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BOSTON PUBLIC LIBRARY

2017 Asset Allocation Update

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Market Outlook

Key Market Themes

- **The US economy is experiencing an extended economic growth cycle**
  - US consumers and a tightening labor market are driving the US economy
  - Growth recovery in Europe and the emerging markets reinforces US economic conditions
  - Stable economic growth is a positive backdrop but expected risk asset returns are subdued

- **Federal Reserve monetary policy remains on a gradual normalization path**
  - Despite the June increase, markets continue to price in a slow pace for Fed rate hikes
  - Market impact of the Fed's planned reduction of the $4.5T balance sheet is untested
  - Chair Yellen's uncertain tenure may stoke market unease has her term expires in Feb. 2018

- **China is modestly tightening financial conditions to slow credit growth and manage an orderly transition to a consumer led economy**
  - Markets have responded positively to the PBOC's management of a more stable yuan
  - Capital outflow pressure persists and large scale currency devaluation remains a tail risk
  - Continued credit expansion and real estate development risk inflating asset price bubbles

- **Globalization backlash is disrupting the political and economic orthodoxy**
  - Outcomes of the French and UK elections have eased market fears but conditions driving anti-establishment political sentiment have not subsided
  - Capital market fundamentals may not be materially altered but risks stemming from globalization backlash likely lead to higher levels of currency volatility
  - Potential changes to US trade policy under the current administration remain uncertain

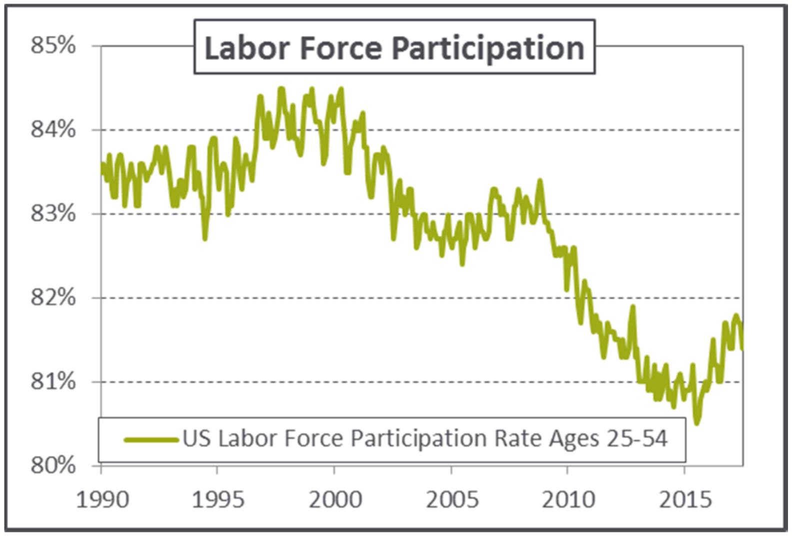
Key Market Themes

Extended US Economic Cycle

US recession concerns are muted

The US economy appears on a path of slow but steady growth as excess capacity is gradually absorbed by the economy

The labor market recovery has been strong but slack remains as many have yet to return to the workforce

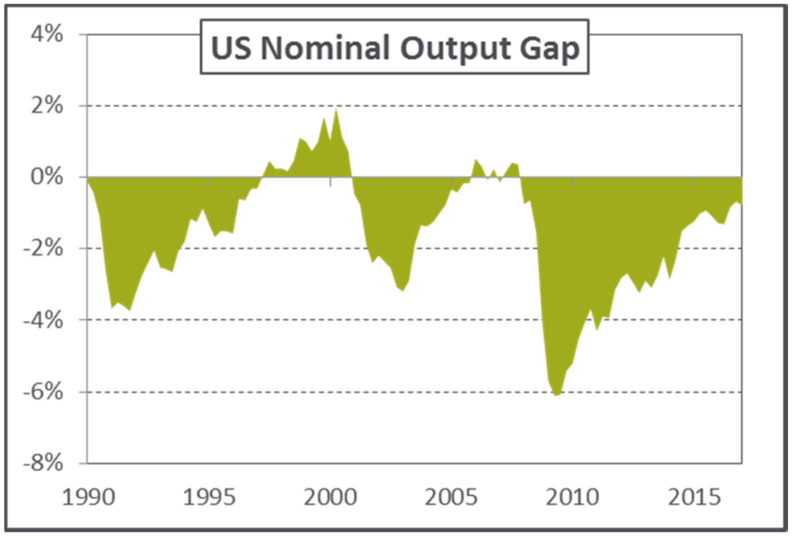


Source: FRED

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

Improvement of economic conditions in Europe and emerging markets reinforce US economic gains as global growth factors synchronize

US corporate profitability is near all time highs and may be a challenge for companies to boost economic growth rate



Source: Congressional Budget Office, Bloomberg

Federal Reserve Gradualism

The Federal Reserve is expected to slowly increase interest rates

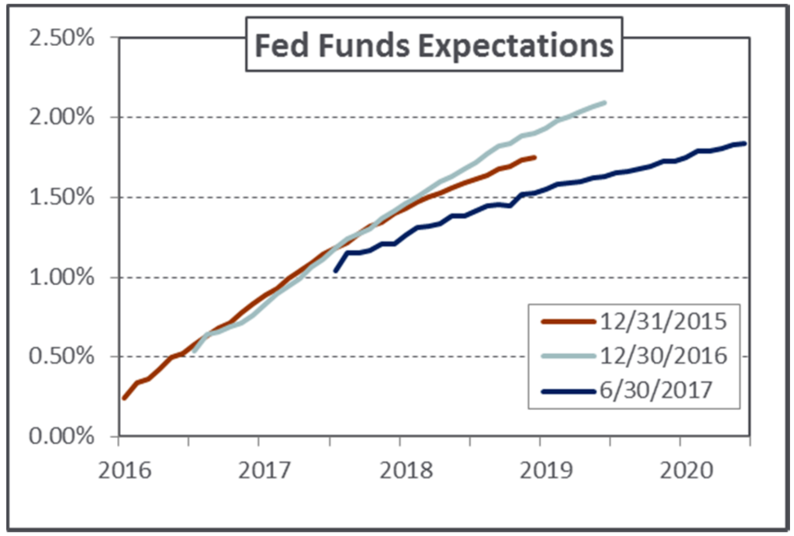
Expected path of Fed policy through 2019 matters more than timing of the next hike as the disconnect between market expectations and Fed signaling has grown

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

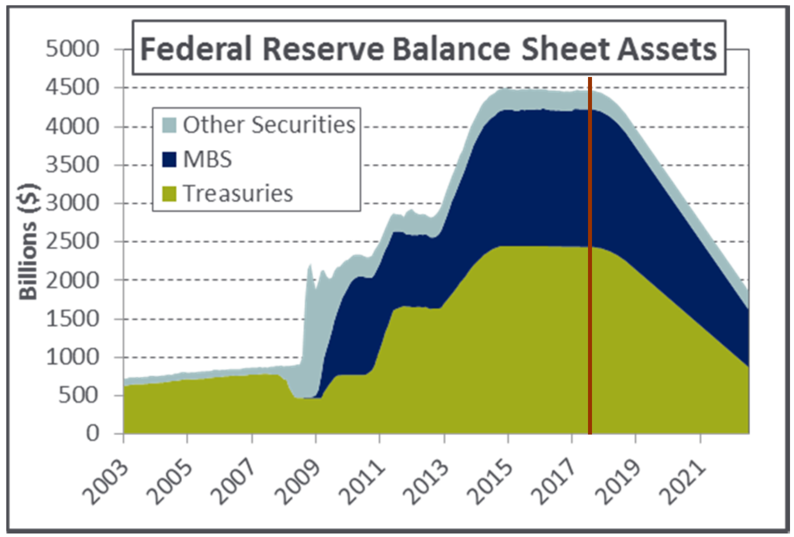
Reduction of the Fed balance sheet will likely be a gradual process

The market impact is untested but the Fed has announced a specific schedule to not reinvest a portion of the balance sheet securities that mature

Politics could intersect with Fed policy as Fed Chair Janet Yellen's term is set to expire in February 2018



Source: Fed, Bloomberg



Source: Fed, Bloomberg, NEPC

Forecast based on the June Fed Minutes: MBS assumes $4B per month for 3-month intervals over 12 months with a $20B cap; Treasuries assume $6B per month for 3-month intervals over 12 months with a $30B cap; Other Securities are assumed to stay constant

China Transitions

China is the global growth engine but faces fundamental transitions

China's economic transition is pivoting from a production to a service and consumption based economy

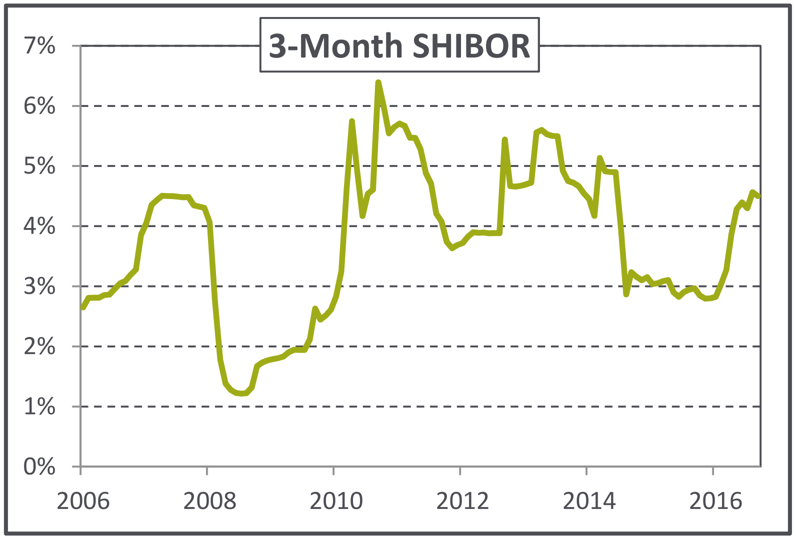
Fixed investment is required to sustain the production based economy and support labor force migration

Any disruption to these transitions will have global repercussions due to China's role in the global economy

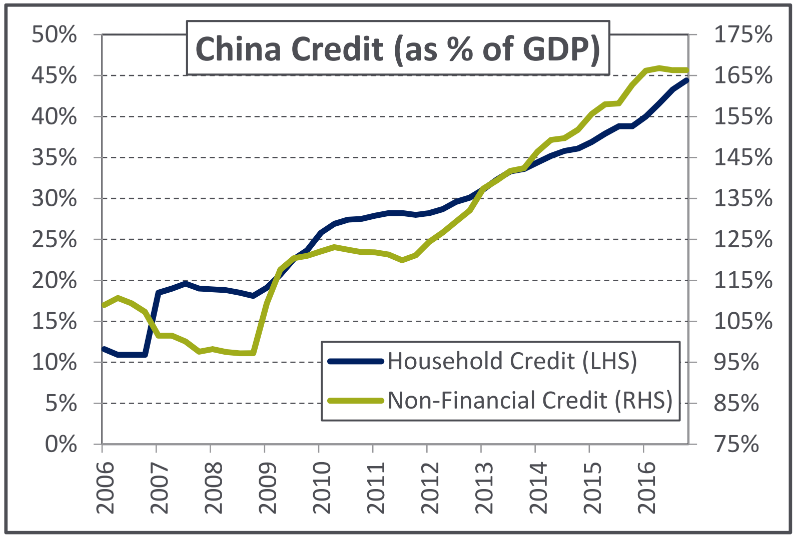
China's government is negotiating a balance between deleveraging and near term economic growth

Unrestrained growth in credit and real estate markets pose a systematic risk

Concerns of capital outflows have forced greater intervention from the central bank to limit currency movements



Source: China Foreign Exchange Trade System, Bloomberg



Source: Bank for International Settlements

Globalization Backlash

Uneven economic growth and wage gains have fueled political discontent in the developed world

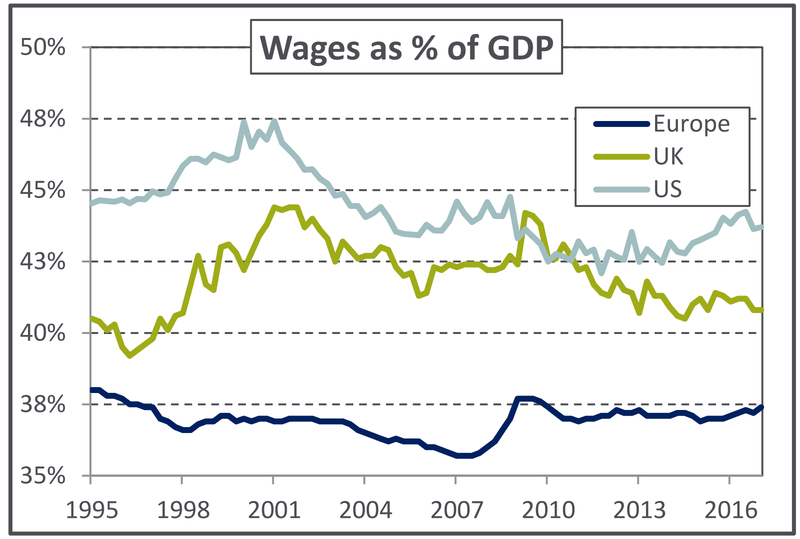
Election results in France and the UK have assuaged fears of political gridlock in Europe – but political conventions have been meaningfully challenged

Despite election outcomes, structural economic issues that stoked unease in Europe remain unresolved

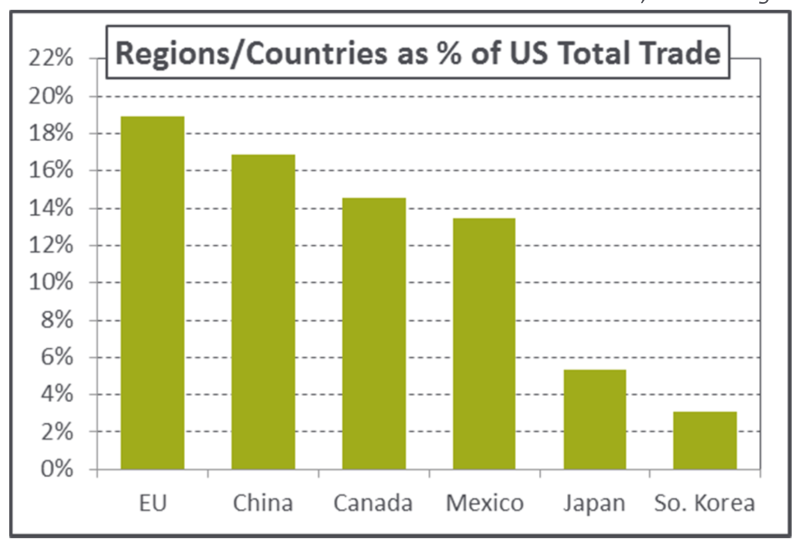
Concern of major trade disruptions stemming from US policy changes have diminished

Markets have taken to interpreting the administrations rhetoric with a grain of salt as significant trade policy changes have yet to materialize

A major change in US trade policy appears unlikely but remains a tail-risk with outsized repercussions



Source: Eurostat, Bloomberg



Source: IMF, Bloomberg

Current Opportunities

- **Trim US equity gains as US equity markets continue to rally**
  - Expanding valuations have driven recent gains and profit margins sit near all-time highs
- **Maintain overweight exposure to non-US developed market equities**
  - We believe a multi-year earnings recovery offers the potential for an elevated return
- **Emerging market equities remain attractive and offer robust total returns**
  - Fundamentals support an overweight relative to index weights (e.g. 15% to 20%)
- **Allocate to TIPS as inflation expectations are priced attractively**
  - Preserve US duration exposure with a bias to TIPS over core bonds
- **Reduce high yield bonds with credit spreads below long-term medians**
  - Credit markets continue to benefit from high demand in a low rate environment but current credit spread levels do not provide adequate compensation for the risks
- **For tactical investors, look to fund emerging local debt from risk assets**
  - Valuations for many emerging market currencies remain attractive despite the recent rally
- **Add macro hedge fund strategies for portfolio diversification benefits**
  - Systematic strategies tend to exhibit low correlation to equity markets

Asset Allocation Discussion

Asset Allocation Review

	Current Target	Mix A	Mix B
Large Cap Equities	30%	24%	20%
Small/Mid Cap Equities	10%	6%	5%
Int'l Equities	10%	15%	20%
Emerging Int'l Equities	0%	5%	5%
Total Equity	**50%**	**50%**	**50%**
Core Bonds	40%	20%	10%
TIPS	0%	5%	10%
Diversified Fixed Income	0%	10%	10%
Total Fixed Income	**40%**	**35%**	**30%**
Total Multi Asset	**10%**	**15%**	**20%**
2017 5 – 7 Year Expected Return	5.1%	5.7%	6.0%
2017 Expected Volatility	10.6%	10.8%	11.0%
2017 Sharpe Ratio	0.32	0.37	0.38

Notes:
- Expected returns are generally not adjusted for manager alpha.
- Numbers may not add due to rounding

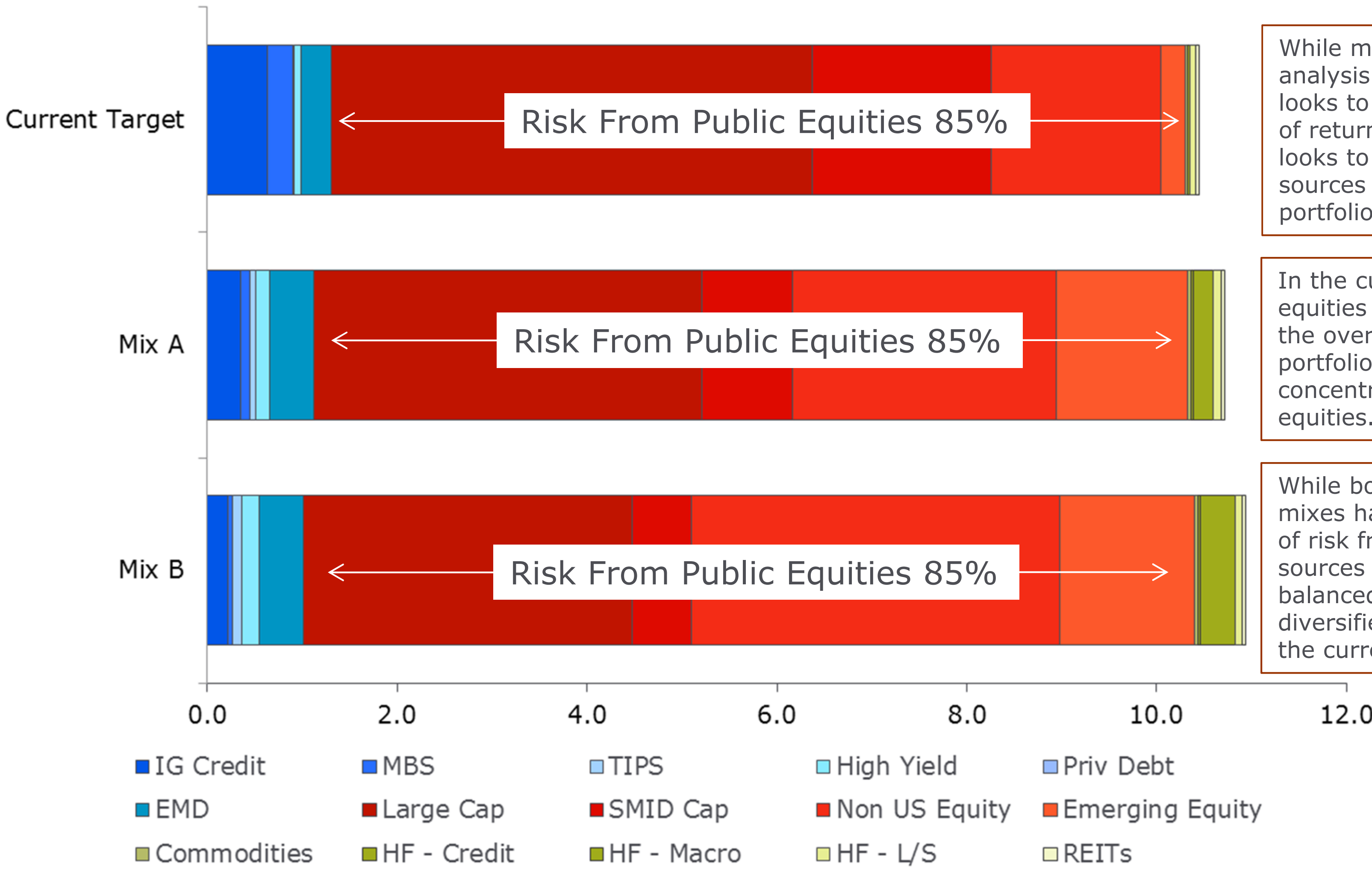
The current target represents a conservative total return approach. The allocation is centered around US stocks and bonds for the majority of the exposure, resulting in concertation risk. We believe that through minor enhancements, the portfolio can achieve a stronger risk adjusted return and be better positioned to take advantage of current market opportunities.

We believe the current allocation to equities is appropriate, however, using the MSCI ACWI as a baseline, we recommend clients overweight Non US and Emerging relative to their US market exposure. Both Mix A and Mix B look to achieve this goal by increasing the allocation to Non US, while reducing US equity exposure. Importantly, both mixes also introduce a stand alone emerging markets equity allocation to the mix.

Within fixed income, the current exposure relies entirely on US core bonds. While IRM is a strong manager, we believe diversification of strategy and approach is prudent. Both Mix A and B introduce a strategic allocation to TIPS and Diversified Bonds. Diversified bonds allow the managers to rotate sectors and manage duration to find and adjust for opportunities in the market.

Lastly, we look to increase multi asset in the two proposed mixes. Currently, the PIMCO All Asset fund is the only exposure here. We believe pairing the manager with a more macro focused strategy will provide a complementary style to both PIMCO and the portfolio overall.

Risk Budgeting



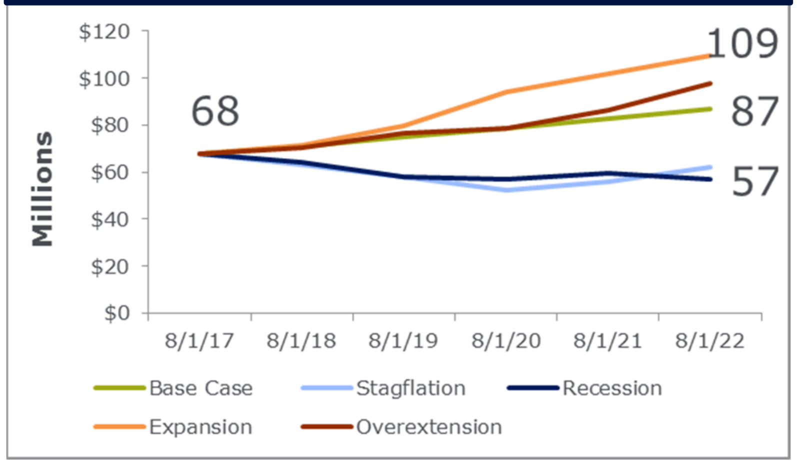
While mean variance analysis (previous page) looks to show the sources of return, risk budgeting looks to identify the sources of risk within a portfolio.

In the current target, equities drive 85% over the overall risk of the portfolio, largely concentrated around US equities.

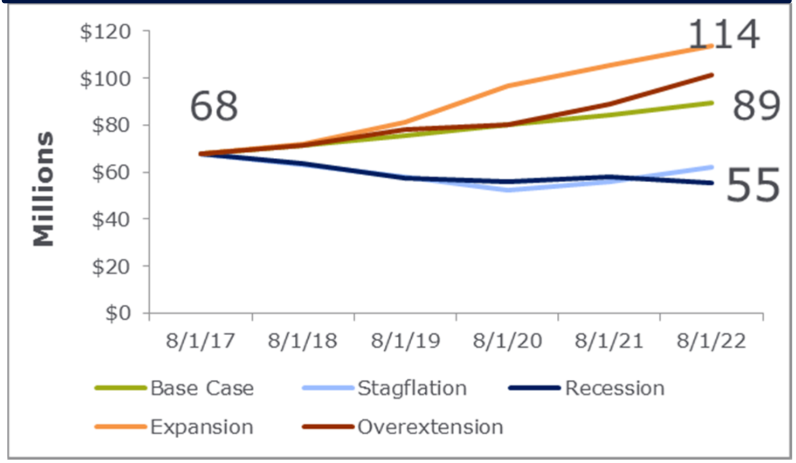
While both proposed mixes have the same level of risk from equities, the sources of risk are better balanced and more diversified compared to the current target.

Scenario Analysis

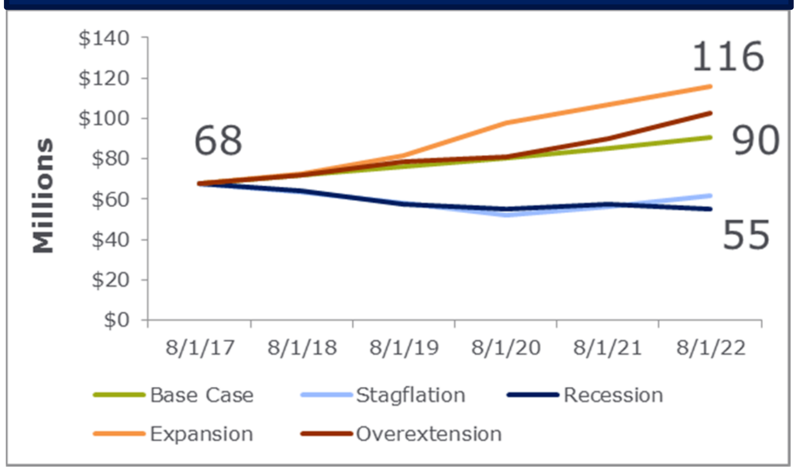
Current Target



Mix A



Mix B



- **Scenario Analysis looks to stress test the portfolio under both up and downside scenarios**
  - This analysis views each scenario of having an equal chance of happening
- **Mixes A and B have similar risk and return profiles; both provide sound up capture, with similar downside protection**
- **Active management can also play a hand, as the analysis considers a beta only return stream**

Appendix

Development of Asset Class Assumptions

We use market data for all asset class assumptions as of November 30th

Assumptions combine historical data and forward looking analysis

- Expected returns based on current market pricing and forward looking estimates
- Volatility informed by history but adjusted to reflect non-normality
- Correlations based on long-term data but recognize ongoing shifts in asset relationships

Forward-looking asset class models to determine expected return are based on current market pricing and a building blocks approach

- Expected return equals yield plus change in price (valuation, roll down, defaults, etc.)
- Country/regional inflation and real growth estimates are key economic observations
- Qualitative inputs and investor sentiment (capital flows, etc.) inform the return outlook

Asset class assumptions are prepared by the Asset Allocation Committee

- Asset Allocation team plus members from consulting practice groups meet to develop ideas for Key Market Themes, Strategic Policy Actions, and Current Opportunities

Partners Research Committee approves asset class assumptions

Inflation

Our outlook for US CPI is 2.5% over 5-7 years and 2.75% over 30 years

Our assumption is informed by break-even inflation expectations and local price indices

Inflation is an integral component of our asset allocation assumptions

Represents an essential building block for creating asset class returns

There are multiple inflation sources used to inform our asset class views

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

Asset classes include various inflation inputs incorporating global inflation data and/or local market inputs

Equity inflation expectations over 5-7 years are each constructed from country inflation inputs derived from the allocation of revenues across geographic regions

Over 30 years we assume equity markets will converge to a global inflation building block that assumes a terminal value of 3.25%

Fixed income assumptions for developed and emerging markets incorporate country specific inflation expectations as implied by forward interest rate curves

2017 5-to-7 Year Return Forecasts

Geometric Expected Return

Asset Class	2016	2017	2017-2016
Cash	1.50%	1.75%	0.25%
Treasuries	1.75%	2.00%	0.25%
IG Corp Credit	3.75%	3.75%	-
MBS	2.00%	2.25%	0.25%
Core Bonds*	2.46%	2.65%	0.19%
TIPS	2.50%	3.00%	0.50%
High-Yield Bonds	5.25%	4.75%	-0.50%
Bank Loans	5.50%	5.25%	-0.25%
Global Bonds (Unhedged)	1.00%	1.00%	-
Global Bonds (Hedged)	1.09%	1.09%	-
EMD External	4.75%	4.75%	-
EMD Local Currency	6.50%	6.75%	0.25%
Large Cap Equities	6.00%	5.75%	-0.25%
Small/Mid Cap Equities	6.25%	6.00%	-0.25%
Int'l Equities (Unhedged)	7.25%	7.25%	-
Int'l Equities (Hedged)	7.57%	7.57%	-
Emerging Int'l Equities	9.75%	9.50%	-0.25%
Private Equity	8.50%	8.25%	-0.25%
Private Debt	7.50%	7.25%	-0.25%
Real Estate	6.50%	6.00%	-0.50%
Commodities	4.50%	4.75%	0.25%
Hedge Funds**	5.75%	5.95%	0.20%

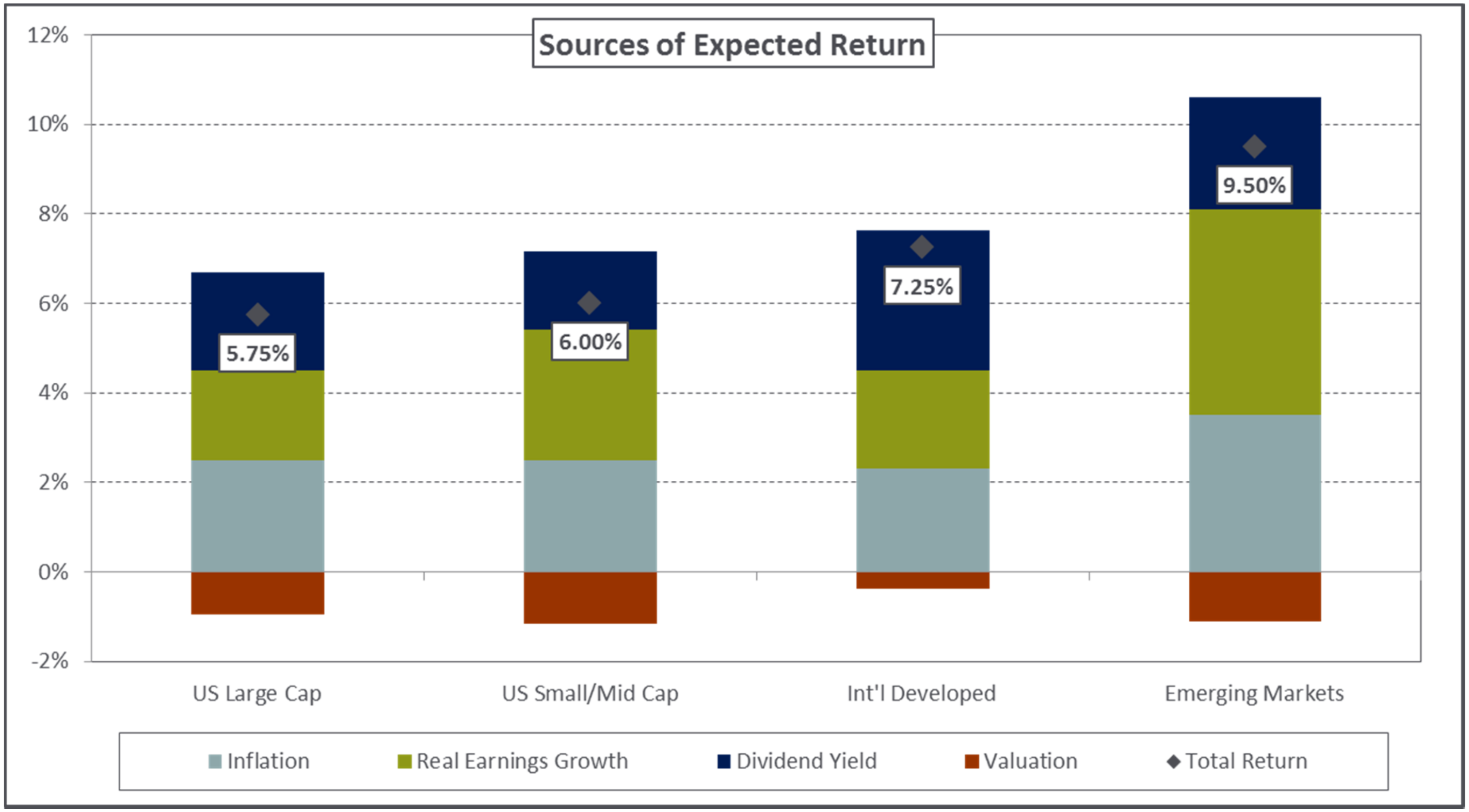
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).
** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

2017 Volatility Forecasts

Volatility			
Asset Class	**2016**	**2017**	**2017-2016**
Cash	1.00%	1.00%	-
Treasuries	5.50%	5.50%	-
IG Corp Credit	7.50%	7.50%	-
MBS	7.00%	7.00%	-
Core Bonds*	6.03%	6.03%	-
TIPS	6.50%	6.50%	-
High-Yield Bonds	13.00%	13.00%	-
Bank Loans	9.00%	9.00%	-
Global Bonds (Unhedged)	8.50%	8.50%	-
Global Bonds (Hedged)	5.00%	5.00%	-
EMD External	13.00%	13.00%	-
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)	21.00%	21.00%	-
Int'l Equities (Hedged)	18.00%	18.00%	-
Emerging Int'l Equities	27.00%	28.00%	1.00%
Private Equity	23.00%	23.00%	-
Private Debt	15.00%	14.00%	-1.00%
Real Estate	15.00%	15.00%	-
Commodities	19.00%	19.00%	-
Hedge Funds**	9.00%	8.74%	-0.26%

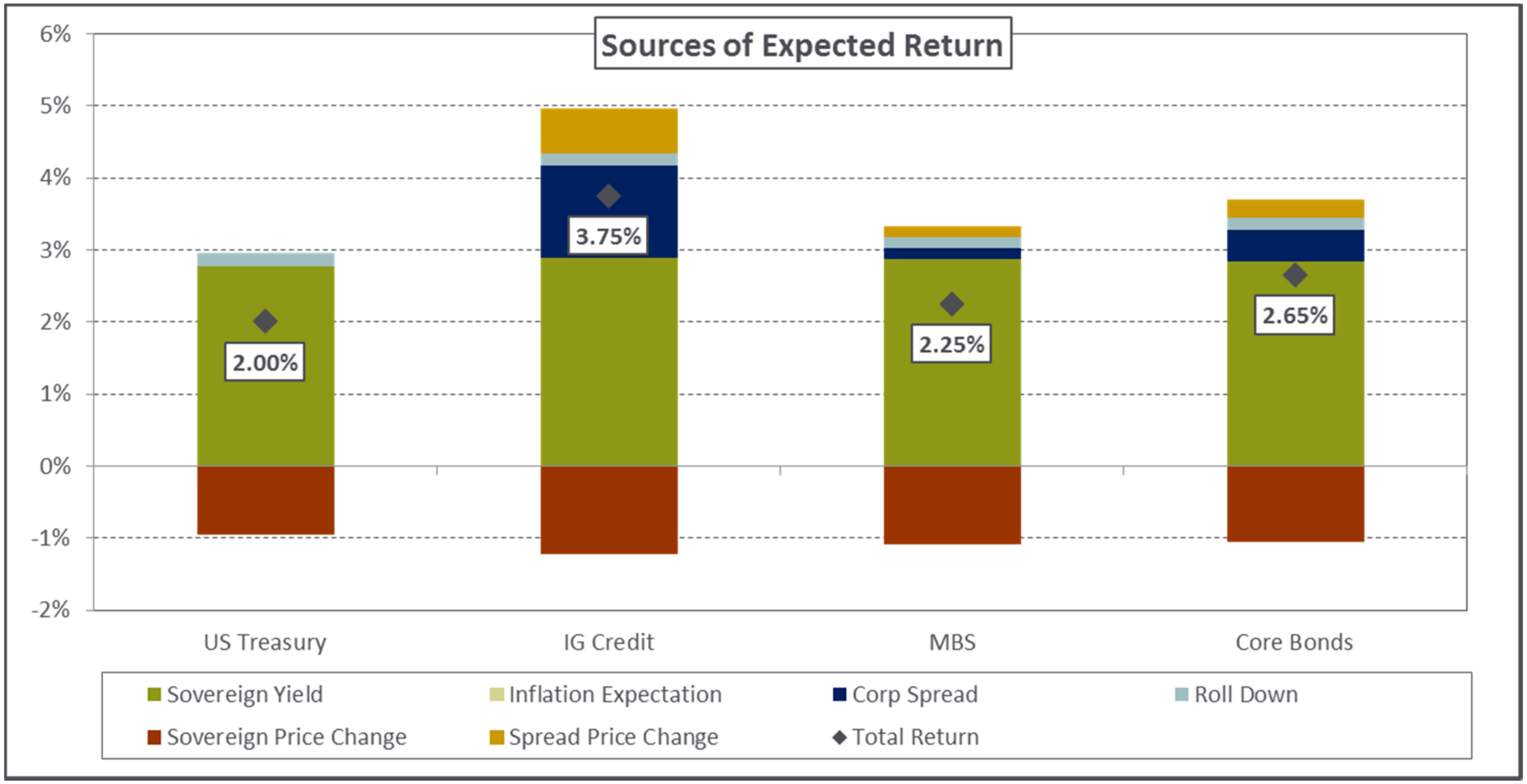
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).
** Hedge Funds is a calculated blend of 40% Equity, 40% Credit, 20% Macro-related strategies.

Assumption Development – Global Equities



Index Current	US Large Cap	US Small/Mid Cap	Int’l Developed	Emerging Markets
Trailing P/E	20.6	31.6	16.9	14.3
Profit Margin	9.5%	4.2%	6.2%	8.0%
Dividend Yield	2.1%	1.7%	3.3%	2.5%

Assumption Development – Core Bonds



Index Current	US Treasury	US Credit	US MBS	US Aggregate
Yield	1.83	3.3	2.8	2.6
OAS	-	1.2	0.2	0.5
Duration	6.1	7.0	4.5	5.9
Quality	AA+/Aaa	A-/A3	AAA/Aaa	A/Aa2
MV (Millions)	6,861,998	5,942,232	5,353,011	19,034,388

Asset Class Building Blocks Summary

- **Global Equity Building Blocks**
  - **Inflation:** Represents global inflation expectation over forecast period
  - **Real Earnings Growth:** Represents assumption for real growth for each market
  - **Profit Margin Adjustment:** Return due to shift of profit margins to forecast value
  - **Dividend Yield:** Represents dividend yield expectation over forecast period
  - **Valuation:** Return due to shift of current price/earnings ratio to forecast value
- **Commodities Building Blocks**
  - **Valuation:** Return from commodity spot price reverting to long term real average
  - **Roll yield:** Average annual yield to roll futures contract over forecast period
  - **Cash:** Expected US cash rate over forecast period
- **Fixed Income Building Blocks**
  - **Sovereign Yield:** Average expected government bond yield over forecast period
  - **Sovereign Price Change:** Expected price change due to changes in interest rates
  - **Roll Down:** Expected price change due to ageing of a bond along the yield curve
  - **Credit Spread:** Average expected credit spread over forecast period
  - **Spread Price Change:** Return due to shift of current credit spread to forecast value
  - **Credit Deterioration:** Return from credit downgrade and default over forecast period
  - **Real Yield:** Average expected government real yield over forecast period (TIPS)
  - **Real Yield Price Change:** Expected price change due to changes in real rates
  - **Inflation Expectation:** Expected inflation accrual over the forecast period (TIPS)
- **Private Markets Building Blocks**
  - **Illiquidity Premium:** Return associated with illiquidity factor specific to asset class
  - **Relative Valuation Adjustment:** Qualitative adjustment reflecting asset class views
  - **Public Market Return:** Return associated with equivalent public market beta

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