# FINANCIAL AUDIT ADVISORY COMMITTEE

## Report

## Wednesday, July 16, 2014

Present: Ald. Fuller (Chairman), Ald. Danberg, Gail Deegan, and Tony Logalbo
Also present: David Wilkinson (Comptroller), Sue Dzikowski (Director of Finance; School Department), Thomas Hanna (Chief Financial Officer and Chief Operating Officer; Pension Reserves Investment Management Board), Paul Todisco (Senior Client Service Officer; Pension Reserves Investment Board) and Kathleen Riley (Senior Vice President and Actuary; Segal Advisors), and Matthew Hunt (CPA; Clifton, Larson, & Allen, LLC)

The Committee met with Actuary Kathleen Riley of Segal Advisors (the actuary for the City's pension fund), CPA Matthew Hunt of the City's accounting firm Clifton Larson and Allen, LLC, and Thomas Hanna and Paul Todisco of the Pension Reserves Investment Management (PRIM) Board (the agency that invests both the City's pension and retiree health insurance (OPEB) funds) to start planning for the implementation of Governmental Accounting Standards Board (GASB) Statement 68. GASB 68 requires the City to include all of its unfunded pension liabilities in the City's Comprehensive Annual Financial Report (CAFR) for Fiscal Year 2015. The City wants to be sure that the implementation process goes smoothly and all of the groups that provide information on pension liability are on the same page in terms of what information is needed and how it is presented.

Auditor Matthew Hunt stated that from an audit perspective Newton is well ahead of the game in terms of implementation of GASB Statement 68. He added that the City's actuarial firm has put the City in a good place. Essentially, Segal Group included GASB Statement 68 information in the January 1, 2014 actuarial evaluation (a year before it is required). Some of the information provided in the valuation is to be determined as 2014 has not yet come to a close. Actuary Kathleen Riley has done a great job of laying out a significant amount of the information that Clifton Larson Allen, LLC (CLA) is going to need for implementation. As an audit firm, CLA assists the City with the financial statements and will require information from the actuarial valuation. Having looked at the January 1, 2014 actuarial valuation, the City and actuary are well on their way to capturing the information that will be needed for the implementation. Mr. Hunt feels the City is in a great position in terms of planning for implementation. Comptroller David Wilkinson added that the Newton Retirement Board has spent time with Actuary Kathleen Riley and are confident that Segal Advisors has an especially good grasp of what is needed for implementation of GASB Statement 68.

The City will not see the pension liability until the June 30, 2015 Comprehensive Annual Financial Report (CAFR); however, on those statements there will be a prior period adjustment that will decrease the net assets as of June 30, 2014 for the liability that existed at that time. The liability is going to have a measurement date of January 1, 2014. The measurement date can be different than the fiscal year end date. Since the City has actuarial valuations every year as of January 1, it makes sense to have that be the measurement date for the City. The January 1, 2014 valuation is going to provide the basis for the prior period adjustment that is going to show up in the 2015 financial statements.

One of the details of implementation is the percentage allocation between the City and Newton Housing Authority. The Newton Retirement System as a whole has an unfunded pension liability of approximately $270.8 million. The City needs to allocate that between the City and the Newton Housing Authority. The Newton Housing Authority's share is about 1% or $2.8 million. The allocation is based on expected future contribution rates. Looking at the 2016 contributions, it looks like the Newton Housing Authority is at a little under 1% of the contributions. The auditors will need a breakout of the City of Newton's portion versus the Newton Housing Authority's portion. Ms. Riley stated that the actuaries will have no problem providing that information. By showing the percentage breakdown between the City and the Housing Authority, it will be very clear to anyone looking at the 2015 financials where the numbers are coming from. Basically, what the City is looking at for the prior period adjustment is a liability of approximately $268 million. The City will not know what the actual liability will be until 2014 comes and goes.

From an implementation preparation stand point, the auditors will work closely with Segal Advisors and the Comptroller after the 2014 books close and some of the needed data is available. Ms. Riley pointed out that there will need to be a decision on what fiscal year appropriation percentage the City wants to use to assign the liabilities, as the percentage varies slightly each year. These are details that can be worked out internally but the decision making process will be documented in writing. Mr. Hunt added that how that determination is made needs to be part of the City's footnote disclosures in the 2015 CAFR. Because the City does an annual valuation, it makes sense to use the January 1, 2015 valuation. The bottom line is that the City is well on its way to implementation. The City already has a good idea of what the beginning balance of the liability is going to be. Once 2014 is over, the auditors will be well on their way to getting the data they need for the Fiscal Year 2015 financial statements. It looks like the Retirement Board actuary, Segal Associates, is doing a great job in capturing what the external auditors will need for GASB Statement 68 implementation.

Mr. Hunt reviewed what the auditors will need from the investment managers – PRIM – for implementation of GASB Statement 68. One piece of the information that gets shown in the financial statements for GASB 68 is the net difference between the projected investment earnings and the actual investment earnings, which the auditors will need. Ms. Riley pointed out that the actuaries already get that information as part of the annual valuation. Mr. Hunt will also need additional information for disclosures, specifically the long-term expected rate of return on pension plan investments and a description of how that long-term rate was determined and the methods and assumptions behind the determination. This information is typically part of the actuarial valuation but the one piece that is really important is the methods and assumptions that are used to come up with the expected rate of return information. PRIM will provide that information. Secondly, if at any point in time there is a situation where the City runs out of net assets, the City would have to use a municipal bond rate as part of the discount rate. The PRIM representative would likely help the City establish the municipal bond rate at that time. This situation is very unlikely to occur. Lastly, disclosures about asset allocation of the pension plan's portfolio are required. The auditors will need the long-term expected rate of return for each asset class within the portfolio, and whether the rates of return are presented on arithmetic or geometric means. PRIM will also provide that information.

Tom Hannah and Paul Todisco provided the attached information titled "Massachusetts PRIM Board Asset Allocation Discussion." The handout provides the kind of information that the PRIM representatives are able to readily provide to the City. The presentation includes information from February 2014 on expected returns for each asset class; it goes into the assumptions underlying how the returns were arrived at, expected returns for each asset class, and risk for each asset class. The PRIM representatives believe that all the information the auditors require is readily available but if more robust information is needed they will be happy to provide the information.

Mr. Hannah has had a conversation with PRIM's bank and has a phone meeting scheduled; the bank is providing the returns in an IRR format. The bank should be able to provide the geometric linked returns, which is what the PRIM shows in its performance report. Mr. Hannah will continue to work with the bank to get the right format for the returns. PRIM is also talking with its auditors about the same issue in order to be as informed as possible and to determine the best way to assist municipalities. Pages 38 and 39 of the handout provide rationale for assumptions. The City may need even more robust information about the assumptions that PRIM uses.

Mr. Hunt stated that he will use the GASB Statement 68 implementation guide that provides sample disclosures to determine the level of information and detail that is needed for correct implementation. The auditors will work with the City Comptroller to determine what level of detail is appropriate, as well. These details can easily be worked out as implementation approaches. David Wilkinson added that the City is very comfortable with the information contained in the handout, as the information has been shared with the Retirement Board over the past few years. The Retirement Board has leaned on that information for purposes of trying to decide what the future rate of return is going to be but the Retirement Board has never gotten into the detail behind the assumptions. If there is going to be a problem with the information, it will be in the logic for the underlying return assumptions.

The PRIM Investment Committee has robust conversation regarding how assumptions are derived at its meetings. The consultants and investment teams are present and discuss the mathematical models that feed the assumptions. New England Pension Consultants (NEPC) and the PRIM Board have more background on the assumptions, if the City needs it. The Comptroller requested that Mr. Hannah alert the PRIM Board that this is an issue and possibly provide boilerplate disclosure language.

There was a discussion about the appropriate time period for the rate of return assumption. From a long-term rate of return perspective, the discount rate on the actuarial valuation is based on the long-term projections of being able to fund the liability. Therefore, it would make sense that the definition of long-term is the horizon over which the pension plan is going to be funded. It was pointed out that the City has continued to change the year that it expects its pension liability to be fully funded. Mr. Hannah asked that as the horizon contracts or expands is the City asking PRIM to define the long-term in different ways. Kathleen Riley stated that she would not say that the definition is necessarily the full funding horizon, as the City's liabilities actually go out over a much longer period of time than when the liabilities will be fully funded. From an actuarial standpoint, when setting that assumption, one looks at a reasonable range for that assumption. To set a reasonable range, experts tend to look at 5, 10, 15, and 20 year time horizons. To get to the 7.65% assumption that the City is using currently, the City needs to go out close to 20 years to justify the long-term assumption given the current interest rate and return environment. The PRIM Board goes out 30 years, which should not be an issue and should work for the implementation.

Mr. Hannah and Mr. Tedisco reiterated that there should be no problem with providing any of the information that the City needs for GASB Statement 68 implementation. If the Prim Board consultant, NEPC, can come with the description of the methodology for projecting the return assumptions this year, it would be very helpful. Mr. Hannah responded that it should not be a problem and that they can also provide more robust detail on the 30 year return assumptions, and provide a sample of the weighted return information. It will allow the auditor to review the information and determine if any of the information needs to be tweaked.

The Commonwealth will be providing the City with information on its share of the Massachusetts Teachers pension liability. Right now, the City reports the "on behalf of the City" payments that the State makes, which is all that has been required. Mr. Hunt will investigate further to determine how the Massachusetts Teachers' retirement piece will come into play for the City of Newton statements.

There was a brief discussion regarding Other Post-Employment Benefits (OPEB) liabilities. The actuarial contract for the OPEB work is a $6,000 a year contract. The City will already have the information from PRIM as it is investing in the same funds for pension and OPEB liabilities. It was pointed out that there needs to be an internal discussion on the OPEB liability funding.

Mr. Hannah gave a big picture overview of steps that PRIM is taking to prepare for a potential market corruption. The market is overdue for a down turn of perhaps 5% to 10%. The market continues to grow but PRIM is moving money in order to have less risk. Within fixed income, PRIM has moved some of its indexed fixed income funds and moved them into 20-year plus treasury type investments as a stabilizer for a market down turn and for higher interest rates. PRIM is reducing its equity exposure from 43% to 40% and taking 1% from the hedge fund allocation and redeploying it into portfolio completion strategies, which will be defined. Some money ($1billion) is being rebalanced to fixed income and hedge fund opportunities. The plan is to shift $3 billion within fixed income from the indexes to the long treasuries as market interest rates increase. From this point on, there is a quarterly plan as rates go up in a systematic way to move things from the indexes into long-term treasuries, which is not going to give the same yield but will improve risk and provide stability as interest rates rise. There is a lot of uncertainty around interest rates. Mr. Hannah added that he can pass around a recent analysis that the Board uses to understand where PRIM's portfolio is going. PRIM wants to be prepared for any down turns in the market. They are trying to find ways to be more cognizant of possible down turns and avoid as much loss as possible.

Respectfully submitted,

Ruthanne Fuller, Chairman

NEPC, LLC

YOU DEMAND MORE. *So do we.*[SM]

# Massachusetts PRIM Board

## Asset Allocation Discussion

January 8, 2014

255 State Street, Boston, MA 02109 | TEL: 617.374.1300 | FAX: 617.374.1313 | www.nepc.com
BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | SAN FRANCISCO

# Agenda

- **Introduction**
- **Capital Markets Overview**
- **Asset Allocation Recommendation**
- **Asset-Liability Analysis**
- **Appendix**
  - Asset Class Assumption Development
  - Asset-Liability Study Assumptions and Methodology

# Introduction

- **This report presents the results of the asset-liability study conducted on the combined pension obligations of the Commonwealth of Massachusetts**
  - State Employees' Retirement System
  - Massachusetts Teachers' Retirement System
  - Boston Teachers
  - Cost of Living Allowance Reimbursements to Local Systems

- **The goals of the study are to:**
  - Review the current and projected financial status of the pension plan over the next 5-10 years
  - Assess the appropriateness of the current asset allocation relative to the expected progress of liabilities and cash flows
    - Identify methods to reduce the volatility of funded ratio and address other key risks facing the plan
    - Recommend an asset allocation target

- **The challenges of the study are:**
  - We need to use assumptions for the funding/contribution schedule which can change
    - The assumptions are based on conversations with PERAC and are detailed in the Appendix
  - We used an assumed calendar year return for PRIM of 13.5%
    - This is an estimate only
  - We won't have an updated scenario analysis until February
    - This analysis should provide additional support for the recommendations contained herein

# Capital Markets Overview

# Background

- **Economic conditions are diverging globally**
  - Developed vs. EM
  - Within regions as well

- **Forward-looking expectations are diverging relative to last year**
  - Continued rally in developed equities compresses outlook
  - Increase in yields for most bond asset classes improves return forecasts
  - EM equity and debt expectations remain elevated
  - 30 year returns are generally higher for fixed income and unchanged or modestly lower for equities

- **US monetary policy is diverging from other developed markets**
  - Taper of Quantitative Easing will have global implications

- **Markets have generally shrugged off macro concerns**
  - Volatility remains quite low
  - Risks and uncertainty remain throughout the global economy

# NEPC 2014 Capital Market Observations

- **Diversification still matters, especially after a period when not rewarded**
  - The discipline of long-term strategy allows for participation in rising markets, while maintaining a defensive position when markets correct
- **Divergence in economic conditions broadens range of outcomes by country**
  - Differences reflect each country's policy response since Financial Crisis
  - Market risks continue to simmer beneath strong equity returns
- **Developed world growth outlook has improved despite fiscal drag**
  - Impact of fiscal tightening is likely to subside and be less of a hindrance going forward
  - Inaction on fiscal concerns may lead to difficult long-term consequences
  - Lack of proactive fiscal response is in stark contrast to audacious moves of central banks
- **US Fed taper will occur throughout 2014 with global implications**
  - Growth and inflation outcomes will dictate any change to path (timing and scale) of tapering
  - Methodical approach to taper means policy should remain accommodative
  - Ability to support risky assets could wane over time
- **Upward pressure on interest rates may have subsided**
  - Markets have absorbed increase in rates, though elevated future volatility is likely
  - Further increase in interest rates must harmonize with stronger economic growth
  - Higher rates and slowing growth could perpetuate currency crisis for some EM countries

# NEPC 2014 General Actions for Clients

- **Remain disciplined and rebalance after strong market run**
  - Resist the temptation to chase returns – focus on your goals and objectives
  - A balanced allocation through the taper allows assessment of opportunities afterward
    - Much more difficult to time a move away from risky assets
- **Take gains in US equities, allocating to underperforming asset classes**
  - US equity risk premium has decreased, as recent performance suppresses future returns
  - In the short-term, US stocks could outperform further due to continued monetary support
  - With improvement off low levels, Europe is positioned for some outperformance
- **Maintain long-term commitment to emerging markets**
  - In the short-term, emerging world faces distinctive conditions in each country
  - Long-term secular outlook of stronger growth and continued development remains in place
  - Use active management to navigate potential macroeconomic and currency issues
- **Assess credit exposure and consider a more dynamic approach**
  - Narrow spreads and constrained liquidity expose investors to potential downside risks
  - Though spreads are tight, overall rates appear more attractive after increase in yields
  - Strategic exposure to interest rates remains an important element of diversification
- **Employ private markets to boost return outlook**
  - European illiquid opportunities from debt to real estate remain compelling
  - Senior lending continues to offer attractive yields, though pricing has compressed
  - Consider increasing strategic inflation hedging through private strategies
    - Inflation is a developing concern but expectations for liquid real assets remain muted

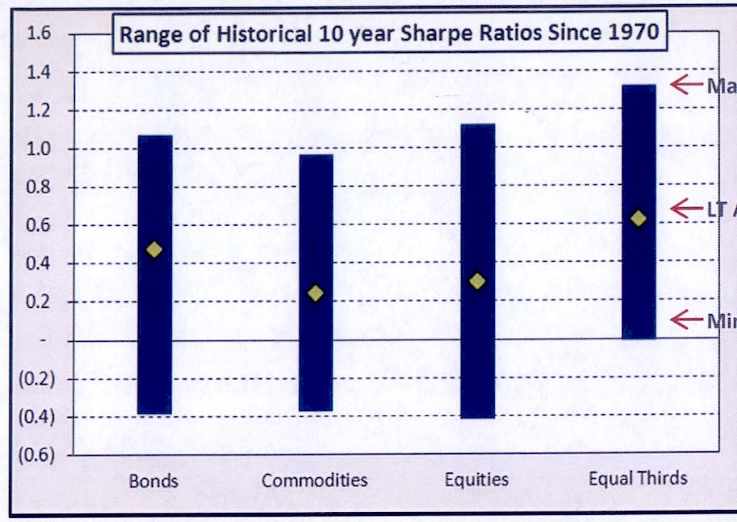
# Diversification Wins In The Long Run

- **Historically strong performance for one asset class does not signal the ruin of diversification**
  - In fact, periods following these runs are often when diversification is most rewarded

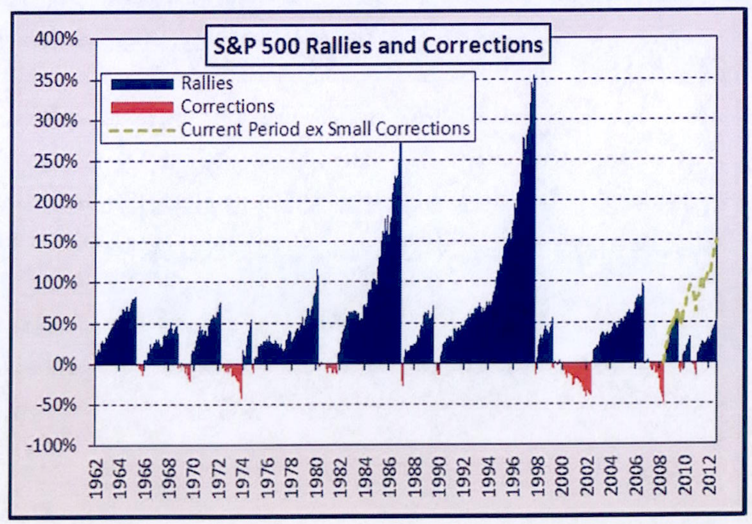
- **Discipline of diversification requires a long-term focus to withstand concentrated results**
  - Both good (US Equities in 2013)…
  - And bad (2008)

- **Over the long term, diversified portfolios will likely produce better risk-adjusted returns than concentrated ones**

- **Concentrated portfolios will correct after long bull runs**

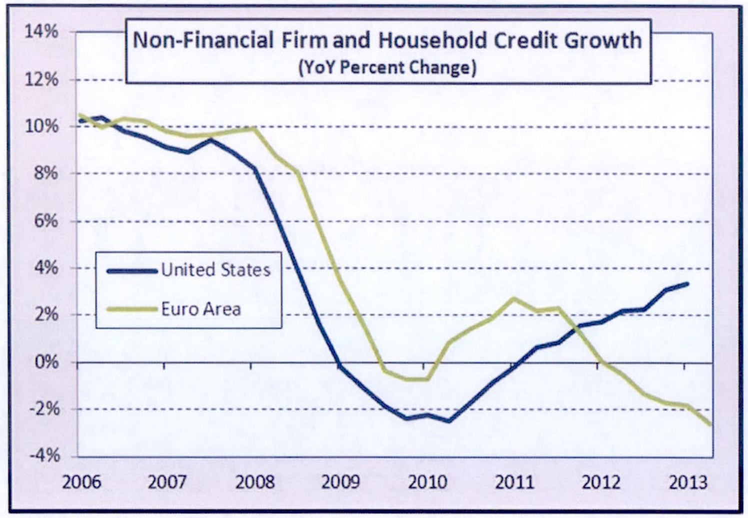



*Source: Bloomberg, NEPC*

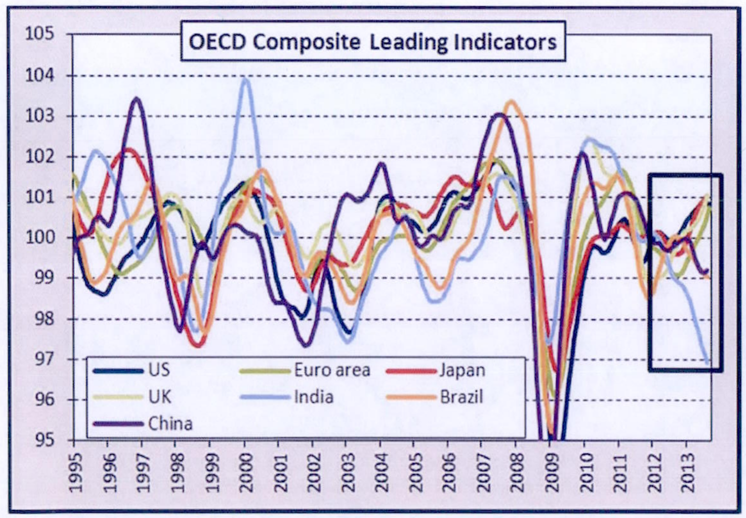



*Source: Morningstar as of 10/31*

- **US Fed has been aggressive and creative in managing monetary policy since 2008**
  - Has led to better economic conditions in the US and potential to pivot away from Quantitative Easing
- **Europe has been much more reactive**
  - Authorities continue to lack the broad coalition to manage the varying conditions across countries
  - Improvement off such low levels has potential to lead to strong asset returns in short term
- **Emerging markets continue to see moderation in economic activity as they work towards more internalized growth**
  - China's announcement of reforms signals a continued willingness to promote growth and further integration with global economy



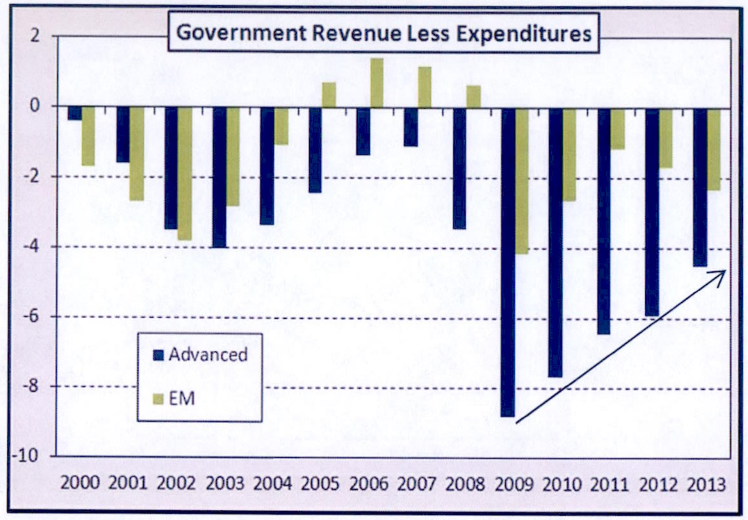

*Source: IMF*



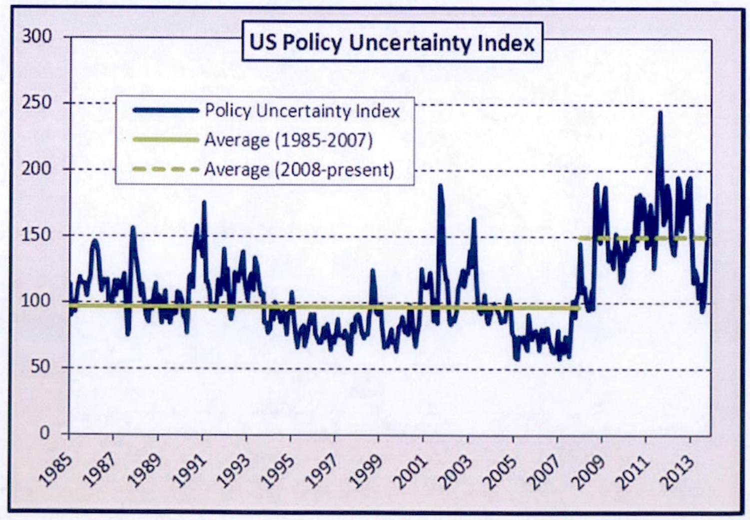

*Source: Bloomberg as of 9/30*

# Fiscal Authorities Continue to "Kick-The-Can"

- **Protraction and indecision have been the drivers of fiscal policy**
  - Lack of consensus has led to fiscal tightening
  - Sequester/shutdown in US
  - Prerequisite of austerity for aid in EU
- **Compression of fiscal deficits slowed economic growth relative to potential in 2013**
- **Developed economies withstood fiscal consolidation and experienced positive growth**
  - Fiscal pressure is reduced in 2014
- **Lack of broad, proactive fiscal policy in developed world leads to increased uncertainty**
  - Potential for further US debt ceiling theatrics
  - Mid-term election rhetoric could cause further discord

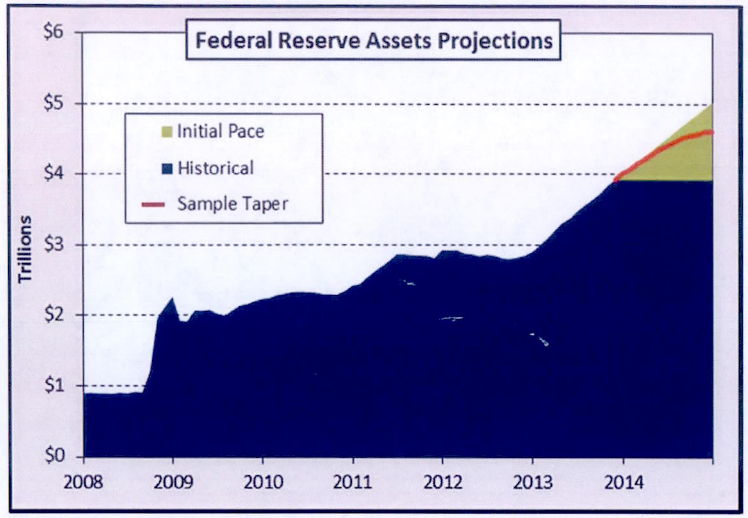



*Source: IMF*

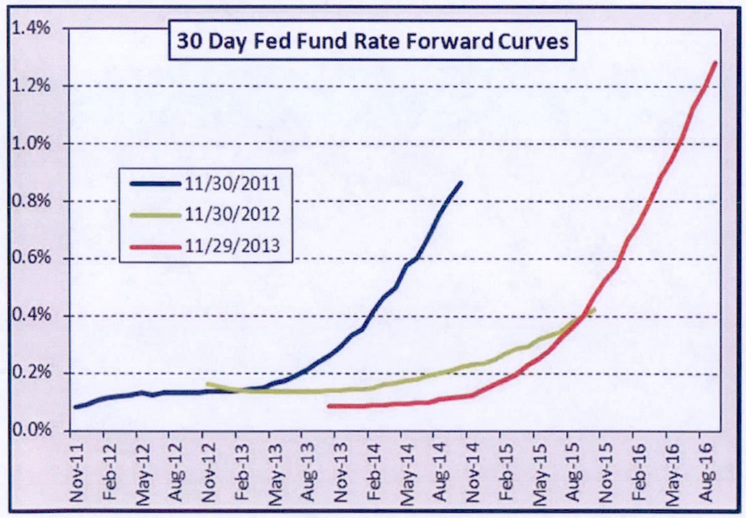



*Source: policyuncertainty.com*

- **Monetary stimulation continues to offset fiscal weakness**
  - New fed chair expected to promote continuity
- **Taper begins in 2014 with modest introduction**
  - Further scale and pacing will be "data-dependent"
  - Driven by underlying economic conditions and reaction to changes
- **Less stimulation is relative to accommodative initial conditions**
  - Zero-rate policy likely in place for extended period
  - Fed will continue experimenting with Forward Guidance as taper evolves
- **US monetary policy has dramatic global implications**
  - Potentially slows US economy, cooling global growth
  - With higher rates, the US becomes a more viable competitor for capital
    - Exacerbates challenges in EM



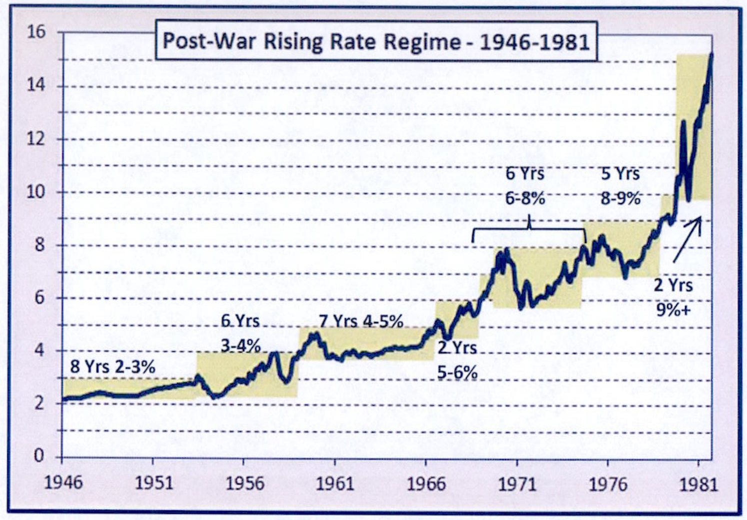

Source: NEPC, Board of Governors of the Federal Reserve System



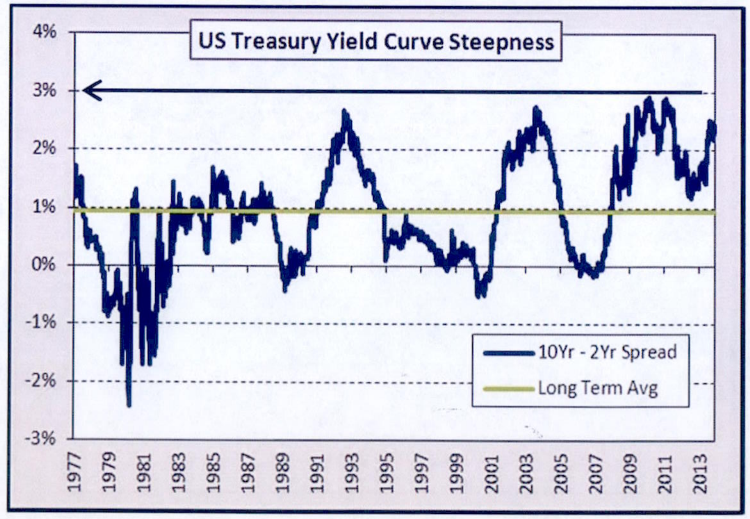

Source: Bloomberg as of 11/30

# Economic Conditions Determine How Far Rates Can Increase

- **In 2013, global markets reacted sharply to potential monetary policy shift**
  - Rates rose and markets sold off
  - Markets have stabilized since the brief period of volatility in May/June
- **Uptick in rates could occur through different factors**
  - Stronger economic growth
  - Higher inflation
  - Aggressive monetary tightening
- **The current yield curve is historically steep which implies that rate increases are more likely to occur on the short end rather than the long end of the curve**
  - Yet economy activity remains subdued
  - Slower growth and muted inflation likely extend cycle for rate increases
  - Fed has indicated rates will remain low even after QE ends
- **Rate cycles are long (30+ years)**
  - 1946-1981 (up for 35 years)
  - 1981-2012 (down for 31 years)
  - 2012-????




Source: St. Louis Fed



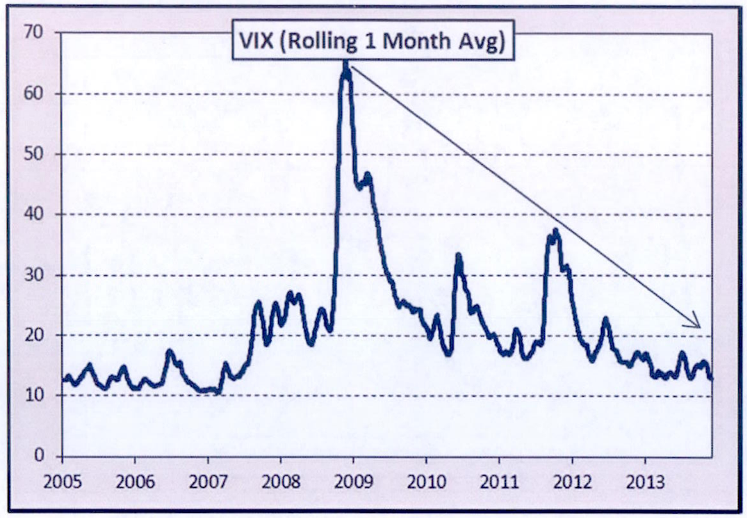

Source: Bloomberg as of 11/30

## Discipline and Discretion are Required Despite Markets Moving Higher

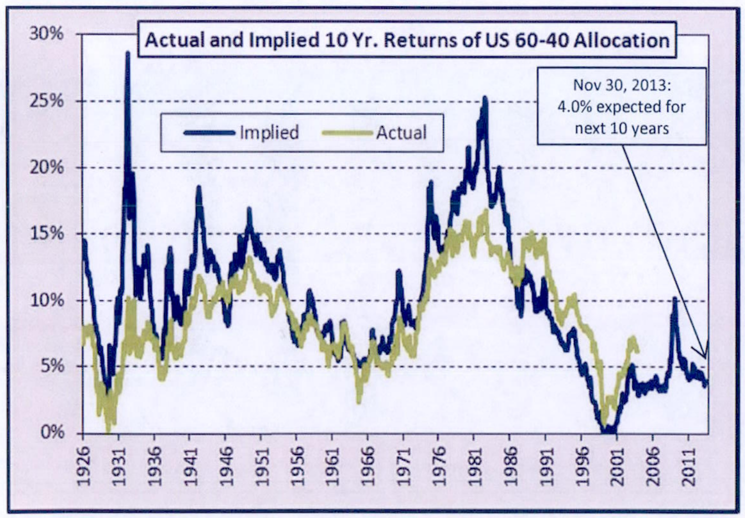
- **Market conditions remain calm**
  - Equity volatility remains near secular lows while prices continue to move higher
  - Credit spreads continue to tighten
  - Markets have been much more resilient to macro news recently

- **Strong returns and tranquil markets can lead to a false sense of comfort**
  - Rebalancing remains critical
  - A willingness to forgo some upside can lead to better outcomes over a full market cycle after markets correct

- **Return expectations are even more compressed following strong rally**
  - Low yields limit potential return
  - Diversification, active management, and risk management can be used to navigate challenging environment rather than simply stretching for returns through increased risk




*Source: Bloomberg as of 11/30*



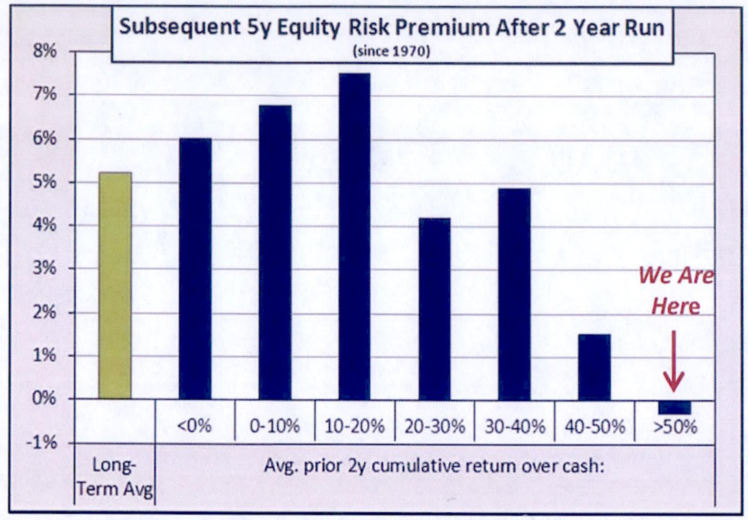

*Source: Shiller Data, Bloomberg, NEPC*

## How Much Further Can US Equities Run?

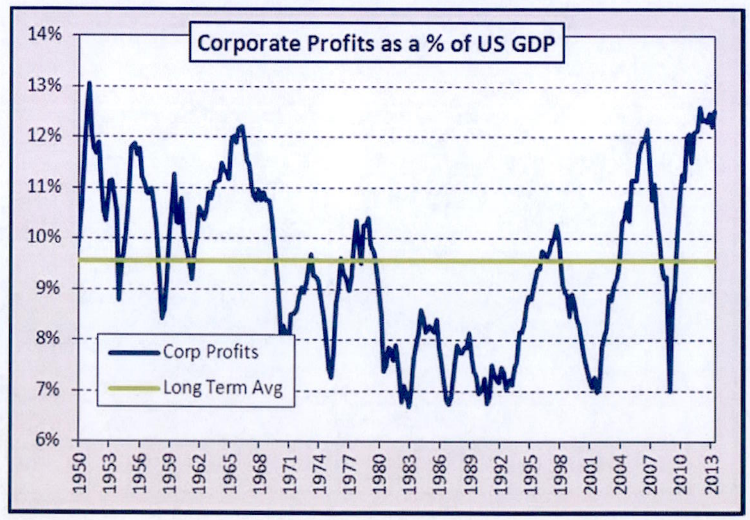
- **S&P 500 has gained more than 50% cumulatively over the last two years (as of Nov. 30th)**
  - Historically, this has led to subdued performance looking forward

- **With accommodative monetary policy, US stock market could continue to grind higher**
  - Further upside (likely driven by more valuation expansion) seems unsustainable given how far markets have run

- **Strength of corporate profits has supported equity rally**
  - Corporate profits have historically shown mean reversion
    - Supported in the short-term by low financing costs for corporations

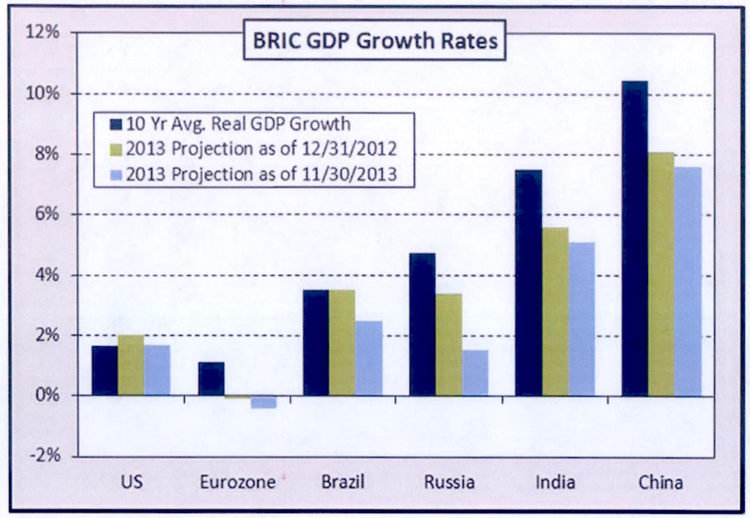



(Eq. Risk Premium is over cash) Source: Bloomberg, NEPC

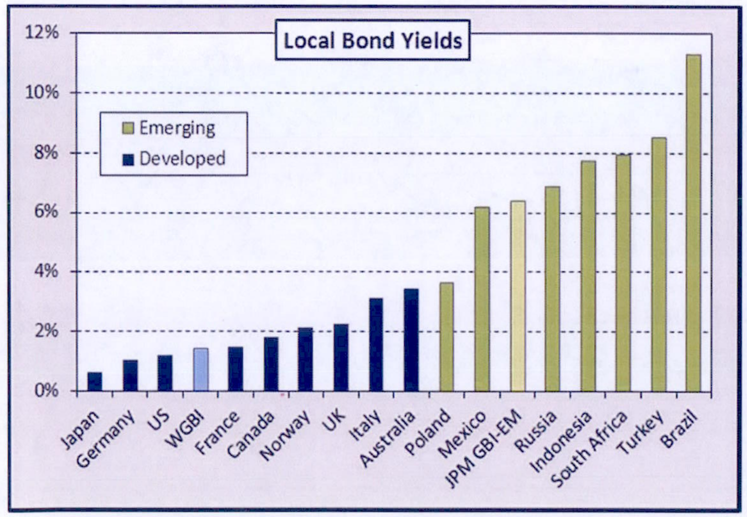



Source: Bloomberg as of 6/30

- **EM output has moderated after decade-long boom**
  - Still positive and expected to exceed developed world growth
  - Emerging world likely to continue to grow in global economic importance
- **Recent weakness offers an opportunity to build positions for those investors with below-market exposure to EM**
  - Valuation and yield levels offer some compensation for current uncertainty
  - Active implementation can facilitate management around volatility at country and security level
- **Credit and liquidity have become constrained in certain countries**
  - Countries reliant on inflows to finance current account deficits now face currency challenges
  - Adjustment in yields (higher) and currencies (lower) in these countries has brought some short-term stability
    - Potential for balance of payment crisis remains elevated in certain countries

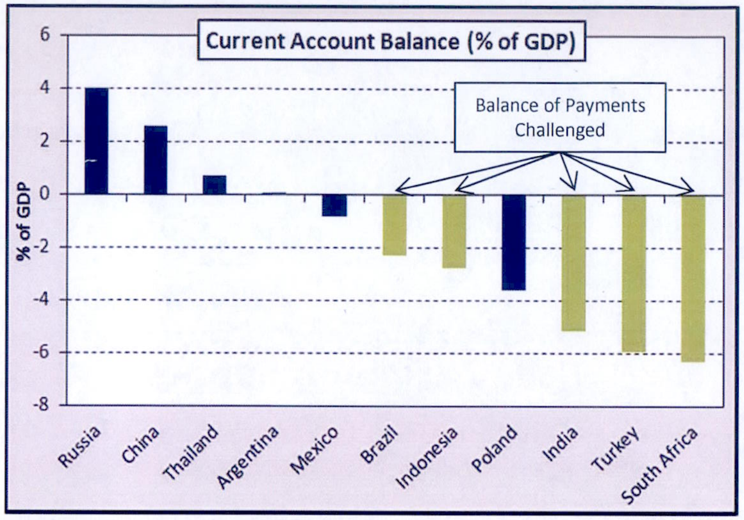



*Source: Bloomberg as of 11/30*

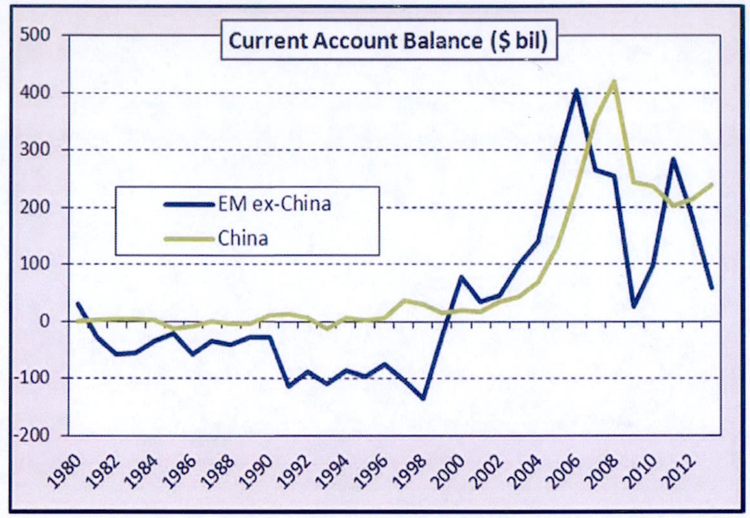



*Source: Bloomberg as of 11/30*

# Emerging Countries Facing Current Account Challenges May Face Further Adjustment




Source: IMF

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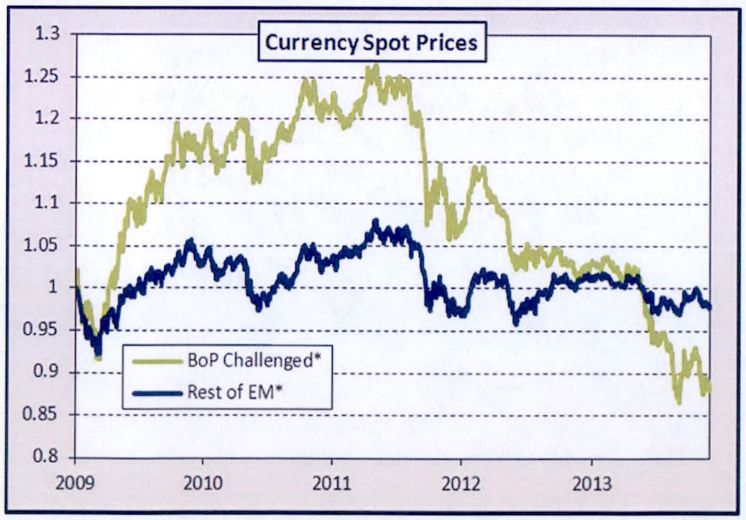
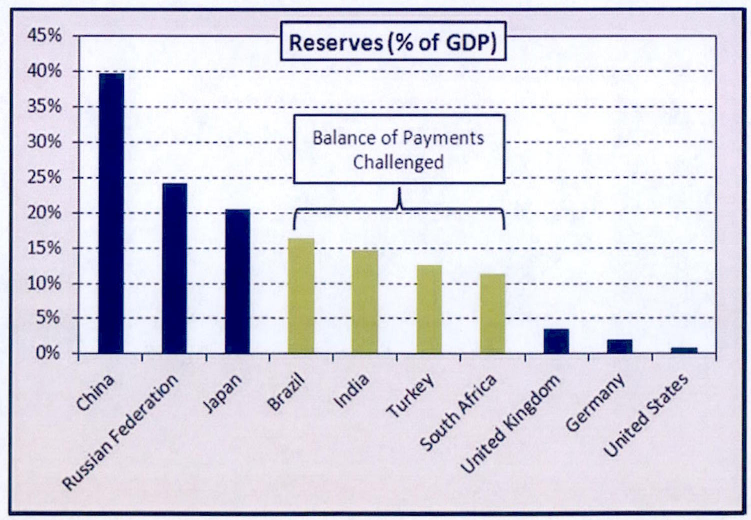



Source: Bloomberg, NEPC as of 11/30 *Non-weighted averages

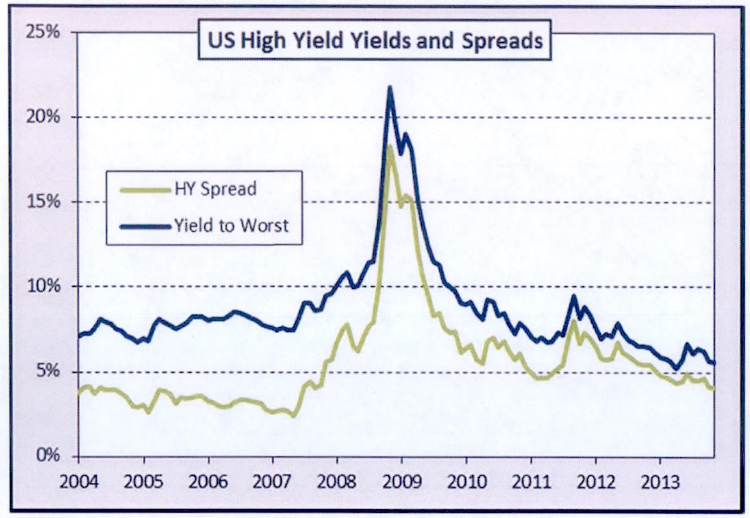



Source: IMF

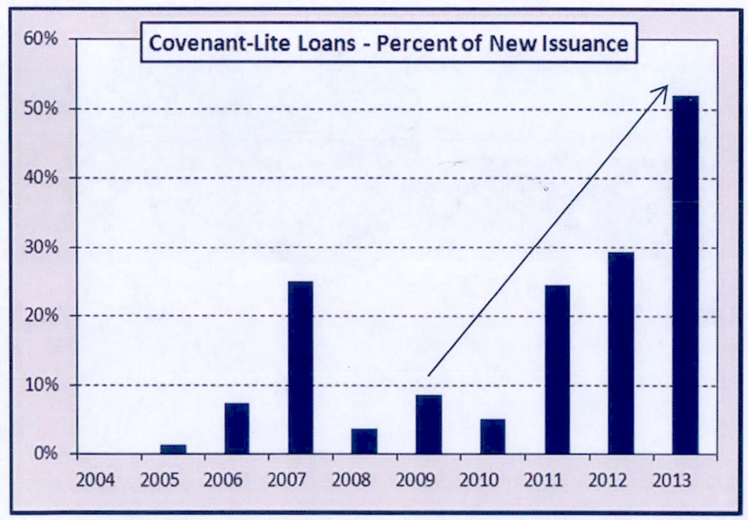
Balance of Payments (BoP) Challenged Countries: Brazil, Turkey, India, Indonesia, South Africa

# US Credit Market Conditions Are Concerning

- **Global monetary policy and low interest rate environment force investors to search for yield**
- **Demand for higher return has led to significant flows into credit markets**
  - Yields and spreads have compressed across credit markets
  - High yield and investment grade total yields are near all-time lows
- **New issuance reflects the demand for yield**
  - Relaxed credit standards in loan market suggest early warning signs of less discipline in lending and credit analysis




*Source: Barclays Live as of 11/30*

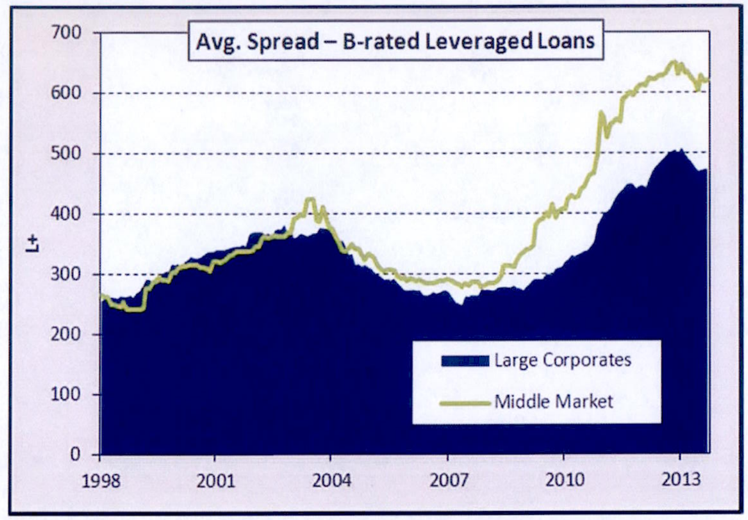



*Source: Standard and Poors*

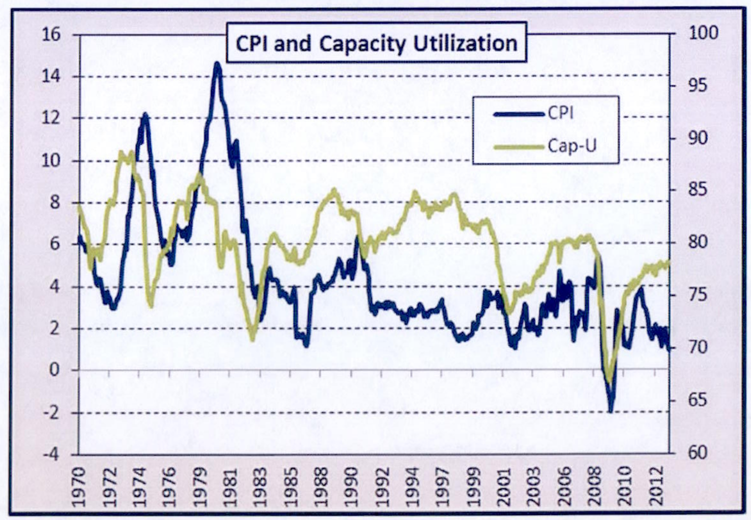
- **Private investments can offer an illiquidity premium and higher return expectations than subdued outlook of liquid markets**
  - Driven by the same forces as public markets and subject to the same building of excesses and loose standards over a cycle
  - Strategy and pacing remain critically important

- **As banks continue to move towards tighter regulatory framework of Basel III, lending opportunities remain attractive**
  - Spreads are less compelling than a year ago
  - European direct lending and real estate appear most interesting now

- **Private exposure to inflation sensitive assets may be a better way to get real assets exposure in near term**
  - Though with spike in real yields, Inflation-Linked bond pricing has improved




Source: S&P Capital IQ LCD and S&P/LSTA Leveraged Loan Index as of 9/30




Source: St. Louis Fed

# Asset Allocation Recommendation

- **We are recommending that the asset allocation policy be adjusted to add long treasuries and incorporate a "portfolio completion" bucket**
  - Long duration Treasuries replacing core bonds to deliver more concentrated rates exposure to help diversify equity risk
  - Portfolio completion category to capture ideas such as absolute return, alternative beta and global asset allocation that do not fit neatly into other categories
    - Funded from equities and hedge funds
  - *Net impact: Lower equity risk concentration, similar expected return with reduced volatility, likely lower fees and better liquidity/transparency*

- **Annual required contributions have increased significantly since the last funding schedule was adopted**
  - Five-year smoothing of investment returns means that 2008 losses weren't fully recognized until 1/1/2013
    - Only 60% of 2008 losses were recognized at time of our last study

- **Funded status expected to increase slightly over next 10 years**
  - Increases in the range of 1-4% depending on contribution schedule adopted by the state

- **Benefit payments exceed expected contributions each year**
  - Not expected to have any adverse liquidity implications over the time horizon

# Recommended 2014 Asset Allocation Mix

| | Current Actual Allocation* | Current PRIM Target | Proposed Allocation | Changes to Allocation (Proposed v. Target) | 2014 Expected Return 5-7 Yr. | 2013 Expected Return 5-7 Yr. | Difference |
|---|---|---|---|---|---|---|---|
| Large Cap Equities | 16% | 15.0% | 14.5% | -0.5% | 6.25% | 6.75% | -0.50% |
| Small/Mid Cap Equities | 5% | 4.0% | 3.5% | -0.5% | 6.25% | 7.00% | -0.75% |
| Int'l Equities (Unhedged) | 18% | 17% | 16% | -1% | 7.25% | 7.75% | -0.50% |
| Emerging Int'l Equities | 7% | 7% | 6% | -1% | 9.50% | 9.75% | -0.25% |
| **Total Equity** | **46%** | **43%** | **40%** | | | | |
| Core Bonds | 12% | 10% | 0% | -10% | 2.53% | 2.04% | 0.49% |
| High-Yield Bonds | 1.5% | 1.5% | 1.5% | | 4.50% | 5.00% | -0.50% |
| Bank Loans | 1.5% | 1.5% | 1.5% | | 5.00% | 5.00% | 0.00% |
| EMD (External) | 1% | 1% | 1% | | 5.00% | 4.00% | 1.00% |
| EMD (Local Currency) | 2% | 2% | 2% | | 5.75% | 5.00% | 0.75% |
| TIPS | 1% | 3% | 3% | | 2.50% | 1.50% | 1.00% |
| Long Treasuries | 0% | 0% | 10% | 10% | 3.00% | 2.00% | 1.00% |
| **Total Fixed Income** | **19%** | **19%** | **19%** | | | | |
| Private Equity | 11% | 10% | 10% | | 8.75% | 9.00% | -0.25% |
| Private Debt | 2% | 4% | 4% | | 8.00% | 8.50% | -0.50% |
| Real Estate (Core) | 8% | 10% | 10% | | 6.25% | 6.00% | 0.25% |
| Hedge Funds | 9% | 10% | 9% | -1% | 5.50% | NA | |
| **Total Alternatives** | **31%** | **34%** | **33%** | | | | |
| Timber/Natural Resources*** | 4% | 4% | 4% | | NA | NA | |
| Portfolio Completion Strategies** | 0% | 0% | 4% | 4% | NA | NA | |
| **Total Other** | **4%** | **4%** | **8%** | | | | |

| | | | |
|---|---|---|---|
| ***Expected Return 5-7 Yr.*** | ***7.1%*** | ***7.1%*** | ***7.1%*** |
| ***Expected Return 30 Yr.*** | ***8.2%*** | ***8.2%*** | ***8.2%*** |
| ***Standard Dev of Asset Return*** | ***13.3%*** | ***12.9%*** | ***12.3%*** |
| ***Sharpe Ratio*** | ***0.42*** | ***0.43*** | ***0.46*** |
| ***Asset Duration*** | ***1.0*** | ***1.0*** | ***2.1*** |

*The Current Actual Allocation is as of Oct. 31st 2013
**For the Portfolio Completion Strategies, the risk/return assumptions are modeled as 50% Credit Hedge Fund and 50% GAA
***Timber/Natural Resources consists of 50% Commodities and 50% Private Real Assets (Illiquid)

- **PRIM should begin to reposition the fixed income portion of the portfolio immediately**
  - Use a phased-in approach removes the risk with moving 10% of the portfolio immediately
  - The proposed transition plan offers both time diversification and potential adjustments based on increased attractiveness after rising rates
    - This is a strategy that many corporate clients use as they implement a liability-based investment strategy

- **PRIM should undertake further due diligence for strategies that could be included in the Portfolio Completion allocation**
  - The actual funding decision and final targets will be subject to successful due diligence and identification of appropriate managers

# Asset-Liability Analysis

## Plan Summary (All $ in Billions)

| Retirement Plan Funded Status | 1/1/2013 Results | 1/1/2014 Estimate |
|---|---|---|
| 1. Actuarial Accrued Liability | $71.9 | $74.3 |
| 2. Actuarial Value of Assets | $43.5 | $45.7 |
| 3. Unfunded Actuarial Liability (1 minus 2) | $28.3 | $28.6 |
| 4. Funded Ratio (2 divided by 1) | 60.6% | 61.5% |
| 5. Market Value of Assets | $43.8 | $47.5 |

- **Asset performance exceeded 8.0% expectation in 2013**
  - 13.5% on a market value basis (estimate only)
  - Due to asset smoothing this is not fully recognized in funded ratio
- **$1.5 billion contribution made in 2013 was ~$400 million short of the Annual Required Contribution (ARC)**
  - Amortization of unfunded liability was not fully met
- **Net impact is a slight increase in unfunded liability in dollars, but an improvement in funded ratio**

# Funding Schedule Uncertainty

- **The current funding schedule (adopted in 2011) is due to be updated this year**
  - Intended to cover the payment of normal cost plus an amortization payment against the unfunded liability
  - Update will reflect full recognition of 2008 investment losses + assumption, plan provision, and demographic changes since 2010

- **Contribution scheduled for FY14 is $1.63 billion**

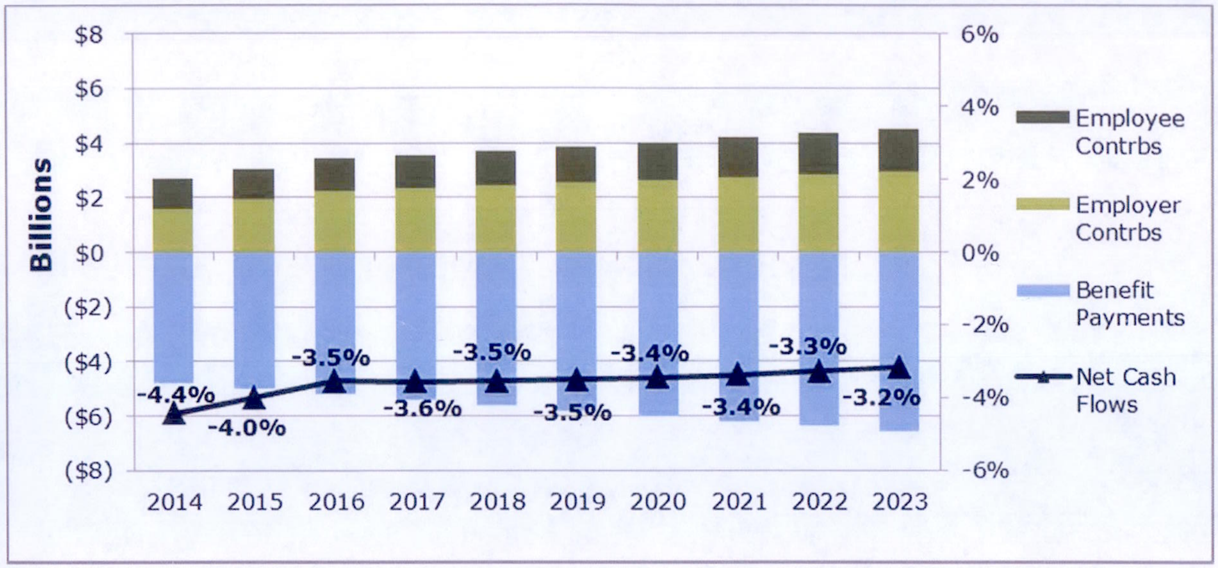
- **While the precise funding schedule is not yet known, we have modeled three sets of assumptions based on conversations with PERAC**
  - Schedule A: $2.20 billion in FY15, increasing 4% per year
  - Schedule B: $1.74 billion in FY15, increasing 7% per year
  - Schedule C: $1.81 billion in FY15, increasing 11% per year through FY19, 4% thereafter

## 10-Year Increase in Funded Ratio: Asset Mix Comparison

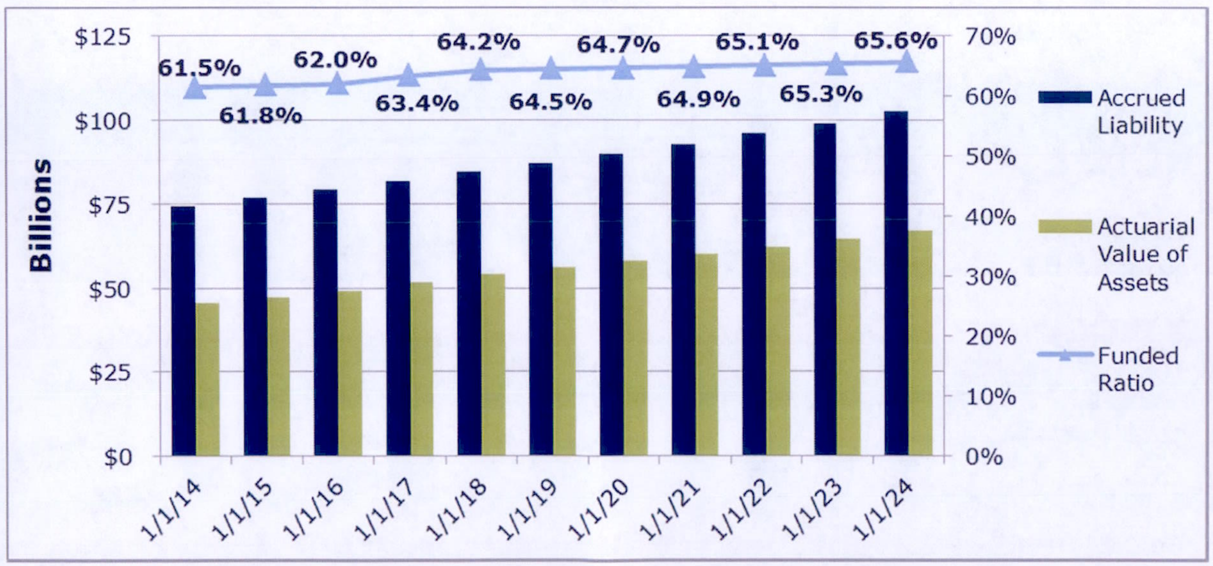
| Asset Mix | Schedule A | Schedule B | Schedule C |
|---|---|---|---|
| Current Actual | 4.3% | 0.8% | 2.9% |
| Current Target | 4.1% | 0.6% | 2.7% |
| **Proposed** | **4.4%** | **0.9%** | **3.0%** |

## Deterministic Projections: Current Target Allocation, Funding Schedule A

Cash Flows

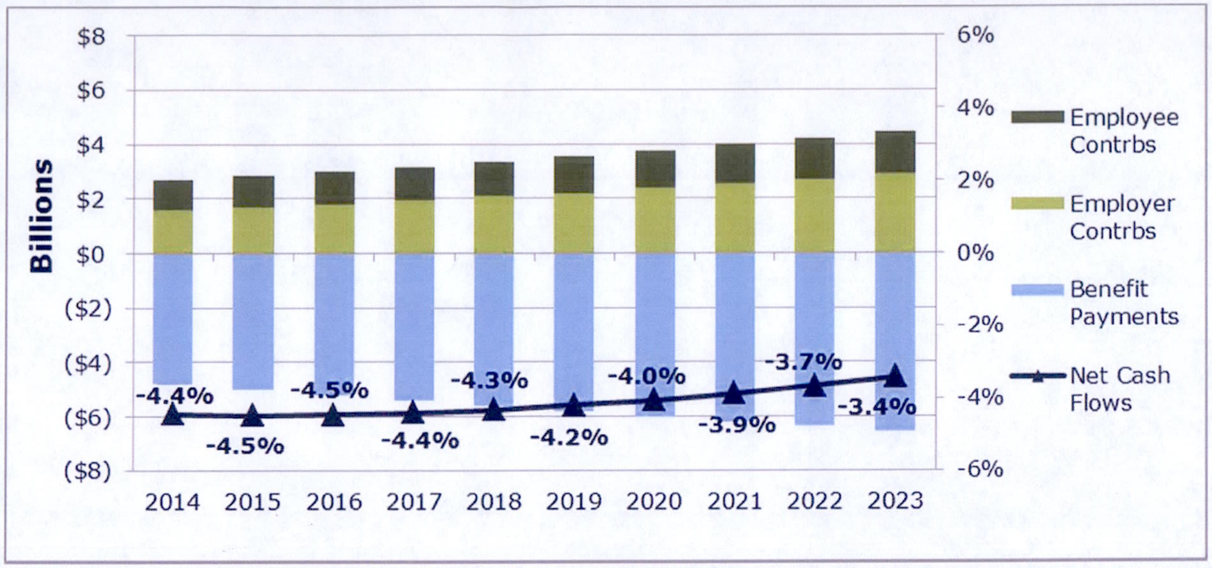



Funded Ratio

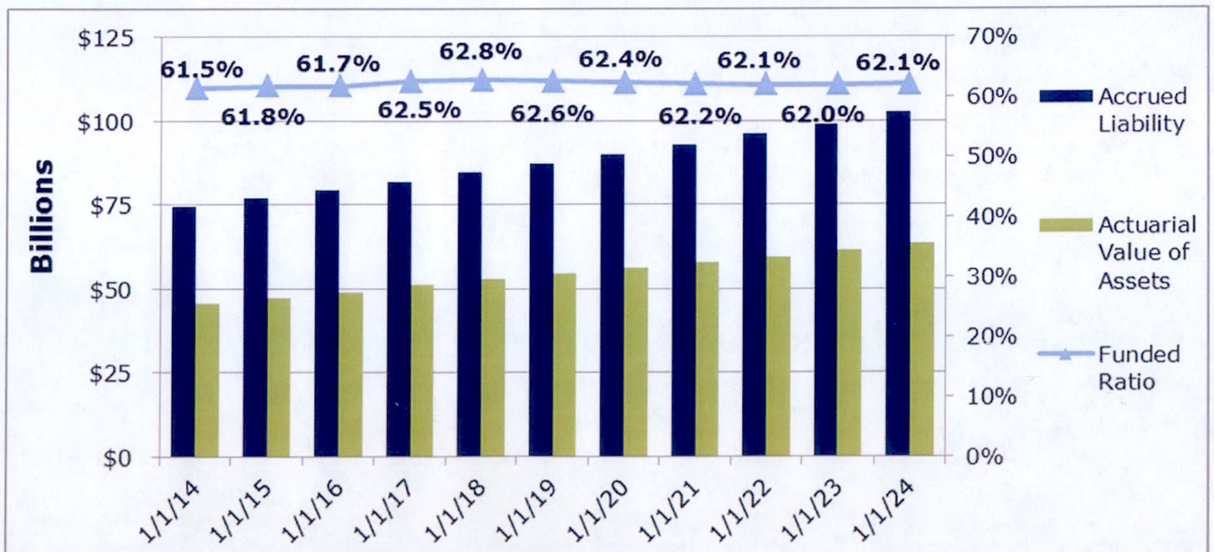


# Deterministic Projections: Current Target Allocation, Funding Schedule B

Cash Flows

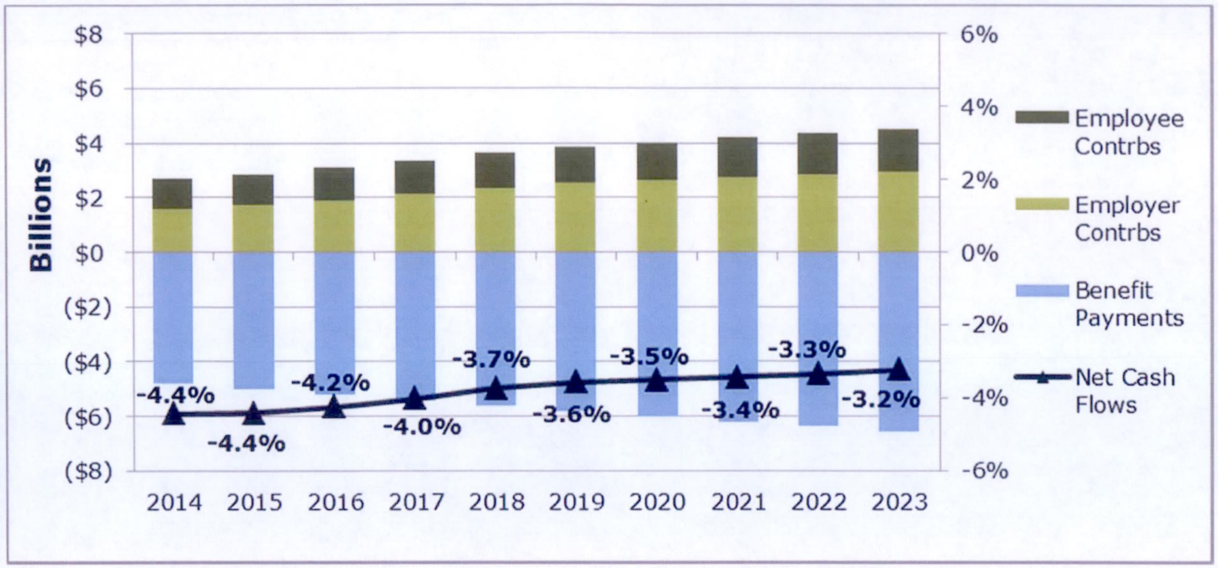



Funded Ratio

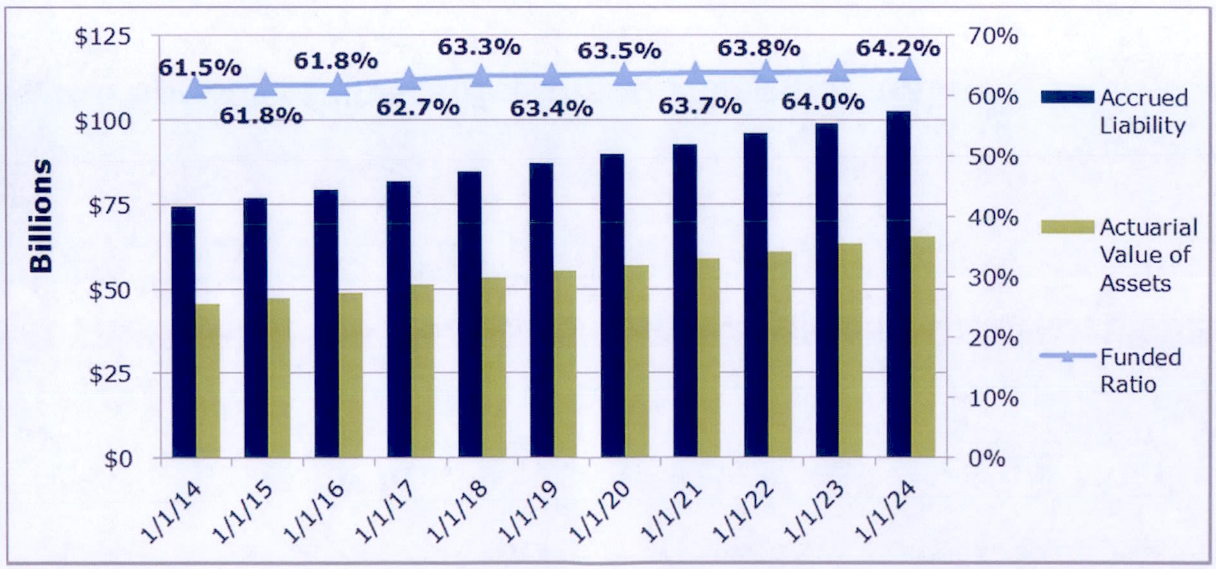


# Deterministic Projections: Current Target Allocation, Funding Schedule C

Cash Flows




Funded Ratio



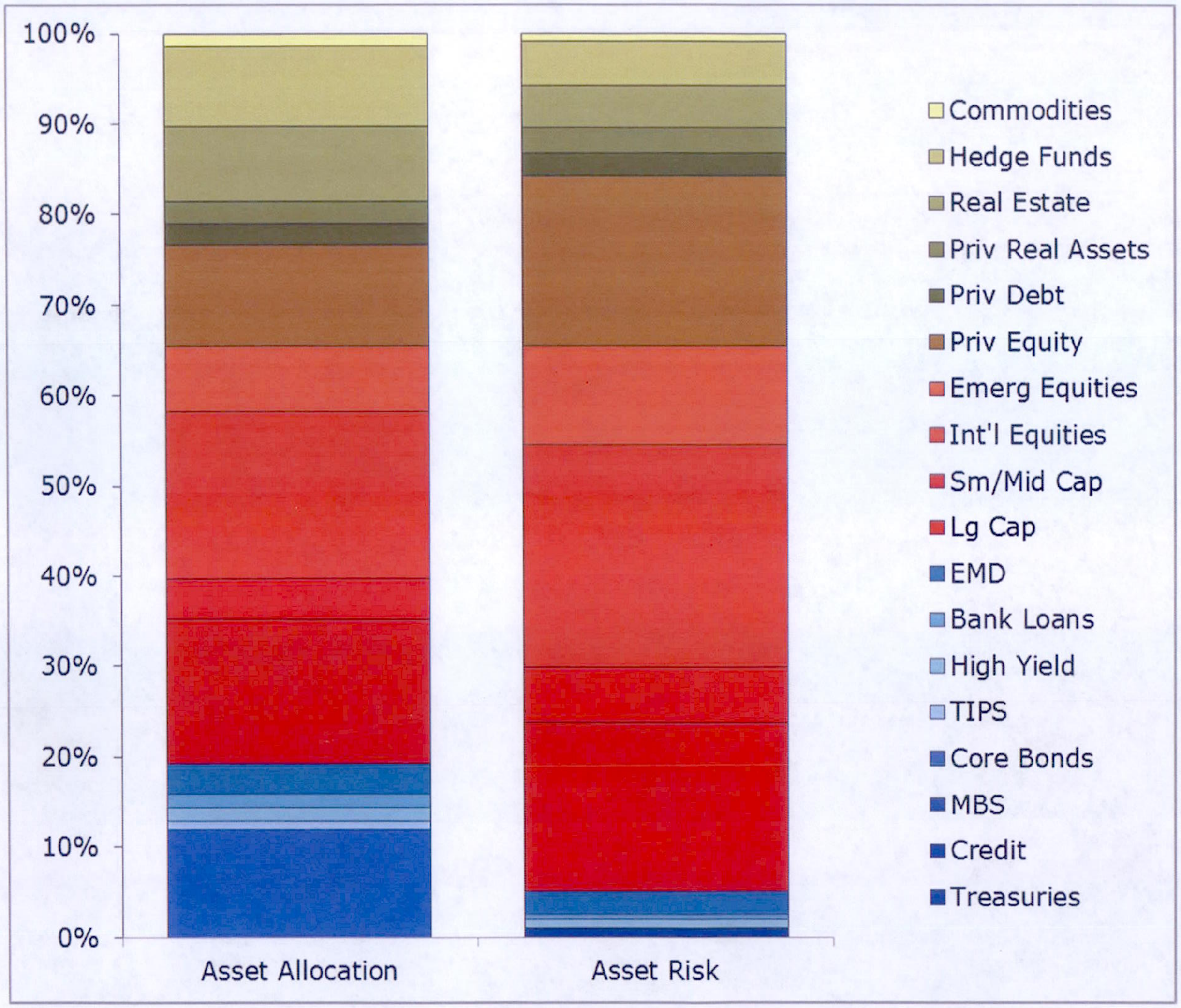
# Risk Allocation Analysis

- **Considers the portfolio from a total risk perspective rather than total return**

- **A way to determine the contribution to overall portfolio risk by each asset class in the portfolio, based on**
  - Asset class volatility assumptions
  - Correlations between asset classes

- **Shows the benefit of diversification within a portfolio**
  - Risk exposures in relation to allocation size

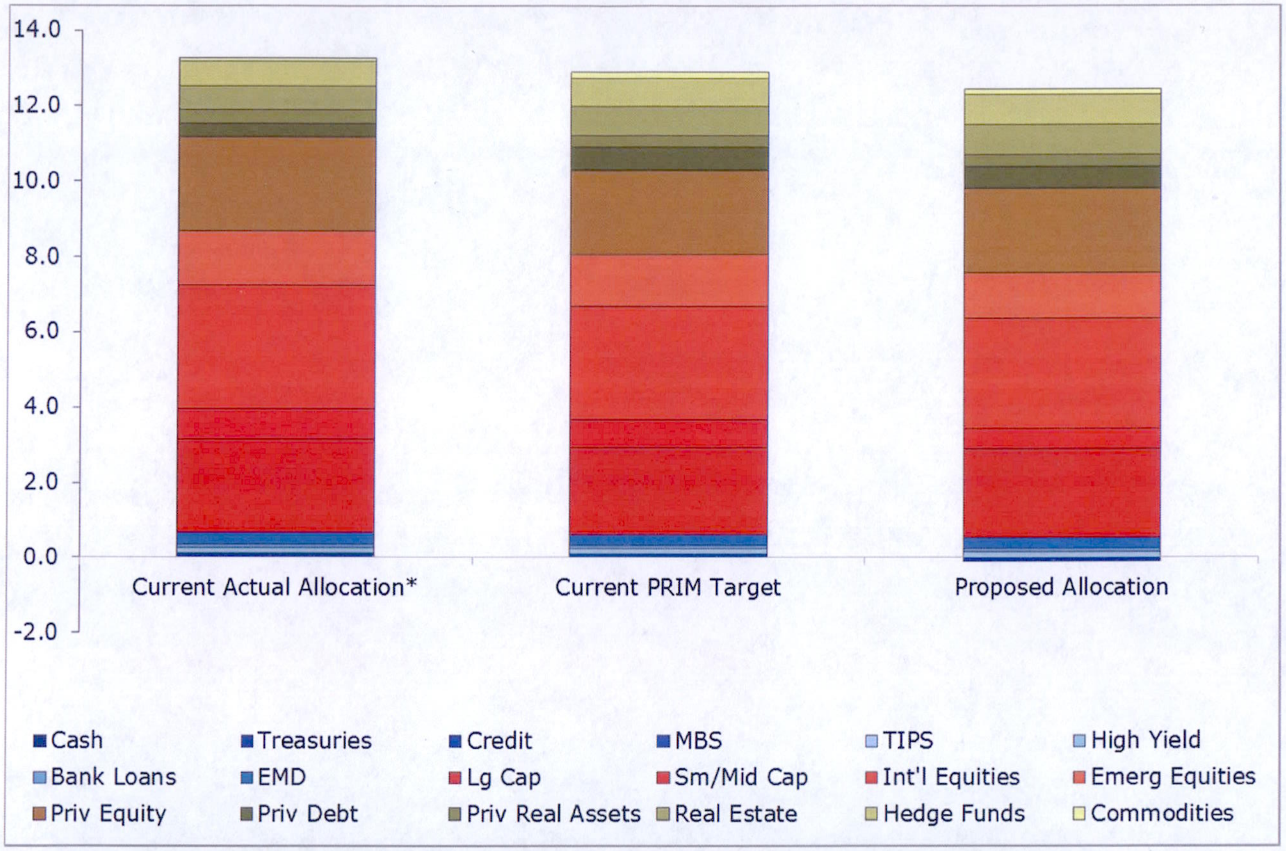
# Risk Analysis – Current Target Allocation




- **57% equity allocation → 79% equity risk allocation**

** Equity allocation includes Private Equity. Long duration Treasuries included in Treasuries.*

# Asset Risk Comparison

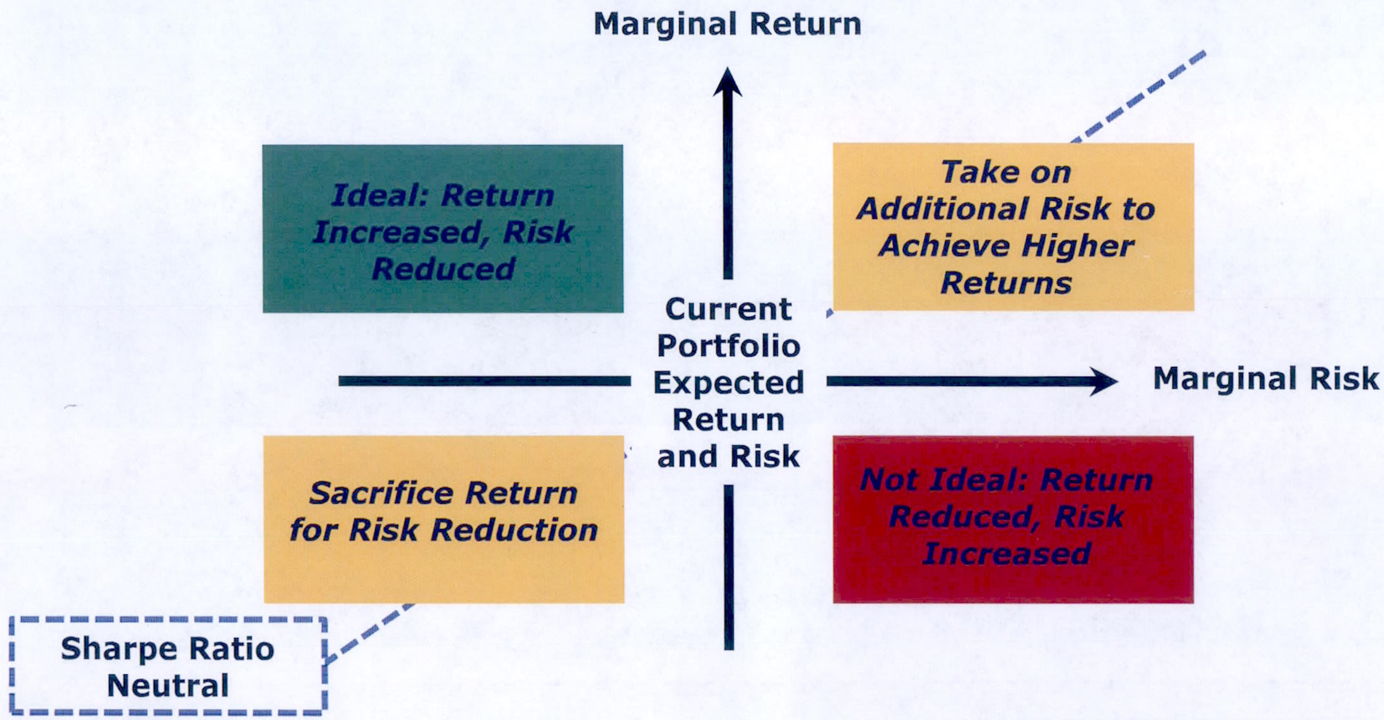



| | Current Actual | Current Target | Proposed |
|---|---|---|---|
| Equity Allocation | 57% | 53% | 51% |
| Equity Risk Allocation | 79% | 75% | 76% |

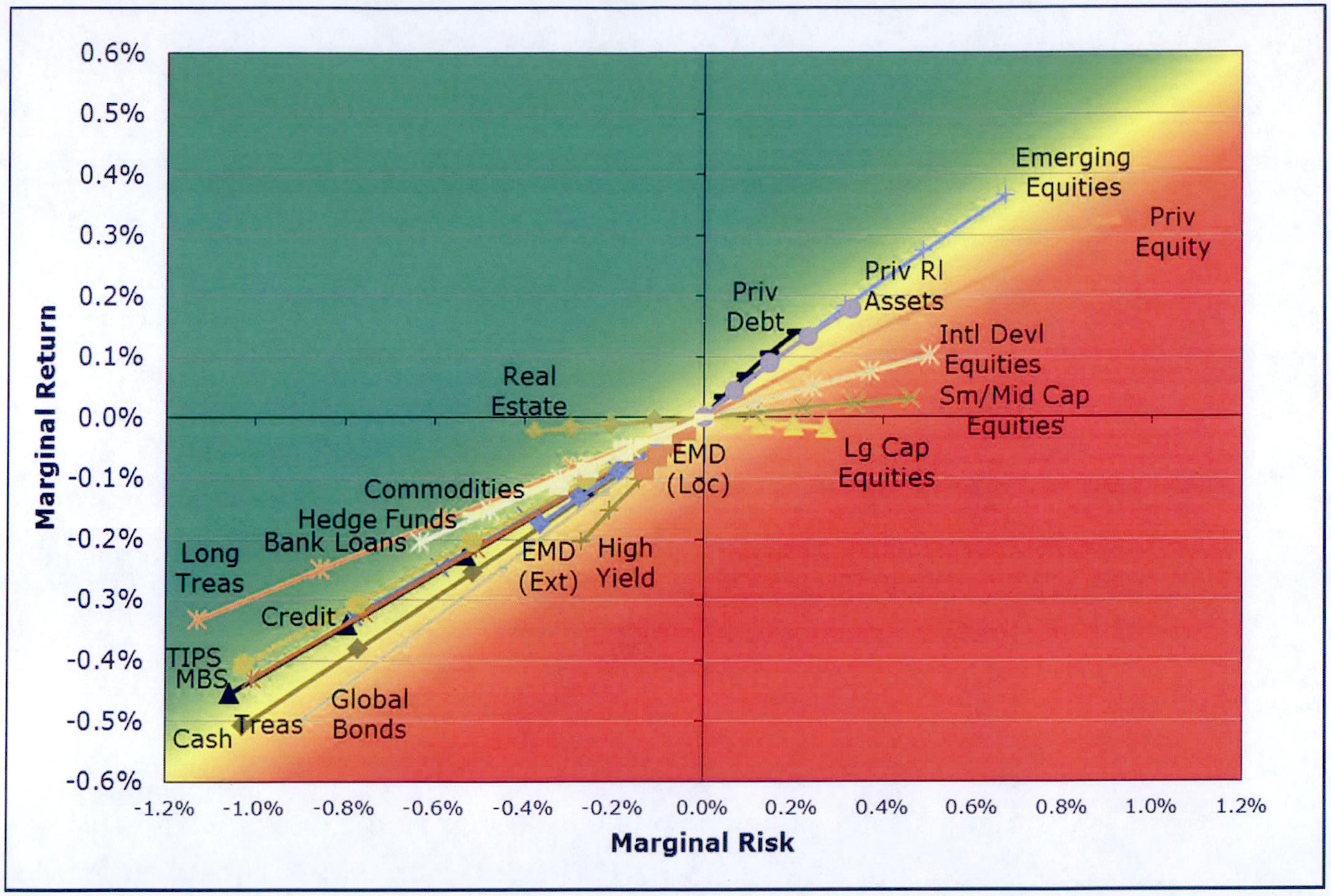
* *Current Actual Allocation is as of 10/31/2013. Equity allocation includes Private Equity. Long duration Treasuries included in Treasuries.*

## Portfolio Efficiency: Marginal Risk and Return

- **Thinking about risk and return on the margin can help evaluate potential asset allocation decisions**
- **Utilizes mean-variance assumptions**
  - Certain limitations (particularly liquidity) should be considered outside of this framework



# Portfolio Efficiency: Marginal Risk and Return (2% shifts)




- **Long Treasuries represent increased efficiency over core fixed income (Credit + MBS + Treasuries)**
- **US equities are marginally inefficient**

# Appendix

# PRIM Allocation Versus Peers

| | Current PRIM Target | Proposed Allocation | Public >$5 bill |
|---|---|---|---|
| **Cash** | 0% | 0% | 1% |
| Large Cap Equities | 15% | 15% | 19% |
| Small/Mid Cap Equities | 4% | 3% | 8% |
| Int'l Equities (Unhedged) | 17% | 16% | 14% |
| Emerging Int'l Equities | 7% | 6% | 4% |
| Global Equity | 0% | 0% | 4% |
| **Total Equity** | **43%** | **40%** | **49%** |
| Core Bonds | 10% | 0% | 26% |
| High-Yield Bonds | 1.5% | 1.5% | 0.0% |
| Bank Loans | 1.5% | 1.5% | 0.0% |
| Global Bonds (Unhedged) | 0% | 0% | 1% |
| EMD (External) | 1% | 1% | 1% |
| EMD (Local Currency) | 2% | 2% | 0% |
| TIPS | 3% | 3% | 0% |
| Long Treasuries | 0% | 10% | 0% |
| **Total Fixed Income** | **19%** | **19%** | **27%** |
| Private Equity | 10% | 10% | 7% |
| Private Debt | 4% | 4% | 0% |
| Real Estate (Core) | 10% | 10% | 7% |
| Hedge Funds | 10% | 9% | 4% |
| **Total Alternatives** | **34%** | **33%** | **18%** |
| Timber/Natural Resources | 4% | 4% | 1% |
| Portfolio Completion Strategies | 0% | 4% | 0% |
| Other | 0% | 0% | 4% |
| **Total Other** | **4%** | **8%** | **5%** |

| | | | |
|---|---|---|---|
| ***Expected Return 5-7 Yr.*** | *7.1%* | *7.1%* | *6.2%* |
| ***Expected Return 30 Yr.*** | *8.2%* | *8.2%* | *7.6%* |
| ***Standard Dev of Asset Return*** | *12.9%* | *12.3%* | *11.6%* |
| ***Sharpe Ratio*** | *0.43* | *0.46* | *0.41* |
| ***Asset Duration*** | *1.0* | *2.1* | *1.7* |

* The above peer comparison was sourced from the 2012 Greenwich Associates Research Survey
**The "Other" classification is modeled as Global Asset Allocation (Low Volatility)
***The U.S. fixed income category in the 2012 Greenwich Associates Research Survey is modeled as Core bonds

# Asset Class Assumption Development

# Development of Asset Class Assumptions

- **Relies on a 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 2014 Asset Class Assumptions

- **5-7 year return expectations diverge relative to prior year**
  - Broad expected return outlook remains subdued
  - Strong performance of developed equity markets leads to reduction in expectations
    - Despite underperformance, EM equities reduced modestly to reflect lower growth
  - Higher yields relative to prior year boost bond market forecasts
  - Increase in expectations for credit markets is more muted due to further spread compression
  - Alternative asset classes generally lower in line with liquid risky asset adjustments
- **30-year returns have similar themes to 5-7 year forecasts**
  - Yield increases flow through to longer-term returns in fixed income
  - US equity markets reduced modestly
- **Volatility expectations reduced incrementally in certain asset classes**

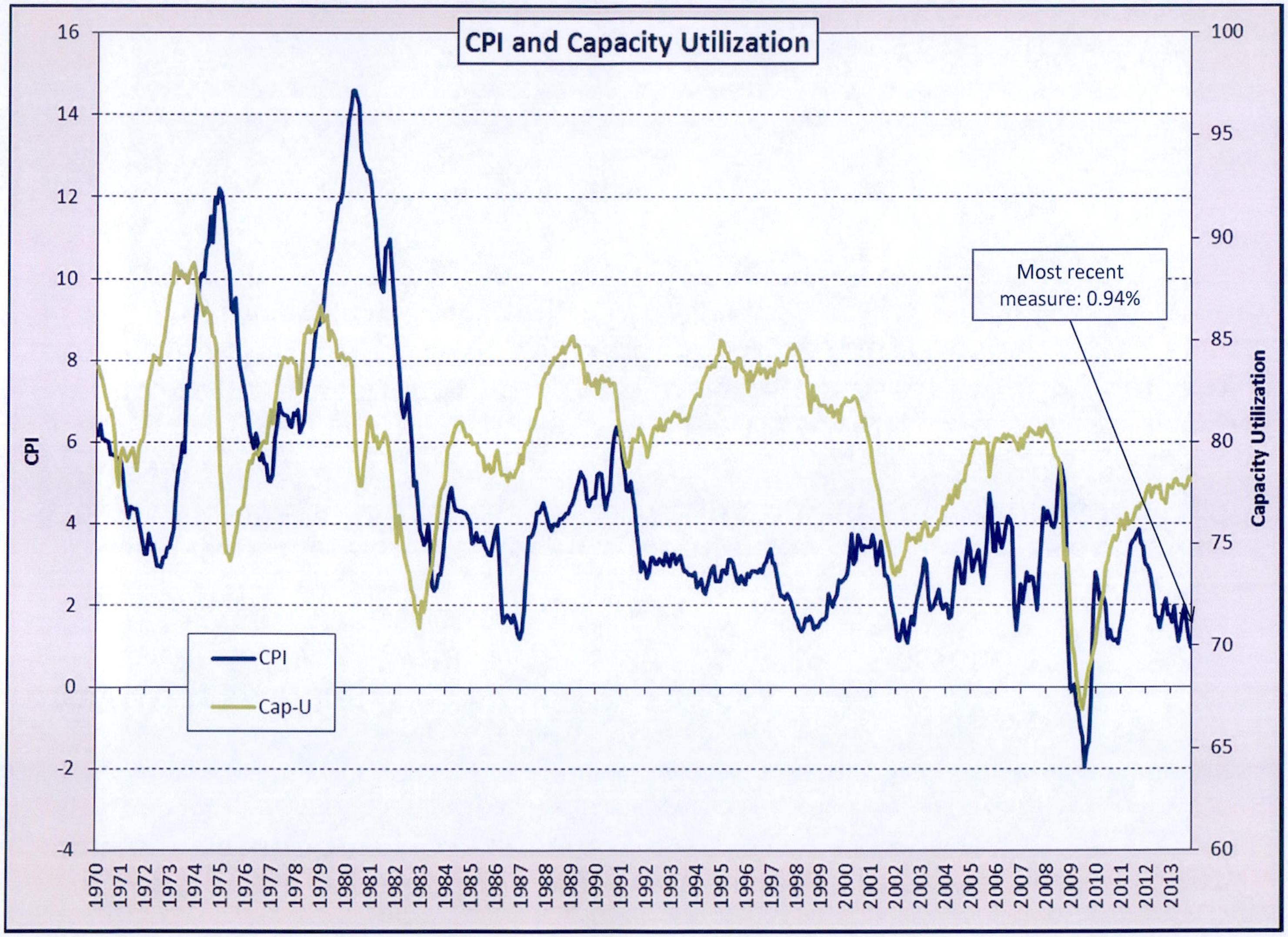
# Inflation

- **Inflation is an important 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 of which have issues)**
  - Consumer Price Index
  - Producer Price Index
  - TIPS break-even inflation
- **We are projecting 3% inflation over the next 5-7 years**
  - This assumption represents the geometric mean of a time series
  - Inflation could take several different paths over 5-7 years to arrive at a 3% mean
  - Given the wide-ranging potential inflation paths (US 1970s or Japan 1990s), we continue to use an elevated estimate of inflation volatility
- **While muted credit growth leaves inflation expectations unchanged in the near term, pressures for higher long-term inflation continue to build**
  - Monetary stimulation continued in 2013
  - Taper in US throughout 2014 but still remain stimulative globally
- **Given increasing long-term inflation pressures, a modestly higher inflation assumption (3.25%) is utilized for determining 30 year return expectations**

# Inflation (cont.)

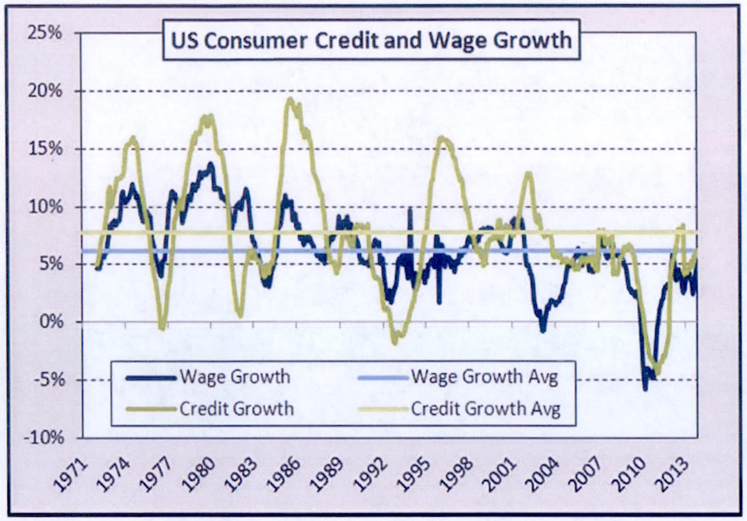
- **For asset class assumptions, we use a broader but less measurable concept of inflation**
  - Thought of as the inflation that flows through to ending corporate earnings for equities, required market yields on fixed income, or spot price returns on commodities
- **NEPC thinks of inflation on a global basis**
  - Considered from an investment perspective
    - That which passes through to the end investor across global investments
- **The inflation measure represents an average of inflation experience across all assets and all countries, including a meaningful weight to emerging markets**
- **Institutional investment pools will experience asset inflation globally, encompassing both developed and emerging countries.**
  - Can be different from inflation experienced on local/home country liabilities or spending needs

# Inflation Has Stayed Low

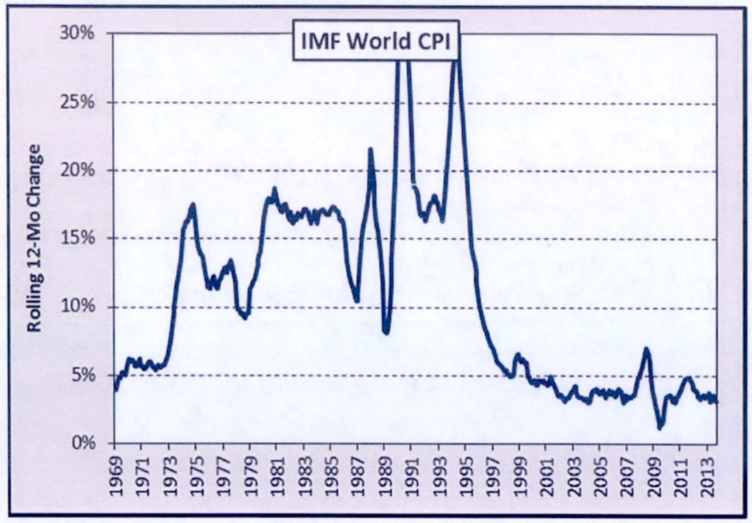



*Source: St. Louis Fed as of 11/30*

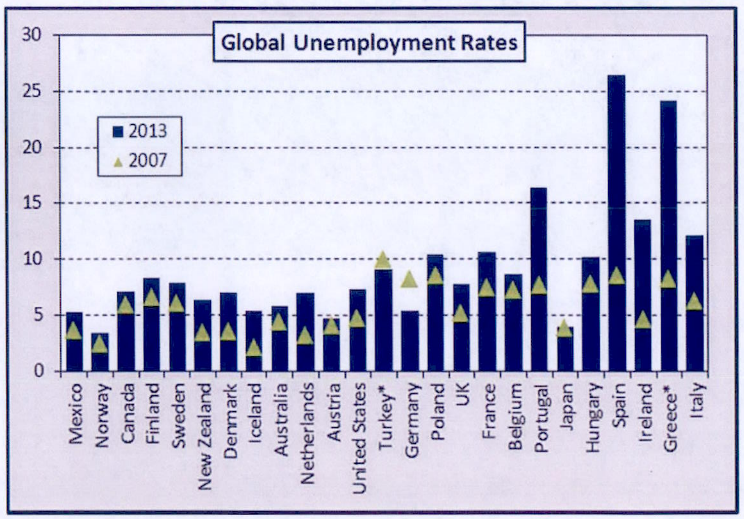
# Many Economic Factors Driving Inflation Remain Subdued



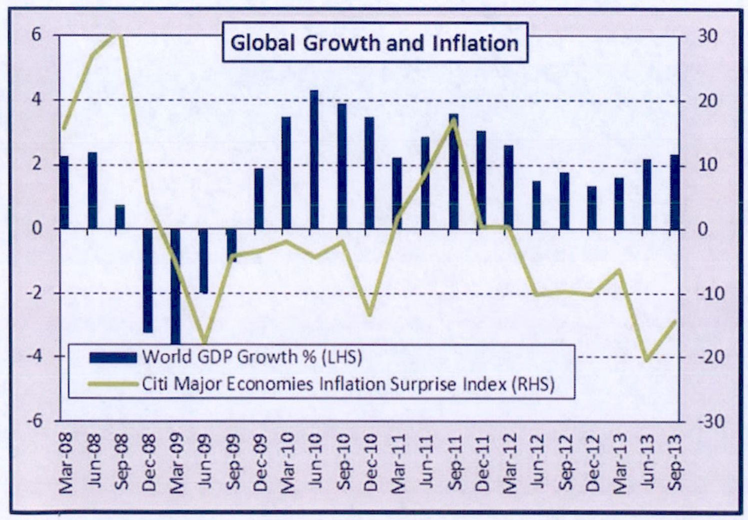

Source: Board of Governors of the Federal Reserve System as of 10/1




Source: Bloomberg as of 9/30

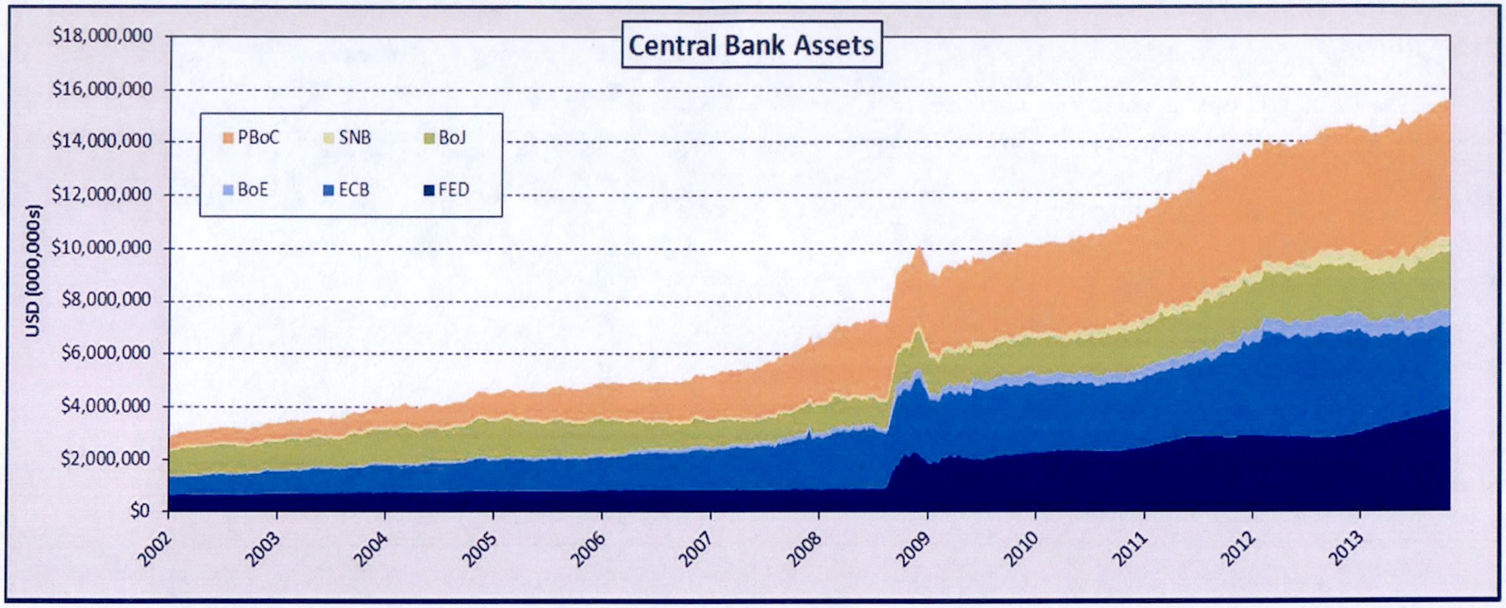



Source: Bloomberg as of 9/30 *as of 12/31/2012




Source: Bloomberg as of 9/30

# Long-Term Inflation Pressures Continue to Build as Central Banks Stimulate




*Source: Bloomberg as of 11/30*

- **Major central bank balance sheets have grown by a 5.3x factor since February 2002 (when PBoC data begins)**
  - While not an apples to apples comparison, US Consumer prices have increased by 1.3x factor over this same time
- **Much of the increases come from the end of 2007 to the present, with very muted inflation**
  - Cumulative CPI increases are 1.1x in this period

## 2014 5-to-7 Year Return Forecasts

| Geometric Expected Return | | | |
|---|---|---|---|
| **Asset Class** | **2013** | **2014** | **2014-2013** |
| Cash | 0.75% | 1.50% | 0.75% |
| Treasuries | 1.00% | 2.00% | 1.00% |
| Long Treasuries | 2.00% | 3.00% | 1.00% |
| IG Corp Credit | 3.00% | 3.50% | 0.50% |
| MBS | 2.50% | 2.25% | -0.25% |
| *Core Bonds** | *2.04%* | *2.53%* | *0.42%* |
| TIPS | 1.50% | 2.50% | 1.00% |
| High-Yield Bonds | 5.00% | 4.50% | -0.50% |
| Bank Loans | 5.00% | 5.00% | |
| Global Bonds (Unhedged) | 0.75% | 1.25% | 0.50% |
| Global Bonds (Hedged) | 0.93% | 1.38% | 0.45% |
| EMD External | 4.00% | 5.00% | 1.00% |
| EMD Local Currency | 5.00% | 5.75% | 0.75% |
| Large Cap Equities | 6.75% | 6.25% | -0.50% |
| Small/Mid Cap Equities | 7.00% | 6.25% | -0.75% |
| Int'l Equities (Unhedged) | 7.75% | 7.25% | -0.50% |
| Int'l Equities (Hedged) | 8.00% | 7.50% | -0.50% |
| Emerging Int'l Equities | 9.75% | 9.50% | -0.25% |
| Private Equity | 9.00% | 8.75% | -0.25% |
| Private Debt | 8.50% | 8.00% | -0.50% |
| Private Real Assets | 8.00% | 7.75% | -0.25% |
| Real Estate (Core) | 6.00% | 6.25% | 0.25% |
| Commodities | 5.00% | 5.00% | |
| Hedge Funds | n/a | 5.50% | |

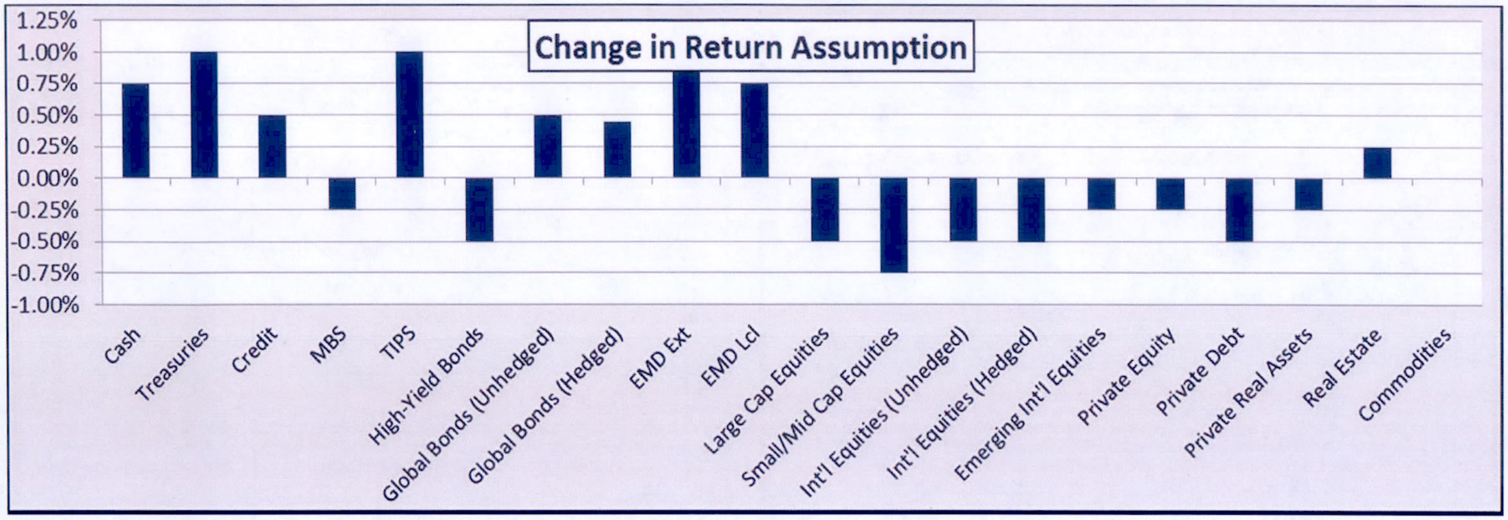
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

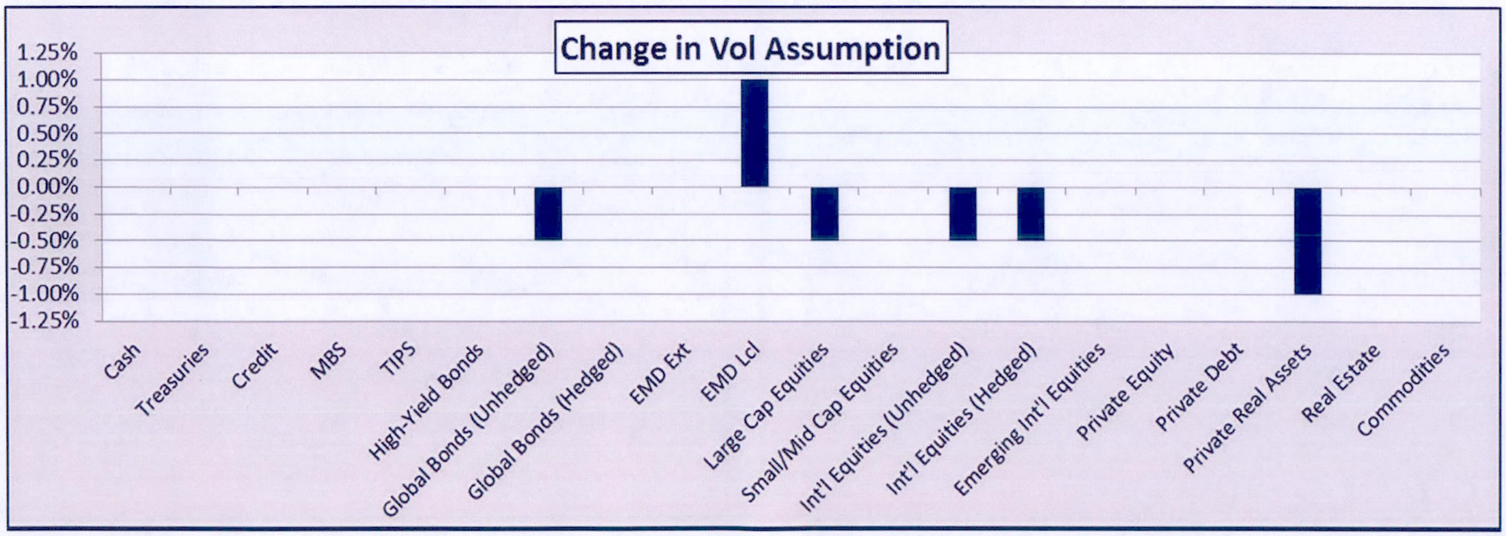
# 2014 Volatility Forecasts

| Volatility | | | |
|---|---|---|---|
| **Asset Class** | **2013** | **2014** | **2014-2013** |
| Cash | 1.00% | 1.00% | |
| Treasuries | 6.00% | 6.00% | |
| Long Treasuries | 12.00% | 12.00% | |
| IG Corp Credit | 7.50% | 7.50% | |
| MBS | 7.00% | 7.00% | |
| *Core Bonds** | *6.31%* | *6.32%* | *0.01%* |
| TIPS | 7.50% | 7.50% | |
| High-Yield Bonds | 13.00% | 13.00% | |
| Bank Loans | 6.50% | 8.00% | 1.50% |
| Global Bonds (Unhedged) | 9.00% | 8.50% | -0.50% |
| Global Bonds (Hedged) | 5.00% | 5.00% | |
| EMD External | 12.00% | 12.00% | |
| EMD Local Currency | 14.00% | 15.00% | 1.00% |
| Large Cap Equities | 18.00% | 17.50% | -0.50% |
| Small/Mid Cap Equities | 21.00% | 21.00% | |
| Int'l Equities (Unhedged) | 21.00% | 20.50% | -0.50% |
| Int'l Equities (Hedged) | 19.00% | 18.50% | -0.50% |
| Emerging Int'l Equities | 26.00% | 26.00% | |
| Private Equity | 27.00% | 27.00% | |
| Private Debt | 19.00% | 19.00% | |
| Private Real Assets | 24.00% | 23.00% | -1.00% |
| Real Estate (Core) | 17.00% | 17.00% | |
| Commodities | 18.00% | 18.00% | |
| Hedge Funds | n/a | 9.00% | |

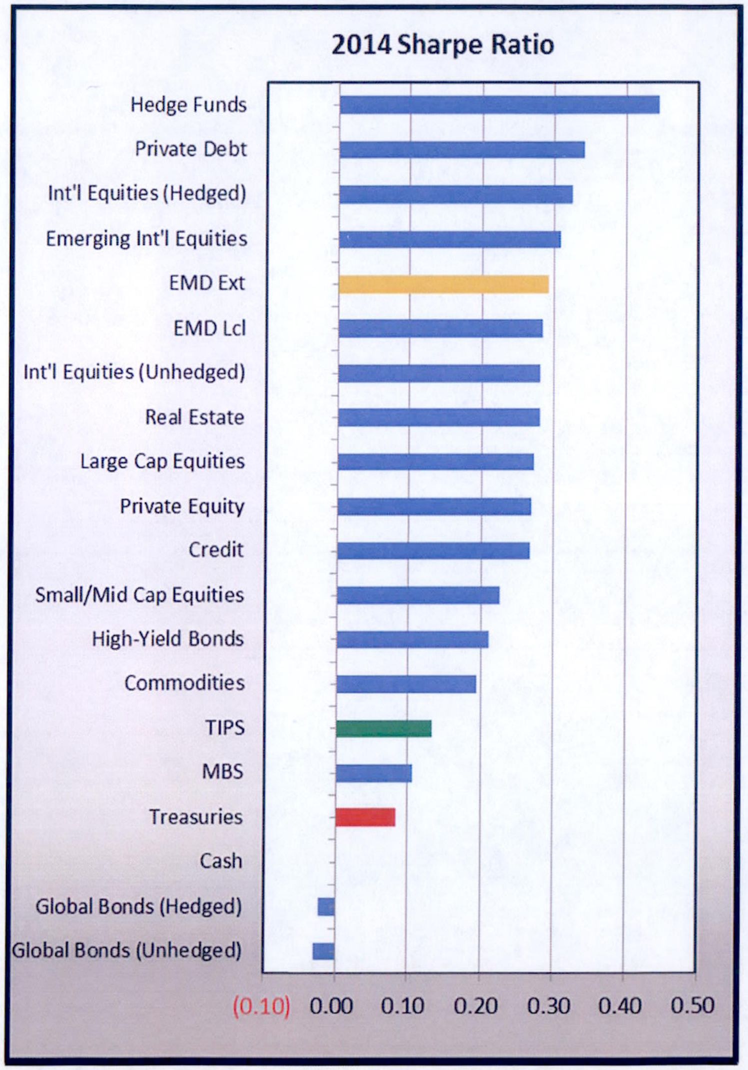
Volatility defined as standard deviation of investment returns.
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

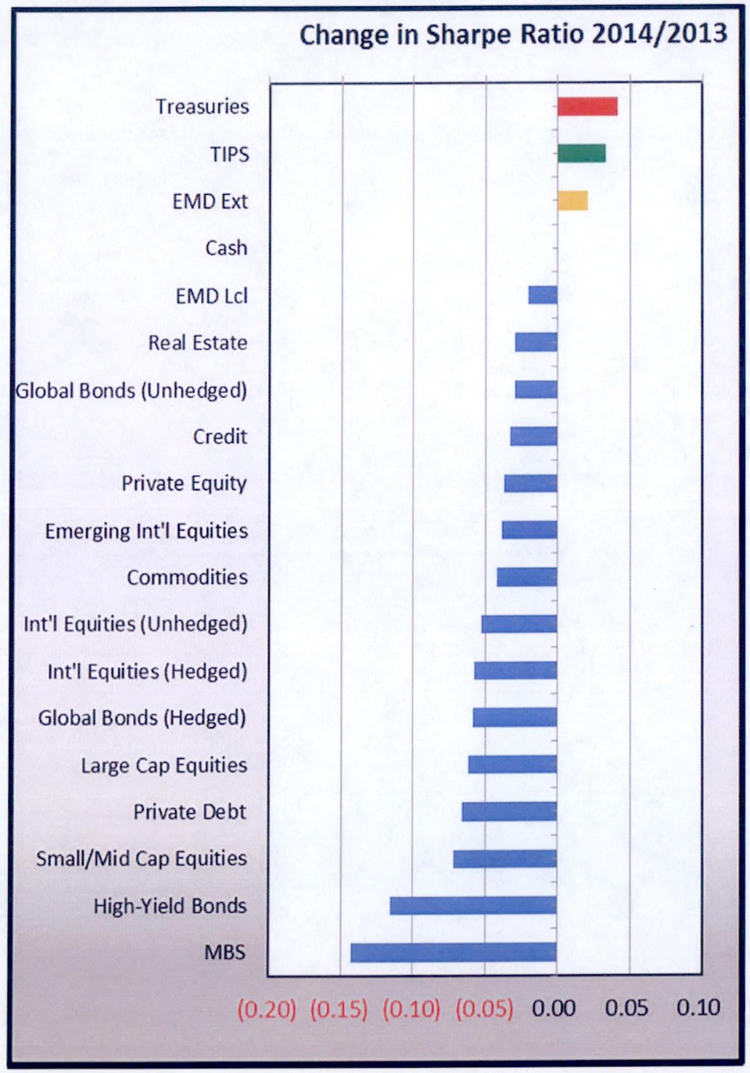
# Summary of Changes to 2014 Return and Volatility Expectations



# Relative Asset Class Attractiveness

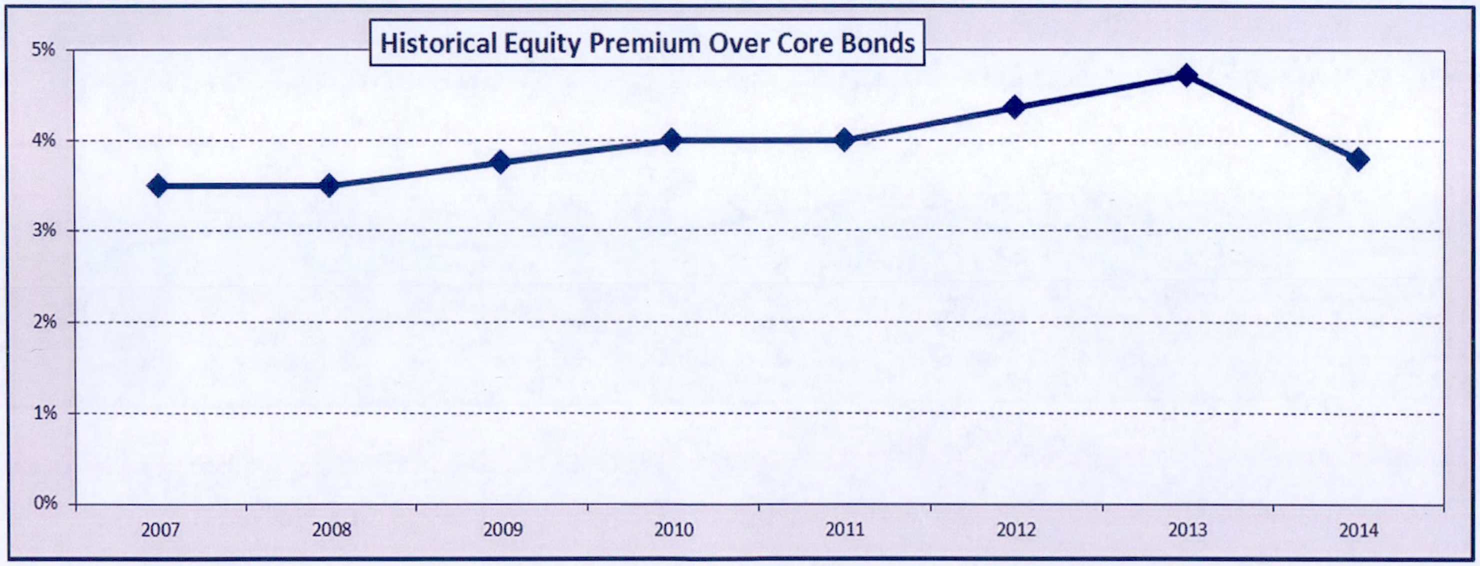



Sharpe Ratio defined as the excess return over cash, divided by the standard deviation.

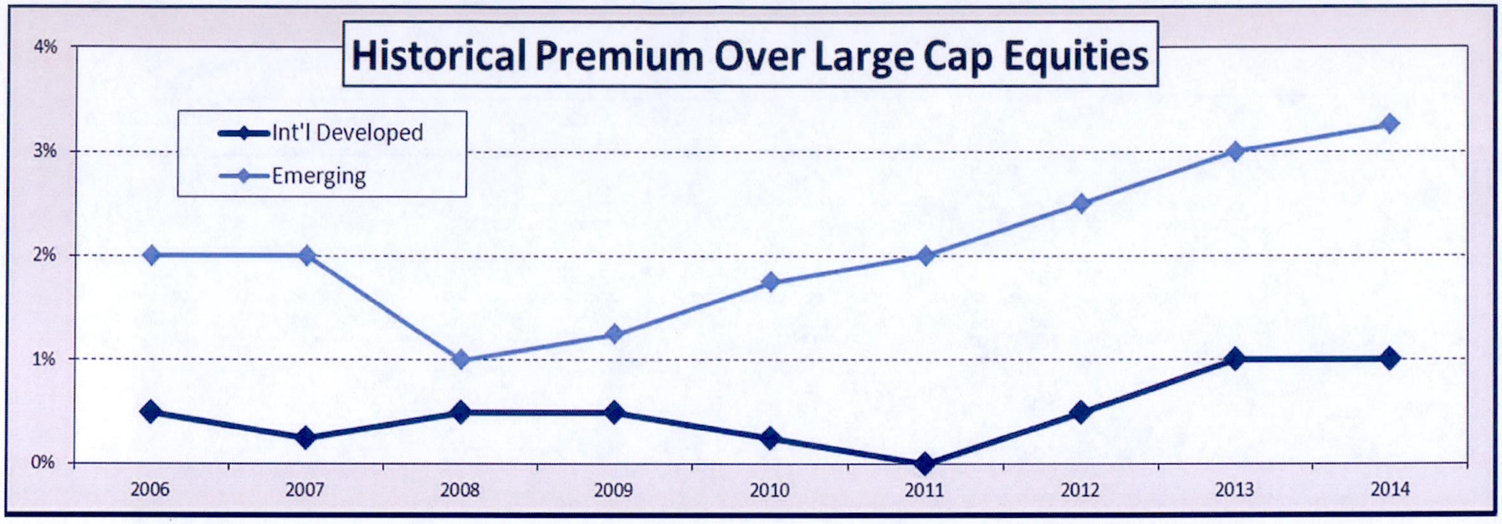
# Major Asset Class Review (Geometric)

| Asset Class | Historical Long Term Geometric Average[1] | 5-to-7 Year NEPC Assumptions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| Cash | 3.5% | 4.00% | 4.00% | 3.00% | 2.00% | 2.00% | 1.25% | 0.75% | 1.50% |
| Core Bonds[2] | 8.0% | 5.00% | 5.00% | 5.50% | 3.75% | 3.00% | 2.88% | 2.03% | 2.53% |
| Large Cap | 10.1% | 8.50% | 8.50% | 9.25% | 7.75% | 7.00% | 7.25% | 6.75% | 6.25% |
| International[3] | 9.3% | 8.75% | 9.00% | 9.75% | 8.00% | 7.00% | 7.75% | 7.75% | 7.25% |
| *US Equity Premium Over Core Bonds* | | *3.50%* | *3.50%* | *3.75%* | *4.00%* | *4.00%* | *4.37%* | *4.72%* | *3.72%* |




1. Reflects average since inception (1926 except as noted below) of the respective index through 11/30/2012
2. LB/BC Aggregate reflects average compound annual return since 1976
3. International reflects average annual return since 1970

# Comparison of International Equity and US Large Cap Equity Expectations




- **Total return expectations for non-US Equities are reduced relative to last year**
- **Yet expectations for US equities are reduced as well**
  - Consistent spread of 1% for developed non-US relative to US Large Cap
  - Increased premium for emerging equity
- **Meaningful downside risks remain in both developed and emerging world**
- **While we expect investors to be compensated over 5-7 years with a higher relative return for holding non-US equities, it is appropriate to use active management to attempt to minimize exposure to downside risks**

# 2014 30-Year Return Forecasts

| Geometric Expected Return | | | |
|---|---|---|---|
| **Asset Class** | **2013** | **2014** | **2014-2013** |
| Cash | 3.00% | 3.75% | 0.75% |
| Treasuries | 3.00% | 4.00% | 1.00% |
| Long Treasuries | 3.25% | 4.25% | 1.00% |
| Credit | 4.25% | 5.25% | 1.00% |
| MBS | 4.50% | 4.25% | -0.25% |
| *Core Bonds** | *3.84%* | *4.46%* | *0.62%* |
| TIPS | 3.25% | 4.50% | 1.25% |
| High-Yield Bonds | 5.25% | 6.00% | 0.75% |
| Bank Loans | 5.50% | 6.25% | 0.75% |
| Global Bonds (Unhedged) | 2.50% | 3.00% | 0.50% |
| Global Bonds (Hedged) | 2.67% | 3.13% | 0.46% |
| EMD External | 6.00% | 7.00% | 1.00% |
| EMD Local Currency | 6.25% | 7.25% | 1.00% |
| Large Cap Equities | 8.00% | 7.75% | -0.25% |
| Small/Mid Cap Equities | 8.25% | 8.00% | -0.25% |
| Int'l Equities (Unhedged) | 8.25% | 8.25% | |
| Int'l Equities (Hedged) | 8.50% | 8.48% | -0.02% |
| Emerging Int'l Equities | 9.50% | 9.50% | |
| Private Equity | 10.00% | 9.75% | -0.25% |
| Private Debt | 8.00% | 8.25% | 0.25% |
| Private Real Assets | 8.00% | 7.75% | -0.25% |
| Real Estate (Core) | 6.00% | 6.50% | 0.50% |
| Commodities | 5.50% | 6.00% | 0.50% |
| Hedge Funds | n/a | 7.00% | |

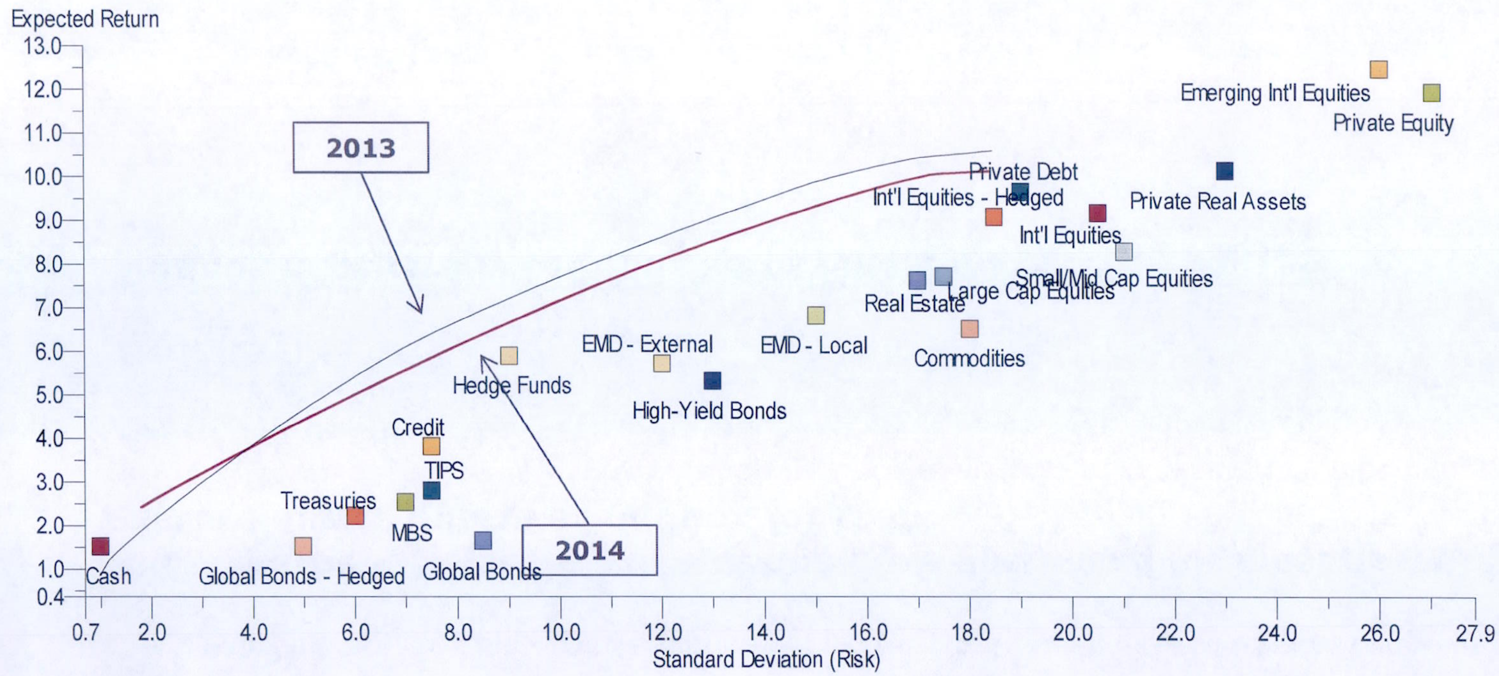
* Core Bonds assumption based on market weighted blend of components of Aggregate Index (Treasuries, IG Corp Credit, and MBS).

- **Slight decrease in US vs. Non-US equities reflecting globally diverging economic condition/policies**

- **Several adjustments made to harmonize correlations across broad factors**
  - Increasing Treasury correlations to EMD, HY, Munis
  - Decreasing TIPS correlations
  - Greater differentiation between EMD external and local
  - Broad increases in alternative/illiquid asset classes to risky assets

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

# Efficient Frontier Comparison

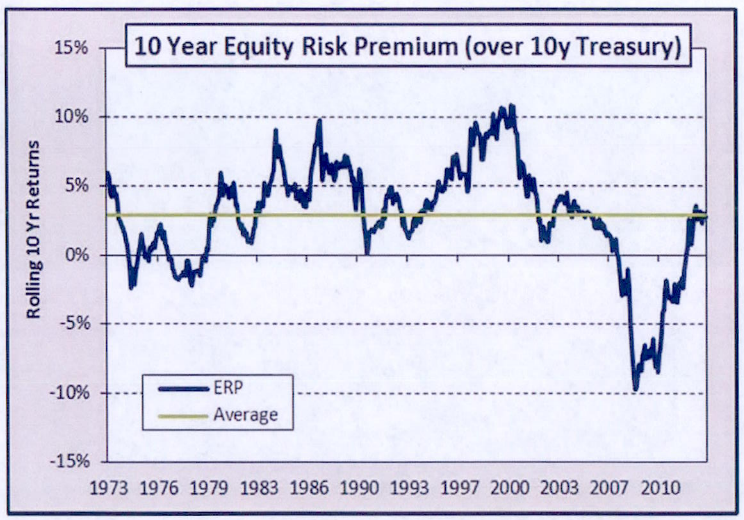


# Summary

- **Expected returns over the next 5-7 years have moved in different directions**
  - Increase in yields results in higher expected returns for most fixed income investments
  - Strong recent performance and valuation expansion leads to a drop in equity assumptions
- **Expectations are also mixed over a 30-year period**
  - Likely still able to support investor long-term targets for well diversified portfolios
- **On a Sharpe ratio basis, 2014 outlook has decreased for most asset classes due to improved outlook for cash**
  - Few asset classes have improved Sharpe Ratios relative to prior year expectations
    - US Treasuries
    - External Emerging Debt
    - US TIPS
- **Outlook is generally cautious across most markets**

- **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* | | -1.0% | 1.5% |
| Dividend Yield | 2.0% | 2.0% | 2.0% |
| Inflation | 3.0% | 3.0% | 3.0% |
| Valuation & Other* | 16.3 | 16 | -0.25% |
| | | Total Expected Return | 6.25% |




*Source: Ibbotson as of 11/30*

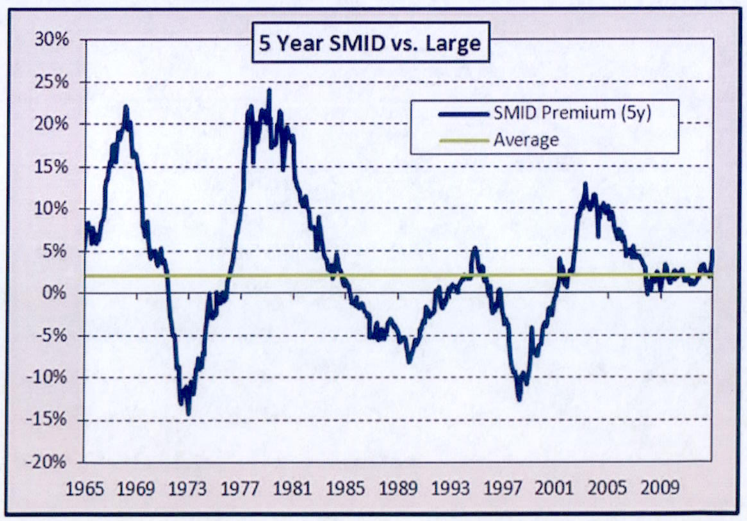
- **Equity Risk Premium over 10 year Treasury is volatile**
  - Long-term average of 2.9%
  - Stock and bond forecasts imply an Equity Risk Premium of 4.25%
  - While high relative to the long-term average, almost 40% of observations exceed this level over the last 50 years
- **Downward adjustment reflects higher but still low interest rates supportive of an elevated equity risk premium**

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

# Assumption Development – US Small/Mid 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 | 3.5% | 3.5% | -- |
| *Profit Margin Adjustment* | | -0.75% | 2.75% |
| Dividend Yield | 1.5% | 1.5% | 1.5% |
| Inflation | 3.0% | 3.0% | 3.0% |
| Valuation & Other* | 23.6 | 22 | -1.00% |
| | | Total Expected Return | 6.25% |

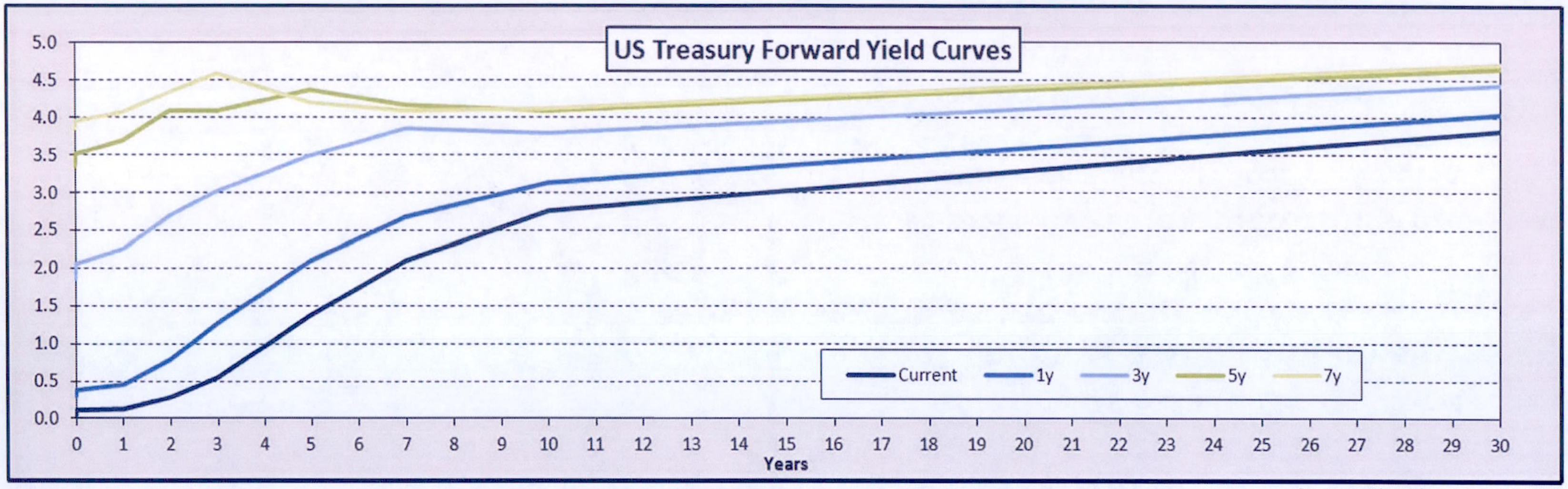



*Source: Ibbotson as of 11/30*

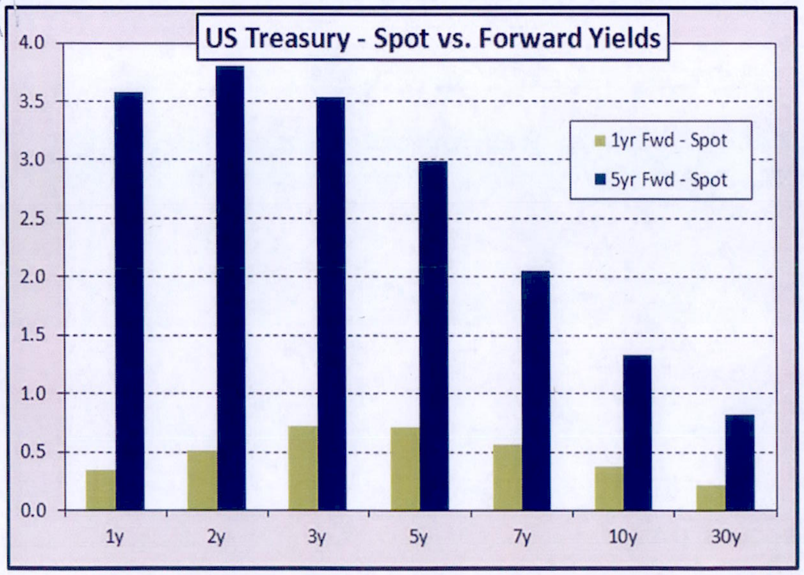
- **Small/Mid Cap equities have earned a premium over Large Cap equities historically**
  - Small/mid cap equities significantly outperformed Large Cap in 2013
  - Trailing 5 year premium slightly above historical average
  - Profit margins remain elevated
    - Potential for mean reversion in earnings
  - Following strength of 2013 performance, no premium expected over Large Cap Equities over 5-7 years

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

# US Spot and Forward Rates – Current



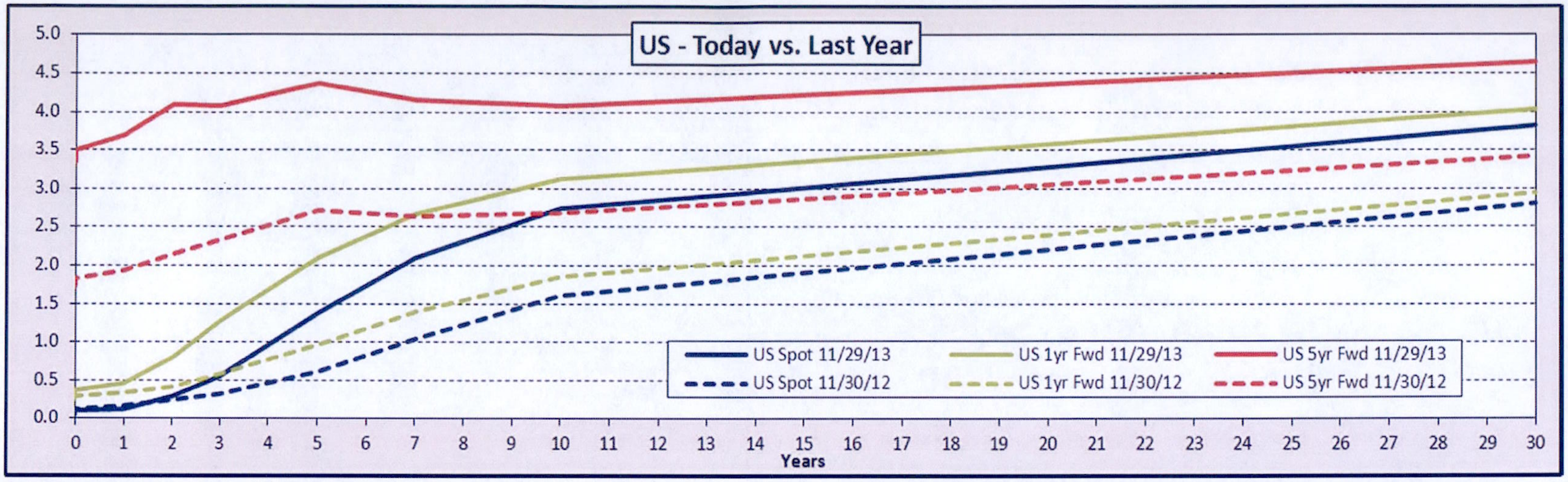

Source: Bloomberg as of 11/30



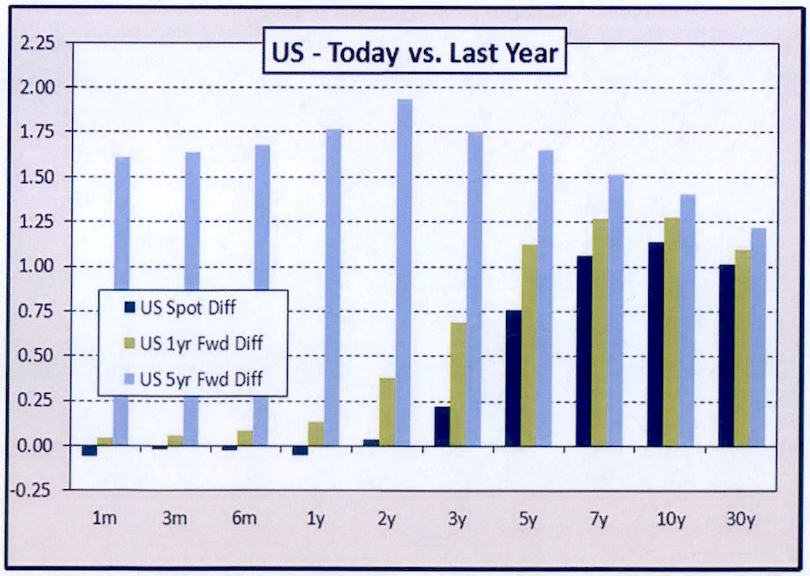

Source: Bloomberg as of 11/30

- **US Treasury expectations reflect higher spot and forward rates relative to prior year**
- **Yields in US Treasury market are expected to move higher based on forward curve**
  - Principal losses but higher reinvestment rates results in a return in line with current yields
- **Incorporated increased term premium reflecting potential for greater uncertainty**

# US Spot and Forward Rates – Change from last year




Source: Bloomberg as of 11/30




Source: Bloomberg as of 11/30

- **US Treasury market is elevated across the curve**
  - Most spot and forward rates are substantially higher than one year ago
- **Spot changes are muted on short end of the curve**
  - Up 75-125 bps beyond 5 years
- **1 year forward expectations up**
  - Muted on short end, but 25-150 bps beyond the 2 year point
- **5 year forward expectations have risen much more**
  - About 100-200bps across the curve

# Assumptions and Methodology for Asset-Liability Study

- **Liability calculations based on the Commonwealth actuarial valuation reports as of January 1, 2013 (Produced by PERAC)**
  - Liabilities discounted at 8.0%
  - Normal cost and employee contributions assumed to increase 4% per year
  - Benefit payments based on plan demographics and projected by PERAC; effective increase is 3-5% annually over the next 10 years
  - $1.63 billion assumed to be contributed during FY 14
  - Due to funding schedule uncertainty beyond FY14, we modeled three scenarios
    - Schedule A: $2.20 billion in FY15, increasing 4% per year
    - Schedule B: $1.74 billion in FY15, increasing 7% per year
    - Schedule C: $1.81 billion in FY15, increasing 11% per year through FY19, 4% thereafter

- **Investment returns for calendar year 2013 assumed to be 13.5%**
  - Represents actual YTD asset returns through October 31, 2013 of 12.5% + 1.0% assumed for November and December
  - Plan earns NEPC 5-7 year expected return in future years (7.1% for current target allocation)
  - Investment gains and losses smoothed over 5 years for actuarial value of assets calculation (limited between 90-110% of market value)

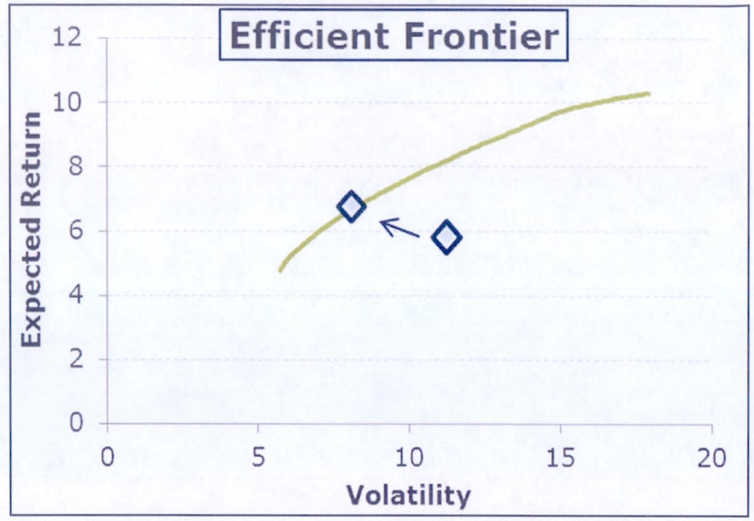
# Foundations of Asset-Liability Study

- **Understand and define objectives**
  - Fund long-term benefit obligations
  - Define liquidity requirements
  - Incorporate other investment constraints

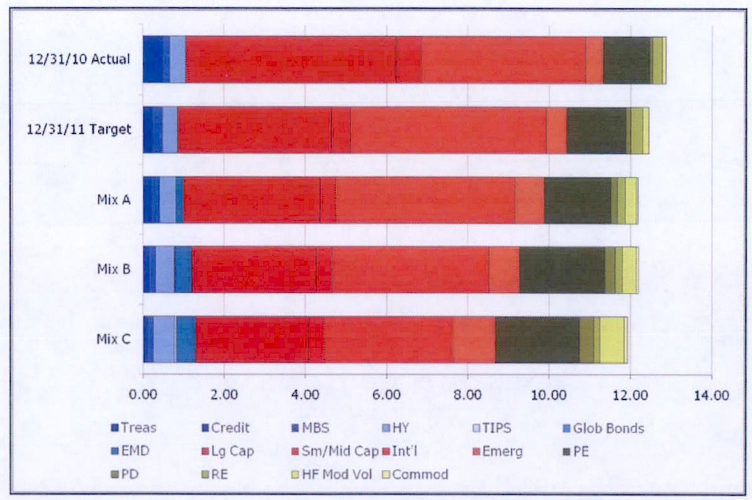
- **Use forward-looking, fundamental based assumptions for all forecasting**
  - Realistic outlook for plan changes over intermediate and long-term
  - Identify opportunities for enhancing portfolio structure

- **Apply multiple perspectives/tools to build robust, objective driven asset allocation solutions**
  - Mean-variance optimization
  - Risk budgeting
  - Deterministic forecasting
  - Scenario analysis

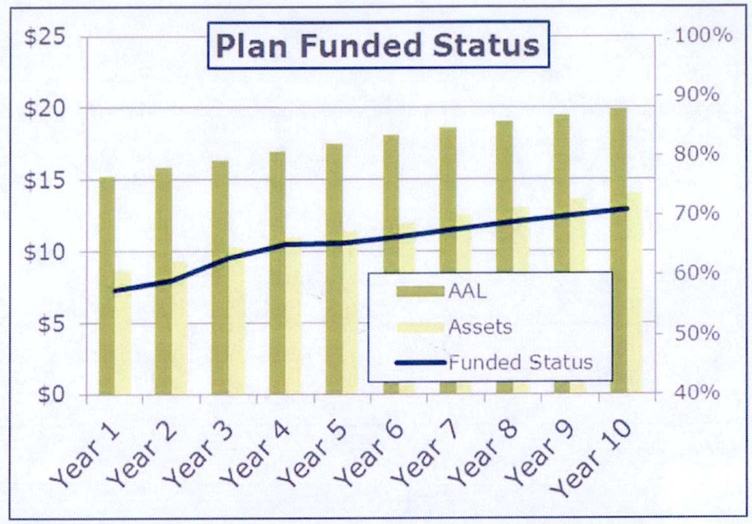
- **Risk-return Analysis**
  - Seeking highest possible expected return for each given level of volatility
  - Model inputs are static
    - Expected return, volatility, correlation, constraints
  - A useful but limited tool for asset allocation
  - Risk-return plots are useful snapshot comparisons of various alternative mixes



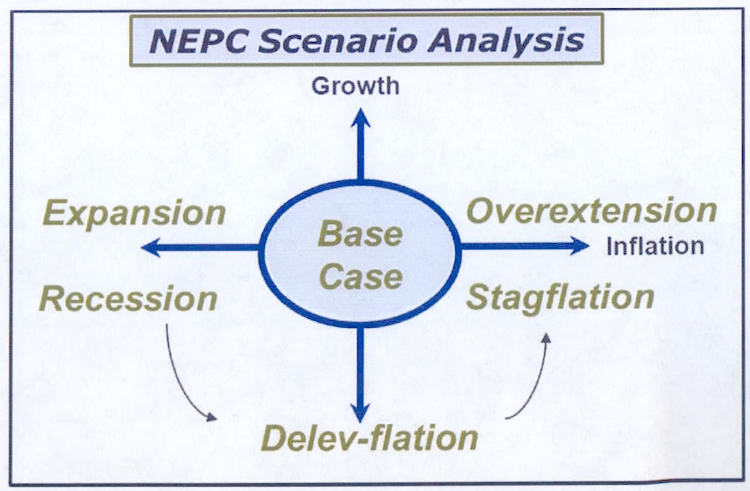

- **Risk Budgeting**
  - Considers the portfolio from a total risk perspective rather than total return
  - Determines the contribution to risk from each asset class based on:
    - Standard deviation (volatility)
    - Correlations
  - Highlights benefits of diversification and risk balance
  - Both total risk and distribution of risk across asset classes can be compared across mixes



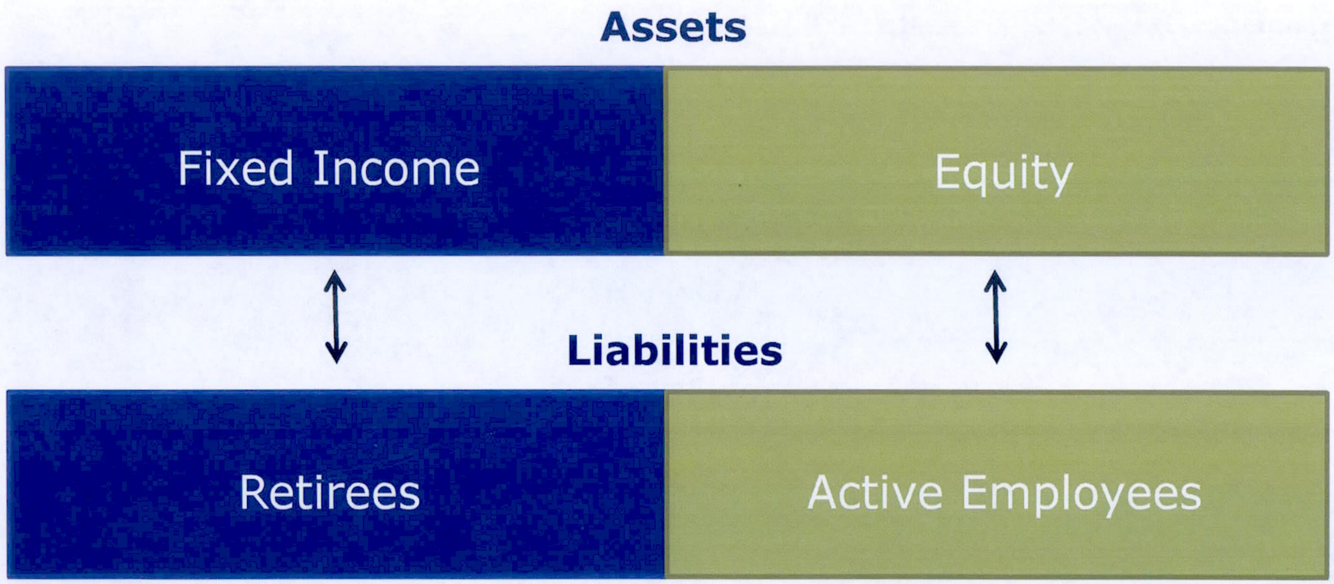
- **Deterministic Forecasting**
  - Provides baseline projections of assets and liabilities
  - Assumes all economic and population assumptions are realized at expectations
    - Expected portfolio returns
    - Expected liability growth
    - Expected contributions
  - Useful for planning but does not capture variability of outcomes or risk of not reaching objectives




- **Scenario Analysis**
  - Tests the viability of alternative asset mixes under multiple economic scenarios
  - Allows better understanding of risk exposures under contrasting inflation and economic growth regimes
  - Can understand the effect on both assets and liabilities
  - Can reveals risk tolerance under various economic environments



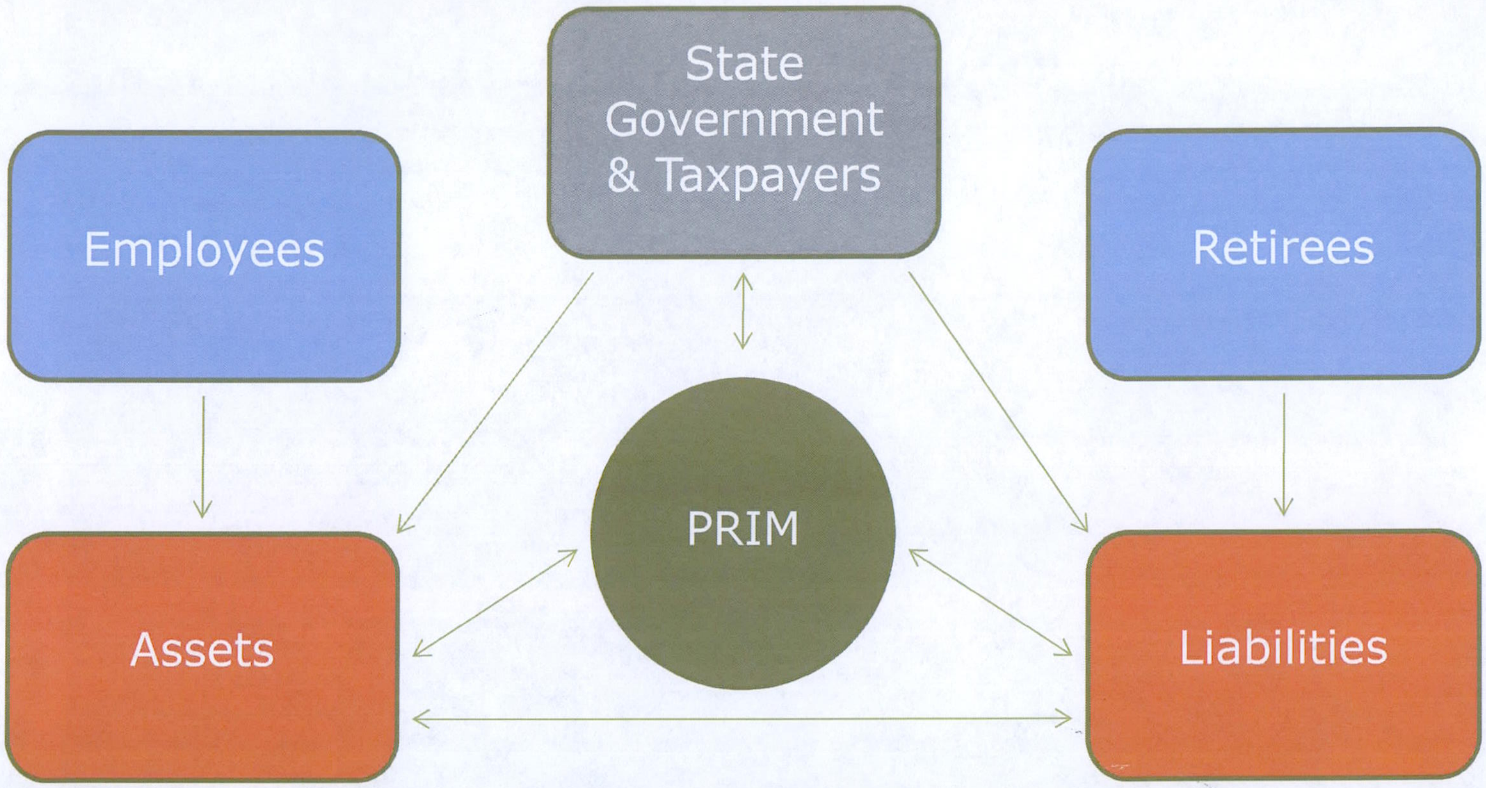
- **At a basic level, assets and liabilities have a key link**




**Characteristics**
- **Stable income streams**
- **Shorter time horizon**

**Characteristics**
- **High expected growth**
- **Minimal income expectations**
- **Longer time horizon**

## Plan Linkages




**Asset specific risks**
- **Manager structure**
- **Rebalancing**

**Asset-liability risks**
- **Inflation**
- **Economic growth**
- **Interest rates**

**Liability specific risks**
- **Demographics**
- **Benefit changes**

# Information Disclaimer

- **Past performance is no guarantee of future results.**
- **Information on market indices was provided by sources external to NEPC. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained within.**
- **The goal of this report is to provide a basis for substantiating asset allocation recommendations.**
- **All investments carry some level of risk. Diversification and other asset allocation techniques do not ensure profit or protect against losses.**
- **This report is provided as a management aid for the client's internal use only. This report may contain confidential or proprietary information and may not be copied or redistributed to any party not legally entitled to receive it.**

# Asset-Liability Disclosures

- **NEPC, LLC is an investment consulting firm. We provide asset-liability studies for certain clients but we do not provide actuarial services. Any projections of funded status or contributions contained in this report should not be used for budgeting purposes. We recommend contacting the plan's actuary to obtain budgeting estimates.**

- **The goal of this report is to provide a basis for substantiating asset allocation recommendations.**

- **The projection of liabilities in this report uses standard actuarial projection methods and does not rely on actual participant data. Asset and liability information was received from the plan's actuary, and other projection assumptions are stated in the report.**

- **Assets are projected using a methodology chosen by the client. Gains and losses are estimated through investment returns generated by applying NEPC's 5-7 year asset class assumptions and scenario assumptions for the current year.**

- **This report is based on forward-looking assumptions, which are subject to change.**

- **This report may contain confidential or proprietary information and may not be copied or redistributed.**