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Arizona Public Safety Personnel Retirement System

2010 Asset Allocation Proposal

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APSPRS Summary and Contents

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NEPC and Staff Recommend Mix 1

	Equity	Fixed Income	Alternative	GTAA	Cash
Current Policy	50%	28%	21%	0%	1%
Mix 1	35%	29%	26%	8%	2%

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NEPC 2010 Capital Markets Observations and Expectations

- 2009 was a welcome respite for investors
 - Recovery across all risky markets; a strong reversal of 2008
 - Credit recovered faster than expected
 - Financial system away from brink on Fed/Treasury actions, without current inflation
 - Despite recovery, major structural imbalances remain
 - Opportunity to re-focus on risk management after a strong return year
- Risk of long-term inflation is at highest level in nearly thirty years
 - Short-term inflation remains contained
 - What will Federal Reserve do if inflation increases before employment picks up?
 - Some inflation could come in the form of a falling US dollar
- Dollar expected to continue long-term weakening trend along with other developed currencies
 - Expect strong dollar rallies but also large drops, despite “everyone’s best interest” in a gradual decline
 - Global diversification away from US dollar as primary reserve currency
 - Depreciation relative to emerging currencies due to lower growth and weaker balance sheet
- Forward-looking expected returns have declined
 - Based on consistent NEPC long-term expectations adjusted for 2009 gains
 - Unemployment, high debt levels, and general uncertainty impair the real economy
 - Recovery based on government actions instead of consumers and small businesses

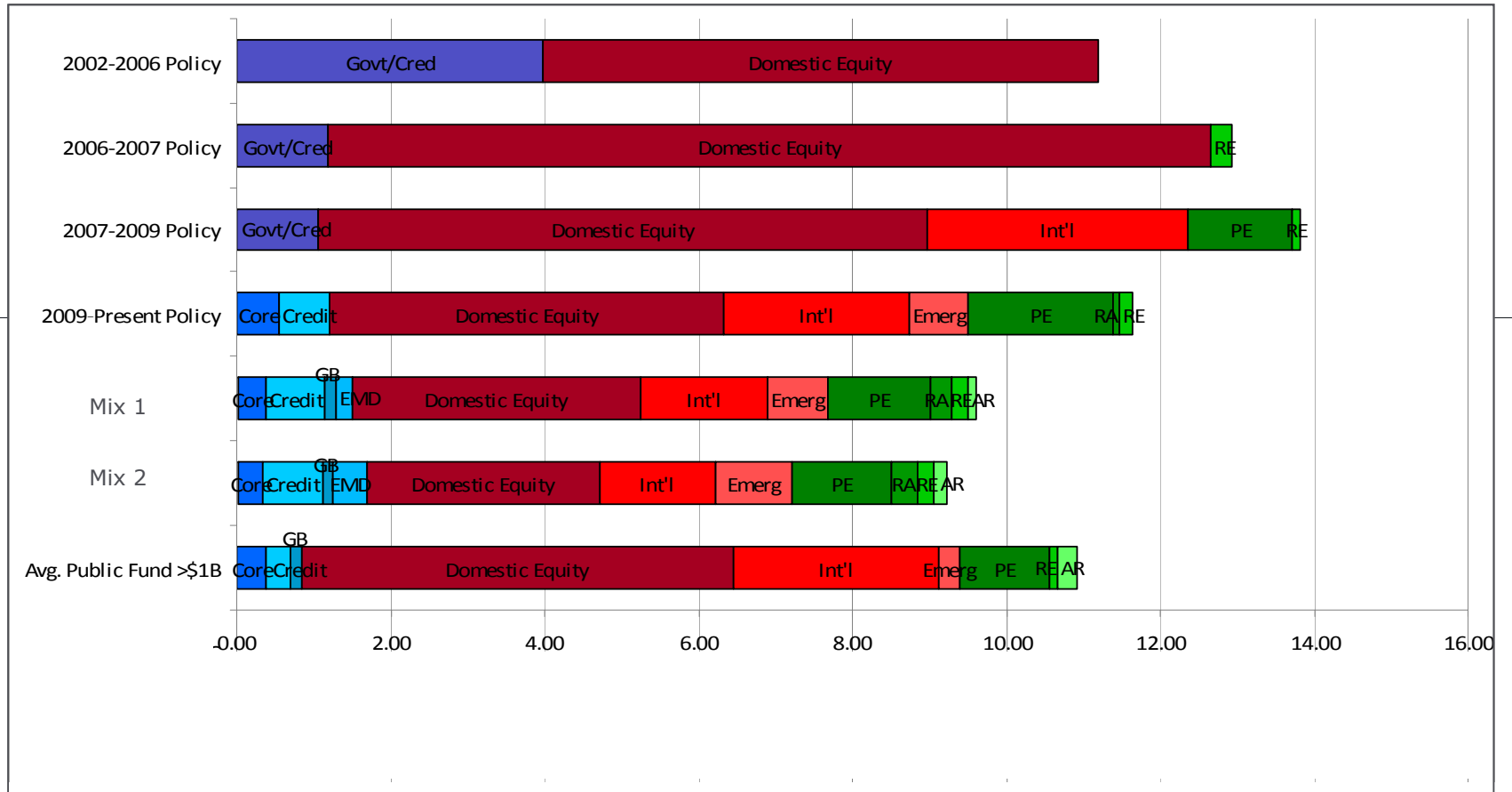
NEPC 2010 General Actions for Clients

- Continue to assess the future from a risk management perspective
 - Confirm long-term goals and objectives
 - Where is risk being taken? – Risk budgeting
 - What environments are unlikely but harmful? – Scenario analysis
 - Avoid chasing returns in a lower return environment
- Review the role of fixed income
 - Meeting program objectives – liquidity, timing, duration, nominal/real commitments
 - Tail-risk management for deflation and inflation
 - Short-term yields are low, the yield curve is steep and credit spreads have tightened
 - Future credit opportunities involve manager skill more than just market exposure
 - Give greater discretion to managers with a broad credit skill set
 - Lend with favorable terms in distressed debt and mezzanine lending
- Build strategic exposure to real assets
 - Higher inflation expectations may already be priced into some markets
- Consider illiquid investments for increased expected returns
 - Demand continues, while traditional suppliers of capital have exited the market
 - Lock-ups protect investors from “fast money”
 - Measure sizing and pacing using project plans and liquidity analysis
- Overweight emerging market investments to protect from dollar losses
- Retain focus on diversification in a time of uncertainty

Asset Allocation Choices

	Current Policy	Recommendation 1	Recommendation 2	Avg. Public Fund Over \$1 Billion
Cash	1%	2%	2%	5%
Domestic Equities	30%	20%	16%	33%
Non-U.S. Equities	20%	15%	14%	18%
<i>International Developed Equities</i>	15%	8%	7%	16%
<i>Emerging Markets Equities</i>	5%	7%	7%	2%
Total Equity	50%	35%	30%	51%
Global Asset Allocation	0%	8%	8%	0%
Domestic Fixed Income	20%	12%	11%	14%
Non-U.S. Fixed Income	0%	8%	10%	6%
<i>International Bonds</i>	0%	6%	6%	6%
<i>EMD</i>	0%	2%	4%	0%
Credit Strategies	8%	9%	9%	4%
Total Fixed Income	28%	29%	30%	24%
Real Estate	8%	8%	8%	6%
Private Equity	8%	8%	8%	5%
Real Assets	5%	6%	8%	0%
Absolute Return	0%	4%	6%	9%
Total Alternatives	21%	26%	30%	20%
Expected Return	7.8%	8.0%	8.0%	7.4%
Standard Deviation	11.5%	9.4%	9.1%	11.1%
Sharpe Ratio	0.4	0.5	0.5	0.5
Sortino Ratio (0% Target Return)	0.9	1.1	1.2	0.9
Target Probabilities of < 0% over 1 year	24.0%	18.9%	17.8%	24.1%
Target Probabilities of < 0% over 5 years	5.7%	2.4%	1.9%	5.8%

Risk Allocation



Appendix

Themes for 2010 Asset Class Assumptions

- Returns are lower than 2009 assumptions
 - Reflect big gains in risky assets since March
 - Comparable with 2008, but still lower
 - Very low short term rates not expected to increase in near-term
 - Low likelihood of strong economic growth
- Fixed income assumptions based on factor model
 - No real change in philosophy behind assumption development
 - Allows us to capture recent trends in credit ops and LDI that have greatly increased the types of client products
 - New broad asset classes:
 - Treasuries
 - Credit
 - MBS
 - Private Debt
 - Current asset classes replaced with factors:
 - Core Bonds
 - Long Bonds
- Hedge fund categories now based on low and moderate volatility

Development of Asset Class Assumptions

- Relies on a combination of historical data and forward-looking analysis
 - Expected returns based mostly on forward-looking current market pricing
 - Volatility based mostly on history, with some recognition of recent volatility spike
 - Correlations based on a mix of history and current trend
 - New focus this year: 5-7 year correlations from similar starting conditions
- 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 to determine expected values of underlying factors (inflation, real growth, dividends, etc.)
 - Structural themes that can have long term effects on asset classes (supply and demand imbalances, US Dollar performance, etc.)
- Historical data is used to frame current market environment as well as to compare to similar historical periods
 - Historical index returns
 - Volatility
 - Correlations
 - Performance during other downturns and subsequent recoveries
 - Average historical P/E, yield, etc.
- Assumptions reviewed and approved by Partner's Research Committee

2010 5-7 Year Return & Risk Forecasts

Geometric Expected Return						Volatility					
Asset Class	2008	2009	2010	2010-2008	2010-2009	Asset Class	2008	2009	2010	2010-2008	2010-2009
Cash	4.00%	3.00%	2.00%	(2.00%)	(1.00%)	Cash	1.50%	2.00%	1.50%	0.00%	(0.50%)
Treasuries			2.75%			Treasuries			5.50%		
Credit			5.50%			Credit			7.00%		
MBS			4.00%			MBS			9.00%		
TIPS	4.75%	6.00%	3.50%	(1.25%)	(2.50%)	TIPS	6.00%	7.50%	7.00%	1.00%	(0.50%)
High-Yield Bonds	6.75%	11.00%	8.00%	1.25%	(3.00%)	High-Yield Bonds	10.75%	18.00%	12.00%	1.25%	(6.00%)
Global Bonds	4.00%	4.25%	3.25%	(0.75%)	(1.00%)	Global Bonds	9.25%	9.75%	10.00%	0.75%	0.25%
Emerg Market Debt	6.50%	8.00%	6.50%	0.00%	(1.50%)	Emerg Market Debt	15.00%	19.00%	15.00%	0.00%	(4.00%)
Large Cap Equity	8.50%	9.25%	7.75%	(0.75%)	(1.50%)	Large Cap Equity	16.00%	20.00%	18.00%	2.00%	(2.00%)
Small/Mid Cap Equity	8.75%	9.50%	8.00%	(0.75%)	(1.50%)	Small/Mid Cap Equity	21.00%	24.00%	23.00%	2.00%	(1.00%)
Int'l Equities	9.00%	9.75%	8.00%	(1.00%)	(1.75%)	Int'l Equities	19.00%	24.00%	21.00%	2.00%	(3.00%)
Emerging Mkt Equity	9.50%	10.50%	9.50%	0.00%	(1.00%)	Emerging Mkt Equity	27.00%	32.00%	29.00%	2.00%	(3.00%)
Commodities	5.00%	5.25%	4.75%	(0.25%)	(0.50%)	Commodities	15.00%	20.00%	22.00%	7.00%	2.00%
Real Estate	6.75%	7.00%	7.00%	0.25%	0.00%	Real Estate	11.50%	13.00%	15.00%	3.50%	2.00%
Private Equity	10.50%	11.50%	10.00%	(0.50%)	(1.50%)	Private Equity	27.00%	32.00%	30.00%	3.00%	(2.00%)
Private Debt			10.00%			Private Debt			19.00%		
Hedge Funds - Low Vol	6.50%	6.50%	6.25%	(0.25%)	(0.25%)	Hedge Funds - Low Vol	7.00%	8.00%	7.00%	0.00%	(1.00%)
Hedge Funds - Mod Vol	8.00%	8.00%	7.50%	(0.50%)	(0.50%)	Hedge Funds - Mod Vol	10.00%	15.00%	12.00%	2.00%	(3.00%)
Core Bonds	5.00%	5.50%	3.75%	(1.25%)	(1.75%)	Core Bonds	6.75%	7.00%	7.00%	0.25%	0.00%
GTAA			5.34%			Risk Parity (GTAA)			11.12%		

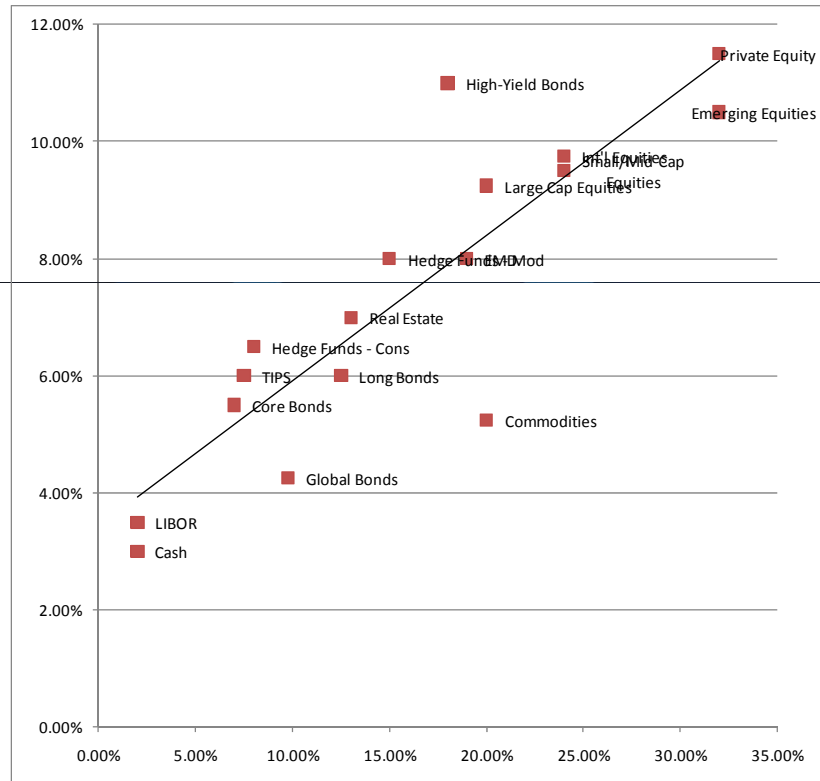
2010 Correlations

Asset Class	Cash	LBR	Treas	Credit	MBS	TIPS	High-Yield Bonds	Global Bonds	EMD	Large Cap Equities	Small/Mid Cap Equities	Int'l Equities	Emerging Int'l Equities	Private Equity	Private Debt	Real Estate	Commodities	Hedge Funds Low Vol	Hedge Funds Mod Vol	Core Bonds	Long Govt/Credit
Cash	1.00	0.75	0.20	0.15	0.25	0.00	-0.05	0.10	0.10	0.05	-0.05	-0.10	-0.10	-0.10	0.00	0.40	0.10	0.40	0.10	0.20	0.15
LIBOR	0.75	1.00	0.05	0.10	0.15	0.00	0.10	-0.05	-0.05	0.10	0.00	-0.10	-0.05	-0.10	0.05	0.45	0.05	0.40	0.05	0.10	0.05
Treasuries	0.20	0.05	1.00	0.95	0.90	0.80	0.35	0.55	0.10	0.40	0.10	0.15	0.00	0.05	-0.25	0.00	-0.05	0.05	0.10	1.00	1.00
Credit	0.15	0.10	0.95	1.00	0.90	0.70	0.50	0.50	0.30	0.45	0.25	0.20	0.10	0.25	0.05	-0.05	-0.05	0.15	0.30	1.00	0.95
MBS	0.25	0.15	0.90	0.90	1.00	0.70	0.45	0.45	0.20	0.45	0.20	0.20	0.05	0.15	0.00	0.00	-0.05	0.10	0.20	0.95	0.90
TIPS	0.00	0.00	0.80	0.70	0.70	1.00	0.20	0.40	0.20	-0.10	-0.10	-0.10	-0.10	0.00	0.05	-0.05	0.20	0.35	0.20	0.75	0.75
High-Yield Bonds	-0.05	0.10	0.35	0.50	0.45	0.20	1.00	0.10	0.60	0.60	0.60	0.40	0.45	0.60	0.65	-0.10	-0.10	0.45	0.50	0.40	0.40
Global Bonds	0.10	0.05	0.55	0.50	0.45	0.40	0.10	1.00	-0.15	0.00	-0.10	0.40	-0.05	0.00	-0.40	-0.05	0.00	0.00	0.00	0.55	0.50
EMD	0.10	0.05	0.10	0.30	0.20	0.20	0.60	-0.15	1.00	0.60	0.55	0.50	0.80	0.25	0.55	-0.10	0.10	0.30	0.25	0.20	0.15
Large Cap Equities	0.05	0.10	0.40	0.45	0.45	-0.10	0.60	0.00	0.60	1.00	0.80	0.60	0.45	0.75	0.40	-0.10	-0.10	0.40	0.55	0.35	0.35
Small/Mid Cap Equities	-0.05	0.00	0.10	0.25	0.20	-0.10	0.60	-0.10	0.55	0.80	1.00	0.50	0.55	0.85	0.50	-0.05	-0.10	0.40	0.60	0.15	0.20
Int'l Equities	-0.10	0.10	0.15	0.20	0.20	-0.10	0.40	0.40	0.50	0.60	0.50	1.00	0.50	0.50	0.40	0.00	0.00	0.25	0.25	0.15	0.15
Emerging Int'l Equities	-0.10	0.05	0.00	0.10	0.05	-0.10	0.45	-0.05	0.80	0.45	0.55	0.50	1.00	0.25	0.45	-0.20	-0.15	0.20	0.25	-0.05	-0.10
Private Equity	-0.10	0.10	0.05	0.25	0.15	0.00	0.60	0.00	0.25	0.75	0.85	0.50	0.25	1.00	0.00	0.00	0.00	0.20	0.30	0.15	0.10
Private Debt	0.00	0.05	-0.25	0.05	0.00	0.05	0.65	-0.40	0.55	0.40	0.50	0.40	0.45	0.00	1.00	-0.30	0.10	0.35	0.60	-0.10	-0.05
Real Estate	0.40	0.45	0.00	-0.05	0.00	-0.05	-0.10	-0.05	-0.10	0.10	-0.05	0.00	-0.20	0.00	-0.30	1.00	0.00	0.00	0.00	0.00	-0.10
Commodities	0.10	0.05	-0.05	-0.05	-0.05	0.20	-0.10	0.00	0.10	-0.10	-0.10	0.00	-0.15	0.00	0.10	0.00	1.00	0.10	0.15	-0.05	-0.10
Hedge Funds Low Vol	0.40	0.40	0.05	0.15	0.10	0.35	0.45	0.00	0.30	0.40	0.40	0.25	0.20	0.20	0.35	0.00	0.10	1.00	0.90	0.05	0.10
Hedge Funds Mod Vol	0.10	0.05	0.10	0.30	0.20	0.20	0.50	0.00	0.25	0.55	0.60	0.25	0.25	0.30	0.60	0.00	0.15	0.90	1.00	0.15	0.25
Core Bonds	0.20	0.10	1.00	1.00	0.95	0.75	0.40	0.55	0.20	0.35	0.15	0.15	-0.05	0.15	-0.10	0.00	-0.05	0.05	0.15	1.00	0.95
Long Govt/Credit	0.15	0.05	1.00	0.95	0.90	0.75	0.40	0.50	0.15	0.35	0.20	0.15	-0.10	0.10	-0.05	-0.10	-0.10	0.10	0.25	0.95	1.00
GTAA	-0.11	0.11	0.70	0.70	0.70	0.75	0.53	0.76	0.31	0.28	0.20	0.57	0.00	0.25	0.00	-0.08	0.31	0.25	0.18	0.00	0.00

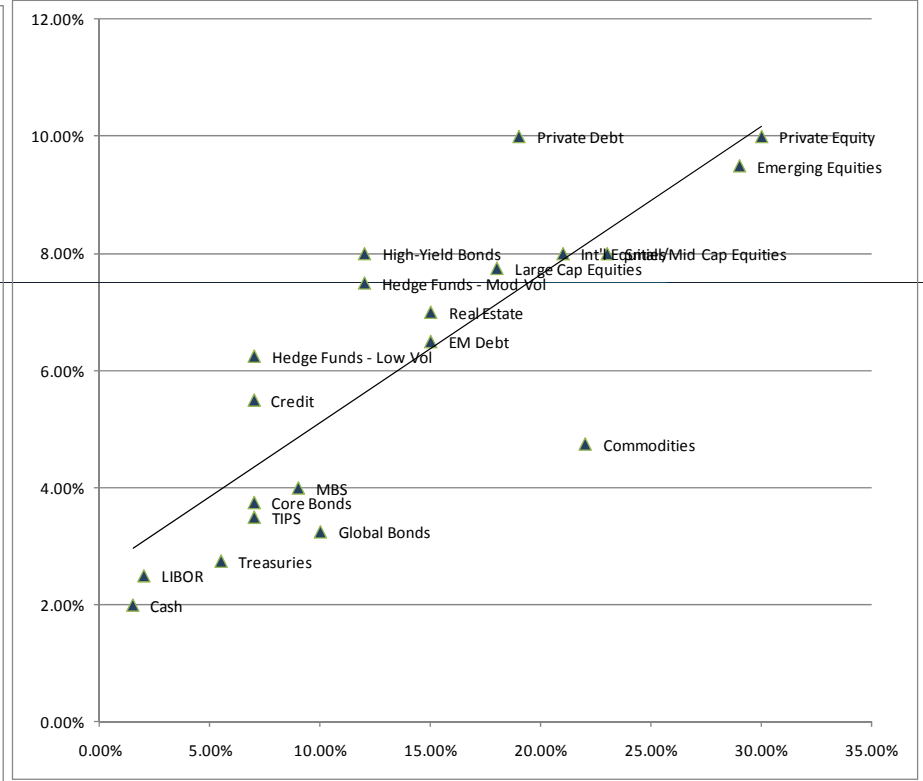


Comparison of Assumptions

2009



2010



Major Asset Class Review (Geometric)

Asset Class	Historical Long Term Geometric Average ¹	5-to-7 Year NEPC Assumptions							
		2003	2004	2005	2006	2007	2008	2009	2010
Cash		3.50%	3.50%	3.50%	3.75%	4.00%	4.00%	3.00%	2.00%
Core Bonds ²		4.50%	4.50%	4.50%	5.00%	5.00%	5.00%	5.50%	3.75%
Large Cap		8.75%	8.50%	8.50%	8.50%	8.50%	8.50%	9.25%	7.75%
International ³		9.75%	9.50%	9.50%	9.00%	8.75%	9.00%	9.75%	8.00%

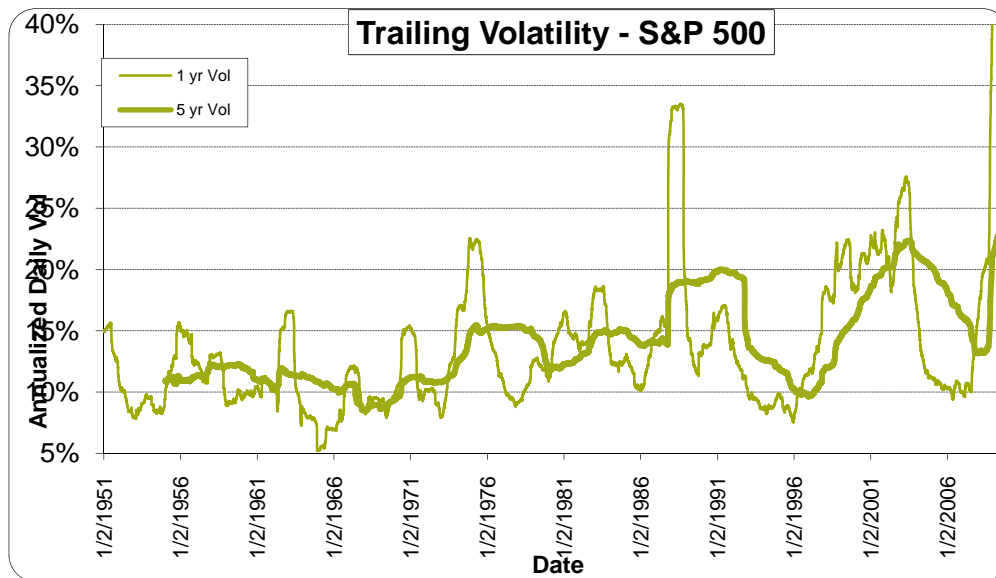
- 1. Reflects average since inception (1926 except as noted below) of the respective index through 12/31/2009.
- 2. LB/BC Aggregate reflects average compound annual return since 1976.
- 3. International reflects average annual return since 1970.

Assumption Development – Large Cap Equity

- Sources of Return
 - Valuation
 - Real earnings growth
 - Dividend yield
 - Inflation

Return Source	Estimates of Historical Averages (1937 - 2009)	Current Values	Expected Forecast Values	Return Contribution
Valuation	15.8	17	15 but with expanding profit margins	-0.25%
Real Growth*	2.5%	2.2%	2.5%	2.50%
Dividend Yield**	2.2%	3.0%	2.5%	2.50%
Inflation	3.8%	1.8%	3.0%	3.00%
Total Expected Return				7.75%

* Real GDP growth used as proxy for real earnings per share growth
 ** Dividend yield history from 1988 – 2009



• Volatility

- Historical annualized volatility = 16%
- Trailing 12 month volatility (Dec 2009) = 22.6%
 - Current VIX Pricing ~ 19
- Volatility is conditional – spikes in volatility tend to result in extend periods of increased volatility
- Annual volatility expected to normalize over 5-7 years but this likely leads to 5-7 year volatility above historical average
- **2010 5-7 year Volatility assumption = 18%**



Other Equity Assumptions

- Small Cap Equity
 - 25 basis point premium over large cap, expected over 5-7 years
 - Volatility expected to be higher than Large Cap
- International Developed Equity
 - 25 basis point premium over Large Cap US
 - Mostly a smaller cap impact, as developed currencies all under pressure
 - Currency impact increases volatility
- Emerging Market Equities
 - Even after huge return in 2009, significant return premium of 1.75% over Large Cap US expected over 5-7 years
 - Higher growth rates, better balance sheets and currency appreciation
 - Currency impact increases volatility

Fixed Income Factor Model

- Return/volatility/correlation assumptions for fixed income sectors
 - Discreet returns for subsectors creates opportunity to build customized allocations across fixed income markets and maturities
- Assumptions built for:
 - US Treasury
 - 1-3 year; Intermediate; Long
 - US Investment Grade Credit
 - 1-3 year; Intermediate; Long
 - US MBS
 - US TIPS
 - US High Yield Credit
 - 1-3 year; Intermediate; Long
 - Global Bonds (Sovereign)
 - Emerging Market Debt (Sovereign)

Fixed Income Factor Model Inputs

- Market based inputs
 - 7 years of forward Treasury yield curve assumptions from Bloomberg
 - Nominal and Real
 - Current Spreads for IG, HY & EMD Credit
 - Historical correlation matrix (approx 20 years of monthly data)
 - Rounded up to reflect expectations of rising correlations
 - Current duration input for 1, 10, 30 yr Treasury
- Adjusted market based inputs
 - Horizon end point for IG, HY & EMD Credit spreads
 - Flat credit curves – historically reasonable
 - Straight line compression from current levels
 - Volatility figures adjusted up from historical medians, lower than current in many cases
 - Adjusted by review of periods of rising yields (mid-70s to early-80s)
 - Most durations based on market medians adjusted for current

Fixed Income Factor Model Methodology

- Each subsector return calculated:
 - Annual Return = Annual yield + Yield differential * Duration
 - Computed for 7 years and annualized to geometric return figure
 - Returns then adjusted for expectations
 - Most are very close to calculation
- Mortgages are more complex to model
 - Return calculated looking backward at periods of rising interest rates
 - 2003-2006: Range of 2.6%-5.2%, during which time MBS yields rose 1%
 - 1987-1988: Range of 4.3%-8.7%, yields rose 2%
 - 1977-1981: Range of 0.1%-2.4%, yields rose 7.5%
 - Very high volatility in this period – much smaller market

Alternative Assumptions

- Mean/variance framework can be used to show diversification benefits of alternatives, but is limited in ability to:
 - Size alternatives relative to traditional investments
 - Address distinctions of sub-categories or current manager strategies in the market
 - Actual implementations should use Research teams to adjust to specific strategies
-
- Real Estate
 - Mix of fixed income, equity, and real asset components
 - Hedge Funds – Low Volatility
 - Cash + 4.25% (includes imbedded .30 beta to equity)
 - Hedge Funds – Moderate Volatility
 - Cash + 5.50% (includes imbedded .60 beta to equity)
 - Private Equity
 - Extension of public equity market

Efficient Frontier Comparison

