging a portion of developed market currency exposure

US Spot and Forward Rates – Current



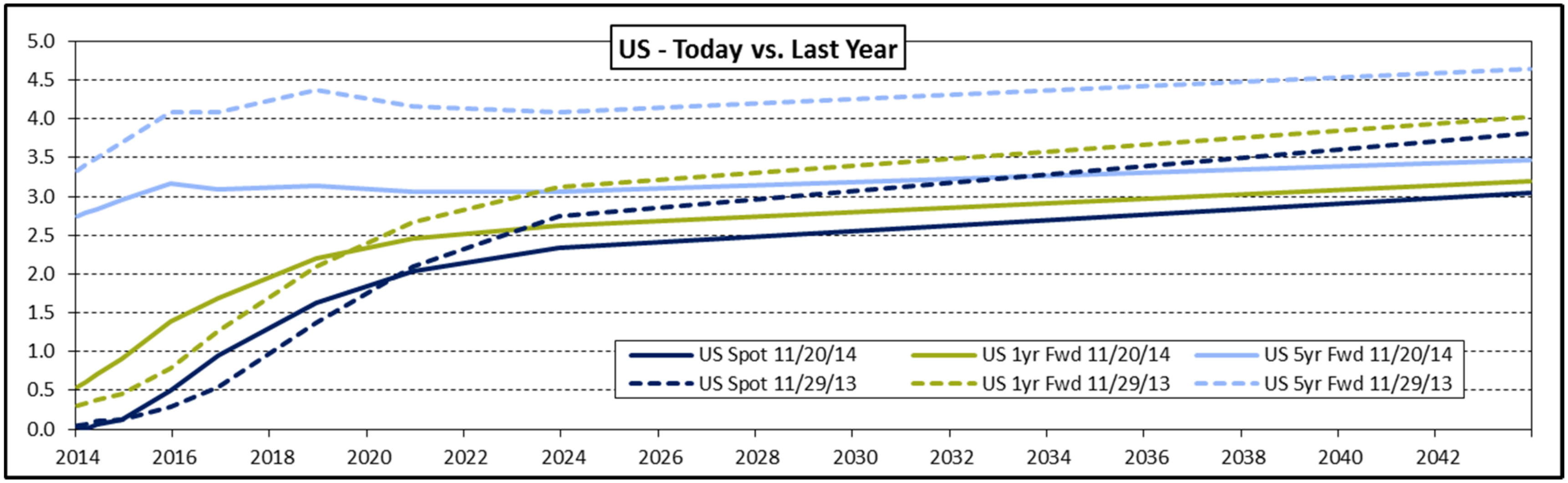
Source: Bloomberg as of 11/30



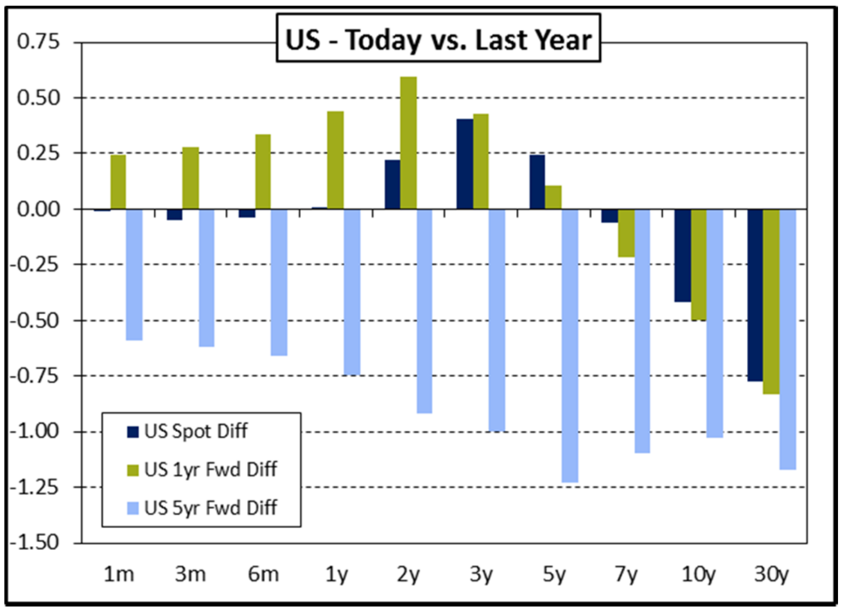
Source: Bloomberg as of 11/30

- **US Treasury expectations reflect lower spot and forward rates relative to prior year**
  - Some principal losses but modestly higher reinvestment rates projected over the horizon
- **Market expectations point to substantial curve flattening over the next 3 years**
  - Increases in short rates acknowledge likelihood of Federal Reserve action
  - Long rates expected to be range bound given growth and demand factors

US Spot and Forward Rates – Change from previous year



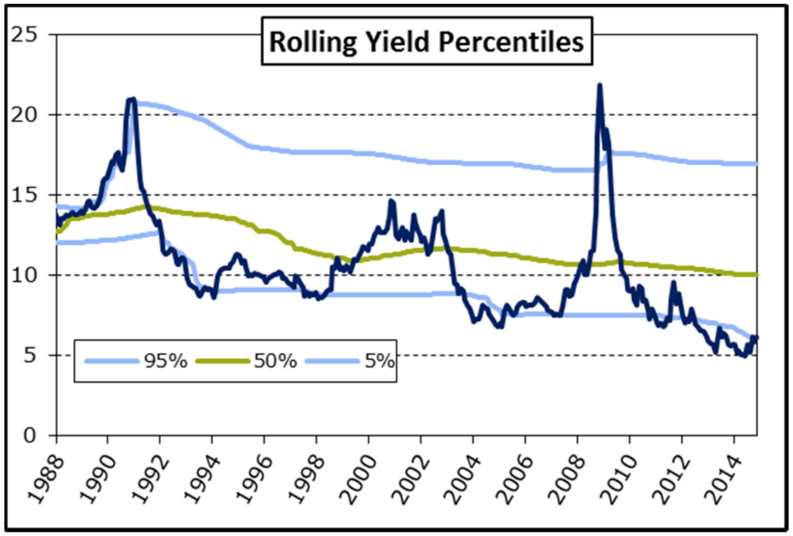
Source: Bloomberg as of 11/30



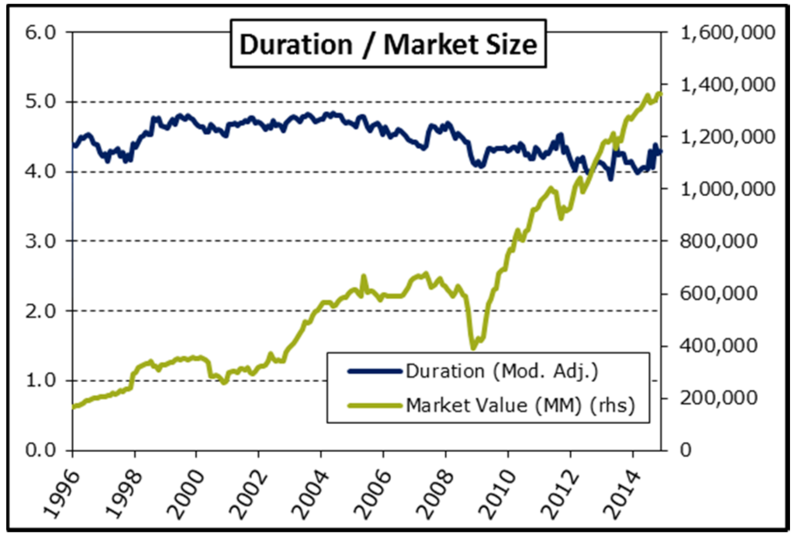
Source: Bloomberg as of 11/30

- **US spot rates shifted lower across much of the curve in 2014**
  - 1-5 year segment increased with long rates down sizably
  - Flat curve anticipated in 5 years but at much lower levels than last year
- **Significant decrease in forward rates pricing "low rates for longer"**
  - Relatively flat yield curve anticipated in 5 years but below normalized levels

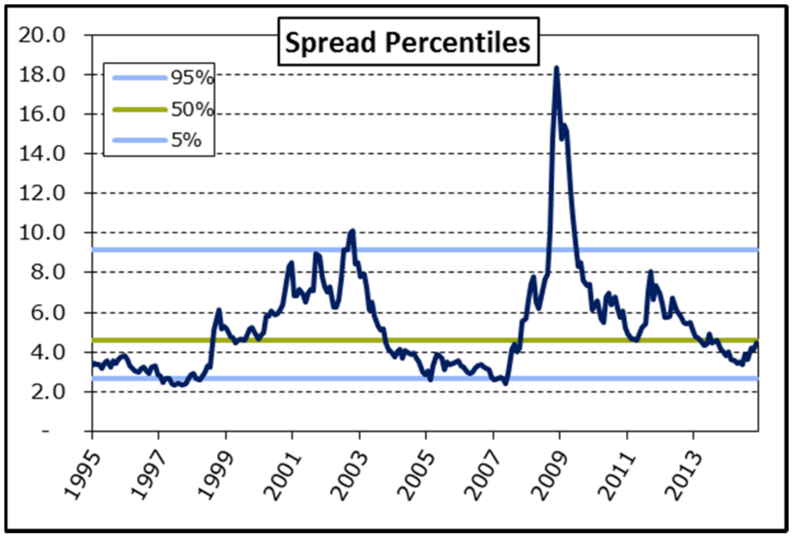
Assumption Development – High Yield



Source: BarCap Live, NEPC as of 11/30



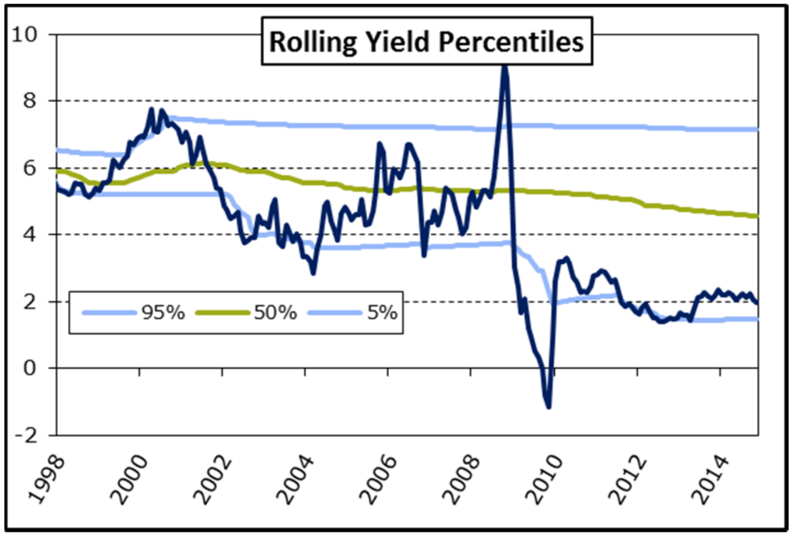
Source: BarCap Live as of 11/30



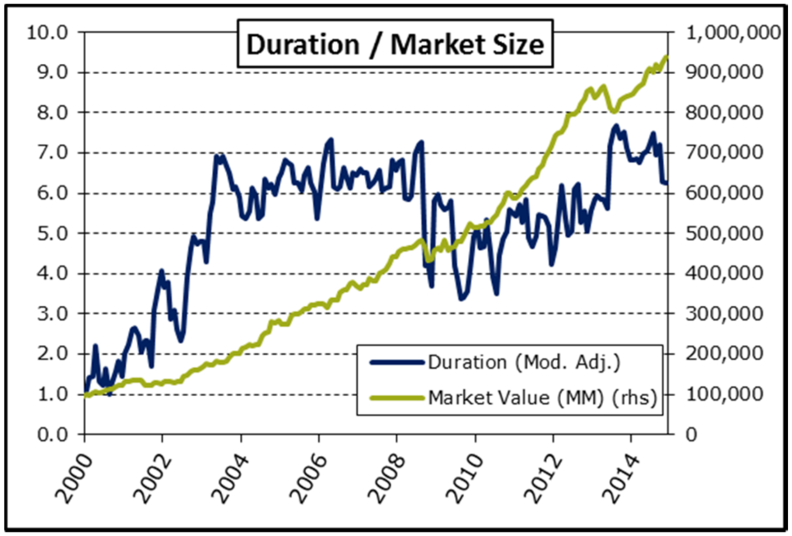
Source: BarCap Live, NEPC as of 11/30

- **Spreads (449 bps) modestly higher versus 2013 and near median levels**
  - Market can support spread compression as demand for high yields entices many fixed income investors
- **Energy represents largest index sector (~20%)**
  - Depressed price of oil may expose weakness in an otherwise higher quality, lower leverage high yield segment

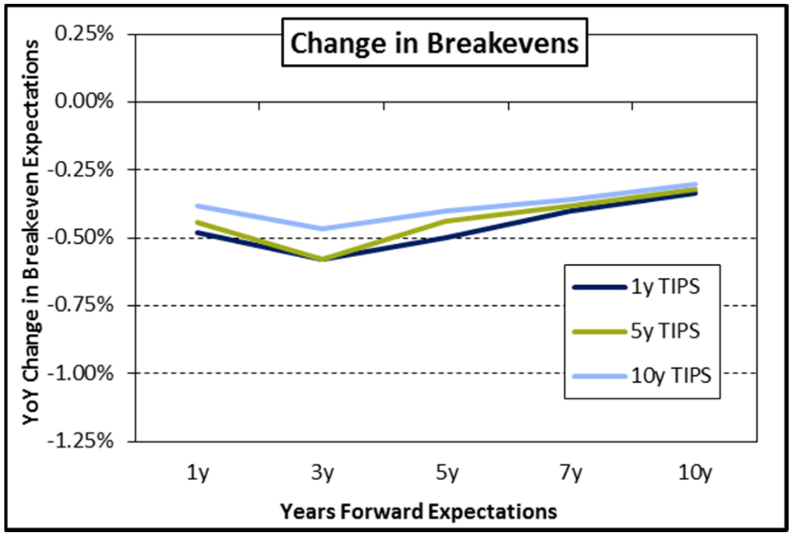
Assumption Development – US TIPS



Source: BarCap Live, NEPC as of 11/30



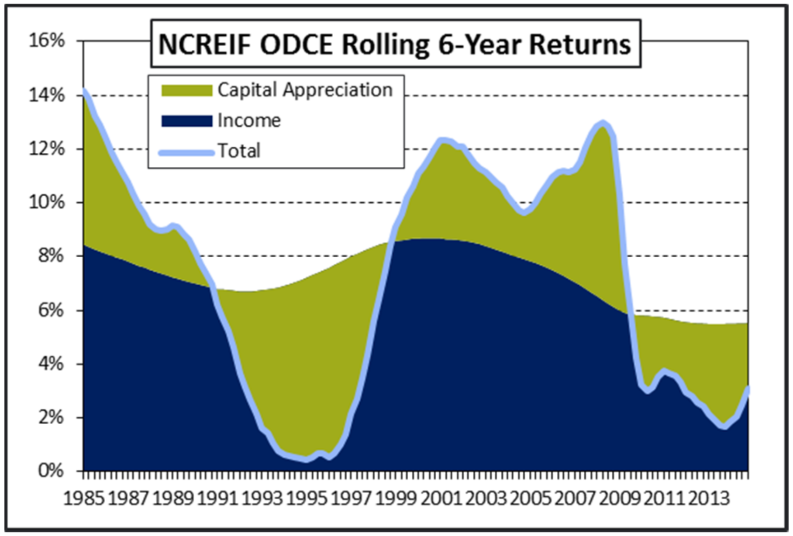
Source: BarCap Live as of 11/30

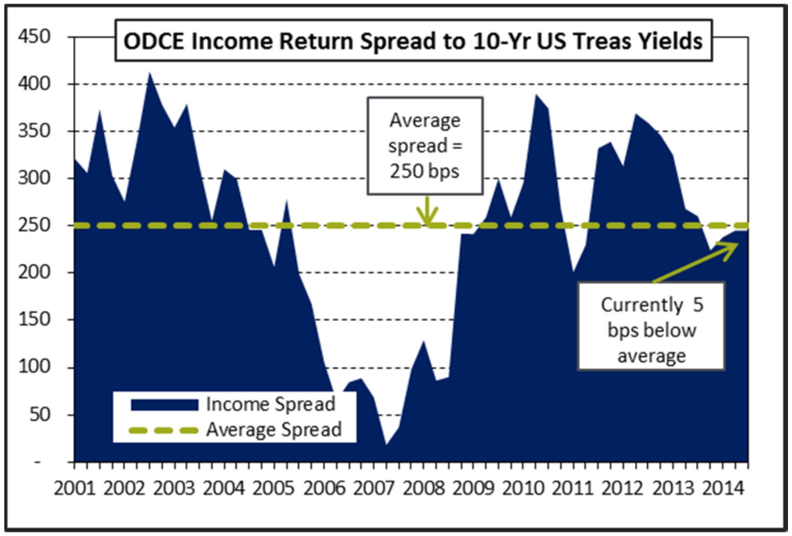


Source: Bloomberg, NEPC as of 11/30

- **Barclays TIPS Index yield above historic lows but very low at 1.96%**
  - Underlying Real Yield is 0.17%
  - Duration higher than historical average with longer issuance
- **TIPS return forecast of 2.25% exceeds index yield**
  - Low real yields challenge ability to exceed CPI inflation
  - Lower break-even assumptions make inflation protection more attractive today versus last year

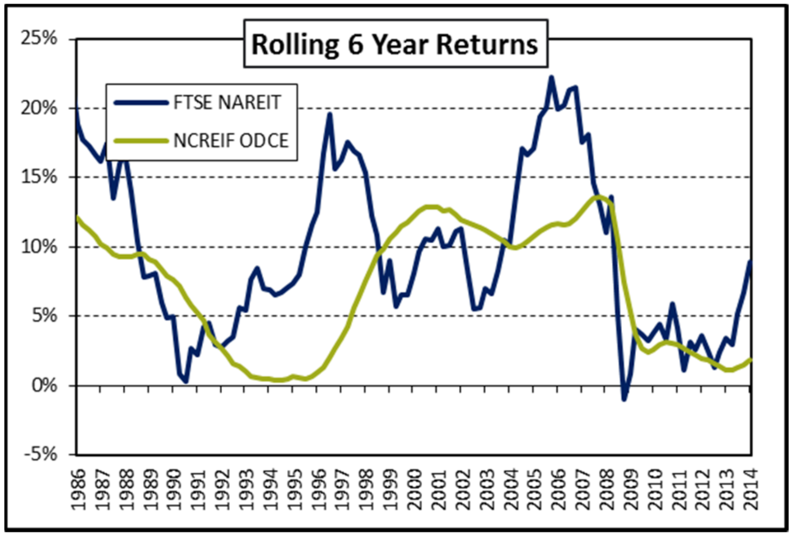
Assumption Development – Real Estate





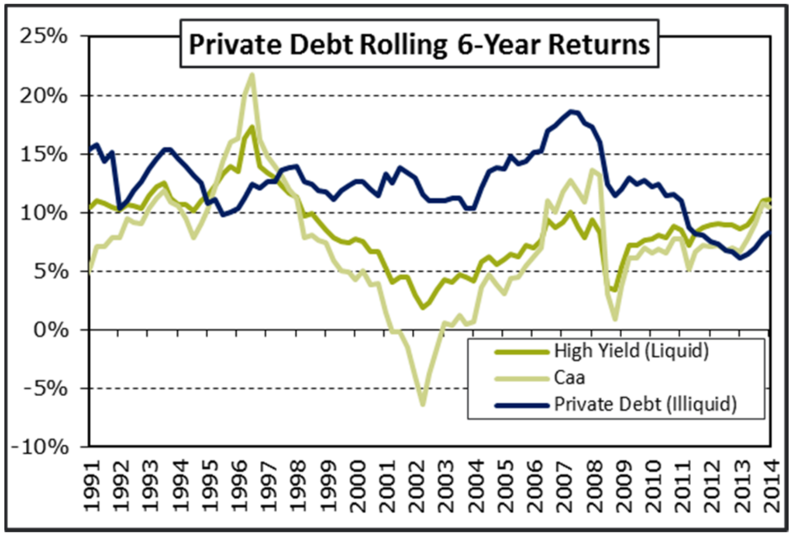
Sources: NCREIF, US Department of Treasury as of 9/30

Sources: NCREIF, US Department of Treasury as of 9/30
**Data since 3/31/2001*

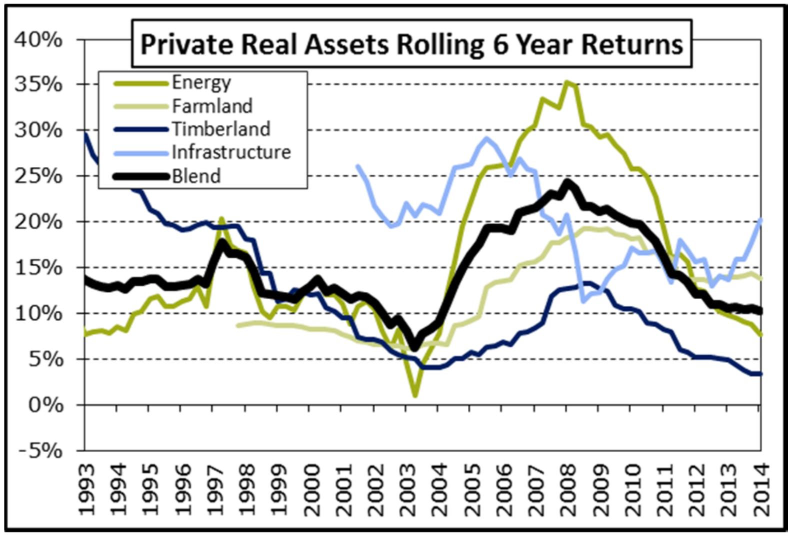


Source: Bloomberg as of 11/30

- **Core real estate assumption represented by NCREIF ODCE**
  - Forecast is based on 5.25% income yield and 1.0% valuation expansion
- **REIT assumption represented by FTSE NAREIT Index**
  - Forecast reconciles with core assumption adjusted for entry point valuations
  - 30 year REIT expectation reflects 25 bps premium over core



Source: Burgiss Group, Ibbotson, Barclays as of 6/30

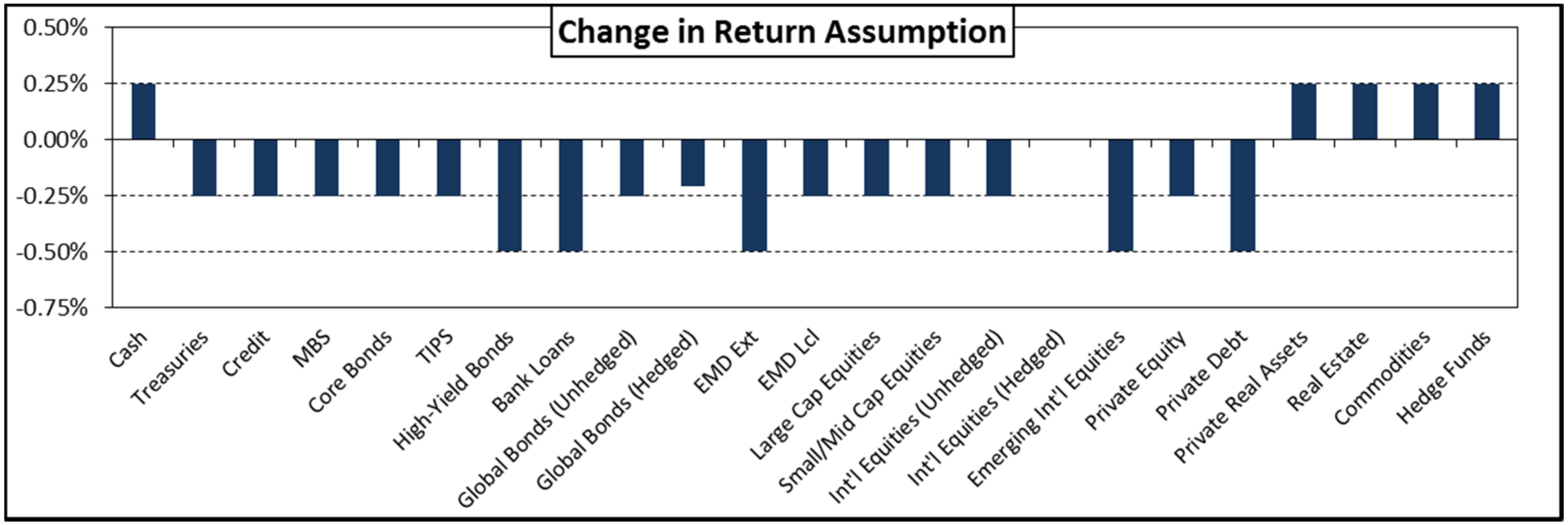


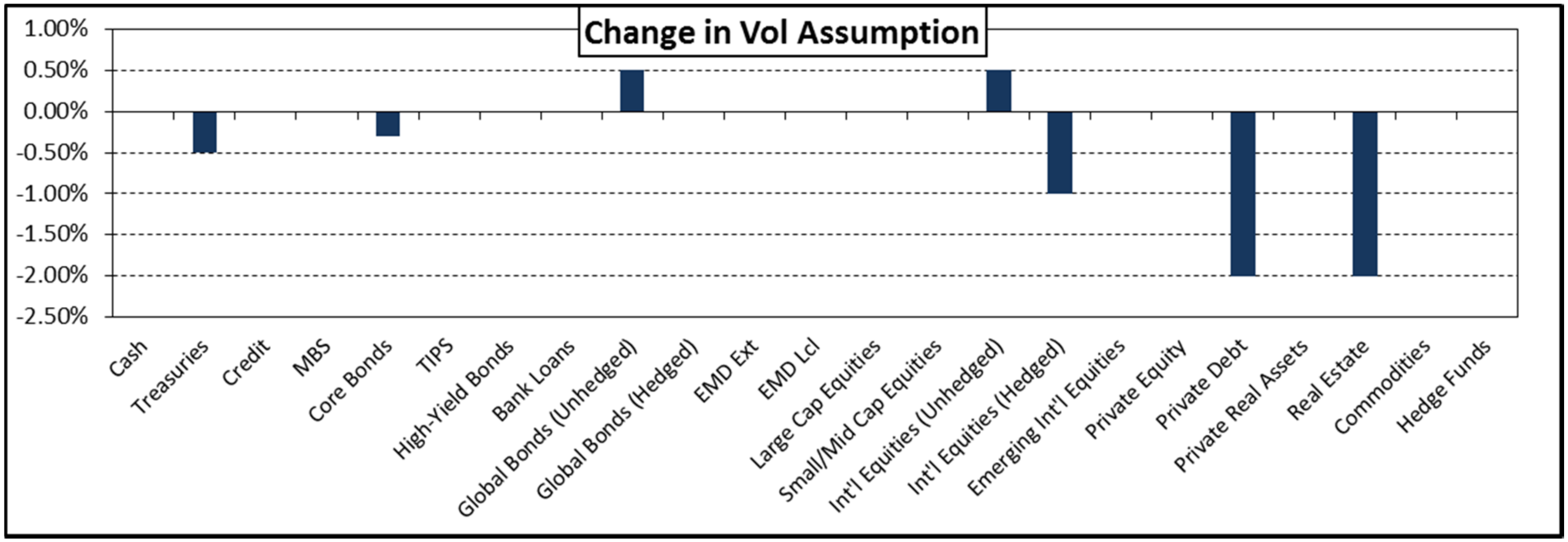
Source: Bloomberg, Burgiss Group, NCREIF as of 6/30

- **Private debt represented by Burgiss Group US Mezzanine and Distressed Debt**
  - Return assumption based on distressed premium over broad high yield + illiquidity premium
  - Volatility assumption representative of underlying economics

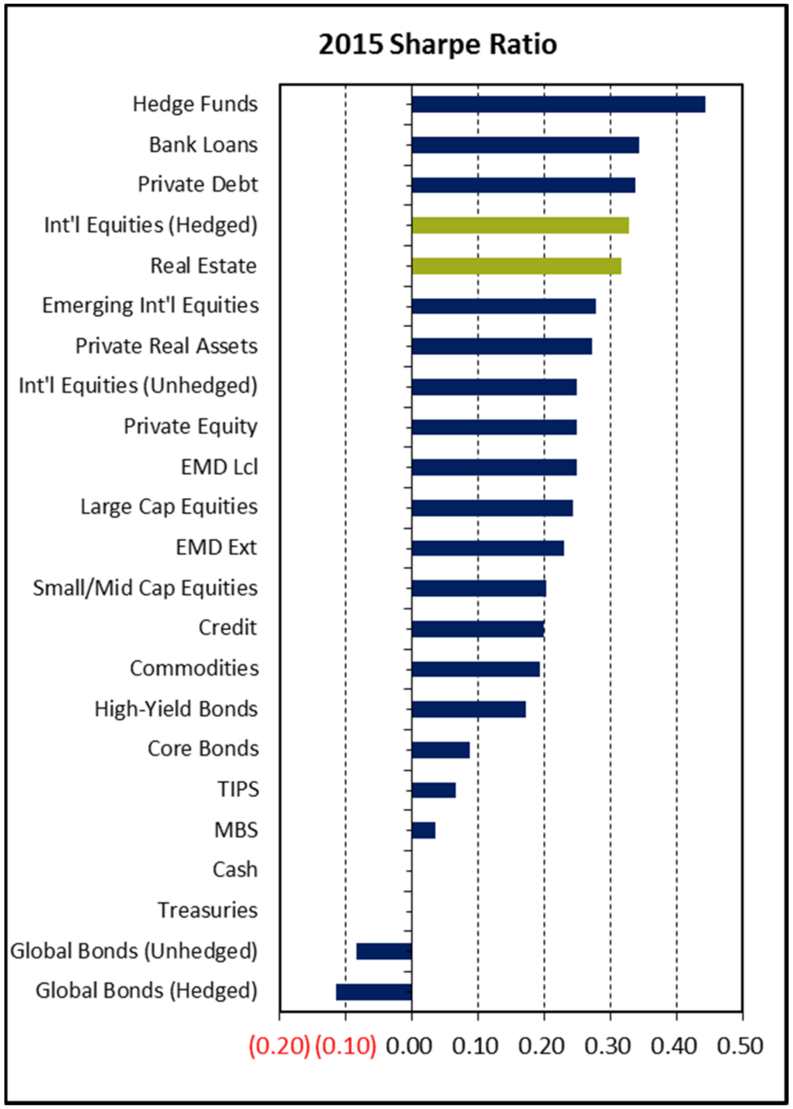
- **Private real assets constructed from a blend of several indices**
  - Burgiss Group PE Energy, Alerian MLP Infrastructure, NCREIF Farmland, and NCREIF Timberland

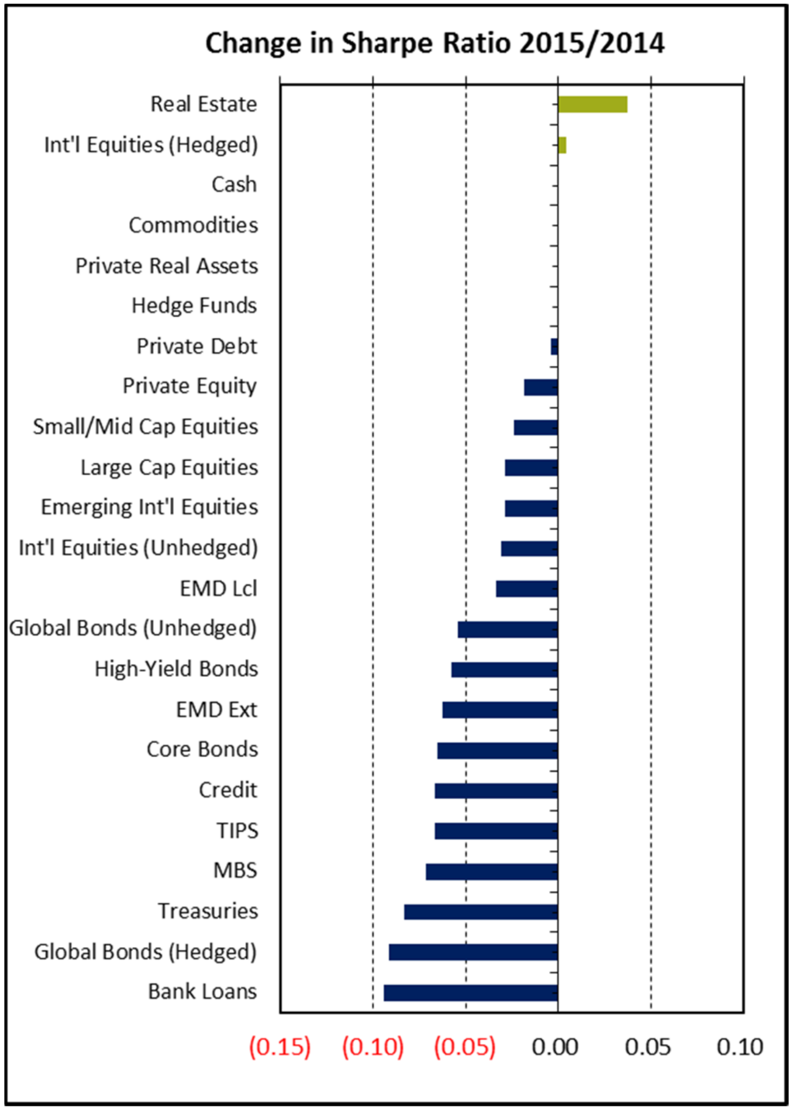
Summary of Changes to 2015 Return and Volatility Expectations





Relative Asset Class Attractiveness





2015 Correlations

Asset Class	Cash	Treas	Credit	MBS	TIPS	HY	Glob Bonds	Glob (H)	EMD (Ext)	EMD (Loc)	Large Cap	Sm/ Mid	Intl Eq	Intl Eq (H)	EM Eq	Priv Eq	Priv Debt	Priv Real	Real Estate	Cmdy	Hedge Funds
Cash	1.00																				
Treasuries	0.20	1.00																			
IG Corp Credit	0.10	0.65	1.00																		
MBS	0.25	0.90	0.75	1.00																	
TIPS	0.00	0.65	0.60	0.70	1.00																
High-Yield Bonds	-0.05	0.20	0.55	0.30	0.20	1.00															
Global Bonds (Unhedged)	0.10	0.50	0.50	0.45	0.40	0.10	1.00														
Global Bonds (Hedged)	0.15	0.80	0.65	0.70	0.65	0.20	0.60	1.00													
EMD (External)	0.05	0.35	0.65	0.35	0.30	0.60	0.25	0.35	1.00												
EMD (Local Currency)	0.05	0.30	0.60	0.25	0.25	0.60	0.30	0.25	0.80	1.00											
Large Cap Equities	-0.10	-0.10	0.45	0.10	0.00	0.65	0.00	-0.10	0.55	0.65	1.00										
Small/Mid Cap Equities	-0.15	-0.15	0.45	0.10	-0.10	0.70	-0.05	-0.15	0.55	0.60	0.90	1.00									
Int'l Equities (Unhedged)	-0.10	0.00	0.30	0.05	-0.05	0.65	0.35	0.00	0.60	0.70	0.70	0.60	1.00								
Int'l Equities (Hedged)	0.00	0.00	0.30	0.05	-0.05	0.65	0.05	0.00	0.60	0.65	0.75	0.65	0.85	1.00							
Emerging Int'l Equities	-0.10	-0.10	0.25	-0.10	-0.10	0.70	0.05	-0.05	0.70	0.80	0.60	0.65	0.70	0.70	1.00						
Private Equity	-0.20	-0.15	0.30	0.10	-0.10	0.60	-0.15	-0.20	0.35	0.40	0.70	0.75	0.60	0.65	0.45	1.00					
Private Debt	0.00	-0.35	0.15	-0.15	-0.10	0.65	-0.10	-0.10	0.50	0.60	0.60	0.65	0.75	0.75	0.80	0.65	1.00				
Private Real Assets	0.15	-0.20	0.05	-0.15	0.00	0.40	-0.05	-0.05	0.40	0.40	0.55	0.60	0.50	0.50	0.50	0.65	0.60	1.00			
Real Estate (Core)	0.25	-0.05	0.15	0.05	0.10	0.25	0.05	-0.05	0.20	0.30	0.40	0.40	0.35	0.40	0.30	0.50	0.40	0.40	1.00		
Commodities	0.10	-0.10	0.10	-0.10	0.30	0.20	0.10	-0.10	0.35	0.45	0.30	0.30	0.35	0.35	0.40	0.25	0.30	0.45	0.30	1.00	
Hedge Funds	0.00	-0.20	0.35	-0.15	0.20	0.60	0.05	-0.20	0.55	0.60	0.60	0.65	0.70	0.65	0.70	0.75	0.80	0.65	0.25	0.50	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.**
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1. **Performance can be volatile and investors could lose all or a substantial portion of their investment**
2. **Leverage and other speculative practices may increase the risk of loss**
3. **Past performance may be revised due to the revaluation of investments**
4. **These investments can be illiquid, and investors may be subject to lock-ups or lengthy redemption terms**
5. **A secondary market may not be available for all funds, and any sales that occur may take place at a discount to value**
6. **These funds are not subject to the same regulatory requirements as registered investment vehicles**
7. **Managers may not be required to provide periodic pricing or valuation information to investors**
8. **These funds may have complex tax structures and delays in distributing important tax information**
9. **These funds often charge high fees**
10. **Investment agreements often give the manager authority to trade in securities, markets or currencies that are not within the manager's realm of expertise or contemplated investment strategy**