Wilshire

Employees' Retirement Fund of the City of Dallas

2017 Asset Allocation Analysis

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Stephen Marshall – Managing Director

March 2017

Introduction to Risk Lenses

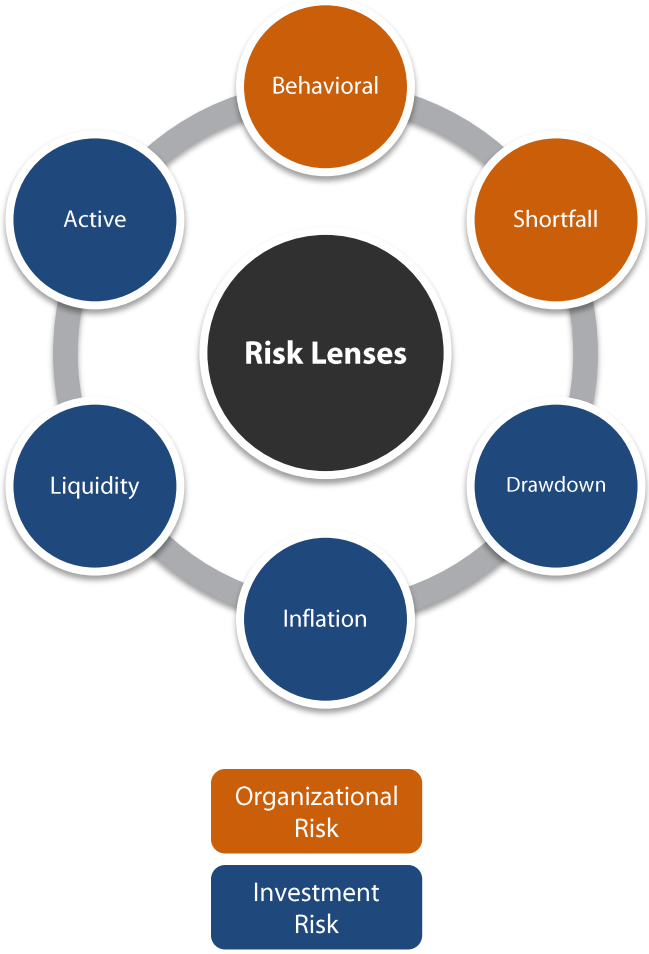
Asset Allocation Framework – Risk Lenses

- Wilshire considers six different risk lenses throughout the investment process. When applied to asset allocation, these lenses help to focus the process by providing context for modeling results and orienting decisions around organizational goals.

Organizational Risk

Investment Risk

The World Through Risk Lenses



Behavioral: The potential for biased decision making to impede the organization's ability to reach it's investment goals.

- The board approves asset allocation ranges, updated regularly, and well defined procedures around re-balancing to minimize behavioral biases

Shortfall: The potential for the portfolio to fail to reach the organization's objectives. *Examples include failing to meet the actuary's assumed rate of return or a decline in funded status.*

- More attractive asset allocations will have a higher expected return, would be expected to meet the actuarial rate over a thirty year period, and improve long term and median pension metrics.

Drawdown: The potential for the portfolio to decline significantly in value. *Examples include negative return in a given year.*

- A new asset allocation will strive to lower the standard deviation of return, can be more defensive in a low growth environment, and improve "Very Pessimistic" pension metrics.

Inflation: The potential for financial assets to lose purchasing power over time. *Examples include the portfolio not being sensitive to inflationary economic environments.*

- Need to balance protection against inflationary environments with other expected risk/return metrics.

Liquidity: The potential for an investor to be unable to buy or sell specific assets in the portfolio *Examples include having to sell assets at depressed prices.*

- Having sufficient liquidity to cover benefit payments and expenses during stressed environments is an important consideration for the system.

Active: The potential for an investment strategy to experience tracking error due to characteristics that differ from those of the market.

- The portfolio includes both active and passive strategies to achieve portfolio objectives in a cost-effective manner

Modeling Inputs

Model Input – Capital Market Assumptions (as of Dec. 31, 2016)

Wilshire

- Wilshire's asset class return, risk and correlation assumptions are developed based on 10-year forward-looking expectations, adjusted to incorporate recent trends/price levels
- Return expectations represent a passive investment in the asset class **(beta)**. They do not reflect value added from active management **(alpha)**

Asset Class	10-Year Expected Compound Return	30-Year Expected Compound Return	10-Year Expected Risk	Cash Yield
Equity/Growth Assets				
Domestic Equity	6.50%	7.65%	17.00%	2.00%
International Equity	6.70%	7.85%	18.75%	2.85%
Global Equity	6.70%	7.85%	17.15%	2.40%
Global Low Volatility Equity	6.70%	7.85%	13.45%	2.55%
Private Equity	9.40%	10.50%	27.50%	0.00%
Fixed Income - Risk Reduction and Mitigation				
Core Fixed Income	3.65%	4.75%	5.15%	3.80%
High Yield Fixed Income	5.35%	6.90%	10.00%	8.40%
Credit Opportunities	6.10%	7.10%	10.35%	4.15%
Risk Mitigation Strategies	6.00%	7.20%	6.55%	0.00%
Cash	1.55%	2.70%	1.25%	1.55%
Inflation Hedging Assets				
REITs	5.40%	6.65%	17.00%	3.95%
Private Real Estate	4.80%	6.10%	12.00%	3.65%
MLPs	9.00%	9.85%	17.00%	7.05%
Timber	6.95%	7.30%	15.00%	0.00%

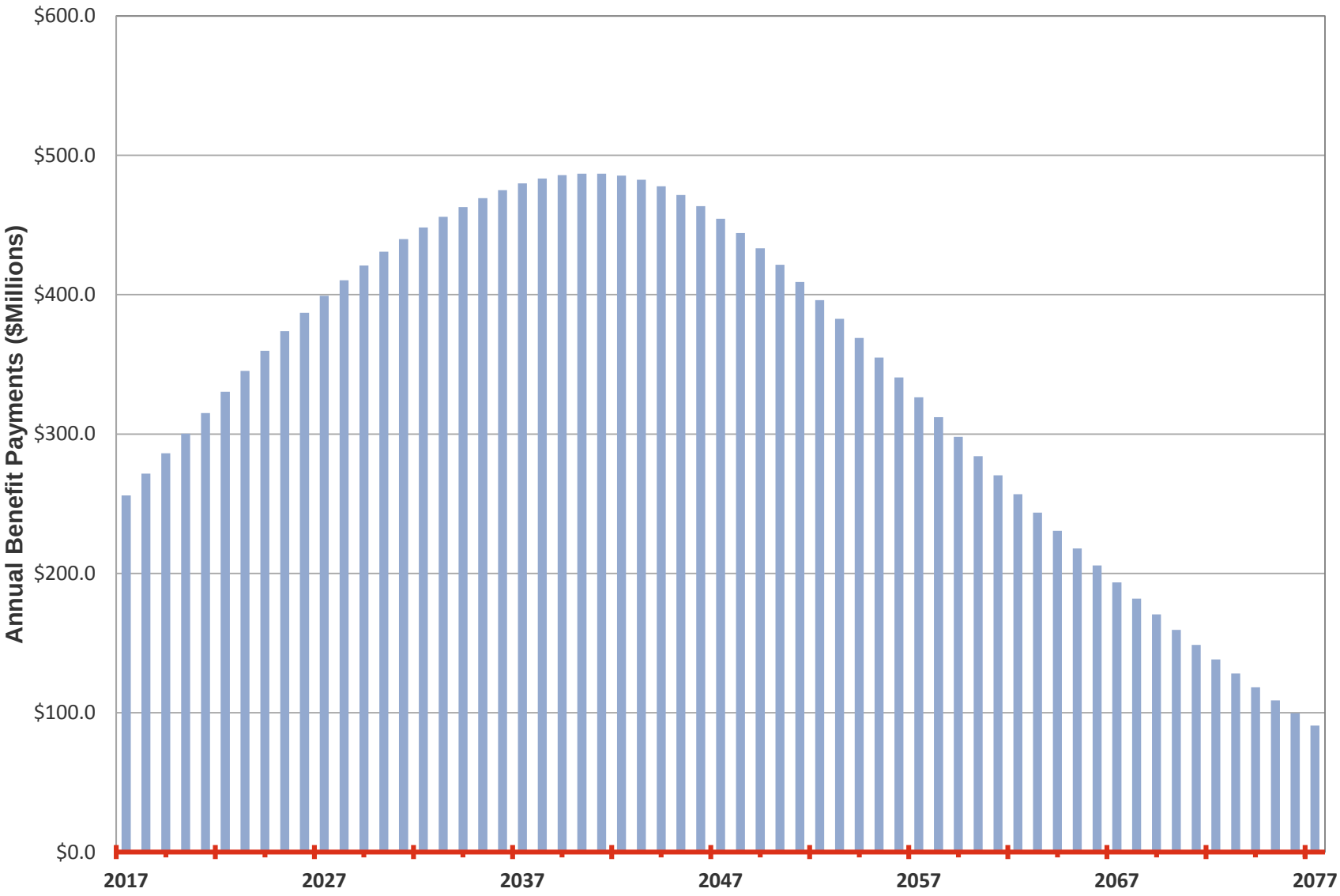
Model Input – Plan Status

Wilshire

- December 31, 2015 data was provided in the actuarial valuation report by Gabriel, Roeder, Smith and Company– the system actuary
- December 31, 2016 data was projected by Wilshire using data from the report and additional metrics provided by the actuary.

$ - Billions	December 31, 2015	December 31, 2016
Asset and Liability Data		
1. Market Value of Assets	3.195	3.338
2. Actuarial Accrued Liability	4.129	4.283
3. Funded Status (1. / 2.)	77.4%	77.9%
4. Present Value of Future Normal Cost	0.524	0.486
5. Present Value of Future Benefits (2. + 4.)	4.654	4.768
6. Present Value of Future Member Contributions	0.353	0.366
7. Economic Cost (5. - 6. - 1.)	1.106	1.065
Economic Assumptions		
Investment Return	8.00%	8.00%
Salary Increases	3.50 - 6.50%	3.50 - 6.50%
Inflation	3.00%	3.00%

Model Inputs – Projected Benefit Commitments



Optimization & Additional Metrics

Optimization – Alternative Portfolios

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The policies shown were chosen in an attempt to maximize return for a given level of risk.

Higher Return decreases **Shortfall Risk**.

Lower Standard Deviation decreases **Drawdown Risk**.

Asset Class	Current Policy	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Domestic Equity	15.00%	10.00%	15.00%	10.00%	10.00%	12.50%
International Equity	15.00%	15.00%	15.00%	10.00%	10.00%	10.00%
Global Equity	5.00%	5.00%	5.00%	5.00%	10.00%	5.00%
Global Low Volatility Equity	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Private Equity	5.00%	7.50%	7.50%	7.50%	7.50%	7.50%
Total Growth Assets	***50.00%***	***47.50%***	***52.50%***	***42.50%***	***47.50%***	***45.00%***
Core Fixed Income	15.00%	15.00%	15.00%	15.00%	15.00%	12.50%
High Yield Fixed Income	12.50%	12.50%	12.50%	15.00%	12.50%	12.50%
Credit Opportunities	2.50%	5.00%	2.50%	5.00%	5.00%	5.00%
Risk Mitigation Strategies	0.00%	5.00%	0.00%	5.00%	0.00%	5.00%
Cash	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total Fixed Income - Risk Reduction and Mitigation	***30.00%***	***37.50%***	***30.00%***	***40.00%***	***32.50%***	***35.00%***
REITs	5.00%	2.50%	5.00%	0.00%	2.50%	2.50%
Private Real Estate	5.00%	5.00%	5.00%	7.50%	7.50%	7.50%
MLPs	10.00%	7.50%	7.50%	10.00%	10.00%	10.00%
Timber	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total Inflation Hedging Assets	***20.00%***	***15.00%***	***17.50%***	***17.50%***	***20.00%***	***20.00%***
Total Assets	***100.00%***	***100.00%***	***100.00%***	***100.00%***	***100.00%***	***100.00%***
Expected (Median) Return (%)	**6.72**	**6.72**	**6.74**	**6.73**	**6.78**	**6.81**
Standard Deviation of Return (%)	**11.21**	**10.91**	**11.56**	**10.38**	**11.04**	**10.86**
Cash Yield (%)	**3.91**	**3.64**	**3.74**	**3.88**	**3.89**	**3.72**
+/(-) in Expected Return (bps)		**0**	**2**	**1**	**6**	**9**
+/(-) in Standard Deviation of Return (bps)		**(30)**	**35**	**(83)**	**(17)**	**(35)**
+/(-) in Cash Yield (bps)		**(27)**	**(17)**	**(3)**	**(2)**	**(19)**
Sharpe Ratio	**0.46**	**0.47**	**0.45**	**0.50**	**0.47**	**0.48**

Capital vs. Risk Allocations

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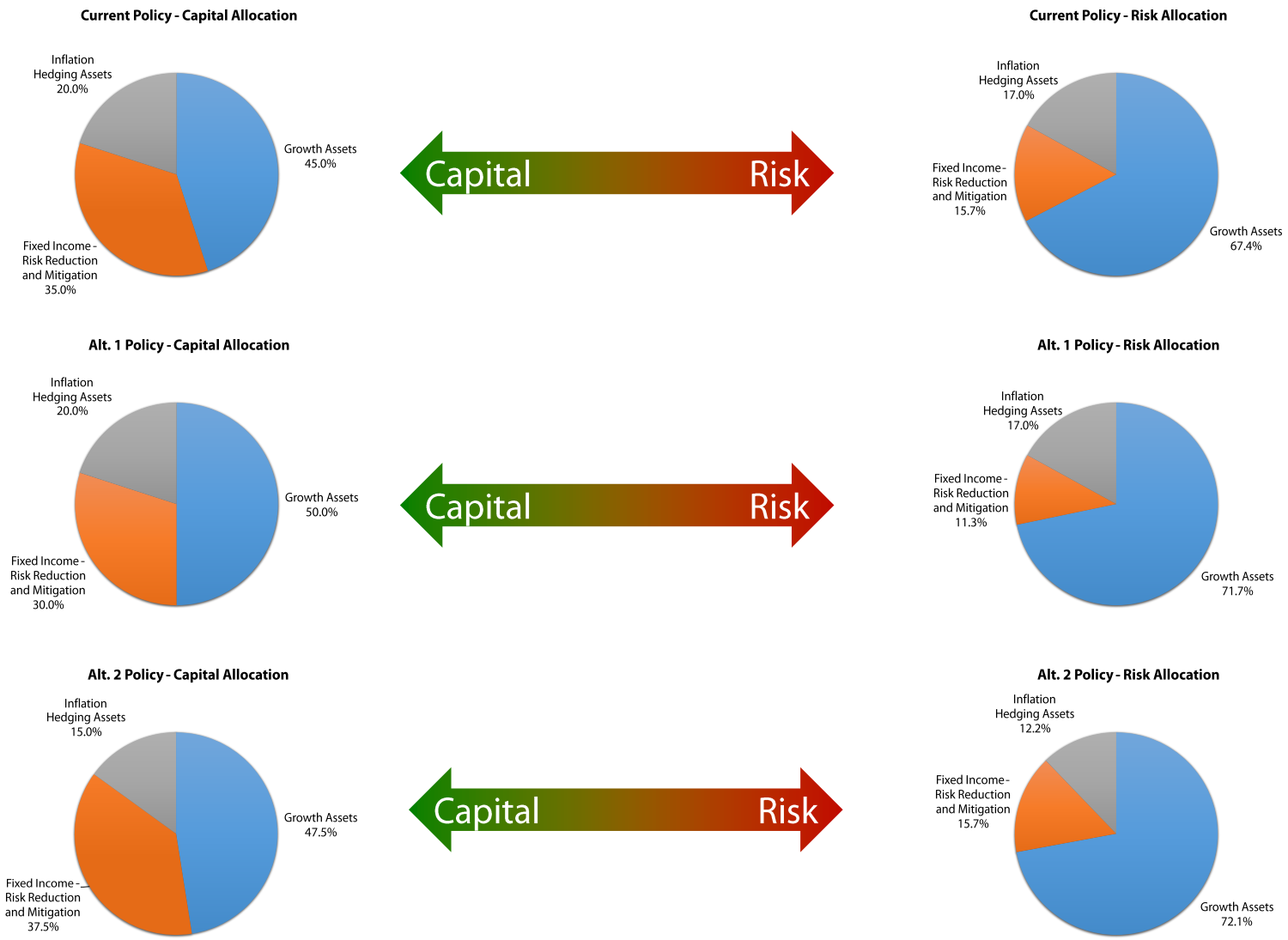
Shortfall Risk:

The potential for the portfolio to fail to reach the organization's objectives.

Identify a risk-controlled approach that has the potential to reach the return objective.



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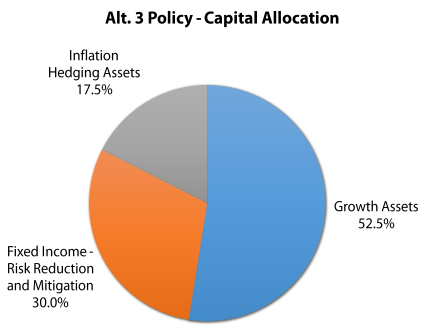
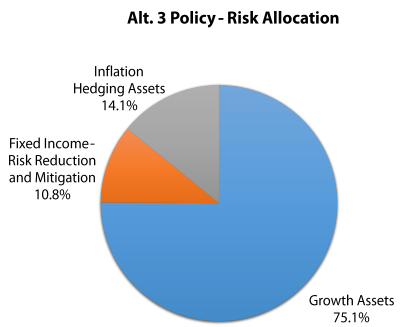
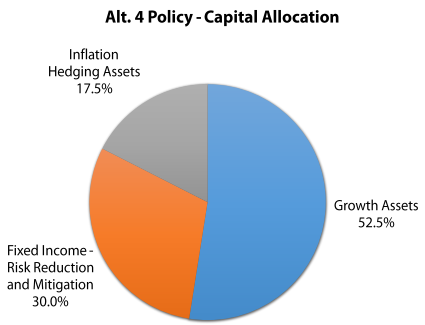
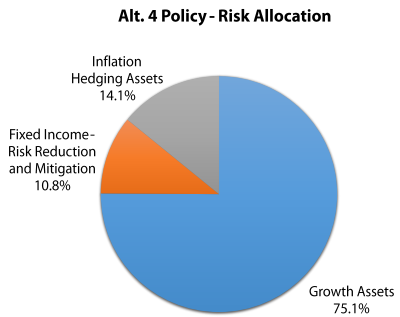
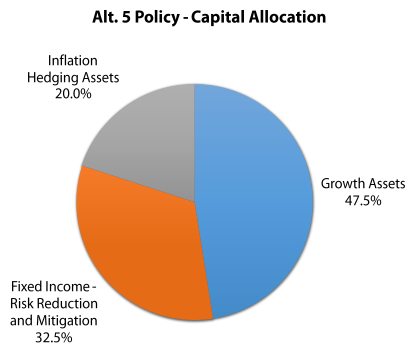
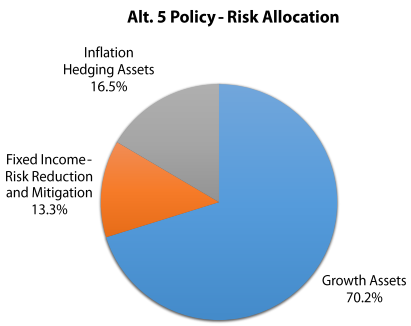












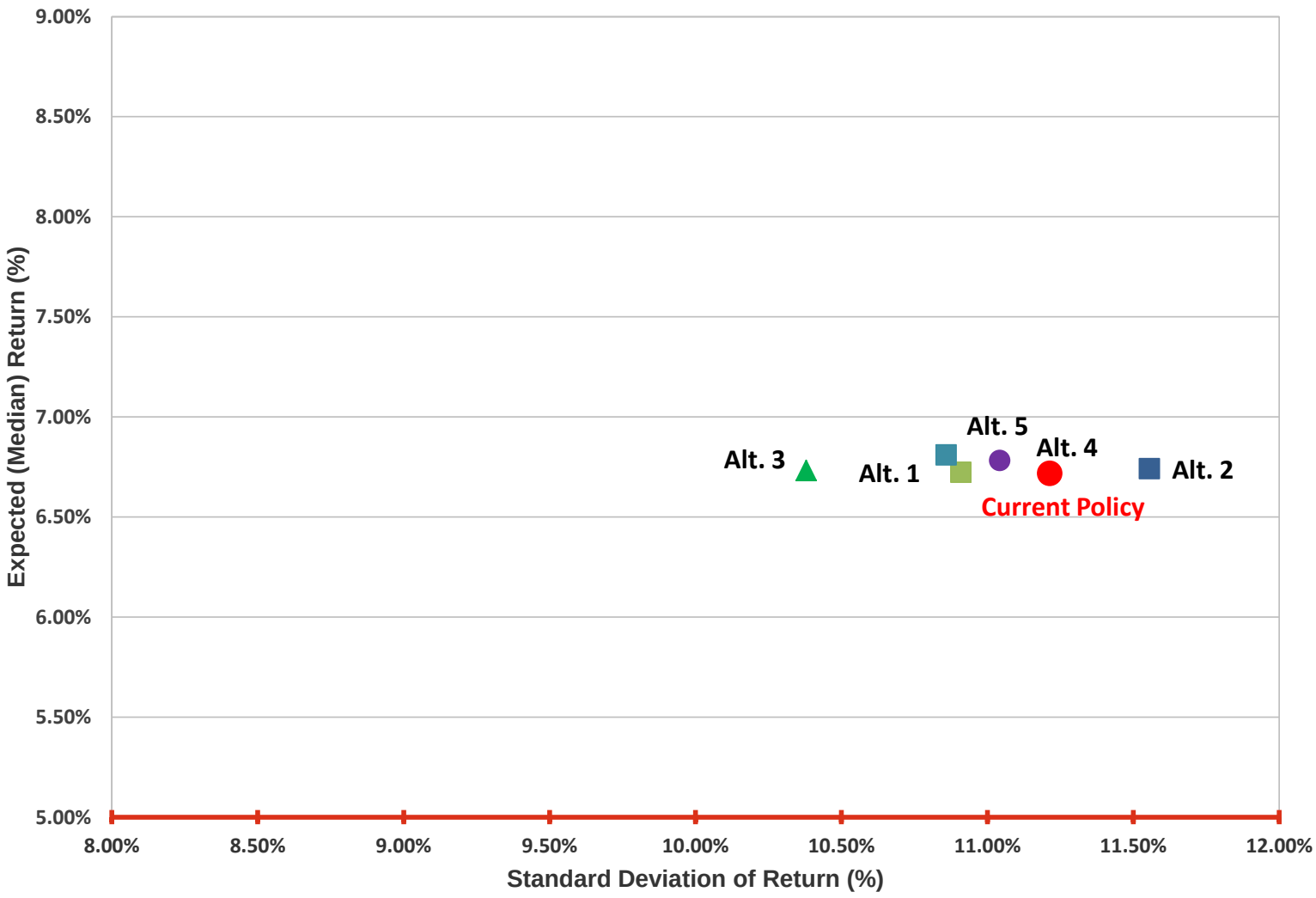
Risk-Return Trade-off

Higher Return decreases

Shortfall Risk.

Lower Standard Deviation decreases

Drawdown Risk.



Distribution of Economic Cost

Economic Cost is defined as the present value cost above current assets and future member contributions necessary to fund promised benefits.

Shortfall Risk:

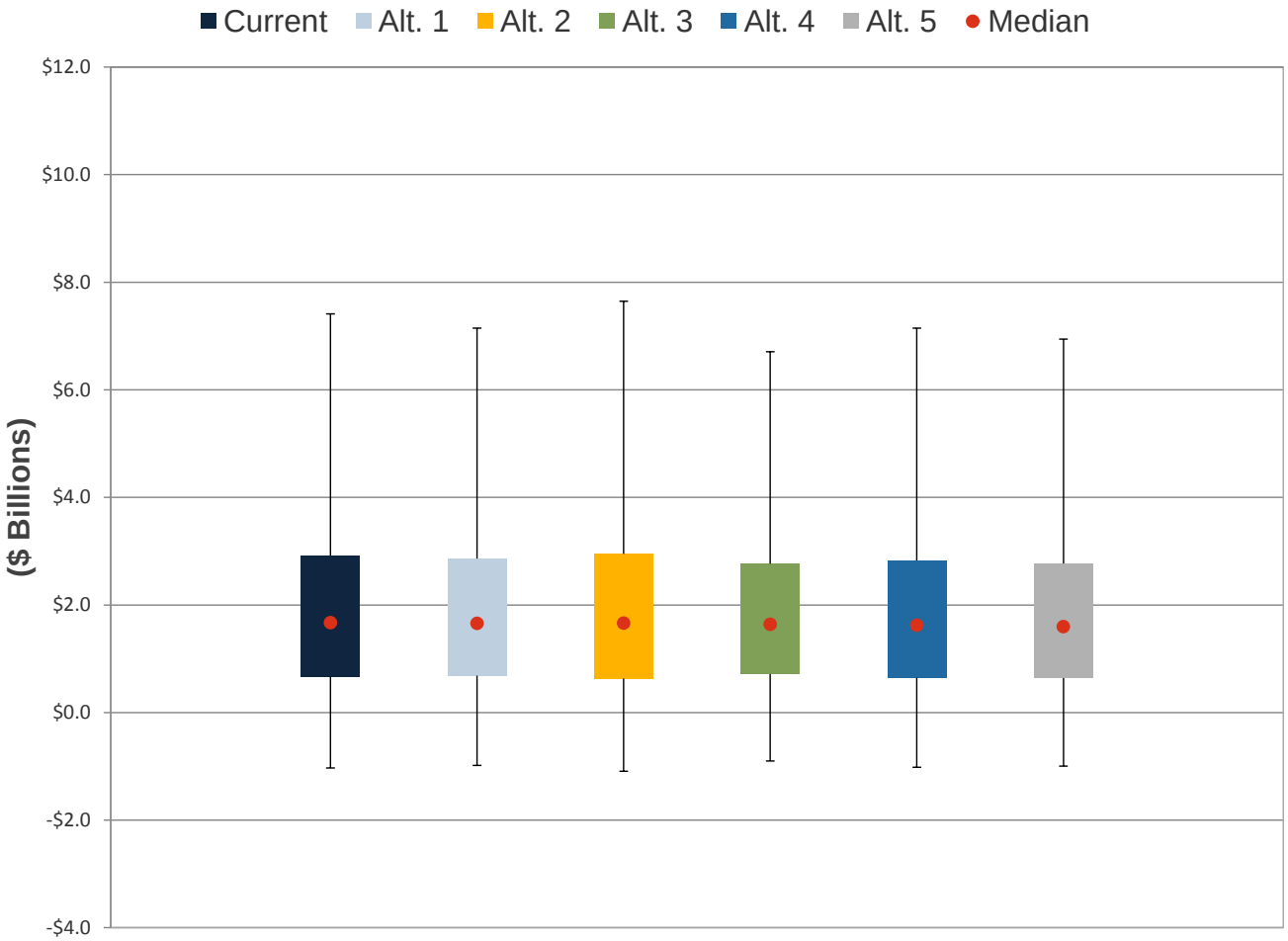
The potential for the alternative to have a higher median economic cost than the current policy.

All alternatives portfolios have a lower Economic Cost at the median than the current

Drawdown Risk:

The potential for the alternative to have a higher "Very Pessimistic" economic cost than the current policy.

All but Alternative 2 have a lower Pessimistic and Very Pessimistic Economic Cost.



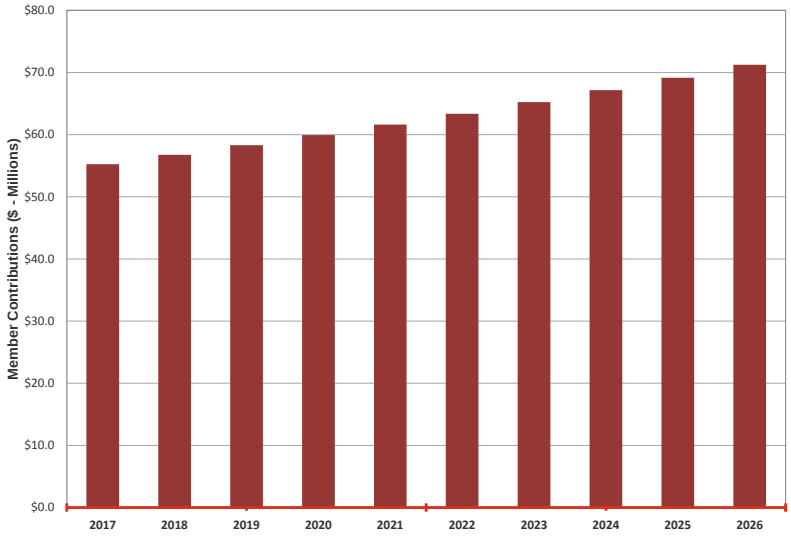
($ Billions)	Economic Cost					
	Current	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Very Pessimistic	7.41	7.15	7.65	6.71	7.15	6.94
Pessimistic	2.92	2.86	2.95	2.77	2.83	2.77
Median (Expected)	**1.67**	**1.66**	**1.66**	**1.64**	**1.62**	**1.60**
Optimistic	0.67	0.69	0.63	0.71	0.65	0.64
Very Optimistic	-1.03	-0.98	-1.09	-0.90	-1.02	-1.00

Funded Status Projections

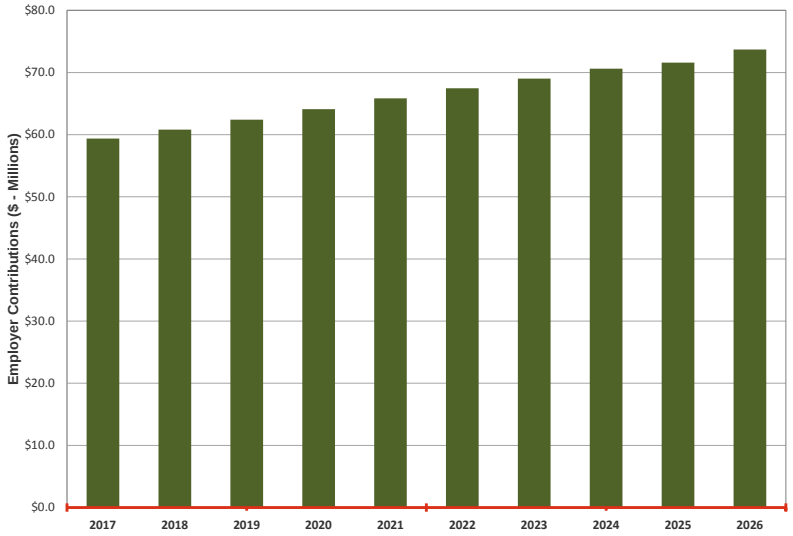
Wilshire

- Dec. 31, 2016 assets - $3.338 billion
- Dec. 31, 2016 liability - $4.283 billion
  - Dec. 31, 2016 Funded Status – 77.9%
- Over our ten-year projection:
  - Benefit payments range from $270 to $408 million.
  - Administrative expenses range from $5 to $6 million.
  - Member contributions range from $55 to $71 million.
  - Employer contributions range from $59 to $74 million.
  - The new benefit tier was considered in our projection of the liability. The liability grows from $4.283 to $5.459 billion.

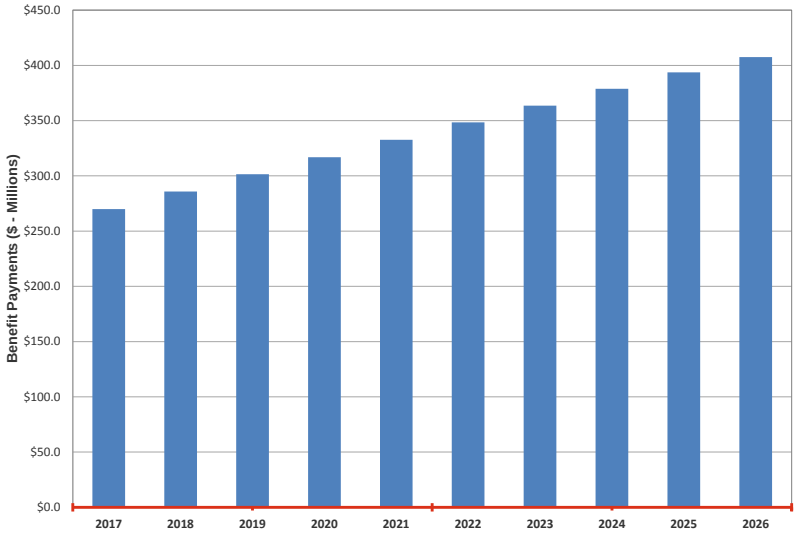
Funded Status Projections – Ten-Years



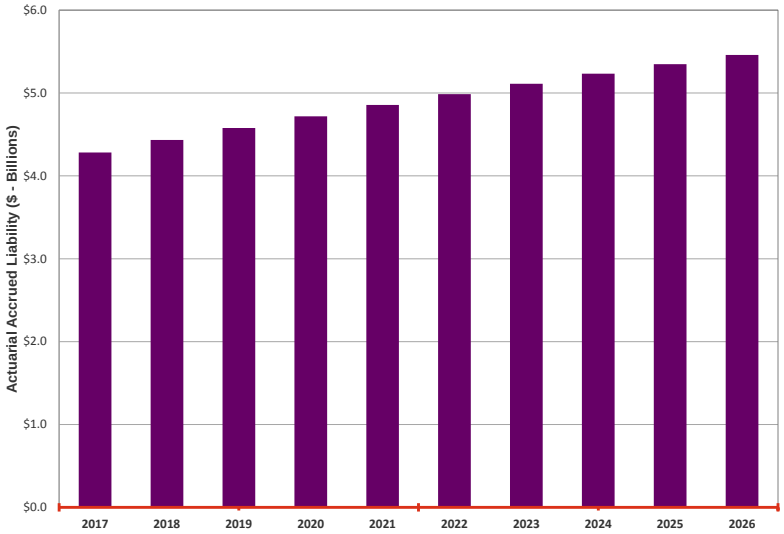
Member contributions range from $55 to $71 million.



Employer contributions range from $59 to $74 million.



Benefit payments range from $ 270 to $408 million.



The liability grows from $4.28 to $5.46 billion

Distribution of Funded Status (Years 1 and 3)

Wilshire

Shortfall Risk:

The potential to experience significant decline in median funded status.

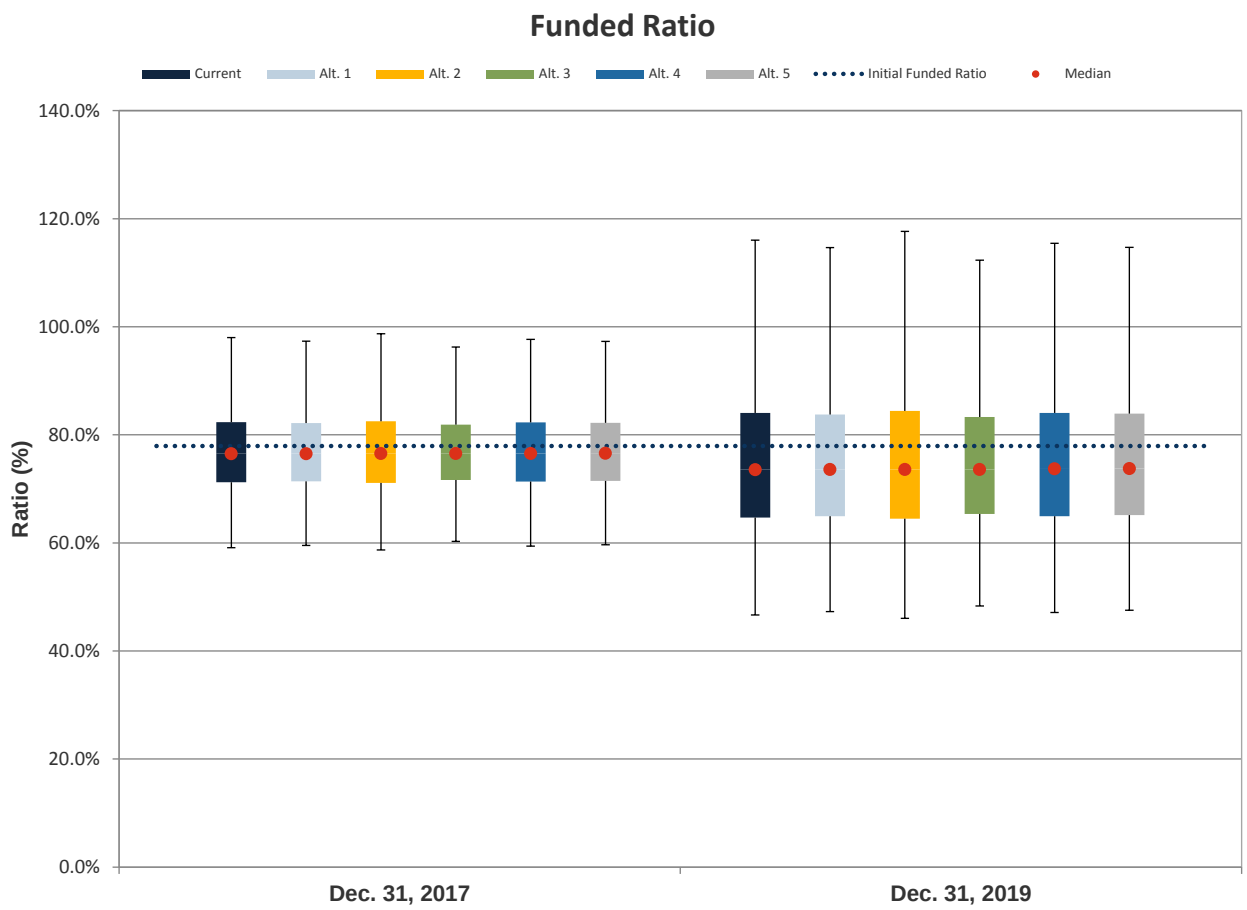
The funded status is expected to decline as contributions are less than the actuarially required contributions.

Drawdown Risk:

The potential for a significant decline in funded status in pessimistic scenarios

In very pessimistic scenarios, the funded status goes below 50%

The initial funded status is 77.9%



(%)	Dec. 31, 2017						Dec. 31, 2019					
	Current	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Current	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Very Optimistic	97.98	97.35	98.73	96.24	97.67	97.30	116.03	114.67	117.67	112.32	115.44	114.70
Optimistic	82.33	82.18	82.52	81.91	82.29	82.21	84.04	83.77	84.43	83.28	84.04	83.93
Median (Expected)	**76.51**	**76.52**	**76.52**	**76.53**	**76.56**	**76.58**	**73.54**	**73.56**	**73.59**	**73.60**	**73.69**	**73.76**
Pessimistic	71.24	71.38	71.10	71.63	71.36	71.46	64.70	64.94	64.49	65.36	64.96	65.16
Very Pessimistic	59.13	59.54	58.68	60.27	59.40	59.67	46.68	47.28	46.06	48.35	47.12	47.53

Distribution of Funded Status (Years 5 and 10)

Wilshire

Shortfall Risk:

The potential to experience significant decline in median funded status.

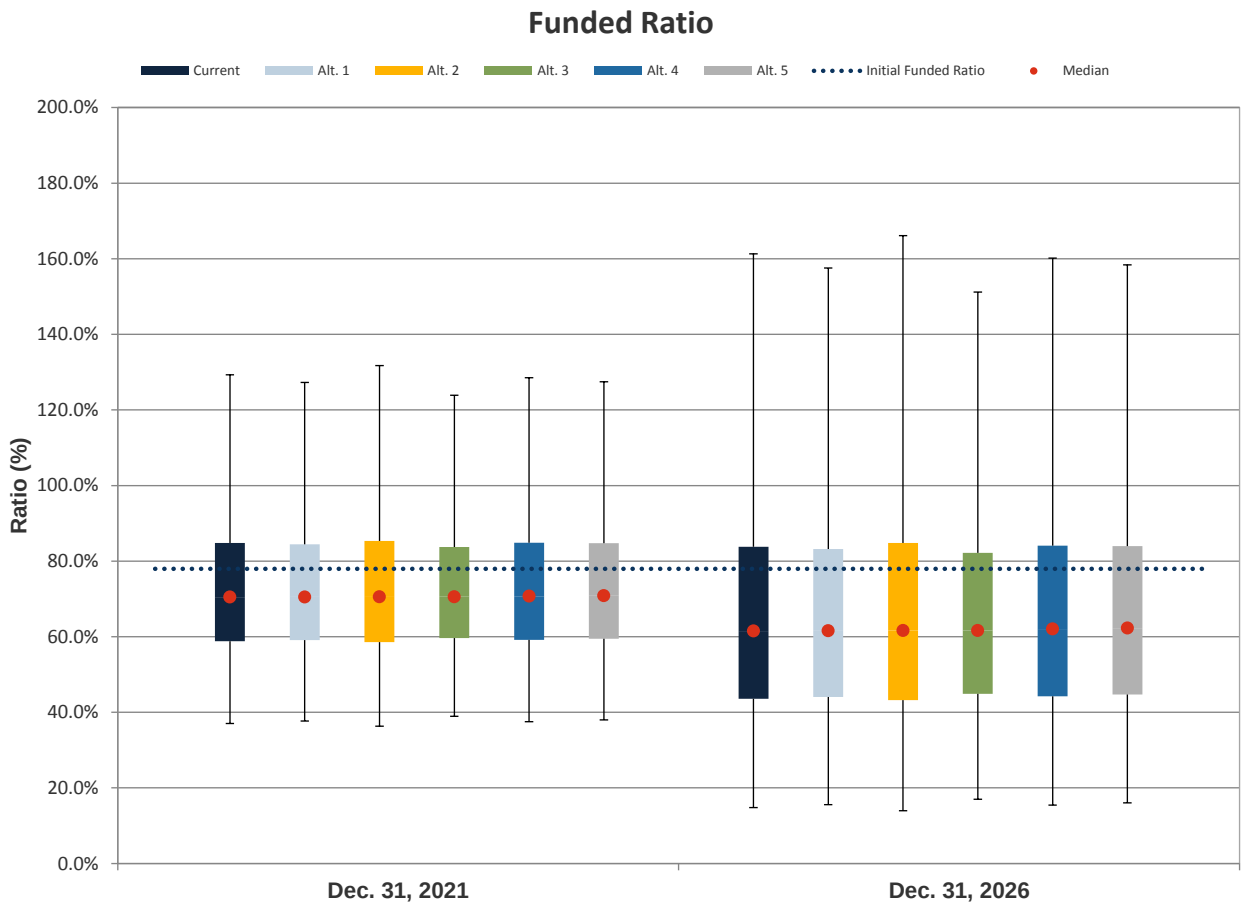
The funded status is expected to decline as contributions are less than the actuarially required contributions.

Drawdown Risk:

The potential for a significant decline in funded status in pessimistic scenarios

In very pessimistic scenarios, the funded status goes very low.

The initial funded status is 77.9%



(%)	Dec. 31, 2021						Dec. 31, 2026					
	Current	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Current	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Very Optimistic	129.27	127.28	131.72	123.88	128.51	127.46	161.27	157.53	166.09	151.16	160.19	158.35
Optimistic	84.80	84.42	85.36	83.75	84.85	84.73	83.82	83.21	84.78	82.17	84.11	84.00
Median (Expected)	**70.48**	**70.51**	**70.55**	**70.56**	**70.73**	**70.84**	**61.50**	**61.56**	**61.66**	**61.66**	**62.04**	**62.27**
Pessimistic	58.81	59.12	58.55	59.67	59.18	59.45	43.59	44.07	43.23	44.89	44.26	44.70
Very Pessimistic	37.01	37.70	36.32	38.92	37.54	38.02	14.80	15.59	13.98	17.02	15.46	16.03

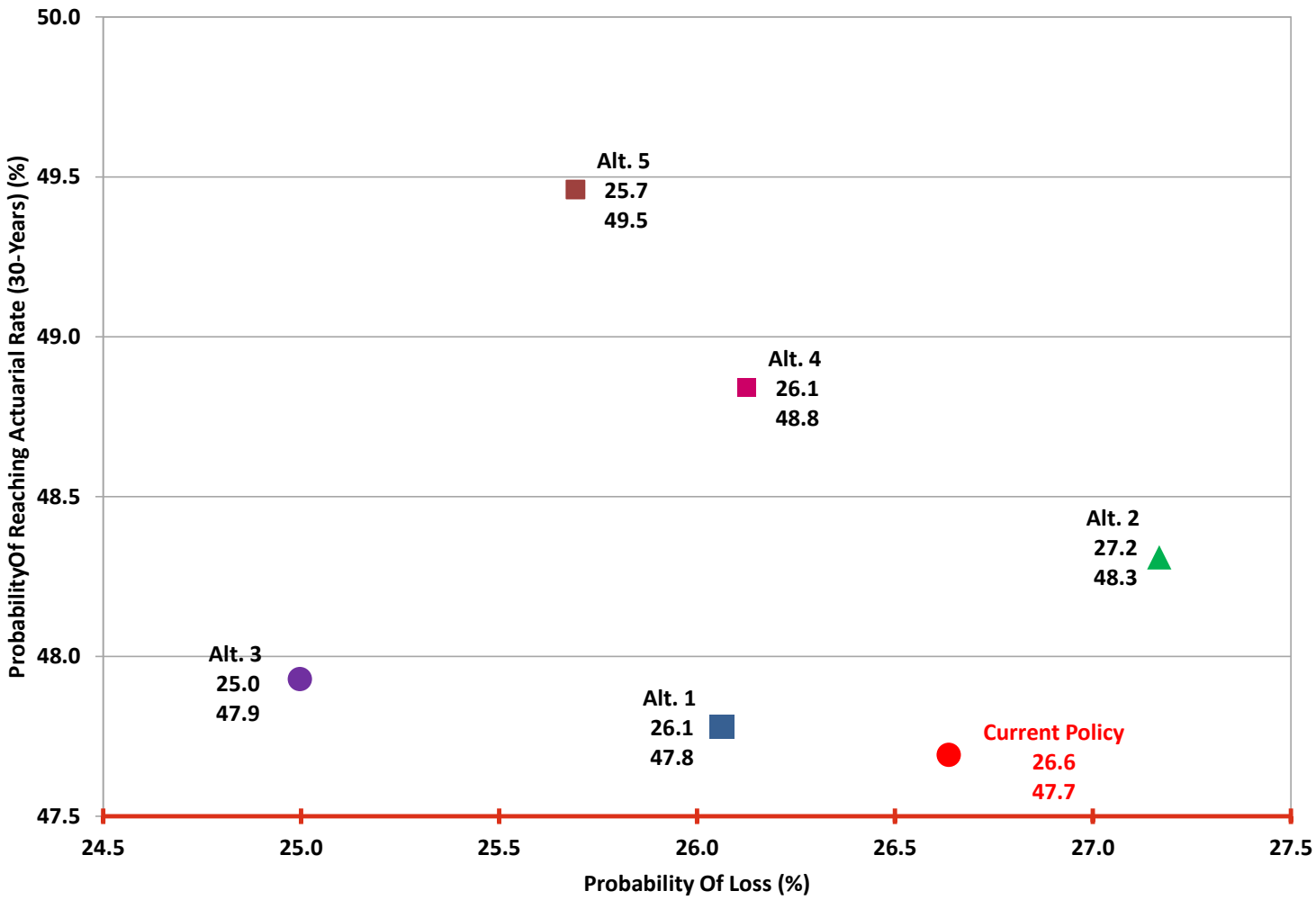
Asset Return – Shortfall vs. Drawdown

Shortfall Risk

The potential for the alternative to have a lower probability of reaching the 8.0% actuarial rate over a 30-yr. period than the current policy.

Drawdown Risk

The potential for the alternative to have a higher probability of negative return in a given year than the current policy.



Asset Drawdown

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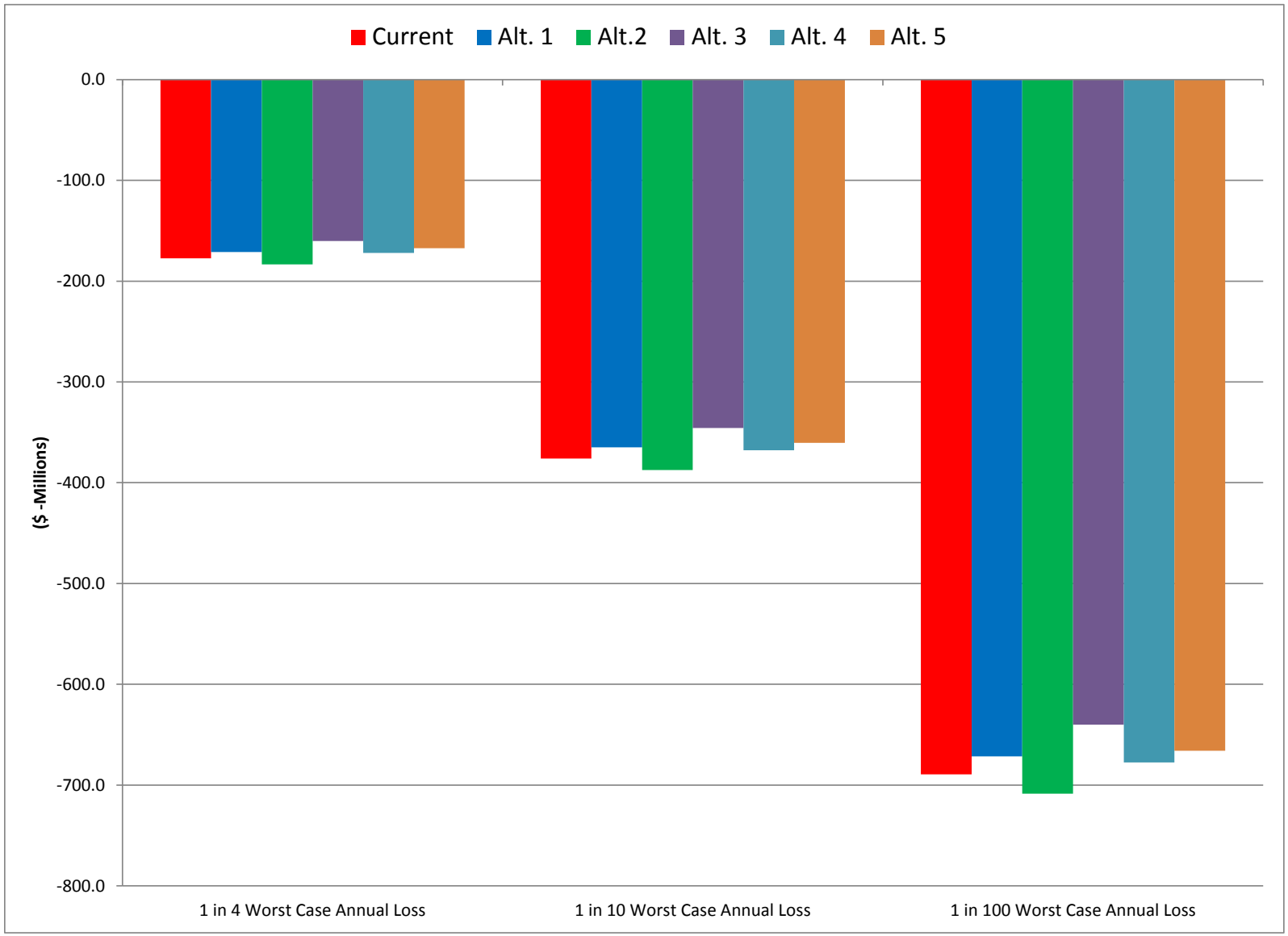
Drawdown Risk

The potential for a significant decline in assets in a give year

- There is a 1 in 4 probability of a decline of $160 to $180 million in a given year
- There is a 1 in 10 probability of a decline of $346 to $387 million in a given year
- There is 1 in 100 chance of a loss of $640 to $708 million in a given year.

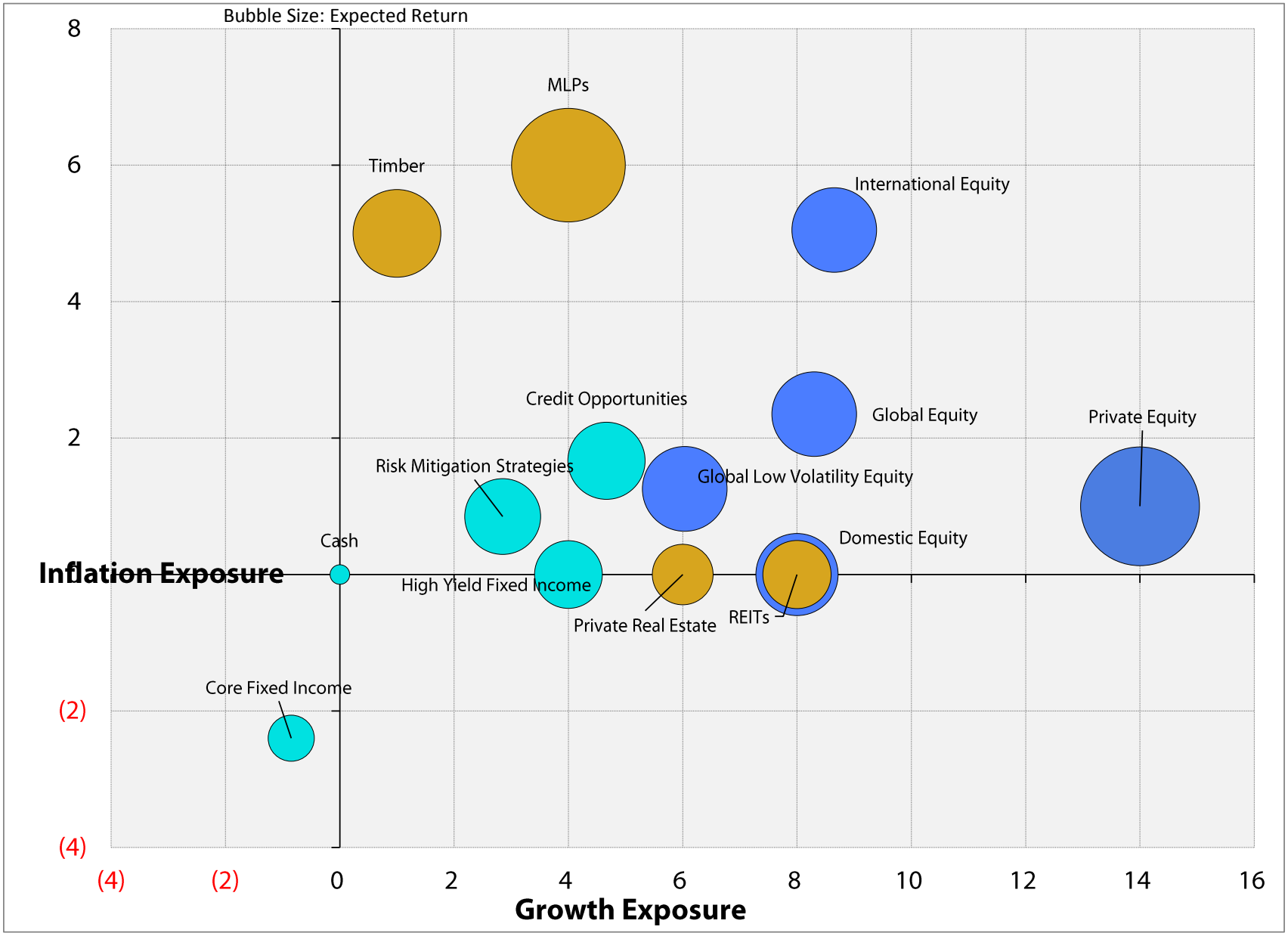


Factor Based Asset Allocation Framework

Wilshire

- Including factors within the asset allocation process provides an opportunity to measure asset class (and portfolio) exposures to key economic factors
- If the underlying economic activity that drives asset performance can be identified, perhaps it can be used to assist in building economically-efficient portfolios
- Macroeconomic risk factors – when separated from the valuation component inherent in investment pricing – may exhibit more stable correlations and, therefore, can better inform the allocation process

Factor Based Asset Allocation Framework



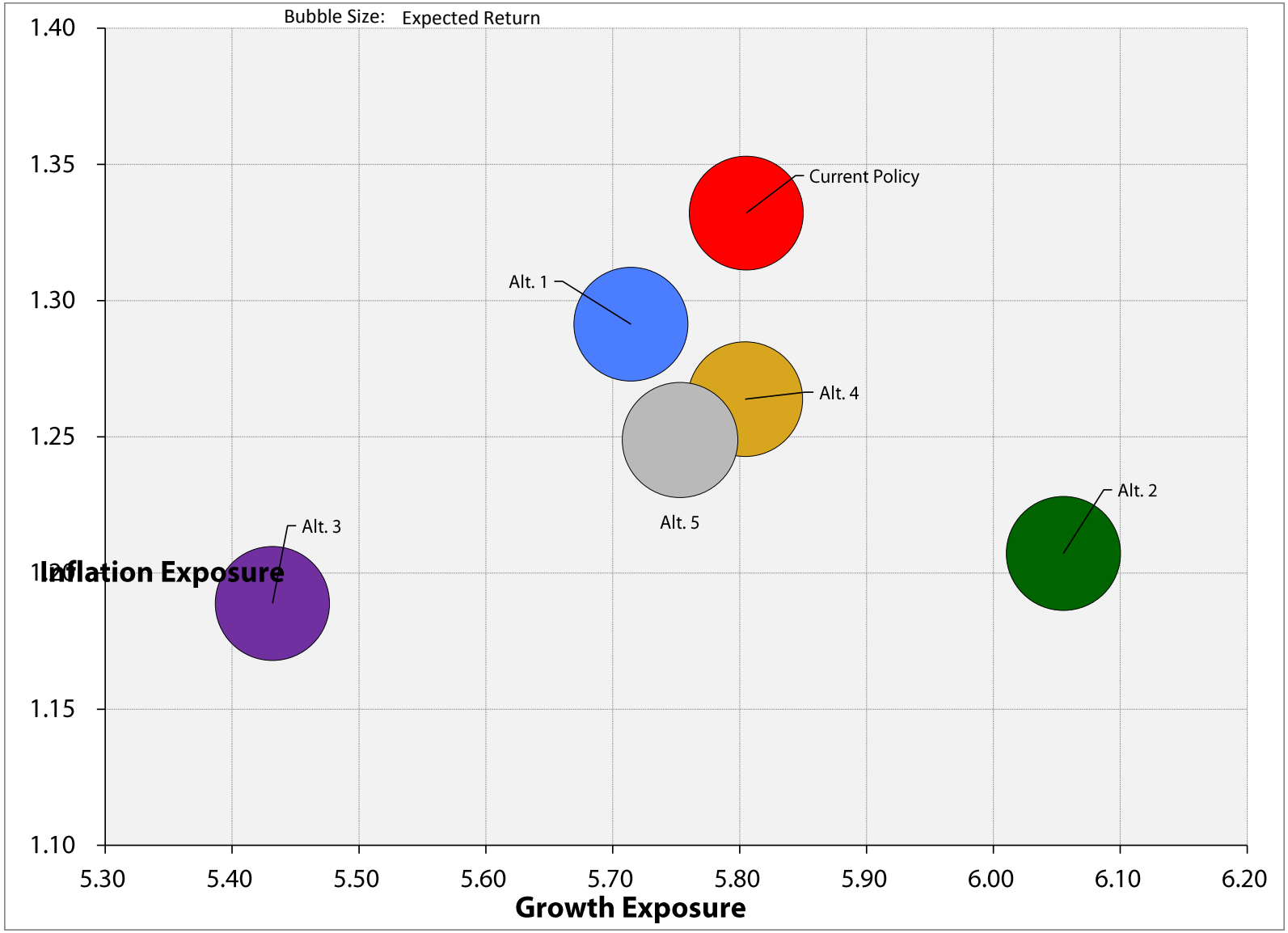
Risk Lenses - Factor Exposure – Inflation vs. Drawdown

Inflation Risk:

Ideally, a portfolio has a higher inflation exposure and provides more protection against inflation risk

Drawdown Risk:

A portfolio with a lower growth exposure protects against drawdown during slow growth periods



Discussion

- Wilshire modeled several asset allocation optimizations with varying constraints and reviewed with Staff
- Outcomes
  - The current asset allocation policy
    - Remains efficient from a risk-adjusted return perspective
    - Is biased to growth-oriented economic environments
    - Provides risk-balanced exposures as much as possible given long-term return needs of System
    - Carefully constructed to address liquidity needs
  - Optimized considerations
    - Larger allocations to High Yield, Core Fixed, Global Low Volatility
    - Smaller allocations to Convertibles, Global REITS
- Discussion
  - Modest potential improvements available but implementation timing could be more challenging
  - Expected improvements are marginal and involve cost

Appendix

Model Input – Capital Market Assumptions (as of Dec. 31, 2016)

Wilshire

- Wilshire's asset class return, risk and correlation assumptions are developed based on 10-year forward-looking expectations, adjusted to incorporate recent trends/price levels
- Return expectations represent a passive investment in the asset class **(beta)**. They do not reflect value added from active management **(alpha)**

	Domestic Equity	International Equity	Global Equity	Global Low Volatility Equity	Private Equity	Core Fixed Income	High Yield Fixed Income	Credit Opportunities	Risk Mitigation Strategies	Cash	REITs	Private Real Estate	MLPs	Timber
Return - 10 Years (%)	6.50	6.70	6.70	6.70	9.40	3.65	5.35	6.10	6.00	1.55	5.40	4.80	9.00	6.95
Return - 30 Years (%)	7.65	7.85	7.85	7.85	10.50	4.75	6.90	7.10	7.20	2.70	6.65	6.10	9.85	7.30
Risk (%)	17.00	18.75	17.15	13.45	27.50	5.15	10.00	10.35	6.55	1.25	17.00	12.00	17.00	15.00
Cash Yield (%)	2.00	2.85	2.40	2.55	-	3.80	8.40	4.15	-	1.55	3.95	3.65	7.05	-
Correlations														
Domestic Equity	1.00													
International Equity	0.85	1.00												
Global Equity	0.96	0.96	1.00											
Global Low Volatility Equity	0.93	0.92	0.96	1.00										
Private Equity	0.75	0.68	0.74	0.77	1.00									
Core Fixed Income	0.29	0.10	0.20	0.21	0.32	1.00								
High Yield Fixed Income	0.55	0.45	0.52	0.51	0.34	0.25	1.00							
Credit Opportunities	0.61	0.57	0.62	0.60	0.41	0.27	0.74	1.00						
Risk Mitigation Strategies	0.70	0.76	0.76	0.78	0.65	0.01	0.69	0.70	1.00					
Cash	-0.05	-0.08	-0.07	-0.04	0.00	0.19	-0.10	-0.03	0.05	1.00				
REITs	0.60	0.50	0.57	0.64	0.51	0.17	0.57	0.59	0.41	-0.05	1.00			
Private Real Estate	0.55	0.48	0.53	0.64	0.51	0.17	0.57	0.59	0.41	-0.05	0.85	1.00		
MLPs	0.30	0.28	0.30	0.29	0.28	0.16	0.45	0.41	0.47	0.05	0.45	0.45	1.00	
Timber	0.00	0.12	0.06	0.06	0.02	0.00	0.05	0.04	0.27	-0.05	0.10	0.10	0.25	1.00

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