Public Agenda Item #2c

Review and Discussion of ERS' Asset Allocation Study

Capital Market Assumptions

December 1, 2016

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Agenda

- Review of Asset Liability Process
- Introduction of Capital Market Assumptions Methodology
- Review of Current Capital Market Assumptions
- Discussion on Presidential Elections
- Review of Asset Liability Process Timeline

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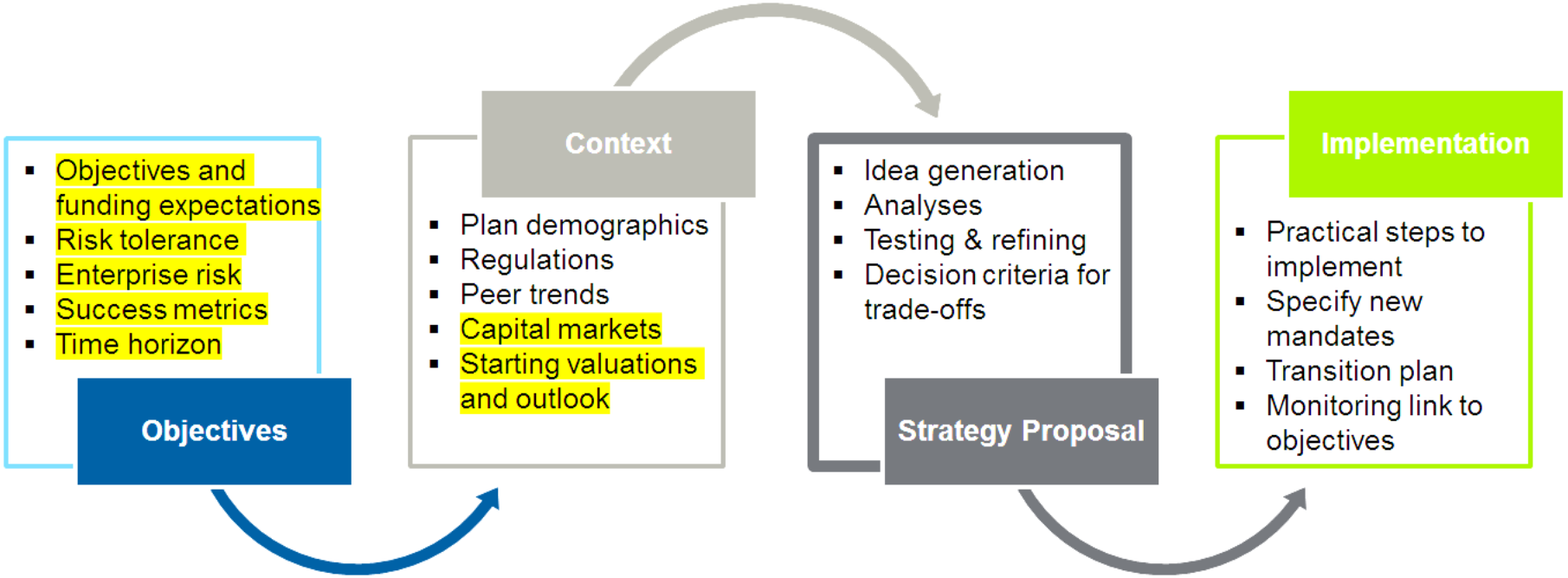
Asset Liability Process Overview



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Capital Market Assumption Method Alternatives

Method	Pros	Cons
Historical	▪ Based on true history of capital market events ▪ Readily explainable	▪ Generally a poor predictor of future outcomes ▪ Tends to project increased returns following outperformance and vice versa
Equilibrium (CAPM)	▪ Grounded in finance theory ▪ Transparent ▪ Consistent relationship between risk and return across asset classes	▪ Theory relies on assumptions that may not always hold ▪ Assumptions highly sensitive to inputs
Judgment-Driven	▪ Incorporates the knowledge and experience of the developer of the assumptions	▪ May not result in fully consistent return and risk assumptions ▪ Not fully transparent ▪ Not easily reproducible
Building Block	▪ Incorporates the primary drivers of return in each asset class ▪ Transparent ▪ Consistent relationship between risk and return across asset classes	▪ Generally assumes less-than-perfect market equilibrium ▪ More complex than other methods

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Capital Market Assumptions

2012 Asset Liability Assumptions vs. 2016 Assumptions (10-Year)

		Policy	2012 AL Study		2016 Assumptions	
		Weight	Return	Risk	Return	Risk
Return Seeking Assets:		**79%**				
Global Equity		55%				
	Public Equity	45%	8.0%	21.0%	7.2%	18.5%
	Private Equity*	10%	10.0%	28.5%	9.3%	24.5%
Global Credit		10%				
	High Yield	10%	5.2%	14.0%	6.1%	12.0%
	Private Credit	0%	--	--	5.5%	9.5%
Real Assets		14%				
	Real Estate*	10%	8.0%	16.5%	7.5%	15.0%
	Infrastructure*	4%	8.7%	18.5%	7.0%	12.0%
Risk Reduction Assets:		**21%**				
Absolute Return		5%				
	Absolute Return Portfolio*	5%	5.6%	4.5%	5.0%	3.6%
Rates		15%				
	Intermediate Treasuries	15%	1.7%	2.0%	1.6%	2.0%
Cash		1%				
	Cash	1%	1.5%	1.0%	1.5%	1.0%
Inflation*			3.0%		2.5%	
Estimated Return (Nominal)			7.5%		6.8%	
Estimated Risk			12.9%		12.0%	
Sharpe Ratio			0.469		0.444	

*Custom assumption of ERS Staff and AHIC

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Capital Market Assumptions

2012 Asset Liability Assumptions vs. 2016 Assumptions (10-Year)

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Asset-Liability Process Update

Capital Market Assumptions (CMAs) – What Are They?

- Aon Hewitt's asset class return, volatility and correlation assumptions
- Long-term (10-year), forward-looking assumptions
  - These are separate from our Medium Term views
- Best estimates (50/50 probability of better or worse long-term results than expected)
- Market returns: no active management value added or fees (other than hedge funds and private equity, where traditional passive investments are not available)
- Produced quarterly by Global Asset Allocation Team

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Asset-Liability Process Update

CMAs: Inflation

- Common approach is to use market implied break-even inflation rates (the difference between yields on nominal and inflation-linked government bonds of equivalent maturity or duration)
- We do not believe that Break-Even Inflation is a good estimator of future inflation
  - Break-even inflation = Expected Inflation + Inflation Risk Premium (IRP)
  - Inflation is a risk for many investors and therefore a premium is demanded to protect against it. Therefore, **we would expect IRP > 0** in the long-term
  - Break-even is affected by lots of things unrelated to inflation expectations
- Aon Hewitt Inflation assumption **based on consensus forecasts**
  - Principal source is Consensus Economics
  - Supplement with other sources (e.g., Philadelphia Fed)
- **Current Aon Hewitt 10-year Inflation forecast = 2.1%**
  - Unchanged from the level in the previous quarter (Q1 2016)

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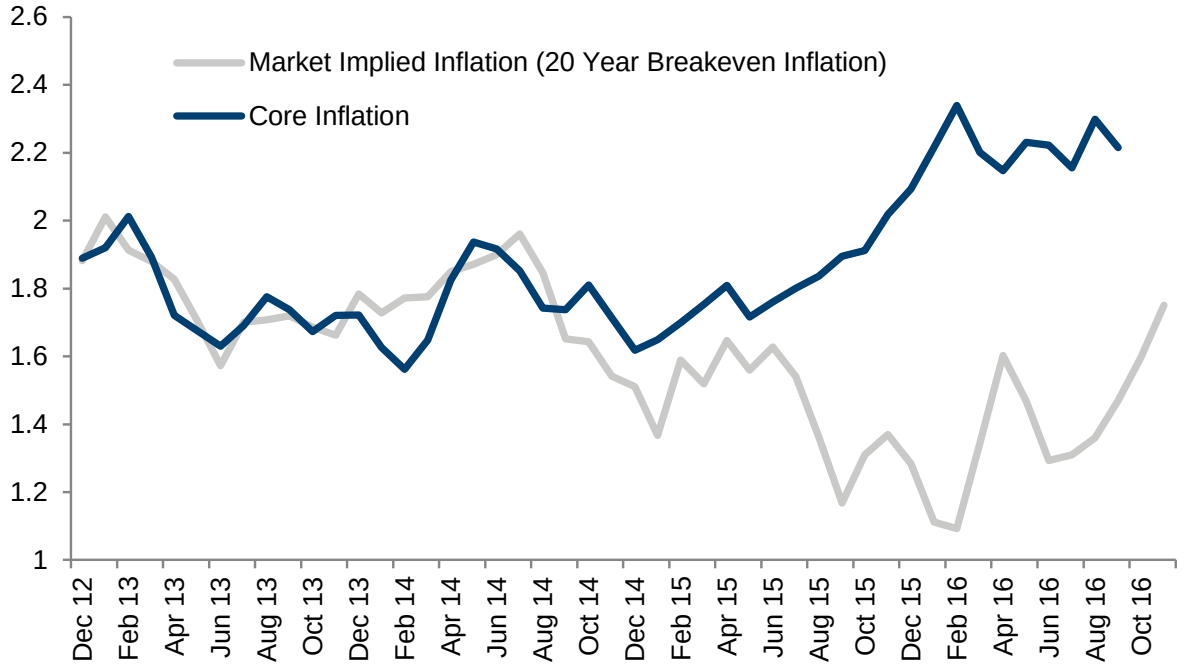
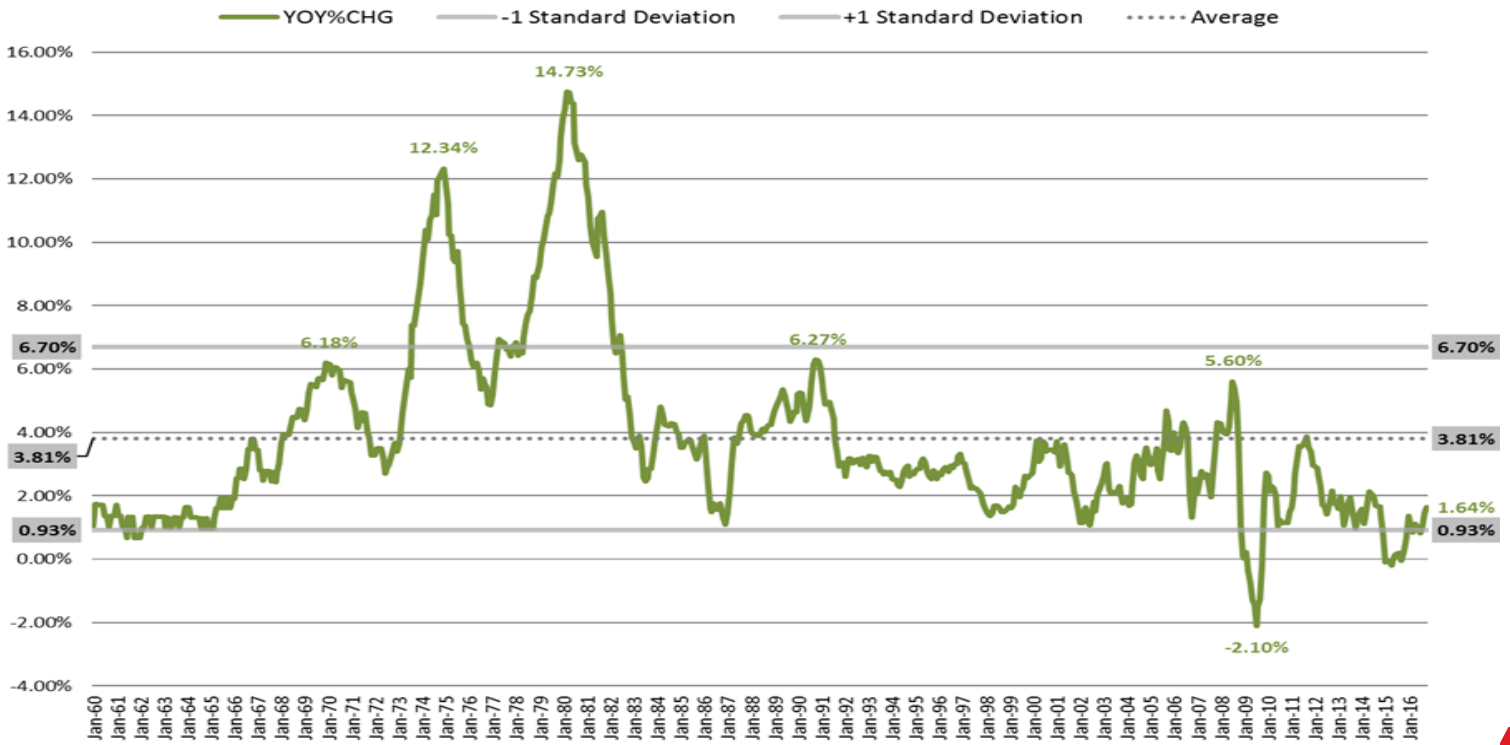
Break-Even Inflation vs. Core Inflation



- Break-even inflation is susceptible to market distortion as we have seen over the last couple of years.

Rolling 1-Year Non-Seasonally Adjusted All Urban Consumer Price Index



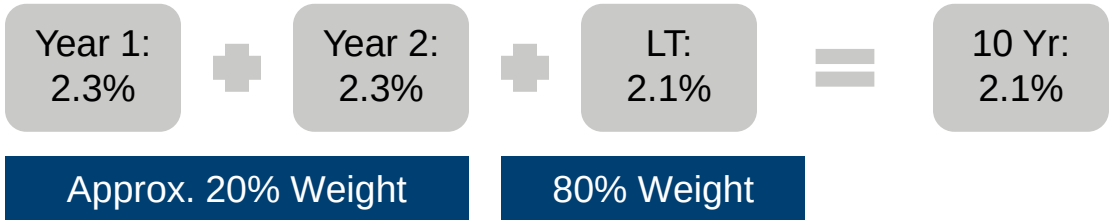
Incorporating Short & Long-Term Market Views

Our capital market assumptions incorporate the shorter term outlook in a number of different ways:

- Initial Yields: Most of our assumptions are built using a starting initial yield. To the extent that market pricing reflects short-term outlooks, our assumptions will capture this.

- Specific Economic Variables: Our growth (GDP and asset income growth) and inflation estimates incorporate the short term by combining it with our long-term steady state expectations. We weight long-term estimates more heavily than the short term.

Example Only – US Inflation



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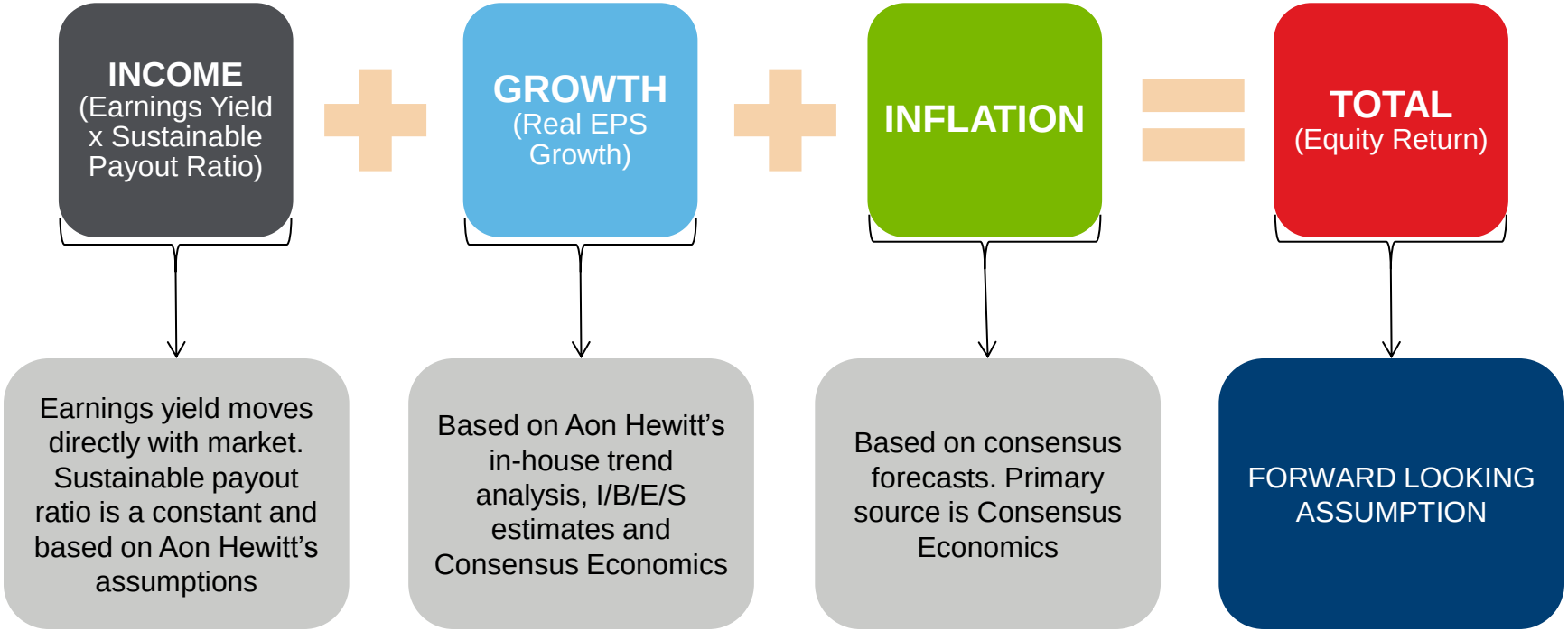
Asset-Liability Process Update

CMAs: Equities



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Asset-Liability Process Update

CMAs: Government Bonds

- We **start from the current yield curve** for government bonds
- Using a simulation model, we combine the current yield curve with an assumption on the long-term behavior of the yield curve to **derive how yields are expected to evolve over time**
  - Dominant driver of government returns is what is priced into the yield curve
- **Total return assumptions** are then derived from the forward looking yield curves
- A similar methodology is followed for **inflation-linked bonds** but based on real yields and incorporating our inflation assumptions

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CMAs: Corporate Bonds and Aggregate Index

- Corporate bond expected return is made up of three components: **Government yield, corporate spread, and expected losses from defaults and downgrades**
- All three are modeled using a wide range of simulation scenarios
- We assume that credit risk premiums revert over time from current levels to long-term historical averages
- Expected losses from defaults and downgrades are modeled using a forward-looking probability transition matrix*

Broad bond market returns are modeled as a combination of government and corporate bonds

* Based partly on historical default rates (Source: Moody's) and partly on Aon Hewitt's subjective views

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Asset-Liability Process Update

CMAs: Real Estate

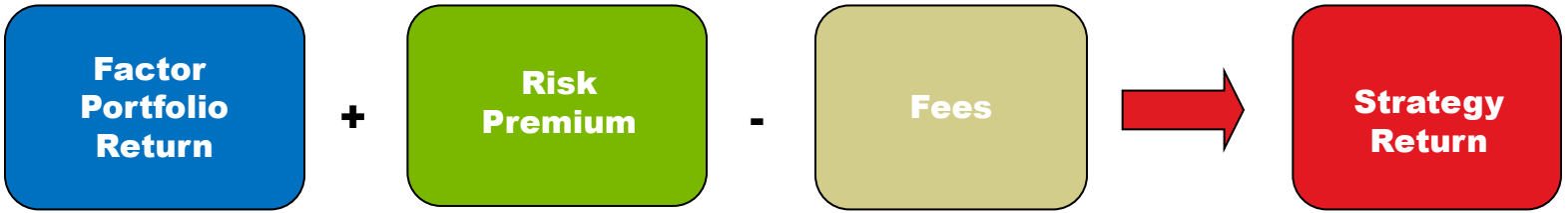
- Methodology similar to equities:

- Starting point is the **rental yield** each market is offering
- **Real rental growth** incorporates both a short term cyclical and long term aspect
  - We assume rents increase in line with consensus expectations over short term. In the long-term we assume rents grow in line with inflation
- Allow for unavoidable **costs** of direct real estate investment
- A real return assumption is calculated as the internal rate of return (IRR) of the projected cash flows **(discounted cash flow analysis similar to equities)**
- Nominal return is then calculated using our expected **inflation**
- **No manager alpha** as return assumption represents the real estate property market (and not real estate funds)

Asset-Liability Process Update

CMAs: Private Equity

- Return assumptions are **formulated for each strategy (sub-sector)** based on an analysis of the **exposure of each strategy to various market factors** with associated **risk premiums**
- Explicit **fee assumptions are subtracted** from expected returns; including base and performance-based fee/carry as appropriate
- Strategies include leveraged buyouts (LBOs), venture capital, mezzanine, and distressed investments



- Assumptions for a diversified (broad) private equity portfolio **is aggregation of assumptions for these underlying strategies**

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Asset-Liability Process Update

CMAs: Hedge Funds

- Granular modeling of hedge funds at the individual hedge fund strategy level. Assumptions exist for 7 single-strategy hedge funds, Fund of Hedge Funds, and Broad Hedge Funds (diversified portfolio of direct hedge funds)
- Unlike most other asset classes, manager skill (**alpha**) is allowed. We also make allowance for **fees**
- Assumptions are developed in a three step process:
  - **"Beta" component** returns and risks formulated by **factor analysis**[1] of underlying building blocks of 7 individual hedge fund strategies. For example, equity long/short has net long position in equity markets
  - **"Alpha" component** returns and risks set with reference to **total future volatility levels** (of hedge fund strategy) **and information ratios**[2] (ratio of excess returns to excess volatility relative to a benchmark)
  - Explicit **fee assumptions are subtracted** from expected returns; including base and performance-based fee/carry as appropriate

[1] A multivariate regression analysis procedure to identify exposures to different factors. Hedge Fund strategy returns are used as dependent variable and asset class returns are used as the independent variables

[2] Incorporates both historical analysis and Aon Hewitt's forward-looking views of information ratios relative to factor portfolios

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Asset-Liability Process Update

CMAs: Infrastructure

- Returns are formulated using a cash flow based approach that projects cash flows on a diversified portfolio of assets over a 10 year period, using IRR method
- We assume **income (initial yield)** that grows at inflation over the 10 year period
- **Capital** is assumed to grow in line with inflation
- **Leverage** is assumed at 55%
- **Debt financing costs** are set at market interest rates with appropriate credit spreads (no refinancing is assumed)
- **Fees** are assumed to be fund level – 1.5% management fee + 20% performance fee payable over 8% hurdle rate
- **Taxes** are assumed to be the standard U.S. corporate tax rate of 35%
  - While infrastructure funds will be structured tax efficiently, the earnings of project companies will be taxable

Asset-Liability Process Update

CMAs: Volatility and Correlation

- We take a **forward-looking view** when setting volatility assumptions as opposed to using purely historic averages. The credit crisis demonstrated the dangers of relying solely on historical values
- We consider:
  - **Implied volatilities** priced into option contracts of various terms
  - **Historical volatility** levels
  - The broad **economic/market environment**
- We assume that **volatilities are not constant over time**; we assume that the volatility of "risky" asset classes such as equities will be at historically high levels in the next few years before declining over time
- For illiquid asset classes such as real estate, desmoothing techniques are employed when assessing historic volatility levels
- Correlation assumptions are formulated with reference to historic experience over different time periods and during different economic conditions
  - We take into account the fact that **correlations are highly unstable over time** and, in particular, we take into account the fact that correlations are very different in stressed environments

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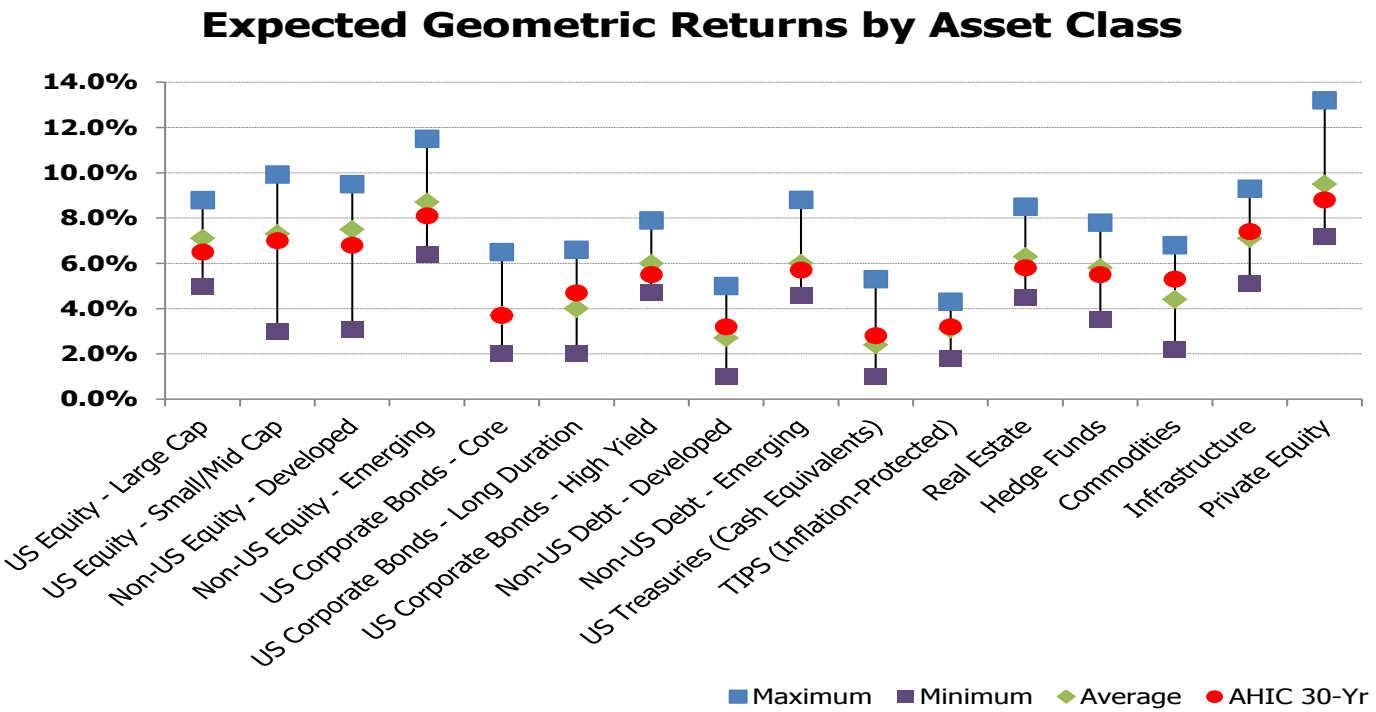
Asset-Liability Process Update

CMAs: AHIC Versus Peers (2015 Horizon Survey)



SOURCE: Horizon Actuarial survey of 2015 capital market assumptions from 29 independent investment advisors
Expected returns of the survey are annualized over 10-20 years (geometric). Returns are 'blended,' using 10-year assumptions when 20-year assumptions are not available. AHIC expected returns are annualized over 30-years.

Recent Presidential Election Results: Key things to watch

Tax and spending plans:

- The bipartisan think tank, The Committee for a Responsible Federal Budget, has estimated that President-Elect Trump's tax and spending plans will add $5.3trn to the national debt over 10 years. The main proposals of these plans include a simplification of the personal income tax rules, which will result in a significant tax cut for wealthy individuals, a reform of business taxes and $450bn of extra defense spending. The reform or repeal of the Affordable Care Act could be an offset and add to the US budget.
- These estimates are forecast to increase US debt as a percentage of GDP to 105% by 2026 but, crucially, this number does not include any adjustment to GDP growth as a result of the boost from tax cuts and defense spending.
- There will be many arguments about the likely boost and it will depend on the actual details of the policies enacted. We will comment on these projections further as more information comes in over the coming months.
- **Nonetheless, the markets have decided, at least initially, that the fiscal position of the government will worsen, implying a greater supply of Treasuries over time, thus reducing their attraction.**

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What now? Key things to watch

Trade and Immigration:

- President-Elect Trump has been highly skeptical regarding free trade deals and immigration, stating that he would be much more inward looking and would reject or repeal many of the current deals, such as NAFTA or the Trans-Pacific Partnership.
- Economic theory overwhelmingly suggests that less free trade results in lower GDP growth over time and if trade restrictions are adopted, global growth will be weaker. Against that, if fiscal stimulus is delivered, there is a partial offset to the broader growth impact.
- Again, we will need to see actual policies before taking a view on this and, while the Republican party controls Congress, many of them are in favor of free trade (and conservative fiscal policies), so it is not necessarily true that protectionist (or fiscally expansionary) policies will come into law easily. We will have to wait and see. **For the time being, the possibility of trade and migration restrictions is being interpreted negatively for Mexico and China.**

The Federal Reserve and Monetary Policy:

- Federal Reserve Chair, Janet Yellen, may not be reappointed when her 4 year term ends in February 2018. In the meantime, it is unclear what the short term economic impact will be and **we still expect an interest rate increase in the mid-December meeting, but the risk of a delay has also risen. This would provide a boost to markets in the short term.**

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Portfolio Considerations

- Political and policy uncertainty is generally higher
- We believe higher uncertainty will be reflected in risk premiums for asset classes
- Greater policy uncertainty is an added reason why our broad asset class views have become more cautious after Brexit and US elections
- Policy shifts that might follow are still very unclear, actual market impact over time is still not particularly predictable
- Diversified portfolios that have managed the risks from different economic scenarios sufficiently remain our recommended approach
- **We will review capital market assumptions as we have more certainty about the new administration**

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Asset Liability Process Overview

Asset Allocation Study	Dates	Completion Status
Orientation with staff and distribution of risk survey to Board and IAC	August - October 2016	Presented
Presentation of risk survey results; Presentation on macroeconomic view and capital market assumptions	December 2016 Board Meeting	Presented
Conduct Asset Allocation Working Session #1 - General Discussion	February 2017 Board Meeting	
Conduct Asset Allocation Working Session #2	May 2017 Board Meeting	
Conduct Asset Allocation Working Session #3	August 2017 Board Meeting	
Conduct Asset Allocation Working Session #4	December 2017 Board Meeting	
Present Asset Allocation and Investment Policy Changes for Board Consideration	February 2018 Board Meeting	

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Questions?