ASSET ALLOCATION THEMES AND OPPORTUNITIES

NEPC FOLLOW-UP PRESENTATION

January 24, 2018

Doug Moseley, Partner
Will Forde, CAIA, Consultant

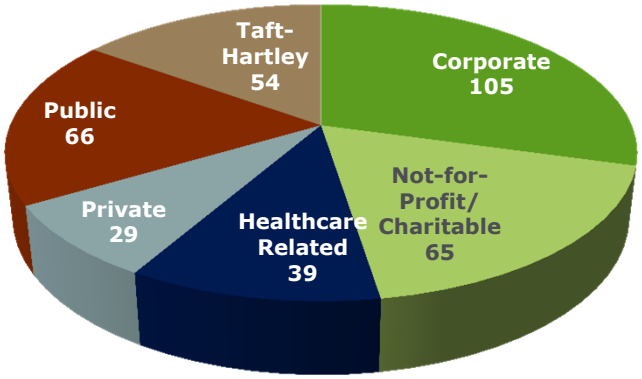
NEPC FIRM INTRO

NEPC, LLC

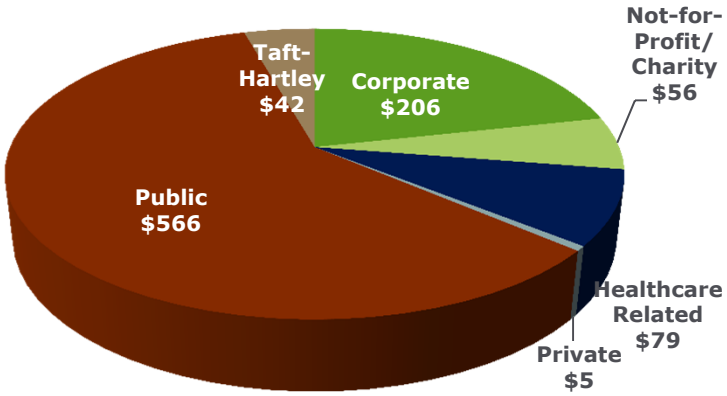
ABOUT NEPC

- **Established in 1986 in Boston, MA**
- **270 employees in 8 regional offices**
- **Employee-owned with 36 partners**
- **100% of revenue from advisory and discretionary consulting services**
- **358 institutional clients[1]**
- **$954 billion assets under advisement[1]**
  - Public funds account for over 59% of total assets
  - 73% of Public Fund clients have retained NEPC for 5 years or longer
- **Practice groups within NEPC deliver expertise by client type**

Total Clients



Total Assets ($ billions)



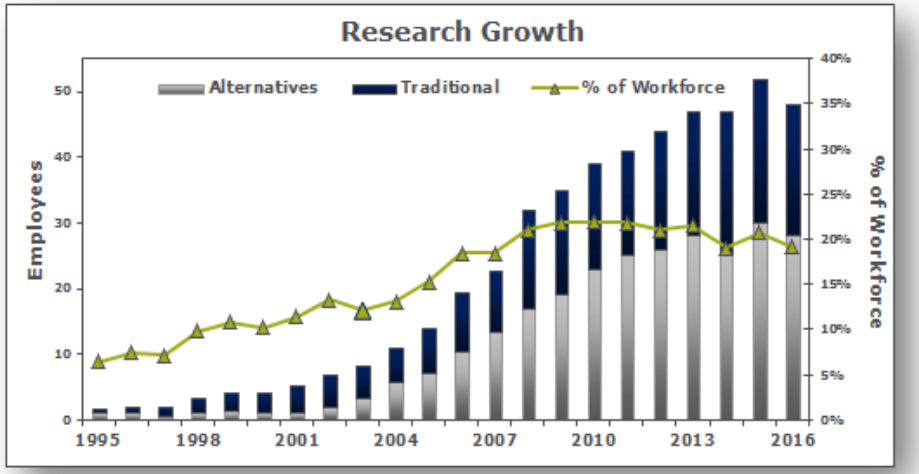
BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

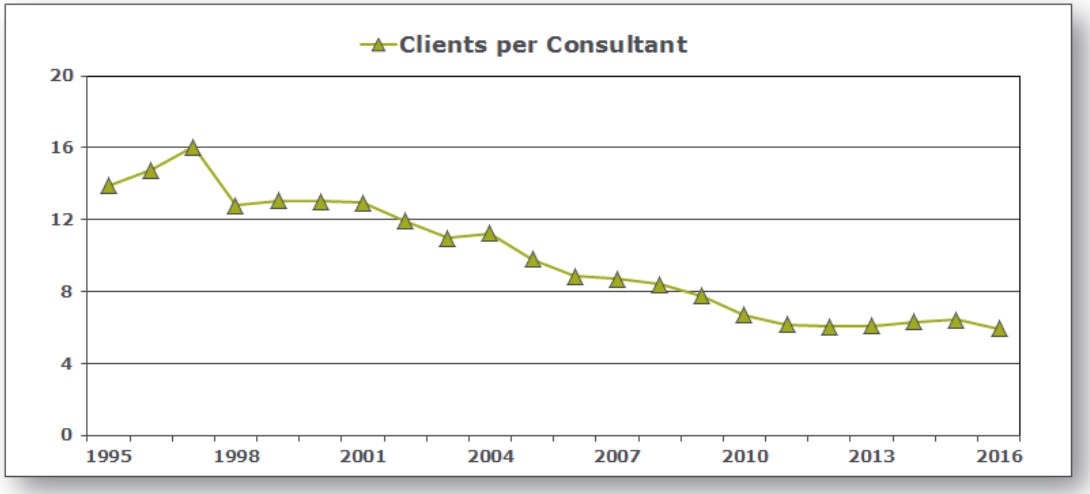
[1] As of 9/30/2017, includes 49 clients with discretionary assets of $16.1 billion.

DEDICATED CONSULTING AND RESEARCH TEAMS

NEPC employs 47 dedicated research professionals[1]

- Traditional manager research is a cornerstone of our efforts
- One of the largest alternative asset research groups in the industry
- Four actuaries on staff, one consultant with formal actuarial training, and one PhD specializing in risk budgeting and asset allocation





Selective growth

- Balance resources, product and services
- Recognize increased servicing requirements
- Declined 178 RFPs in 2016

[1] As of 9/30/2017

PROPOSED CONSULTING TEAM

- **Douglas W. Moseley, Partner**
  - Twenty-two years' investment experience
  - Member: Discretionary Committee; Traditional Due Diligence Committee;
  - Fixed Income Advisory Group
  - Previous affiliations: Massachusetts PRIM Board; State Street Bank & Trust
  - MBA, Bentley College; BS, University of Massachusetts
  - Board Affiliations: NCPERS Executive Board, Quincy Community Action Program

- **William Forde, CAIA, Consultant**
  - Seven years' investment experience
  - Member: Asset Allocation Committee
  - Previous affiliation: Brown Brothers Harriman
  - BA, Tufts University
  - Level 3 CFA Candidate

PROPOSED TEAM'S CLIENT PROFILE & EXPERIENCE

Plan/Client Name	Length of Relationship	Asset Size ($million)	Consultant	Role	Mandate	Notes
New York City Fire Pension	11 years	$11,000	Moseley	Primary	General & Private Credit	Work with Townsend, Aksia & Stepstone
Fairfax Teachers	9 years	$2,330	Moseley	Primary	General & Alternatives	Dedicated Investment staff. ***Actuary is GRS***
Fairfax County Uniformed RS	14 years	$1,641	Moseley	Primary	General & Alternatives	Overlay account
Hampshire County	11 years	$290	Moseley	Primary	General & Alternatives	No Dedicated Investment Staff, outsource RE to Mass PRIM
1199 SEIU Greater NY	15 years	$620	Moseley	Primary	General & Hedge Fund	Work with Townsend, Hamilton Lane
Detroit General RS	23 years	$1,965	Leonard	Primary	General & Alternatives	Dedicated Investment Staff
IL SURS	3 years	$17,000	Leonard	Primary	General & Alternatives	Dedicated Investment Staff, Overlay account, ***Actuary is GRS***
MoDOT / MPERS	6 years	$2,114	Leonard	Primary	General & Private Credit	Work with Albourne
New Hampshire Retirement System	9 years	$7,936	Leonard	Primary	General & Private Equity, Debt	Work with Townsend. ***Actuary is GRS***
City of Orlando	9 years	$650	Leonard	Primary	General & Alternatives	Multiple Plans
City of Richmond RS	9 years	$556	Leonard	Primary	General & Alternatives	
Philadelphia Housing	18 years	$196	Leonard	Primary	General & Alternatives	No Dedicated Investment Staff
Boston Ret. System	13 years	$4,548	Forde	Secondary	General & Alternatives	
City of Hartford, CT	6 years	$1,022	Forde	Secondary	General & Alternatives	Work with PCA for PE
Government of Bermuda	10 years	$1,756	Forde	Secondary	General & Alternatives	
MoDOT / MPERS	6 years	$2,114	Forde	Secondary	General & Private Credit	Work with Albourne, ***Actuary is GRS***
New Castle County	9 years	$419	Forde	Secondary	General & Alternatives	No Dedicated Investment Staff
St. Louis Public Schools	15 years	$849	Forde	Secondary	General & Alternatives	No Dedicated Investment Staff
WMATA Local 922	13 years	$202	Forde	Secondary	General & Alternatives	No Dedicated Investment Staff

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY: ERSRI

- **ERSRI's long-term SAA provides an appropriate balance of asset class exposures that are consistent with NEPC's asset allocation views**
  - Lower public equity allocation than peers is appropriate way to seek better balance and protection of funded status
  - Appropriate use of private markets exposures to enhance return and provide diversification
    - Higher private market allocation targeted but still being built out
    - The current portfolio is under-weight private markets in favor of public equities
  - Exposure to strategies designed to perform well in down-markets & inflationary periods
    - Natural Resource and TIPS allocations both targeted at 1%

- **Current market environment offers little opportunity to tactically seek return opportunities**
  - Given goal of protecting funded status, discussion should focus on adjusting near term portfolio risk slightly lower
  - Need to balance private market implementation schedule with ability to tactically allocate to public asset classes
    - Income and Inflation Protection Buckets may be better alternative to public equities in current environment
  - Alternative weightings within the income bucket should be considered to generate the targeted return

EXECUTIVE SUMMARY: ERSRI (CONTINUED)

- **Based on NEPC's 2018 market outlook and assumptions NEPC would recommend the following tactical positioning relative to the SAA**
  - Lower overall Equity allocation while shading more toward International Developed exposure
    - ***Rationale:***
      - *US Equity market more richly-valued and economic growth has picked up in non-US markets*
      - *Move the portfolio closer to the long-term Policy target of 40%*
  - Fund Natural Resource (Commodity) mandate from Equity reduction and increase to 2%
    - ***Rationale:***
      - *Move to fund additional long-term policy exposure*
      - Commodities less richly-valued & lower correlation to equities
  - Increase Income bucket to target from Equity reduction (US) and restructure Liquid Credit to reduce current Bank Loan/High Yield mandates in favor EMD Local
    - Conduct formal review of existing Liquid Credit managers
    - Introduce EMD Local mandate as part of Liquid Credit allocation
    - ***Rationale:***
      - *High Yield and Bank Loans are richly-valued and offer lower than expected intermediate return*
      - *EMD Local offers high expected return and similar correlation to the equity markets*
  - Lower Cash allocation in favor of a small increase to US TIPS
    - ***Rationale:***
      - *TIPS more attractive than Investment Grade (BC Aggregate) and increase inflation protection*
      - *Lower correlation to equity and credit markets, highly liquid*

MAJOR ASSET CLASS RETURN ASSUMPTIONS

	Asset Class	5-7 Year Return	Change 2018-2017	Volatility
	Cash	2.00%	+.25%	1.00%
	US Inflation	2.50%	-	-
Equity	Large Cap Equities	5.25%	-.50%	17.50%
Equity	International Equities (Unhedged)	7.50%	+.25%	21.00%
Equity	Emerging International Equities	9.00%	-.50%	28.00%
Equity	Private Equity	8.00%	-.25%	23.00%
Credit	Treasuries	2.25%	+.25%	5.50%
Credit	US TIPS	3.25%	+.25%	6.50%
Credit	Core Bonds	2.75%	+.10%	5.99%
Credit	Bank Loans	4.50%	-.75%	9.00%
Credit	High Yield Bonds	3.75%	-1.00%	13.00%
Credit	Emerging Mkt. Debt (Local)	6.00%	-.75%	13.00%
Credit	Private Debt	6.50%	-.75%	13.00%
Real Assets	Commodities	4.75%	-	19.00%
Real Assets	REITs	6.50%	-	21.00%
Real Assets	Core Real Estate	5.75%	-.25%	13.00%
Multi-Asset	Global 60/40*	4.91%	-.13%	11.78%
Multi-Asset	Hedge Funds*	5.83%	-.10%	9.07%

**Page reference - Hedge Funds is a calculated blend of 40% Equity, 40% Credit , and 20% Macro-related strategies.*

THEMES AND OPPORTUNITIES

The outlook for developed market equities outside the US has improved

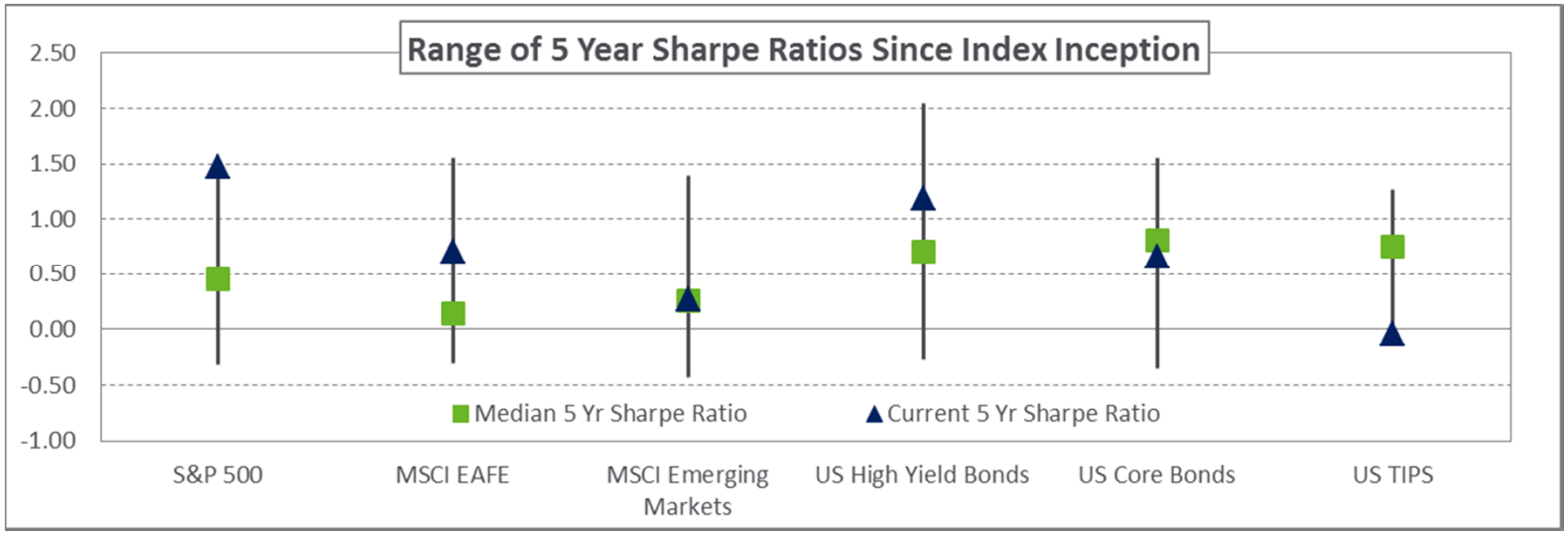
Growth conditions across the globe are on the upswing supported by easy financial conditions and an improved corporate earnings outlook

We encourage reducing exposure to assets that have outperformed expectations over a prolonged period such as US stocks and high yield

Tilt exposure to assets underperforming expectations in recent years, particularly emerging market equities, developed market equities, and US TIPS

Market stability must not elicit complacency, we encourage investors to increase exposure to strategies that mitigate market drawdowns

Look to rebalance "safe haven" fixed income exposure back to strategic targets



Index Inception: S&P 500 - 1926, MSCI EAFE – 1970, MSCI EM – 1988, US High Yield – 1983, US Core Bonds – 1976, US TIPS – 1997

Source: Ibbotson-Morningstar, eVestment, Sharpe Ratio range spans 5th to 95th percentile

2018 THEMES AND OPPORTUNITIES

Key Market Themes

- Extended US Economic Cycle
- Synchronized Economic Resurgence
- Federal Reserve Gradualism
- China Transitions
- Globalization Backlash

Current Opportunities for ERSRI

- Trim US Equity Gains
- Overweight Non-US Developed Market Equities
- Move towards a Market Overweight to Emerging Market Equities
- Allocate to TIPS
- Consider Emerging Local Debt

FOUNDATIONS OF ASSET-LIABILITY STUDY

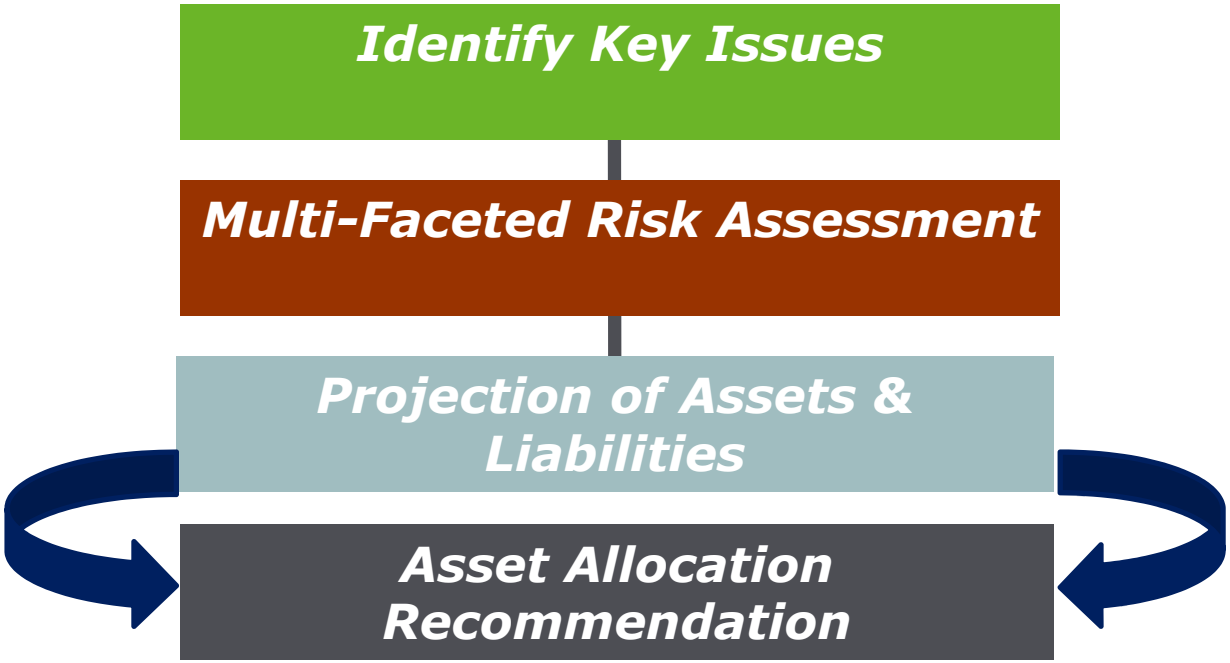
Understand and define objectives

- Fund benefit obligations, meet short and long-term liquidity requirements, and incorporate any investment constraints

Apply multiple perspectives/tools to build robust, objective driven asset allocation solution

- Identify opportunities for enhancing portfolio structure
- Align with the expected progress of liabilities and cash flows

NEPC typically conducts an Asset-Liability study in conjunction with any significant changes to a client's asset allocation



ANALYTICAL MODELING TOOLS

NEPC uses a variety of proprietary tools developed to assess strategic asset allocation changes and the impact of tactical adjustments

Approach	Advantages	Shortcomings
Mean-Variance	• Calculates most efficient portfolio for given volatility • Produces range of portfolios	• Relies on static assumptions and assumes normal distribution • Chosen constraints can drive results • Limits risk definition to volatility
Liquidity Analysis	• Recognizes a "risk" not captured in traditional tools: illiquidity • Highlights impact of changing cash flows (both investment-driven and exogenous)	• Requires portfolio specific cash flow and partnership details • Long-term planning tool – cannot easily adjust portfolio or compare different portfolios
Scenario Analysis	• Focuses on low-probability, high magnitude economic environments (tail risks) • Recognizes environmental biases of each asset class	• Offers opportunity to test risk tolerance to various outcomes but should not be used to construct best portfolio for each environment
Risk Budgeting	• Provides risk allocations • Recognizes that less efficient portfolios may have better risk balance	• Relies on mean-variance optimization assumptions • Defines risk as standard deviation • Ignores tail risks
Factor Analysis	• Recognizes underlying economic drivers of asset class volatility • Can identify risk concentrations across asset classes	• Requires intuitive belief of asset class relationships to underlying factors – less quantitative and more qualitative
Active Risk Budgeting	• Assesses which managers are driving risk-budget and calculates correlation of alpha's across manager line-up	• Relies on historical manager returns to set expectations of risk and correlation
Stochastic Forecasting	• Shows range of results based on Monte Carlo simulation • Includes natural feedback loops	• Percentiled results show ranges but not reasons • Each simulated trial represents a possible but highly unlikely path

Please note that all investments carry some level of risk. No investment strategy or risk management technique can guarantee returns or eliminate risk in any market environment.

ERSRI POTENTIAL TACTICAL ALLOCATION

	Target	Actual	Potential Tactical Allocation
US Equities	20.8%	22.8%	19.8%
Int'l Equities	14.4%	18.4%	18.4%
Emerging Int'l Equities	4.8%	4.4%	4.4%
Total Equity	**40.0%**	**45.6%**	**42.6%**
Private Equity	11.3%	5.9%	5.9%
Non-Core Real Estate	2.3%	2.0%	2.0%
Opp. Private Credit	1.5%	0.3%	0.3%
Private Growth	**15.1%**	**8.2%**	**8.2%**
HY Infrastructure	1.0%	1.8%	2.0%
REITs	1.0%	0.0%	0.0%
Liquid Credit	2.8%	4.3%	5.3%
Private Credit	3.2%	0.9%	0.9%
Income	**8.0%**	**7.0%**	**8.2%**
Treasury Duration	4.0%	3.9%	3.9%
Systematic Trend	4.0%	4.0%	4.0%
CPC	**8.0%**	**7.9%**	**7.9%**
Core Real Estate	3.6%	5.0%	5.0%
Private Infrastructure	2.4%	1.5%	1.5%
TIPS	1.0%	2.4%	3.4%
Natural Resources	1.0%	0.0%	2.0%
Inflation Protection	**8.0%**	**8.9%**	**11.9%**
Investment Grade Fixed	11.5%	11.4%	11.4%
Abs. Return	6.5%	7.3%	7.3%
Cash	3.0%	3.0%	2.0%
Vol. Protection	**21.0%**	**21.7%**	**20.7%**
Short-Term Tactical	**0.0%**	**0.4%**	**0.4%**
Expected Return 5-7 yrs	**6.3%**	**6.1%**	**6.2%**
Expected Return 30 yrs	**7.4%**	**7.2%**	**7.2%**
Standard Dev	**11.7%**	**11.4%**	**11.2%**
Sharpe Ratio (5-7 years)	**36.8%**	**36.2%**	**37.3%**

*Actual allocation as of 12/31/2017

**Proposed Liquid Credit portfolio includes 2.3% to High Yield/Bank Loans and 3% to EMD Local

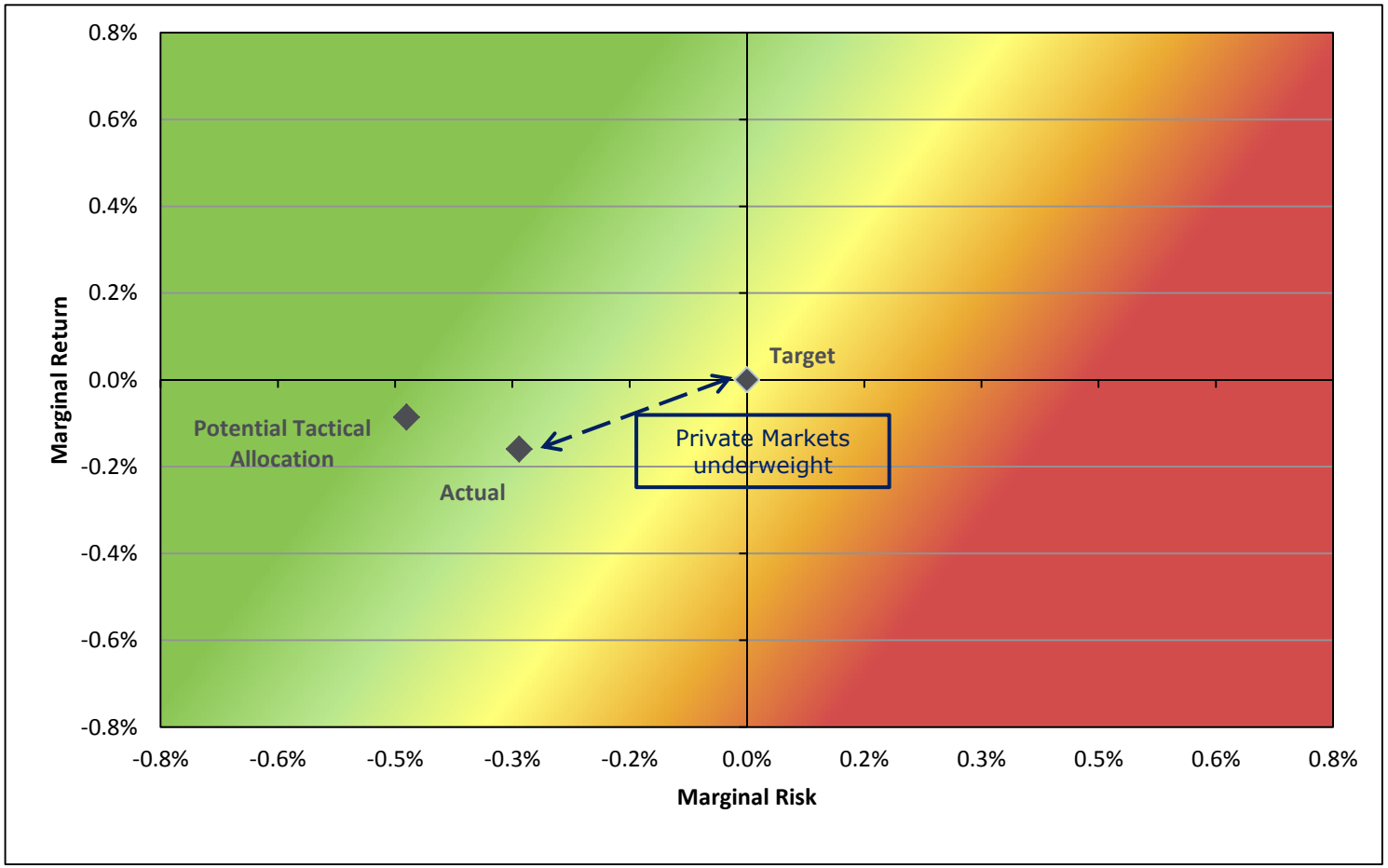
1. **Continue to lower overall Equity allocation while maintaining overweight to Non US exposure**
   - Lower equity allocation by 3.0% with the reduction sourced from US equities
   - This will result in a continued overweight to Int'l Developed

2. **Move the 2% of the reduction from Equity to Natural Resources and the remaining 1% to Liquid Credit**
   - Natural Resources remain an uncorrelated asset class to Global Equities while also exhibiting attractive valuations given recent sell offs
   - Within the new Liquid Credit bucket we recommend a 3% target to EMD Local

3. **Reduce Cash allocation by 1% and increase TIPS exposure**
   - A reduced Cash position should still allow for ERSRI to meet obligations
   - US TIPS's duration exposure provides a anchor to windward in the event of a sell off but also helps protect against inflation

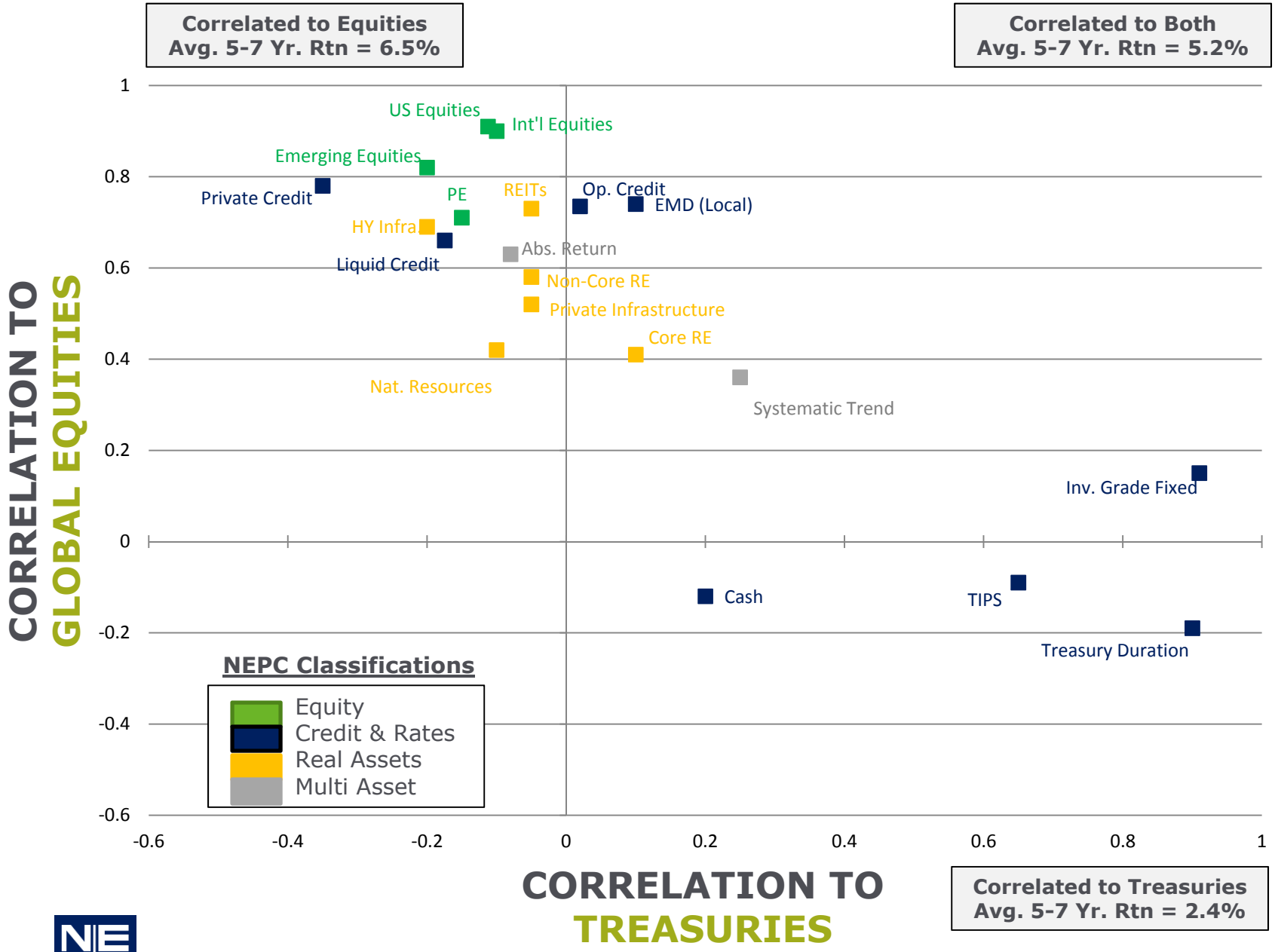
TACTICAL ALLOCATION HEAT MAP

- **Relative to the Target allocation, the Potential Tactical allocation provides a greater risk/return benefit than the Actual allocation**
  - This is in part due to a lower equity ratio and the inclusion of more diversifying assets including Natural Resources and US TIPS



*Actual allocation as of 12/31/2017

CORRELATION CHART



NEPC'S KEY MARKET THEMES & OPPORTUNITIES

KEY MARKET THEMES

Extended US Economic Cycle

Excess capacity remains in the system and provides fuel for the expansion

Labor market gains have been robust but slack remains as many have not returned to the workforce

Muted wage gains and low inflation metrics are reflective of the excess capacity remaining in the US economy

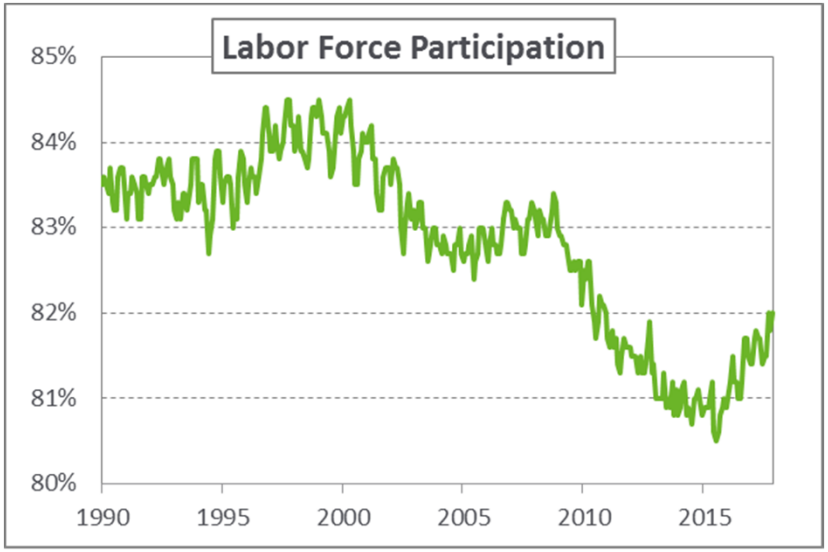
Tax cuts and fiscal stimulus can potentially remove spare economic capacity and be a catalyst for an uptick in inflation measures

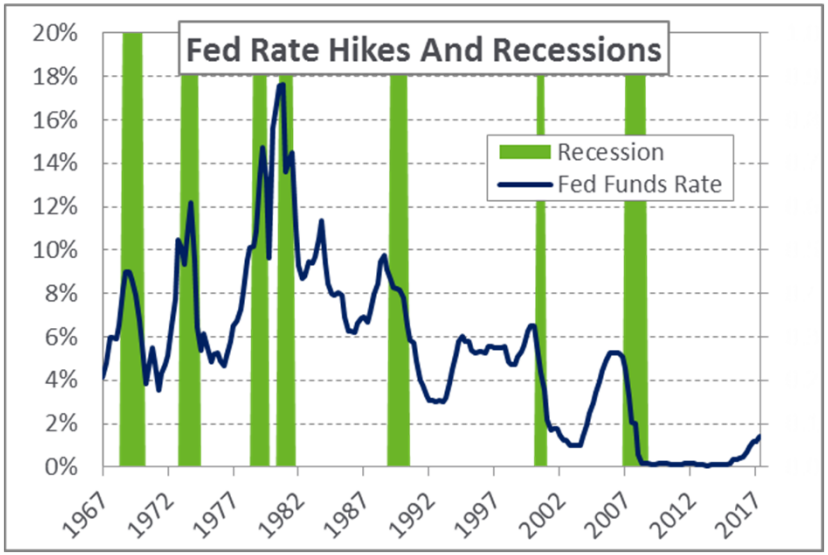
US recession concerns are muted

An acceleration in inflation leading to a tightening of financial conditions has historically been a catalyst to end economic expansions

However, improved US household balance sheets have room to expand and support further consumer spending gains

Improving global economic conditions reinforce an expansion of the US economy as global growth factors synchronize





Source: (Top) Federal Reserve Bank of St. Louis
Source: (Bottom) Federal Reserve, NEPC

KEY MARKET THEMES

Federal Reserve Gradualism

The Federal Reserve is expected to slowly increase interest rates

Expected path of Fed policy through 2020 matters more than timing of the next hike as the disconnect between market expectations and Fed signaling has grown

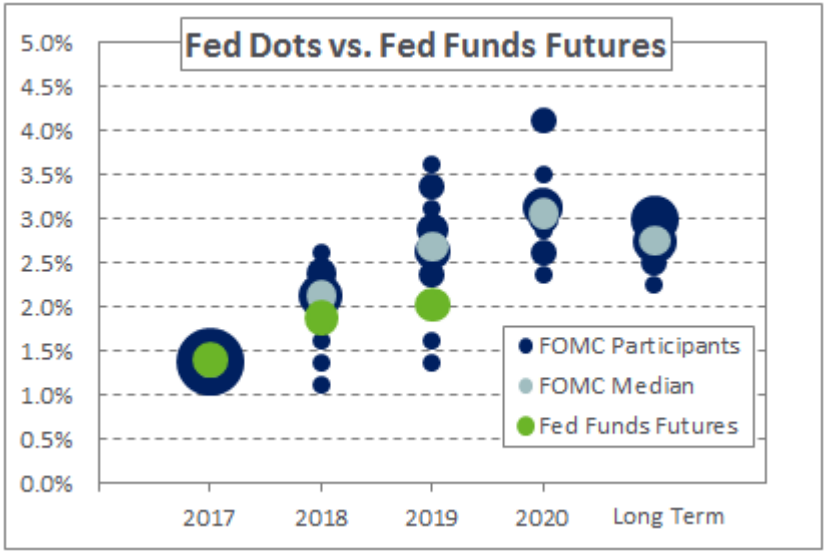
A relatively accommodative Fed is likely to continue, unless there is a dramatic acceleration in inflation

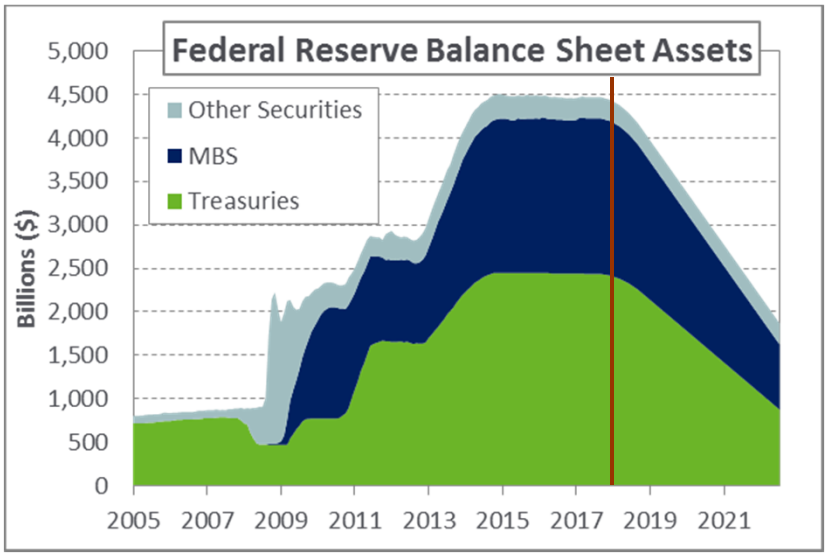
The Fed's balance sheet normalization is a low grade tightening of monetary policy but its impact is untested

Fed is expected to be careful and data dependent yet balance sheet disbursement into a strong economy will likely have tightening effects – in the same way balance sheet expansion had easing effects

The balance sheet will gradually shrink over time assuming conditions remain supportive

The gradual progression of balance sheet reduction combined with the accommodative policies of global central banks supports easy global financial conditions





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

KEY MARKET THEMES

China Transitions

The PBOC is tasked with straddling a delicate path as the economy evolves

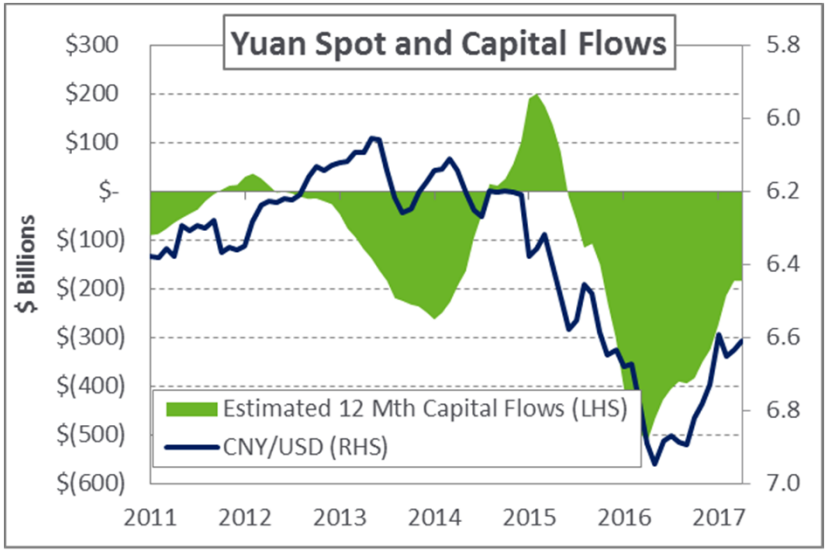
China maintains control of its currency and monetary policy but would have to make concessions to open its capital account and allow the free movement of capital in order to encourage investment

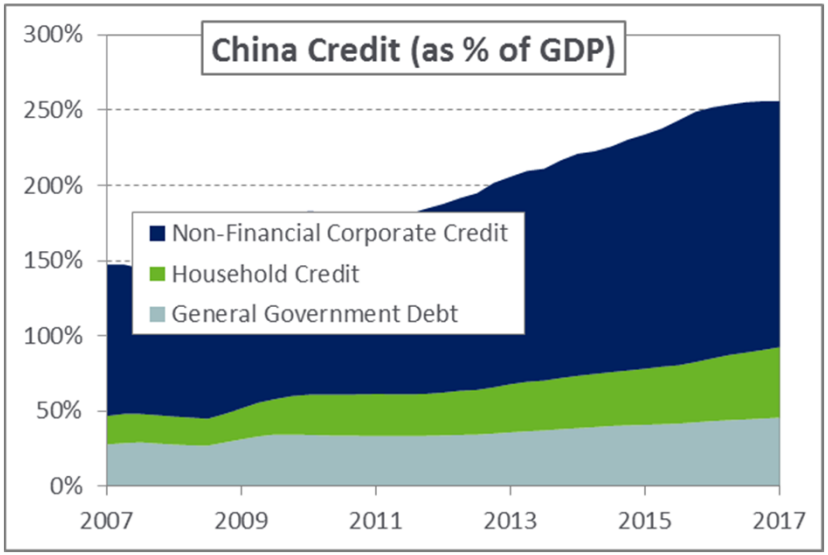
Restrictions on capital markets are slowly being eased, with an eye towards limiting social disruption

China's government is negotiating a balance of tightening credit expansion and support for economic growth

Continued credit expansion and real estate development risk inflating asset price bubbles and pose a systemic risk

Markets have responded positively to the PBOC's management of a more stable yuan as capital outflow pressure has eased but currency devaluation remains a tail risk





Source: (Top) Bloomberg, NEPC
Source: (Bottom) Bank of International Settlements

CURRENT OPPORTUNITIES

Trim US Equity Gains

US stocks have posted strong returns over the last 9 years

US stocks are "priced for perfection" with valuations and profit margins hovering near secular highs despite the recent earnings growth improvement

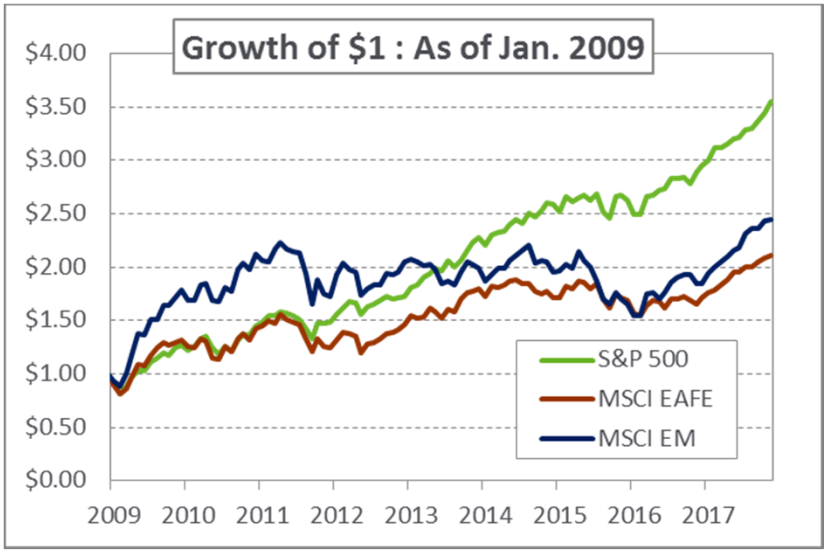
However, a prolonged US economic expansion can continue to support a rally in US equities, specifically small-cap stocks that may benefit from corporate tax cuts

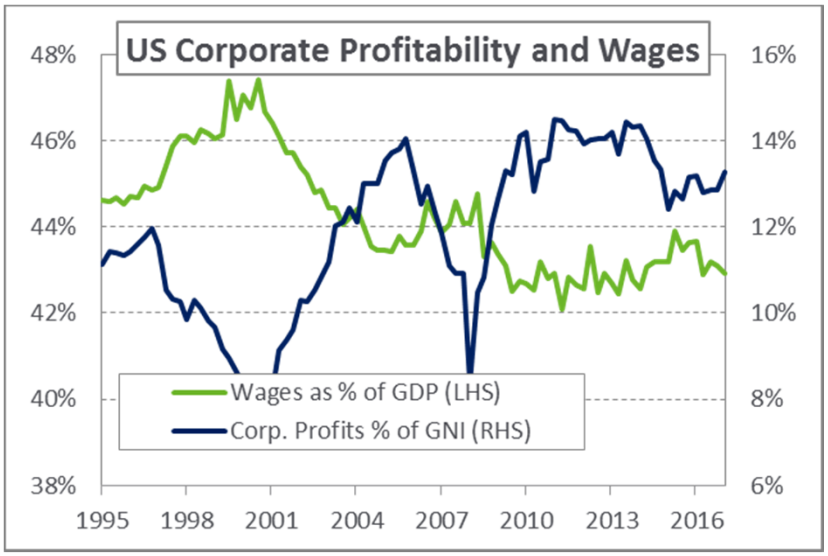
Reduce US large-cap exposure to fund global equity strategies

Opportunity for alpha generation and total return is greater outside the US

US equities are also a viable funding source for private market commitments

Should US equity markets decline materially, look to rebalance to exploit market volatility





Source: (Top) Federal Reserve Bank of St. Louis
Source: (Bottom) S&P, MSCI, Bloomberg

CURRENT OPPORTUNITIES

Overweight Non-US Developed Market Equities

A multi-year earnings recovery in EAFE markets offers the potential for an elevated return

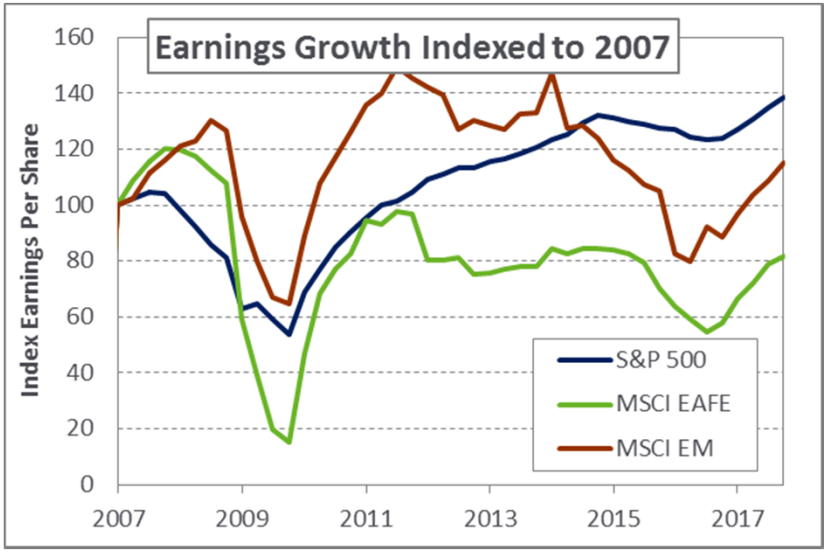
Catalysts for outperformance are present with improving economic conditions in Europe and continued corporate governance improvements in Japan

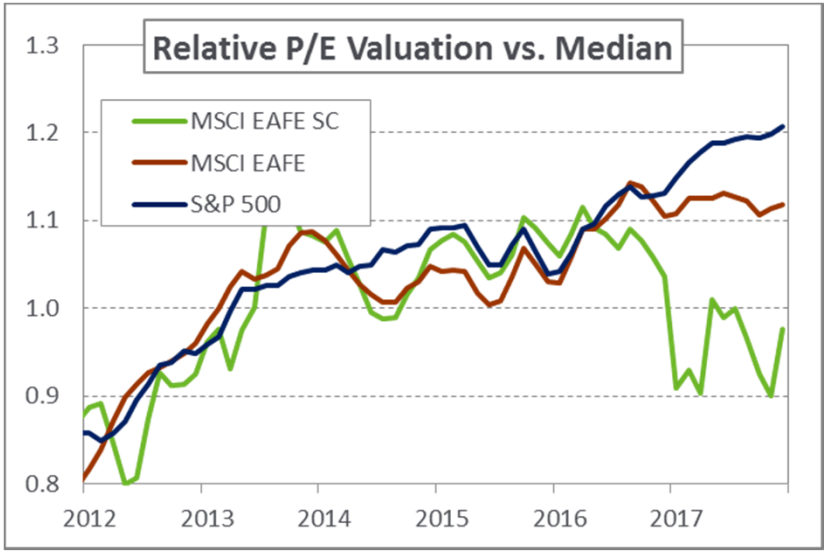
Earnings recovery appears to be taking hold in Europe where an uncertain political outlook has gained clarity

Non-US small cap and global equity are preferred for implementation

These strategies offer the best opportunity to exploit valuation discrepancies among stocks across countries and sectors

Hedging a portion of non-US developed currency exposure remains a strategic recommendation





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

CURRENT OPPORTUNITIES

Consider Moving Towards an Overweight to Emerging Market Equities

Emerging equities offer the highest total return potential for investors

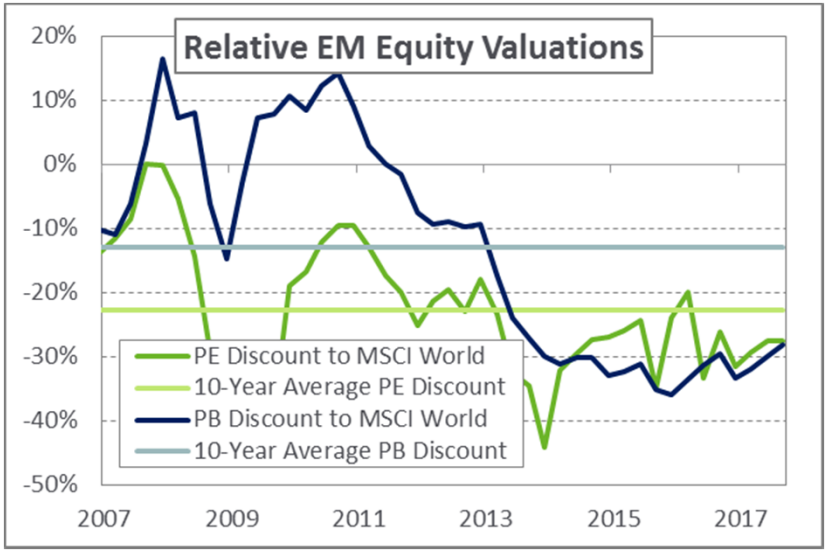
Valuation levels and fundamentals suggest an overweight relative to global equity market cap weights (e.g. 15% to 20%)

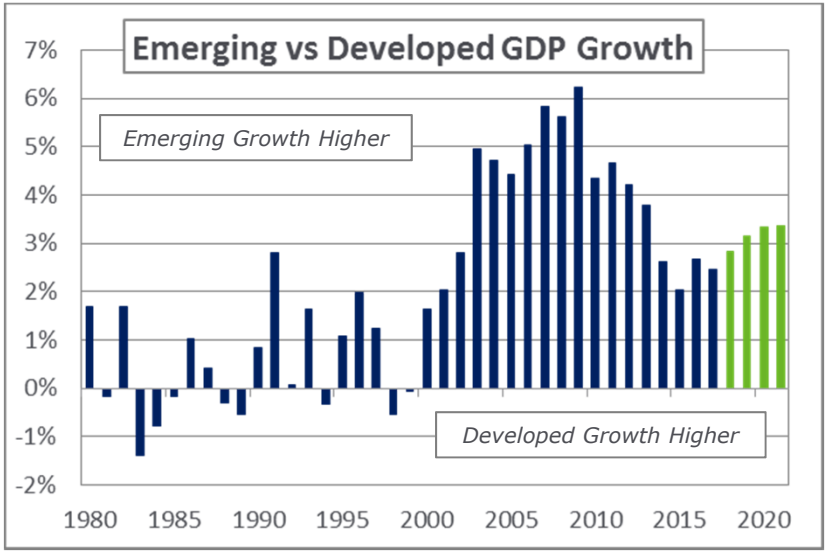
Growth premium relative to the developed world persists as economic conditions in EM improve due to synchronized global growth

High tracking error strategies offer greater flexibility to invest across emerging countries and are preferred to benchmark focused mandates

Opportunity set for excess return appears more abundant in EM versus developed markets

Strategies that invest down the market cap spectrum can offer investors more pure local growth exposure





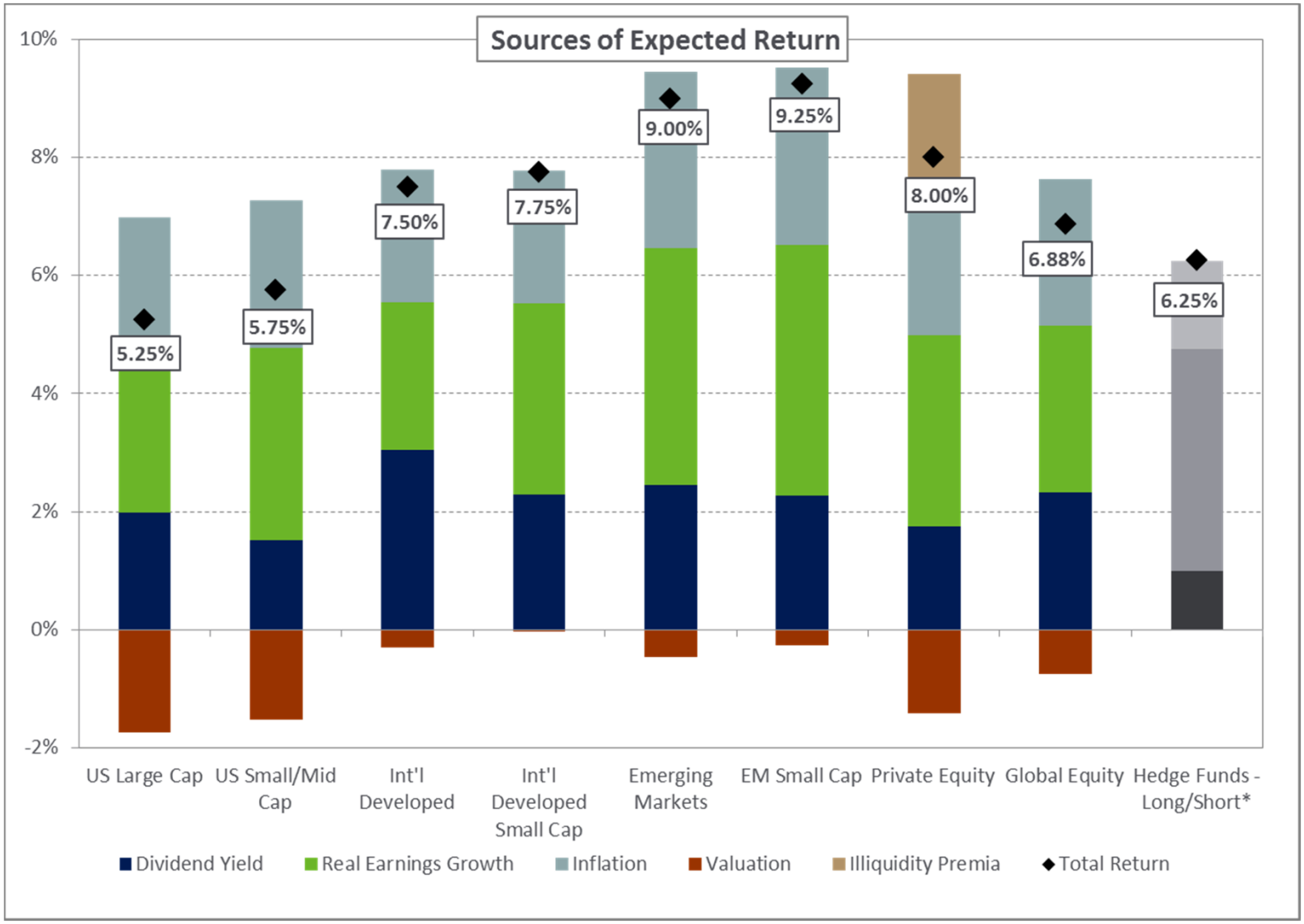
Source: (Top) MSCI, Bloomberg
Source: (Bottom) IMF

EQUITY: ASSUMPTIONS

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

Asset Class	5-7 Year Return	Change 2018-2017
US Large Cap	**5.25%**	**-.50%**
US Small/Mid-Cap	**5.75%**	**-.25%**
International (Unhedged)	**7.50%**	**+.25%**
International (Hedged)	**7.82%**	**+.25%**
International Small Cap	**7.75%**	**+.25%**
Emerging International	**9.00%**	**-.50%**
Emerging Intl. Small Cap	**9.25%**	**-.75%**
Private Equity	**8.00%**	**-.25%**
Hedge Funds – Long/Short	**6.25%**	**-**
Global Equity	***6.88%***	***-.33%***

EQUITY: BUILDING BLOCKS



Source: NEPC
**Hedge Funds are discussed in detail in the Multi-Asset section*

TACTICAL OPPORTUNITIES FOR ERSRI

NEPC, LLC

A CLOSER LOOK: LOWER EQUITY ALLOCATION AND OVERWEIGHT NON US

NEPC recommends lowering the overall Equity allocation from 45.6% to 42.6%

More specifically, consider lowering the US Equity allocation as valuations and price margins continue to near record highs

An Equity allocation of 42.6% would make ERSRI lower than most of their peers but in line with NEPC Public Fund clients

Consider overweighting Non US markets which look more attractive based on valuations and growth prospects

NEPC believes that starting point for a client's equity allocation should mirror the MSCI ACWI

- 52% to US
- 36% to Int'l Dev.
- 12% to Emerging

Over/under weights relative to the MSCI ACWI should be based on current market opportunities which currently point to more Non US exposure

	Target	Actual	ACWI	Proposed
U.S. Equities	52%	50%	52%	47%
Int'l Equities	36%	40%	36%	43%
Emerging Equities	12%	10%	12%	10%

A CLOSER LOOK: ERSRI INCOME PORTFOLIO

The goal of the Income portfolio is to generate a high level of interest and dividend income

- Sourced from both public (liquid) and private (illiquid) markets
- Designed to help offset negative annual plan cash flows

The current Income portfolio implementation targets exposure to a diversified mix of income-oriented, higher-yielding asset classes

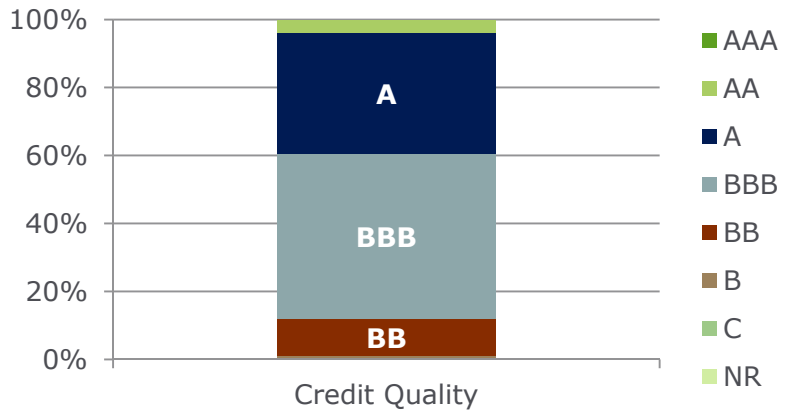
- **High Yield Infra. (MLP):** *7.25% exp. return, 19% volatility, 0.70 correlation to equity*
- **REITS:** *6.5% exp. return, 21% volatility, 0.70 correlation to equity*
- **Liquid Credit (HY and BL):** *3.75-4.5% exp. return, 9-13% volatility, 0.70 correlation to equity*
- **Private Credit:** 6.5% exp. return, 13% volatility, 0.60 correlation to equity

NEPC recommends that ERSRI consider the following:

- Small increase to the Income Portfolio offset by reduction to US equity (trim gains)
- Introduce EMD Local in Liquid Credit category to target higher expected return
  - Offers *6.0% exp. return, 13% volatility, 0.60 correlation to equity*
  - *Yield sourced from government bonds, diverse interest rate and inflationary environments*
  - *Recommend it as a permanent category in the Income Portfolio*
- Reduce size of current Liquid Credit manager allocation and conduct formal review of structure and managers
  - Adjust Policy benchmark to target different mix of Bank Loans and High Yield
  - Conduct formal manager review to evaluate existing managers vs. alternatives
    - *Western has under-performed target benchmark and peers with higher volatility*

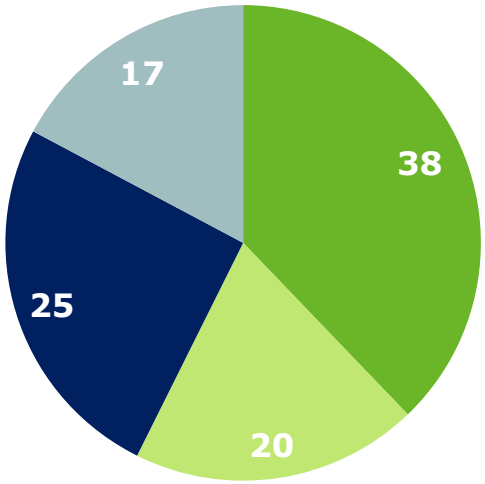
EMD LOCAL INDEX CONSTRUCT

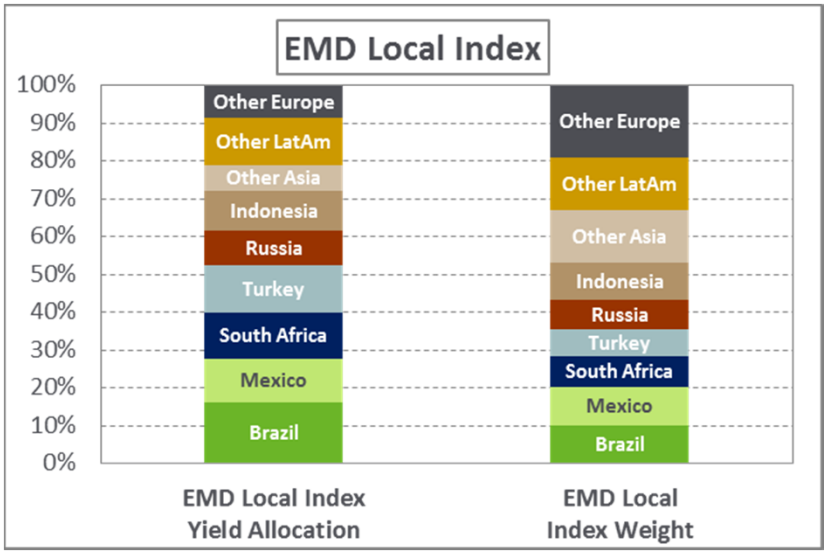
	EM Local (Local Currency Sovereign)
	JPM GBI-EM Global Diversified
Yield (%)	6.13%
Avg. Credit Quality	BBB
Duration	4.86 Years



Total ex-Asia: 80%

- Latin America
- Asia
- Europe
- Africa/Middle East





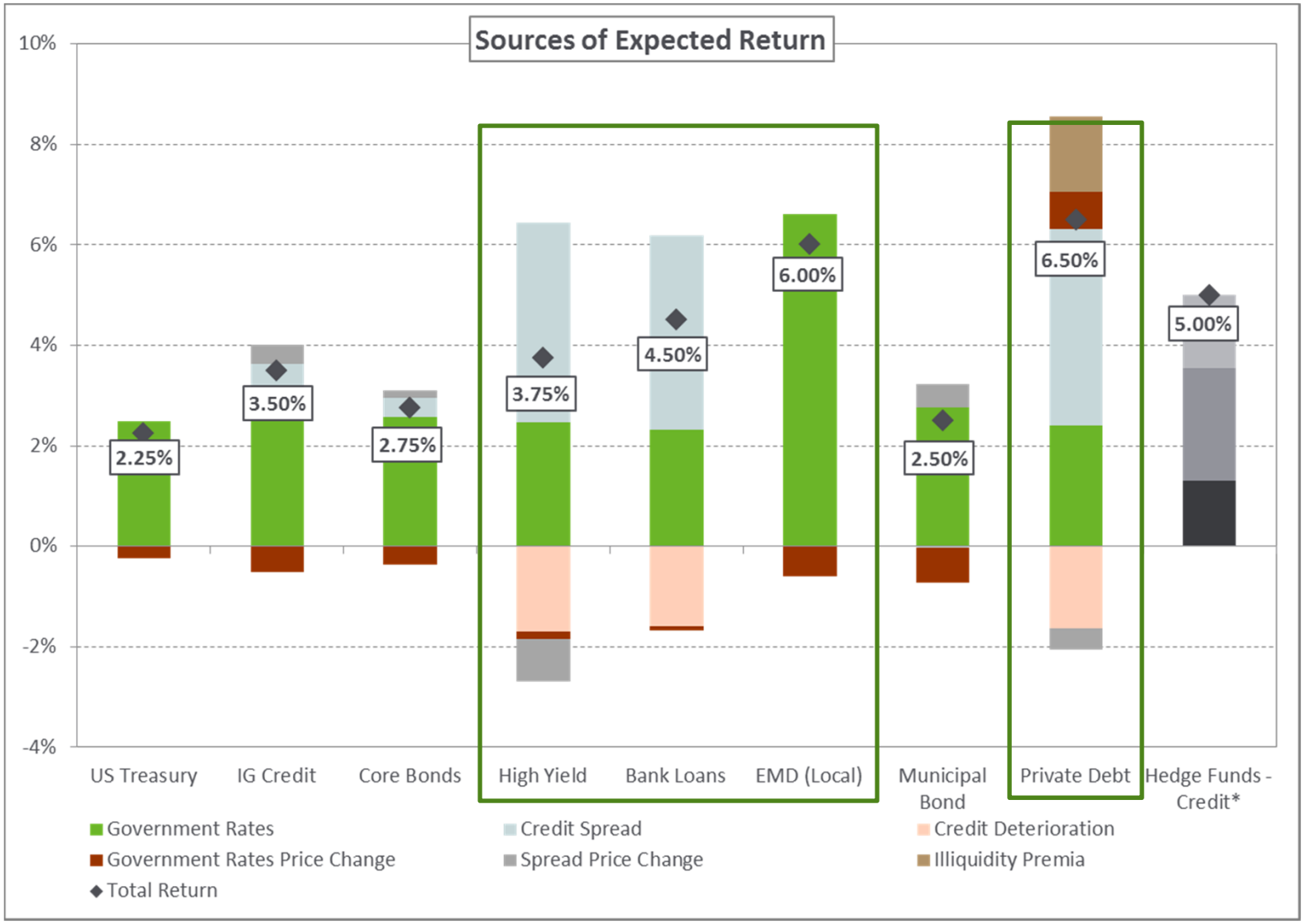
*Characteristics are as of 12.31.17

RATES & CREDIT: ASSUMPTIONS

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

Asset Class	5-7 Year Return	Change 2018-2017
Treasuries	**2.25%**	**+.25%**
Investment-Grade Corporate Credit	**3.50%**	**-.25%**
Municipal Bonds	**2.50%**	**+.25%**
TIPS	**3.25%**	**+.25%**
High-Yield Bonds	**3.75%**	**-1.00%**
High-Yield Municipal Bonds	**3.75%**	**-.50%**
Bank Loans	**4.50%**	**-.75%**
Non-US Bonds (Unhedged)	**0.50%**	**-.50%**
EMD (External)	**4.25%**	**-.50%**
EMD (Local Currency)	**6.00%**	**-.75%**
Private Debt	**6.50%**	**-.75%**
Core Bonds	***2.75%***	***+.10%***

CREDIT: BUILDING BLOCKS



Source: NEPC
**Hedge Funds are discussed in detail in the Multi-Asset section*

CURRENT OPPORTUNITIES

Allocate to TIPS from Core Bonds

Duration exposure remains a key asset allocation building block for a diversified portfolio

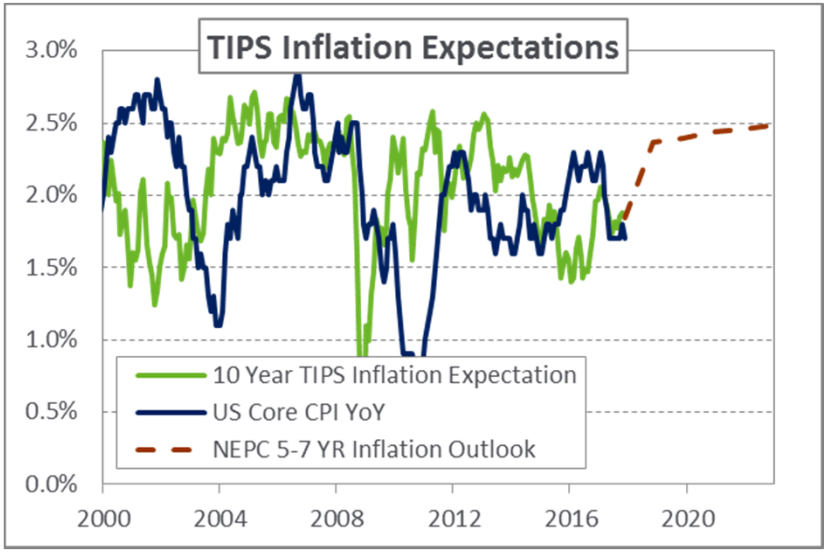
TIPS offer safe haven exposure with an explicit hedge for realized inflation and can be implemented with a low cost passive strategy

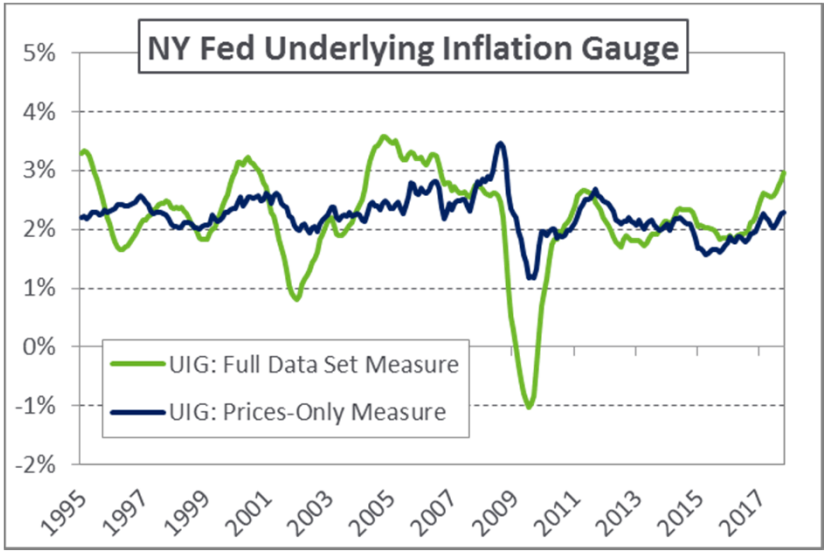
Current core bond yields offer limited cushion before taking on losses in a rising interest rate environment

Increase in inflation expectations would favor TIPS over nominal bonds

TIPS yields are priced off real rates and sensitive to Fed tightening but a gradual path of normalization should mitigate the risk of a sharp rise in real interest rates

An allocation to TIPS diversifies core bond exposure and improves risk balance across economic environments





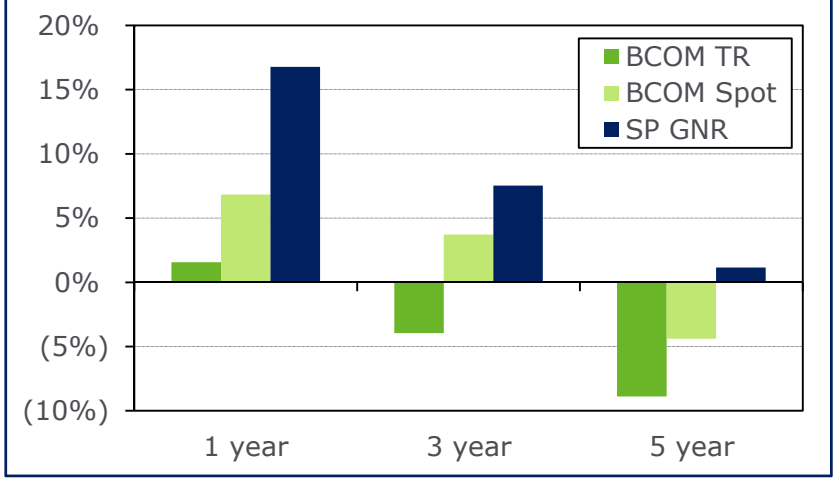
Source: (Top) Bureau of Labor Statistics, Bloomberg, NEPC
Source: (Bottom) New York Fed

COMMODITY MARKET SNAPSHOT

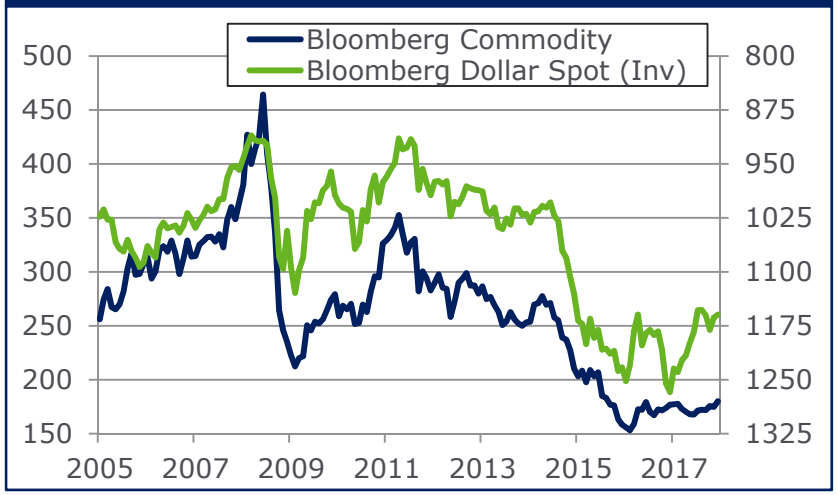
Commodity Prices Firming

- **Commodities appear cheap, but negative roll yield persists**
  - 16 of 26 commodities are in contango
  - This has started to shift as many commodities have seen flattening futures curves
- **Downward pressure from dollar strength waning**
- **Low collateral yield could grow should rates continue to rise**

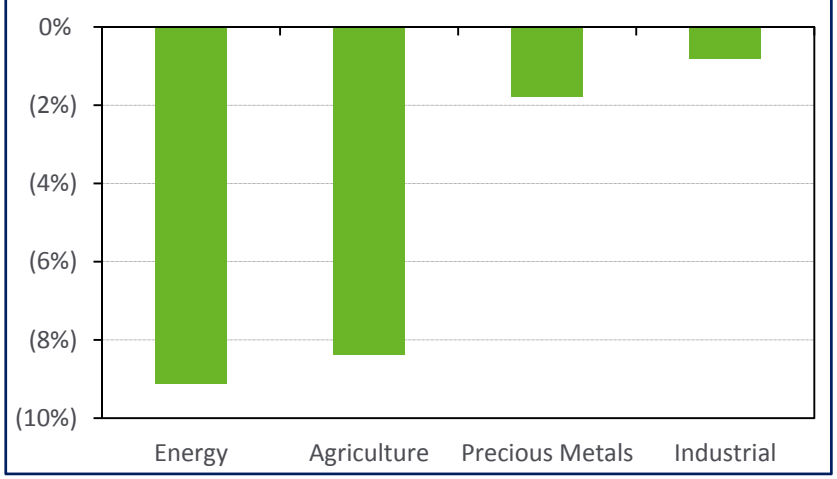
Spot Returns Outpace Total Return



Dollar Headwind Weakening

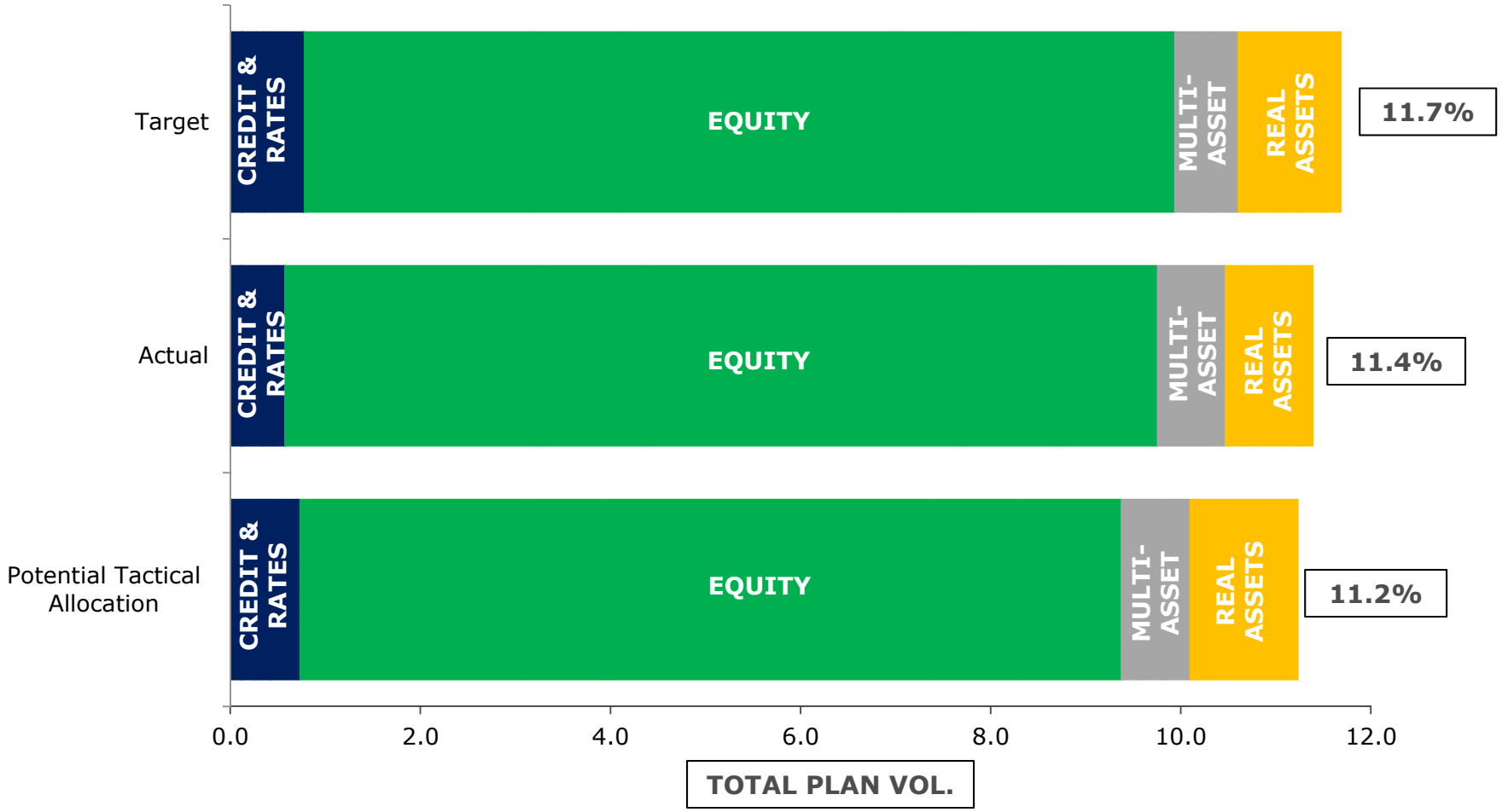


Broad Discounts vs. 10-yr Avg.



Source: Bloomberg; data as of December 31, 2017.

RISK BUDGETING ANALYSIS



*Actual allocation as of 12/31/2017

ERSRI ASSET CLASS ASSUMPTIONS & ALLOCATION

NEPC, LLC

ERSRI ASSET CLASS MAPPING

Asset Class	NEPC Assumption
U.S. Equities	(75%) U.S. Lrg / (25%) U.S. Small
Int'l Equities	International Equities
Emerging Int'l Equities	Emerging Equities
Total Equity	
Private Equity	Private Equity
Non-Core Real Estate	Non-Core Real Estate
Opp. Private Credit	(50%) Global Multi-Sector / (50%) Private Debt
Private Growth	
HY Infrastructure	MLP
REITs	REITs
Liquid Credit	(50%) High Yield / (50%) Bank Loans
Private Credit	Private Debt
Income	
Treasury Duration	Long Treasuries
Systematic Trend	Hedge Fund - Macro
CPC	
Core Real Estate	Core Real Estate
Private Infrastructure	Private Real Assets - Infrastructure/Land
TIPS	U.S. TIPs
Natural Resources	Commodities
Inflation Protection	
Investment Grade Fixed	Core Bonds
Absolute Return	Hedge Funds
Cash	Cash
Volatility Protection	

ERSRI CURRENT VS. ACTUAL ALLOCATION

	Target	Actual	Difference
US Equities	20.8%	22.8%	2.0%
Int'l Equities	14.4%	18.4%	4.0%
Emerging Int'l Equities	4.8%	4.4%	-0.4%
Total Equity	**40.0%**	**45.6%**	**5.6%**
Private Equity	11.3%	5.9%	-5.4%
Non-Core Real Estate	2.3%	2.0%	-0.3%
Opp. Private Credit	1.5%	0.3%	-1.2%
Private Growth	**15.1%**	**8.2%**	**-6.9%**
HY Infrastructure	1.0%	1.8%	0.8%
REITs	1.0%	0.0%	-1.0%
Liquid Credit	2.8%	4.3%	1.5%
Private Credit	3.2%	0.9%	-2.4%
Income	**8.0%**	**7.0%**	**-1.1%**
Treasury Duration	4.0%	3.9%	-0.1%
Systematic Trend	4.0%	4.0%	0.0%
CPC	**8.0%**	**7.9%**	**-0.1%**
Core Real Estate	3.6%	5.0%	1.4%
Private Infrastructure	2.4%	1.5%	-0.9%
TIPS	1.0%	2.4%	1.4%
Natural Resources	1.0%	0.0%	-1.0%
Inflation Protection	**8.0%**	**8.9%**	**0.9%**
Investment Grade Fixed	11.5%	11.4%	-0.1%
Abs. Return	6.5%	7.3%	0.8%
Cash	3.0%	3.0%	0.0%
Vol. Protection	**21.0%**	**21.7%**	**0.7%**
Short-Term Tactical	**0.0%**	**0.4%**	**0.4%**
Expected Return 5-7 yrs	**6.3%**	**6.1%**	
Expected Return 30 yrs	**7.4%**	**7.2%**	
Standard Dev	**11.7%**	**11.4%**	
Sharpe Ratio (5-7 years)	**36.8%**	**36.2%**	

*Actual allocation as of 12/31/2017

ERSRI ALLOCATION (RE-MAPPED) VS. PUBLIC FUND MEDIAN GREATER THAN $1 BILLION

	Target	Actual	NEPC > $1B
Cash	**3.0%**	**3.4%**	**2.3%**
US Equities	20.8%	22.8%	26.5%
Int'l Equities (Unhedged)	14.4%	18.4%	15.0%
Emerging Int'l Equities	4.8%	4.4%	4.5%
Global Equity	0.0%	0.0%	2.7%
Total Equity	**40.0%**	**45.6%**	**48.8%**
Investment Grade Fixed	11.5%	11.4%	11.4%
TIPS	1.0%	2.4%	1.0%
High Yield & Bank Loans	2.8%	4.3%	2.8%
EMD	0.0%	0.0%	1.9%
Long Treasuries	4.0%	3.9%	0.4%
Global Multi-Sector Fixed Income	0.0%	0.0%	0.9%
Absolute Return Fixed Income	0.0%	0.0%	1.1%
Total Fixed Income	**19.3%**	**22.0%**	**19.9%**
Private Real Assets	2.4%	1.5%	1.4%
Liquid Real Assets	1.0%	0.0%	0.6%
MLPs	1.0%	1.8%	0.2%
Total Real Assets	**4.4%**	**3.3%**	**2.3%**
REITs	1.0%	0.0%	0.5%
Private Real Estate	5.9%	7.0%	6.1%
Private Equity	11.3%	5.9%	7.4%
Private Credit	4.7%	1.2%	2.5%
Hedge Funds	10.5%	11.3%	6.4%
Total Alternatives	**33.4%**	**25.4%**	**22.8%**
Total Other	**0.0%**	**0.0%**	**3.8%**

*Total Other includes GAA, Risk Parity, Convertibles, and Alt. Beta strategies

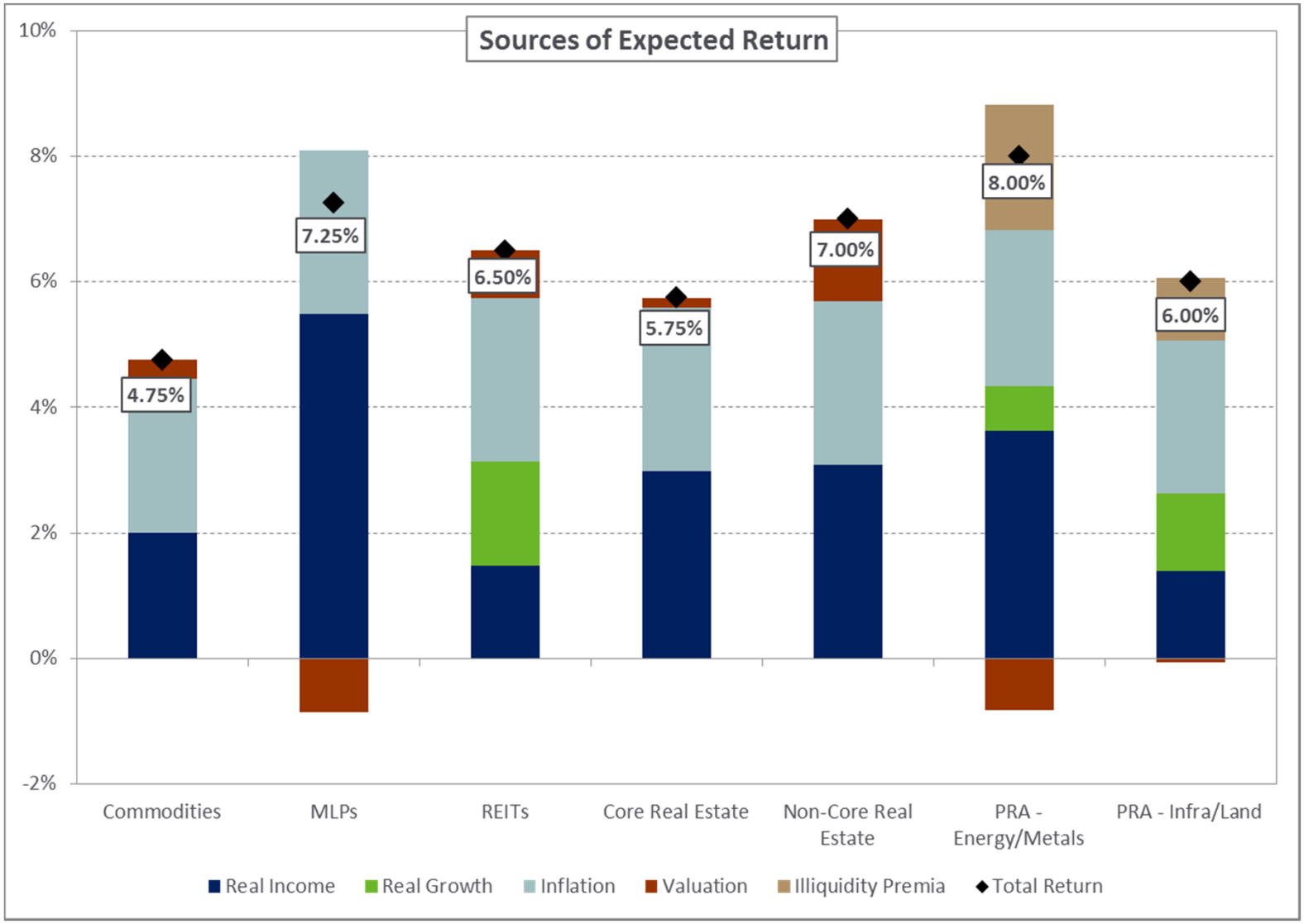
APPENDIX

REAL ASSETS: ASSUMPTIONS

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

Asset Class	5-7 Year Return	Change 2018-2017
Commodities	**4.75%**	**-**
MLPs	**7.25%**	**+.25%**
REITs	**6.50%**	**-**
Core Real Estate	**5.75%**	**-.25%**
Non-Core Real Estate	**7.00%**	**N/A**
Private Real Assets: Energy/Metals	**8.00%**	**-.25%**
Private Real Assets: Infrastructure/Land	**6.00%**	**-**
Real Assets (Liquid)	***5.87%***	***-.05%***

REAL ASSETS: BUILDING BLOCKS



Source: NEPC

MAJOR ASSET CLASS RETURN ASSUMPTIONS

	Asset Class	30 Year Return	Change 2018-2017	Volatility
	Cash	2.75%	**-.25%**	1.00%
	US Inflation	2.75%	-	-
Equity	Large Cap Equities	7.50%	-	17.50%
Equity	International Equities (Unhedged)	7.75%	-	21.00%
Equity	Emerging International Equities	9.25%	**-.25%**	28.00%
Equity	Private Equity	9.50%	-	23.00%
Credit	Treasuries	3.25%	**-.25%**	5.50%
Credit	US TIPS	3.75%	-	6.50%
Credit	Core Bonds	3.75%	**-.25%**	5.99%
Credit	Bank Loans	5.50%	**-.50%**	9.00%
Credit	High Yield Bonds	5.50%	**-.25%**	13.00%
Credit	Emerging Mkt. Debt (Local)	6.50%	-	13.00%
Credit	Private Debt	7.50%	**-.50%**	13.00%
Real Assets	Commodities	5.50%	-	19.00%
Real Assets	REITs	6.75%	-	21.00%
Real Assets	Core Real Estate	6.50%	-	13.00%
Multi-Asset	Global 60/40*	6.44%	**-.03%**	11.78%
Multi-Asset	Hedge Funds*	6.34%	**-.13%**	9.07%

**Page reference - Hedge Funds is a calculated blend of 40% Equity, 40% Credit , and 20% Macro-related strategies.*

2018 5-7 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	**2018**	**2017**	**2018-2017**
Cash	2.00%	1.75%	+0.25%
Treasuries	2.25%	2.00%	+0.25%
IG Corp Credit	3.50%	3.75%	-0.25%
MBS	2.50%	2.25%	+0.25%
Core Bonds*	2.75%	2.65%	+0.10%
TIPS	3.25%	3.00%	+0.25%
High-Yield Bonds	3.75%	4.75%	-1.00%
Bank Loans	4.50%	5.25%	-0.75%
Non-US Bonds (Unhedged)	0.50%	1.00%	-0.50%
Non-US Bonds (Hedged)	0.73%	1.09%	-0.36%
EMD External	4.25%	4.75%	-0.50%
EMD Local Currency	6.00%	6.75%	-0.75%
Large Cap Equities	5.25%	5.75%	-0.50%
Small/Mid Cap Equities	5.75%	6.00%	-0.25%
Int'l Equities (Unhedged)	7.50%	7.25%	+0.25%
Int'l Equities (Hedged)	7.82%	7.57%	+0.25%
Emerging Int'l Equities	9.00%	9.50%	-0.50%
Private Equity	8.00%	8.25%	-0.25%
Private Debt	6.50%	7.25%	-0.75%
Core Real Estate	5.75%	6.00%	-0.25%
Commodities	4.75%	4.75%	-
Hedge Funds**	5.83%	5.95%	-0.12%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).
** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2018 5-7 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	**2018**	**2017**	**2018-2017**
Short Treasuries	2.25%	2.00%	+0.25%
US 10 Yr. Treasury	2.25%	2.00%	+0.25%
Long Treasuries	2.00%	1.75%	+0.25%
20+ Year STRIPS	1.75%	1.50%	+0.25%
Short Credit	2.75%	2.75%	-
Long Credit	4.00%	4.25%	-0.25%
Long Government/Credit*	3.26%	3.33%	-0.07%
Non-US Cash**	0.50%	0.25%	+0.25%
Non-US Inflation-Linked Bonds	1.75%	1.00%	+0.75%
Short High Yield	4.25%	5.00%	-0.75%
Municipal Bonds (1-10 Year)	2.50%	-	-
High Yield Municipal Bonds	3.75%	4.25%	-0.50%
Global Equity*	6.88%	7.21%	-0.33%
MLPs	7.25%	7.00%	+0.25%
REITs	6.50%	6.50%	-
Real Assets (Liquid)**	5.87%	5.92%	-0.05%
Non-Core Real Estate	7.00%	N/A	N/A
Private Real: Energy/Metals	8.00%	8.25%	-0.25%
Private Real: Infrastructure/Land	6.00%	6.00%	-
Hedge Funds - Long/Short	6.25%	6.25%	-
Hedge Funds – Credit	5.00%	5.25%	-0.25%
Hedge Funds – Macro	6.25%	6.25%	-

* Assumption based on market weighted blend of index components
** Custom weighted blend of underlying asset classes

2018 VOLATILITY FORECASTS

Volatility			
Asset Class	**2018**	**2017**	**2018-2017**
Cash	1.00%	1.00%	-
Treasuries	5.50%	5.50%	-
IG Corp Credit	7.50%	7.50%	-
MBS	7.00%	7.00%	-
Core Bonds*	5.99%	6.03%	-0.04%
TIPS	6.50%	6.50%	-
High-Yield Bonds	13.00%	13.00%	-
Bank Loans	9.00%	9.00%	-
Non-US Bonds (Unhedged)	10.00%	8.50%	+1.50%
Non-US Bonds (Hedged)	4.50%	5.00%	-0.50%
EMD External	13.00%	13.00%	-
EMD Local Currency	13.00%	15.00%	-2.00%
Large Cap Equities	17.50%	17.50%	-
Small/Mid Cap Equities	21.00%	21.00%	-
Int'l Equities (Unhedged)	21.00%	21.00%	-
Int'l Equities (Hedged)	18.00%	18.00%	-
Emerging Int'l Equities	28.00%	28.00%	-
Private Equity	23.00%	23.00%	-
Private Debt	13.00%	14.00%	-1.00%
Core Real Estate	13.00%	15.00%	-2.00%
Commodities	19.00%	19.00%	-
Hedge Funds**	9.07%	8.74%	-0.33%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).
** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2018 VOLATILITY FORECASTS

Volatility			
Asset Class	**2018**	**2017**	**2018-2017**
Short Treasuries	2.50%	2.50%	-
US 10 Yr. Treasury	7.50%	7.50%	-
Long Treasuries	12.00%	12.00%	-
20+ Yr. STRIPS	19.00%	19.00%	-
Short Credit	3.50%	3.50%	-
Long Credit	12.00%	13.00%	-1.00%
Long Government/Credit*	11.26%	12.01%	-0.75%
Non-US Cash**	1.00%	1.00%	-
Non-US 10 Yr. Sovereigns**	6.50%	6.50%	-
Non-US Inflation-Linked Bonds (H)	5.50%	6.00%	-0.50%
Short High Yield	8.50%	9.00%	-0.50%
Municipal Bonds (1-10 Year)	5.50%	-	-
Global Equity***	18.22%	18.26%	-0.04%
MLPs	19.00%	20.00%	-1.00%
REITs	21.00%	21.00%	-
Real Assets (Liquid)****	13.06%	12.83%	+0.23%
Non-Core Real Estate	17.00%	N/A	N/A
Private Real: Energy/Metals	21.00%	21.00%	-
Private Real: Infrastructure/Land	12.00%	14.00%	-2.00%
Hedge Funds - Long/Short	11.00%	11.00%	-
Hedge Funds – Credit	9.50%	9.50%	-
Hedge Funds – Macro	9.50%	9.50%	-

* Assumption based on market weighted blend of index components
** Custom weighted blend of underlying asset classes

2018 30 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	**2018**	**2017**	**2018-2017**
Cash	2.75%	3.00%	-0.25%
Treasuries	3.25%	3.50%	-0.25%
IG Corp Credit	4.75%	5.00%	-0.25%
MBS	3.25%	3.50%	-0.25%
Core Bonds*	3.75%	4.00%	-0.25%
TIPS	3.75%	3.75%	-
High-Yield Bonds	5.50%	5.75%	-0.25%
Bank Loans	5.50%	6.00%	-0.50%
Non-US Bonds (Unhedged)	2.50%	2.75%	-0.25%
Non-US Bonds (Hedged)	2.77%	2.87%	-0.10%
EMD External	5.00%	5.75%	-0.75%
EMD Local Currency	6.50%	6.50%	-
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 Equities (Hedged)	8.14%	8.14%	-
Emerging Int'l Equities	9.25%	9.50%	-0.25%
Private Equity	9.50%	9.50%	-
Private Debt	7.50%	8.00%	-0.50%
Core Real Estate	6.50%	6.50%	-
Commodities	5.50%	5.50%	-
Hedge Funds**	6.34%	6.47%	-0.13%

* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).
** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2018 30 YEAR RETURN FORECASTS

Geometric Expected Return			
Asset Class	**2018**	**2017**	**2018-2017**
Short Treasuries	3.00%	3.00%	-
US 10 Yr. Treasury	3.50%	3.50%	-
Long Treasuries	3.50%	3.75%	-0.25%
20+ Yr. STRIPS	3.50%	3.75%	-0.25%
Short Credit	3.75%	3.75%	-
Long Credit	5.25%	5.75%	-0.50%
Long Government/Credit*	4.62%	5.04%	-0.42%
Non-US Cash**	2.00%	2.00%	-
Non-US 10 Yr. Sovereigns**	2.50%	2.50%	-
Non-US Inflation-Linked Bonds	3.00%	2.75%	+0.25%
Short High Yield	5.25%	5.75%	-0.50%
Municipal Bonds (1-10 Year)	3.25%	-	-
Global Equity***	8.24%	8.35%	-0.11%
MLPs	7.50%	7.50%	-
REITs	6.75%	6.75%	-
Real Assets (Liquid)****	6.75%	6.79%	-0.04%
Non-Core Real Estate	7.50%	N/A	N/A
Private Real: Energy/Metals	7.75%	7.75%	-
Private Real: Infrastructure/Land	6.25%	6.00%	+0.25%
Hedge Funds - Long/Short	7.25%	7.25%	-
Hedge Funds – Credit	5.25%	5.50%	-0.25%
Hedge Funds – Macro	6.25%	6.25%	-

* Assumption based on market weighted blend of index components
** Custom weighted blend of underlying asset classes

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