



ASSET/LIABILITY STUDY

Tulare County Employees' Retirement Association

October 2013

WURTS  ASSOCIATES

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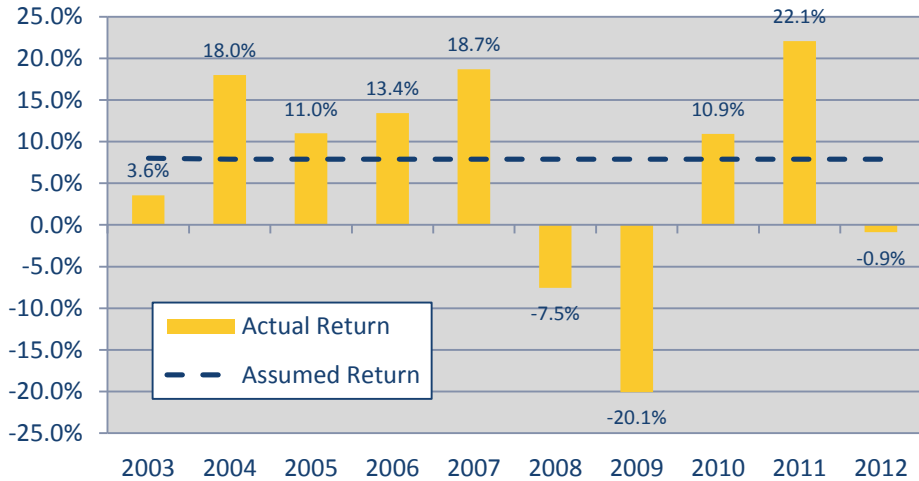
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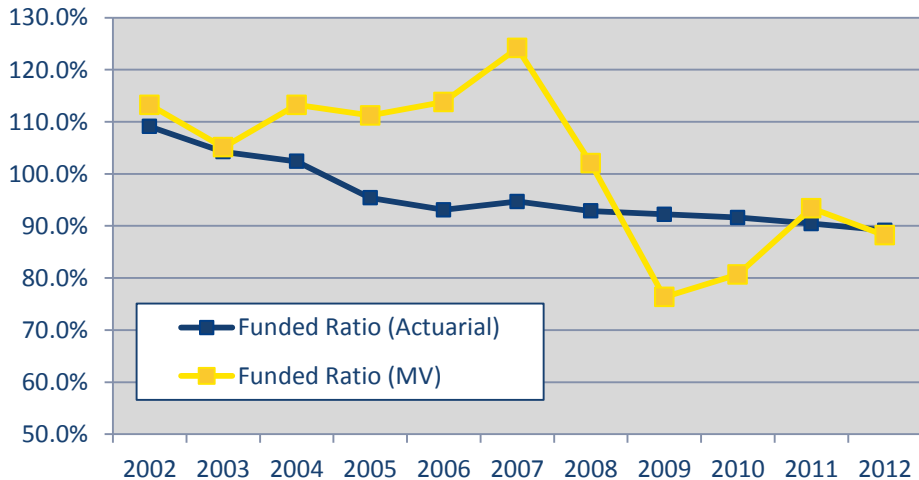
INTRODUCTION

HISTORICAL PERFORMANCE

Actual vs. Assumed Returns



Funded Ratio

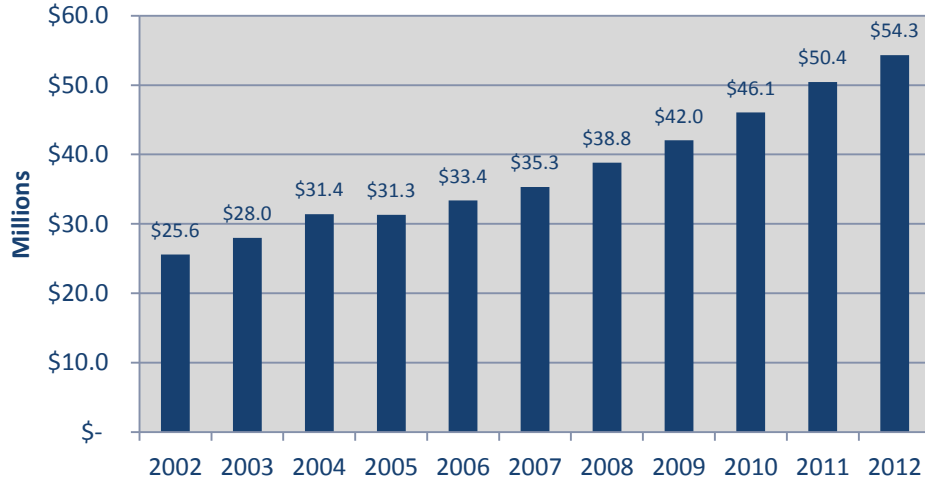


- Fiscal year returns have been volatile. The Plan has outperformed the assumed rate in 6 of the last 10 years.
- Annualized return for the 10 years ended June 30, 2012 was 5.8% net of investment expenses, 210 bps below the current assumption.
- Actuarial funded status uses a smoothed market value, mitigating volatility of returns.
- Despite this, the amortization of large losses has caused the funded status to trend downward.

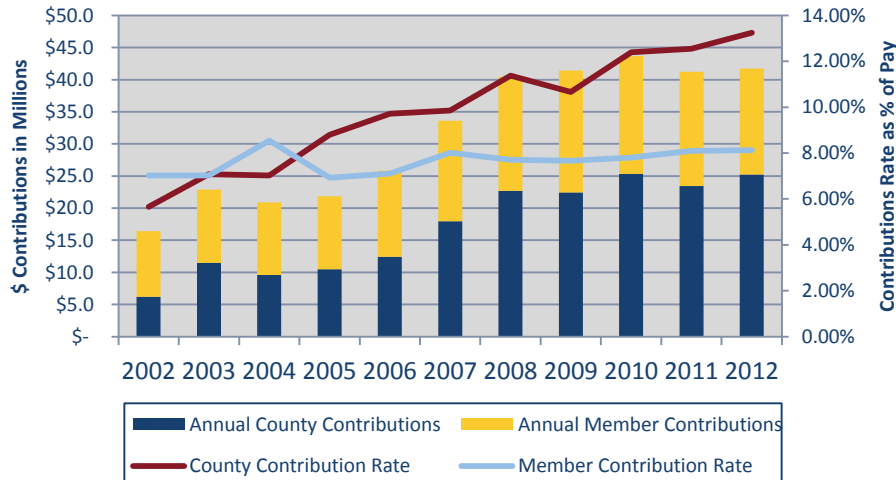
Note: Data is for the periods ending 6.30.12, the date of the last actuarial valuation.

HISTORICAL CASH FLOWS

Benefits Paid (in Millions)



Annual Contributions



- Total benefits paid continue to increase each year, averaging a 7.8% annual growth rate since 2002.
- This has been funded through increased County and Member contributions (on an absolute basis, as well as relative to payroll).
- As of 6/30/2012, the County contributions as a percentage of payroll was 13.3%.

Member Contributions:

The contribution rate is dependent on the membership tier, and calculated so that the accumulation of basic contributions will be sufficient to fund an annuity at retirement that is equal to a portion of average final compensation.

County Contributions:

Normal Cost:

The annual contribution rate that, if paid annually from first year of membership to the year of retirement, would accumulate the amount necessary to fully fund the member's retirement benefits.



Contribution to the Unfunded Actuarial Accrued Liability:

The annual contribution rate that if paid annually over the UAAL amortization period, would accumulate the amount necessary to fully fund the UAAL.

BASELINE PROJECTIONS: IF EVERYTHING GOES TO PLAN...

Before examining different portfolios we want to set expectations for what the future holds:

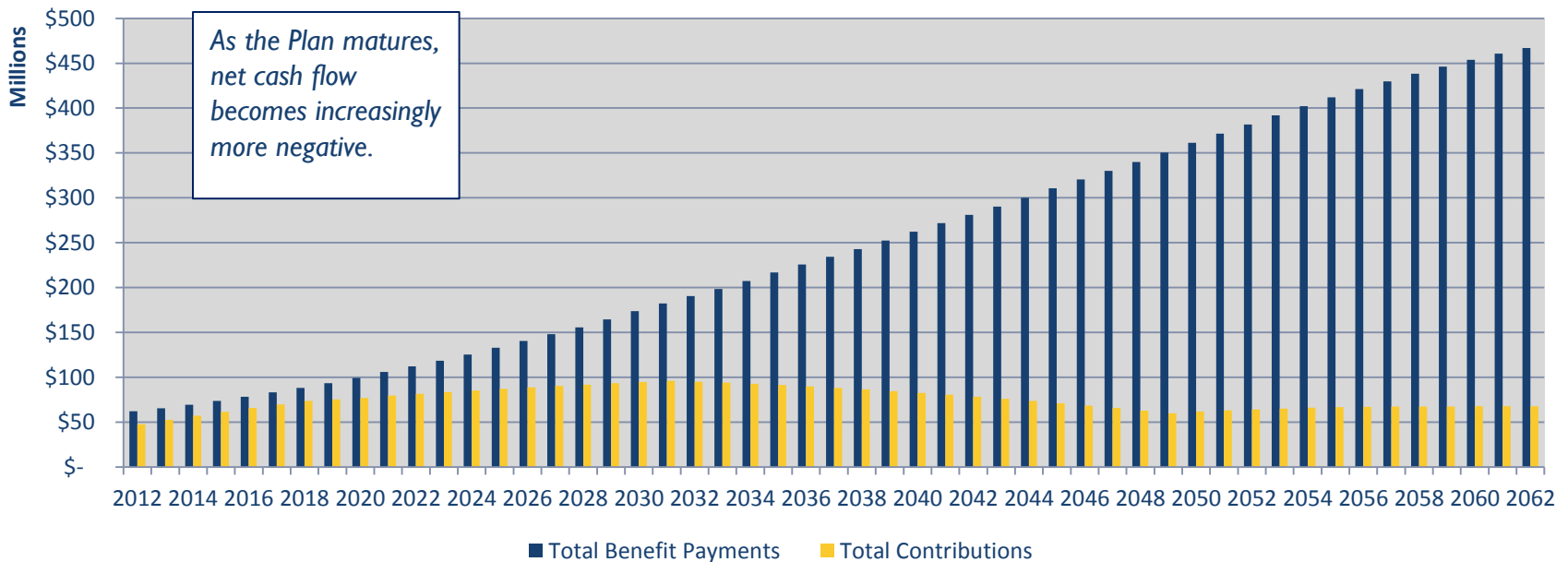
Assume:

- Investments meets the current assumed rate of 7.9%, net of fees and administrative costs.
- Inflation is 4.0% per year.
- Actual contributions are in line with recommended contributions.

What is the impact on:

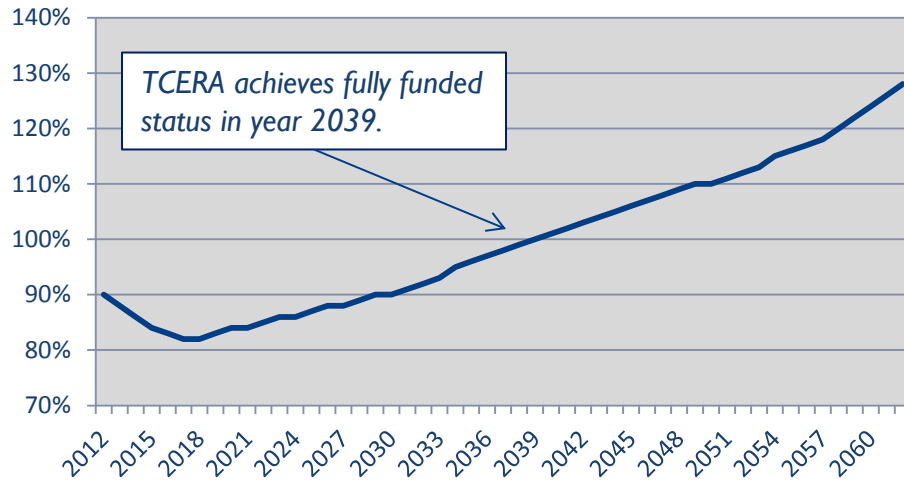
1. Future Funded Status
2. Employer Contributions
3. Contributions as a % of Pay

Benefits Payments and Contributions



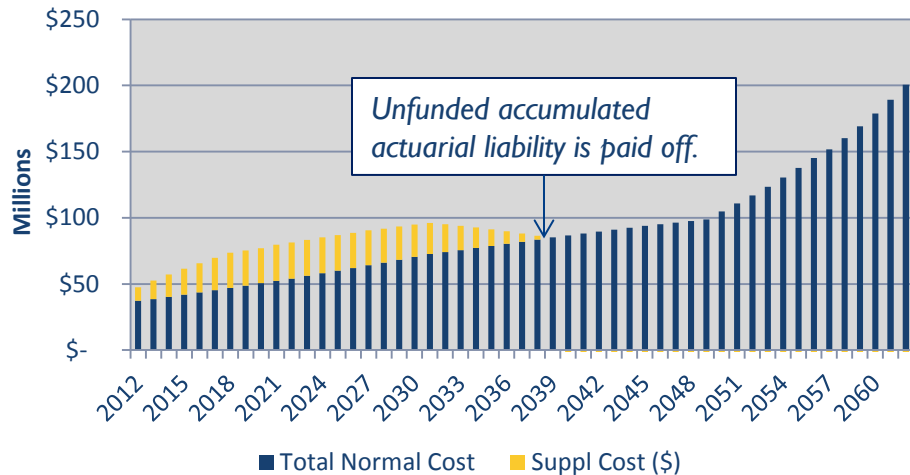
BASELINE PROJECTIONS: IF EVERYTHING GOES TO PLAN...

Funded Ratio



- Funded status is projected to increase from 89.1% to 100% in 27 years.¹

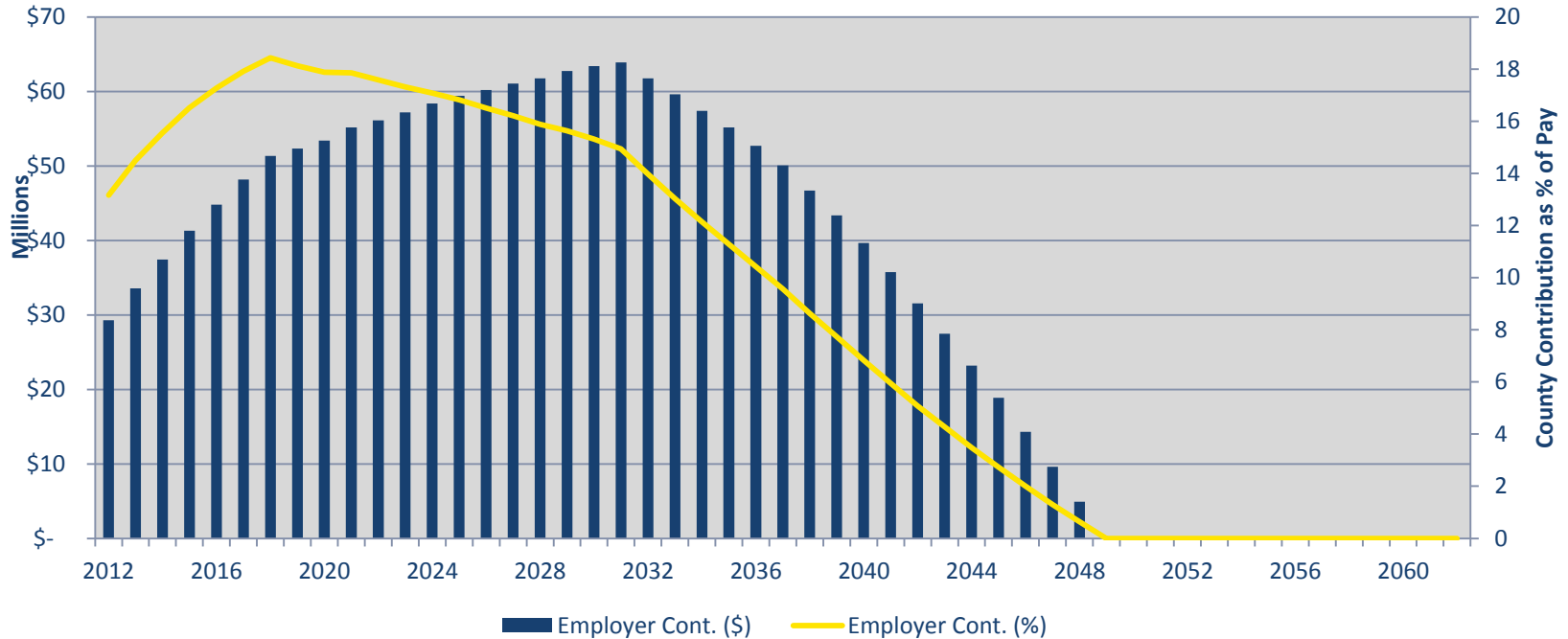
Normal Cost vs. Supplemental Cost



- Since we assume that in all future years, actual returns will equal assumed returns, there are no further accruals to the UAAL.
- The existing UAAL is fully amortized by 2039. After this, the contributions only consist of the normal cost component.
- Normal cost increases with inflation and wage growth.

¹ As of 6.30.12. The funded status using the actuarial value of assets is 89.8%.

County Contributions



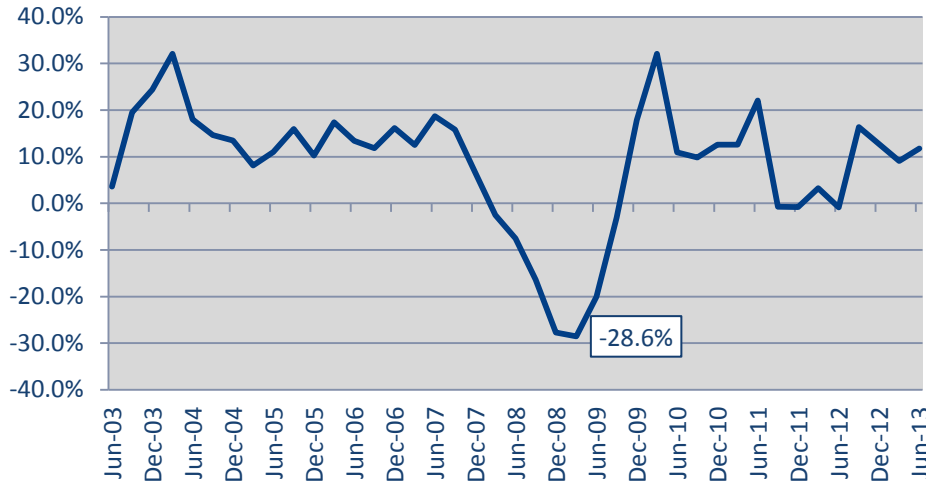
- While the dollar amount of contributions increases through 2031, contributions relative to payroll trends downward beginning in 2018.
- Asset values will grow to a point where investment returns and member contributions are sufficiently covering benefit payments and the County, hypothetically, will not need to make any contributions in 2049.

RISK & DRAWDOWNS

HISTORICAL DRAWDOWNS

- While the baseline projection shows the health of the Plan will trend upwards, this is dependent on the Plan earning the assumed rate of return every year.
- In reality, we know that returns are volatile, driven by the performance of global equity markets.

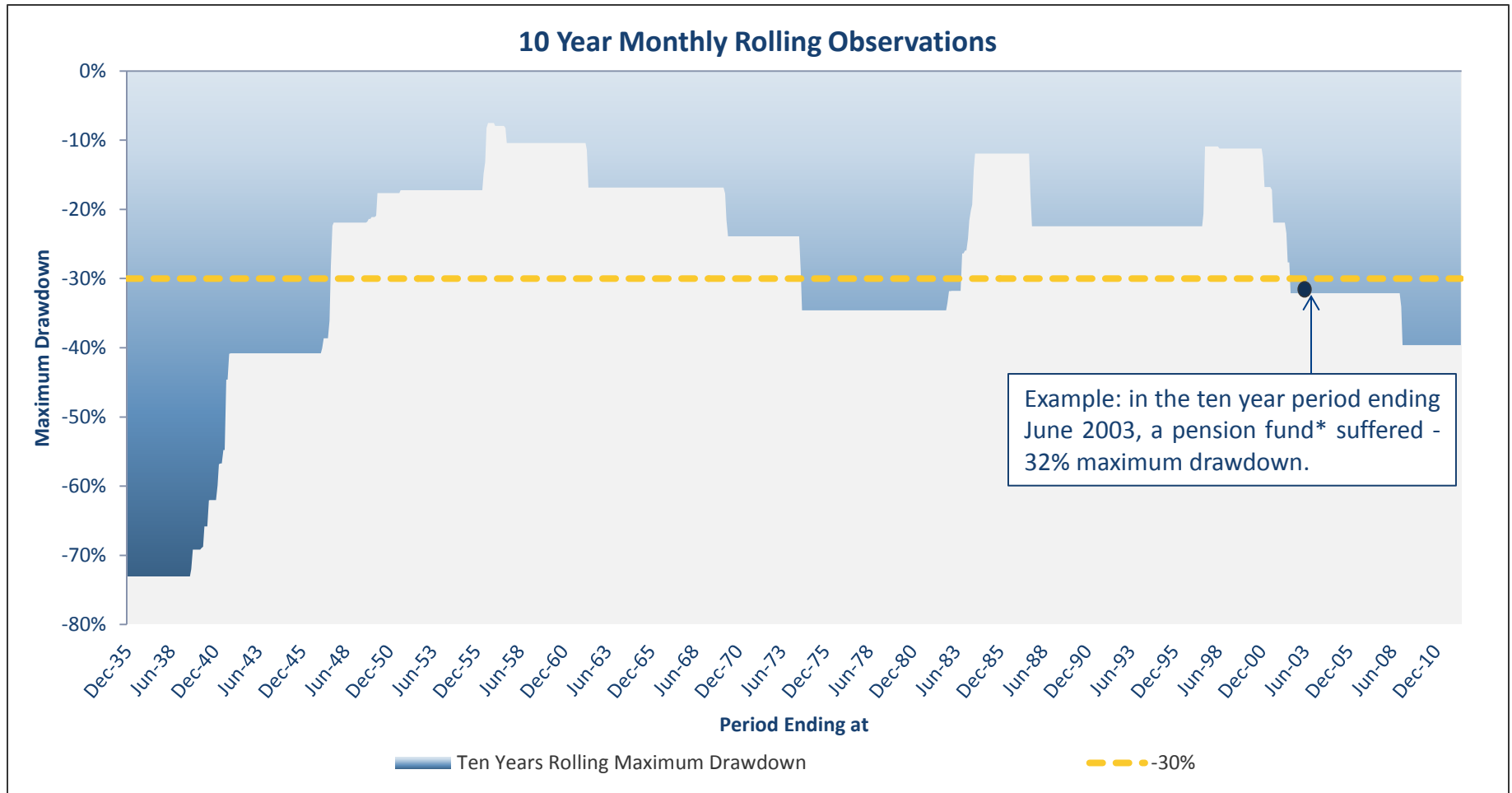
TCERA Trailing 1 Yr. Returns



- TCERA experienced a 28.6% drawdown for the 12 months ended March 31, 2009.
- This drawdown was the primary factor contributing to the Plan not achieving the assumed return for the trailing ten years ending 6.30.13.
- To illustrate, if the plan earned 0% in calendar year 2008, the 10 year trailing return would have been 10.5%, meaningfully higher than both the 7.9% assumption and the actual return of 6.9%.

Was the 2008-09 drawdown really a “100-year storm” or should we expect it to happen again?

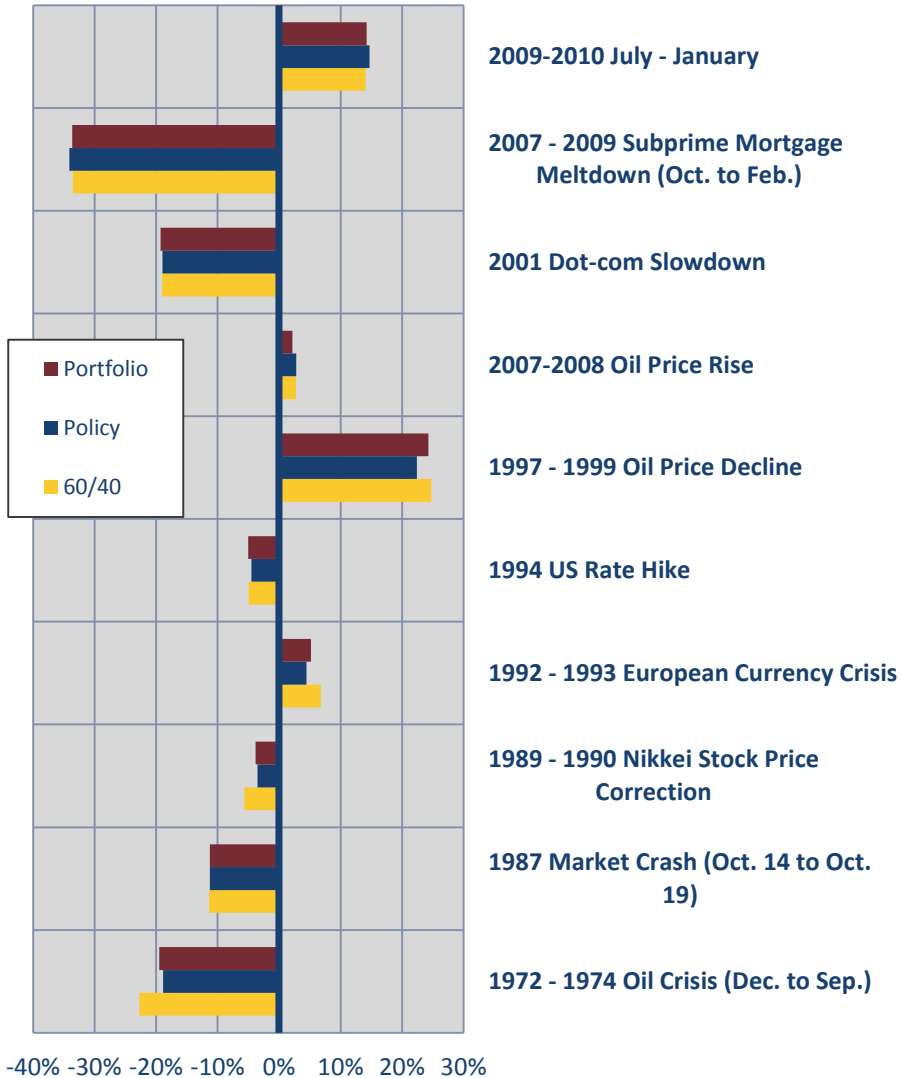
DRAWDOWNS HAPPEN MORE OFTEN THAN YOU THINK



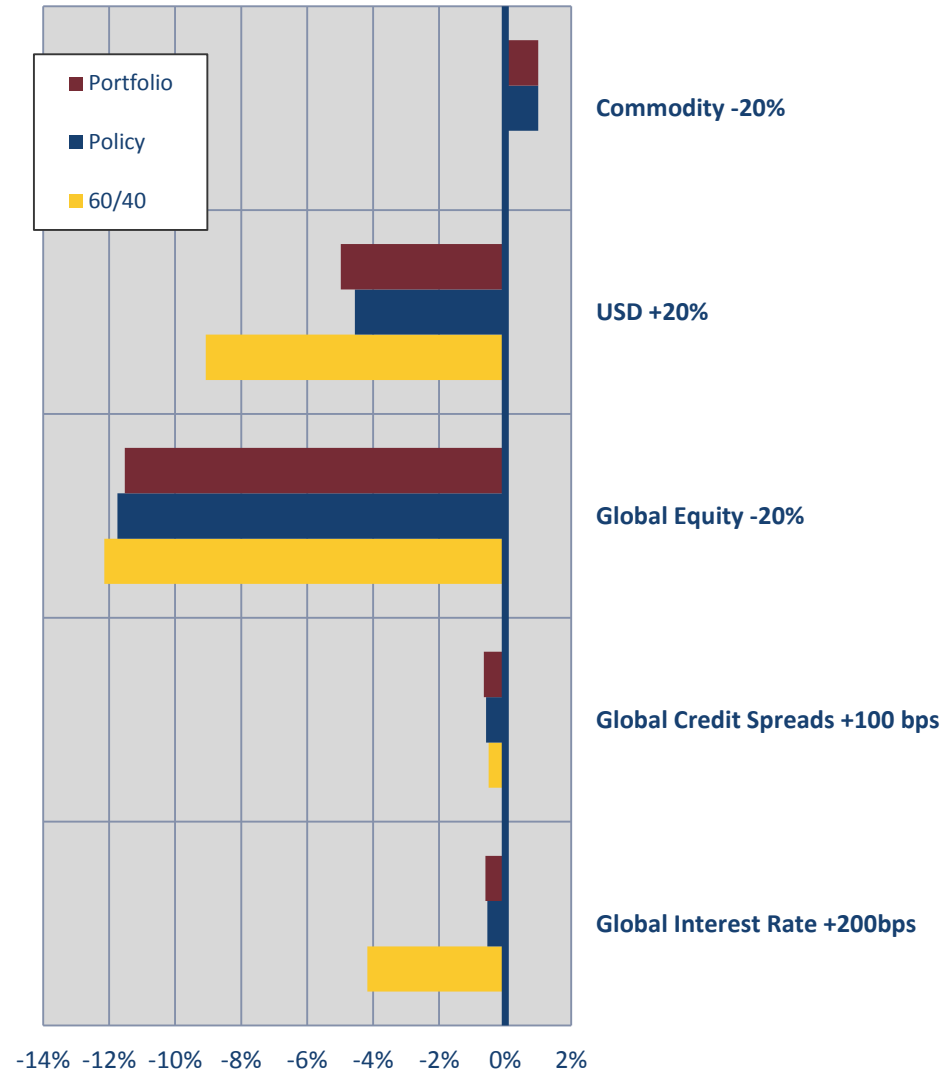
Average Max Drawdown in a Ten Year Period	-23%
Probability of Suffering a Drawdown of -30% in Any Ten Year Period	45%

*Typical pension fund risk equivalent asset allocation portfolio with ~14% ex-ante volatility.

Tail Risk - Scenario Analysis



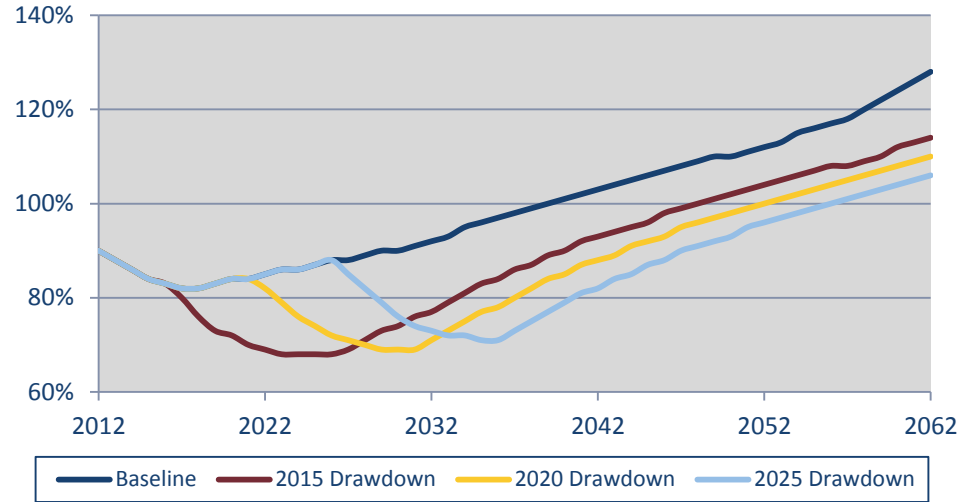
Tail Risk - Stress Tests



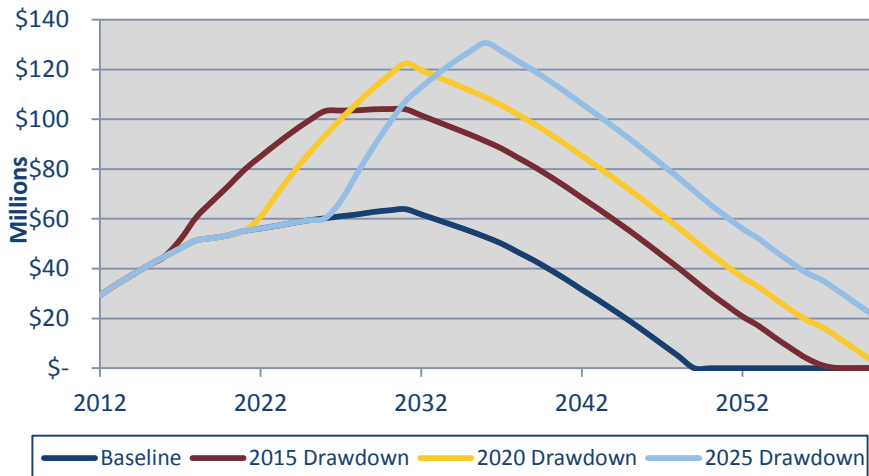
SOLVENCY & DRAWDOWNS

- We can say with a reasonable degree of confidence that TCERA is likely to experience another large drawdown with the current allocation. But when?
- Assuming the County can meet all future recommended contributions, the Plan can still achieve fully funded status, albeit 10-20 years later.
- Contributions are projected to reach as high as 29% of payroll in 2031 if the Plan experiences a 25% drawdown during the year 2020.
- The hypothetical drawdowns result in contribution greater than the current level.

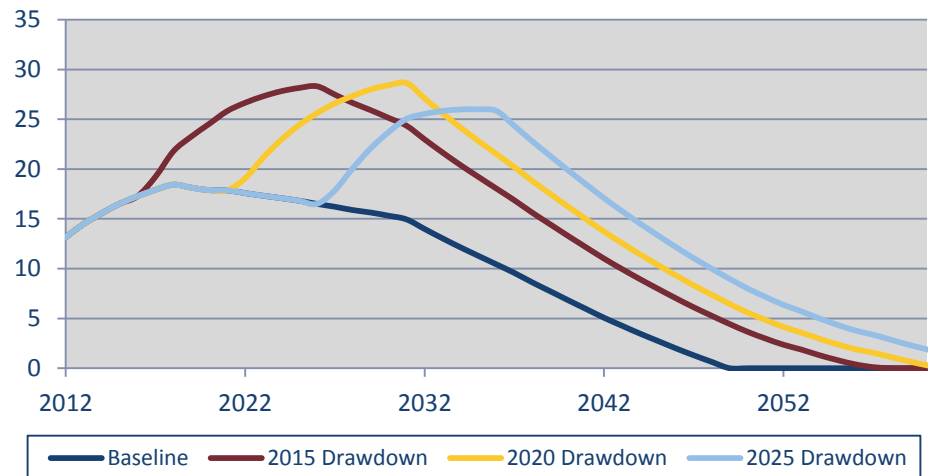
Funded Ratio



Annual County Contributions



Annual County Contributions as % of Pay



Compound Return

- 10 Years at 10% return produces an annualized return of **10%**.

What would be the annualized return if on the 10th year the portfolio experiences a -30% return?

The Importance of Limiting Drawdowns

- 9 years at 10% return plus a one year return of -30% produces an annualized return of **5.14%**.

Its easy to focus on endpoints in terms of funded status/contributions, etc.

But there are other qualitative considerations to think about that can happen along the way:

1. To what extent does a near term event impact the County's ability to borrow in municipal markets?
2. To what extent do funding concerns impact the tax base or future growth prospects for the County?
3. To what extent does the health of the Pension impact employee recruitment, morale, and retention?

SUMMARY: DRAWDOWNS

- We know that large drawdowns occur roughly once every ten years.
- When we encounter another drawdown event, TCERA can either:
 1. Increase County contributions (*may not be feasible*)
 2. Allow the Plan to eventually experience much higher contributions and much lower funded status (*may not be acceptable*)

Is it possible to structure the portfolio differently to mitigate large drawdowns?

PORTFOLIO CONSTRUCTION PROCESS

PEER RISK: TCERA VS. SACRS PLANS

- TCERA returns have been relatively similar to other SACRS Plans:

U.S. Equity: 10 Years	
Median of SACRS Counties:	5.8%
Standard Deviation:	0.46%
TCERA:	6.4%

Domestic Fixed Income: 10 Years	
Median of SACRS Counties:	6.9%
Standard Deviation:	0.86%
TCERA:	6.3%

International Equity: 10 Years	
Median of SACRS Counties:	6.5%
Standard Deviation:	0.69%
TCERA:	5.5%

Total Fund: 10 Years	
Median of SACRS Counties:	6.5%
Standard Deviation:	0.76%
TCERA:	6.1%

~68% of SACRS Counties had plan-level investment returns between 5.7% and 7.3%

- Nearly all Counties employed the same method of portfolio construction, the same definition of diversification, and the very similar constrained minimum variance portfolios using an efficient frontier.
- The 0.76% standard deviation comprises differences in both asset allocation and manager selection.

All of the time and energy spent managing managers, style tilts, administrative issues, etc., has resulted in remarkably little differentiation.

- Portfolios were constructed by optimizing asset classes to identify those mixes that maximized returns for a given level of risk, as defined by standard deviation.

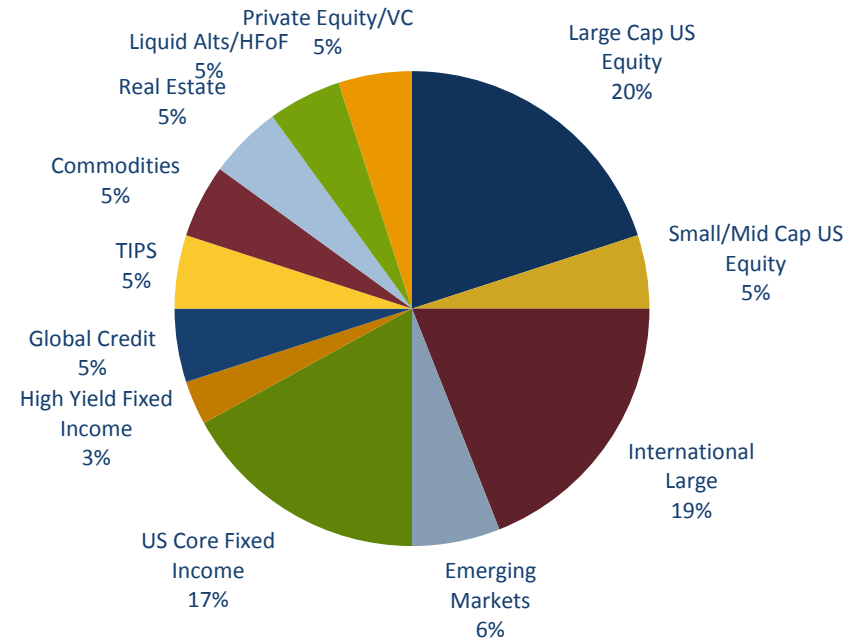
Major inputs:

- Expected Return
 - Expected Standard Deviation
 - Expected Correlations
- The underlying principles of Mean Variance Optimization (“MVO”) are sound... “Diversification is a free lunch.” However:
 - MVO requires an accurate prediction of expected returns, volatility (standard deviations), and correlations.
 - MVO assumes markets are normally distributed.
 - MVO assumes correlations remain constant over time.

The conclusion is that MVO is not an effective tool for modeling the devastating effects of drawdowns.

TCERA'S POLICY PORTFOLIO

	Policy	CMA's (10 Yr.)
Large Cap US Equity	20	6.3
Small/Mid Cap US Equity	5	6.9
Total Domestic Equity		25
International Large	19	8.0
Emerging Markets	6	9.6
Total Int'l Equity		25
Total Equity		50
US Core Fixed Income	17	2.0
High Yield Fixed Income	3	4.9
Global Credit	5	3.7
TIPS	5	2.2
Total Fixed Income		30
Commodities	5	4.3
Real Estate	5	5.6
Total Real Assets		10
Liquid Alts/HFoF	5	5.4
Private Equity/VC	5	9.9
Total Non-Public Investments		10
Total Allocation	100	



Tulare County ERA	
10 Year Forecast	
Mean Variance Optimizer Analysis	
Forecast 10 Year Return	6.5
Standard Deviation	10.6
Sharpe Ratio	0.43

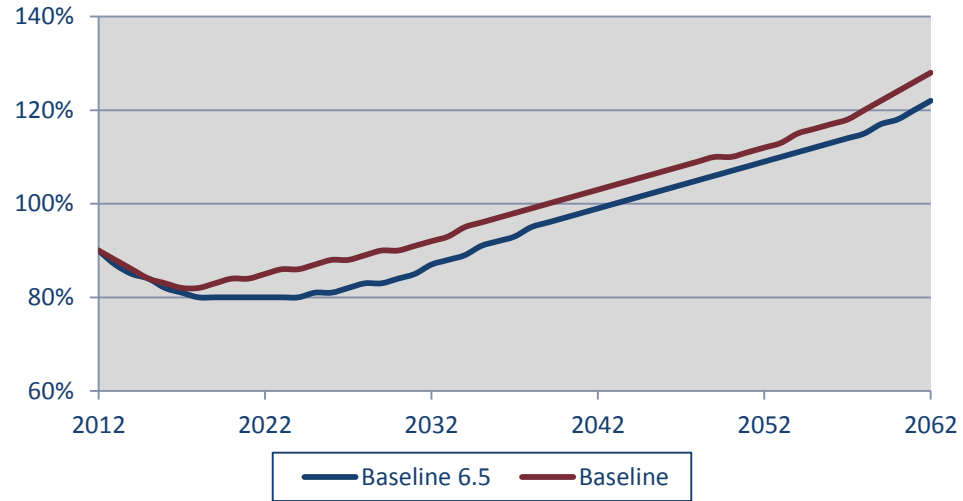
* See appendix for details regarding Wurts' 2013 Capital Market Assumptions.

- Wurts & Associates uses a 10 year time horizon, whereas the actuarial assumed rate covers the entire life of the Plan.
- Forecasting is difficult to begin with. However, we prefer a 10 year time frame because it is long enough for markets to correct themselves but short enough to use tangible data points.
- In Wurts' judgment it is reasonable to assume a lower rate of return for the next decade and a higher rate of return thereafter.
 - It is problematic to try to construct a portfolio that is projected to achieve 7.9% in the current low return environment. Doing so would require the Plan to assume an unacceptable level of risk.
 - It is Wurts' view that TCERA should not take on additional risk given the low return environment when risk-premia are historically expensive.

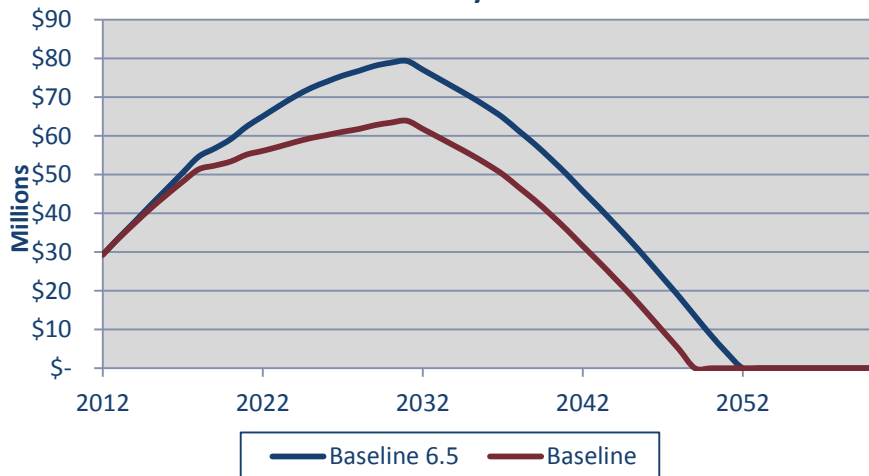
IMPACT OF 10-YEAR PERFORMANCE BELOW ASSUMED RATE

- Assumes the Plan's investments earn 6.5% for the next 10 years, and the actuarial assumed rate thereafter.

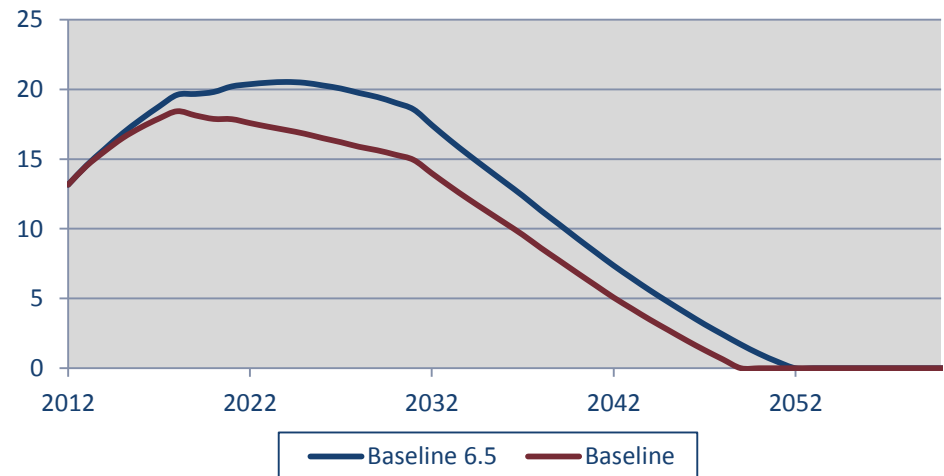
Funded Ratio



Annual County Contributions



Annual Employer Contribution (%Pay)

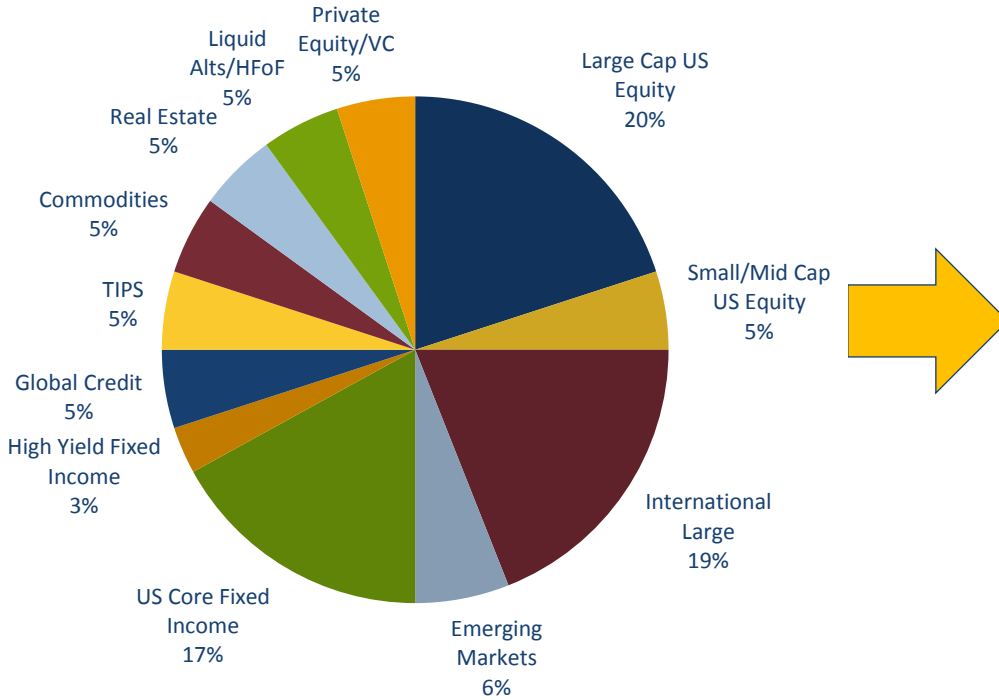


- I. The current portfolio was constructed using MVO, just like most other SACRS Plans
- II. While MVO is a necessary tool in that it is a simple way of comparing different portfolios, it does not adequately address the risk of large drawdowns. Large drawdowns can threaten the financial viability of mature plans.
- III. We believe it is to assume another large drawdown will occur in the future. If it does, the UAAL will be negatively affected, and the Plan will need to increase contributions to ensure sustainability. This risk should to be factored into any asset/ liability review.

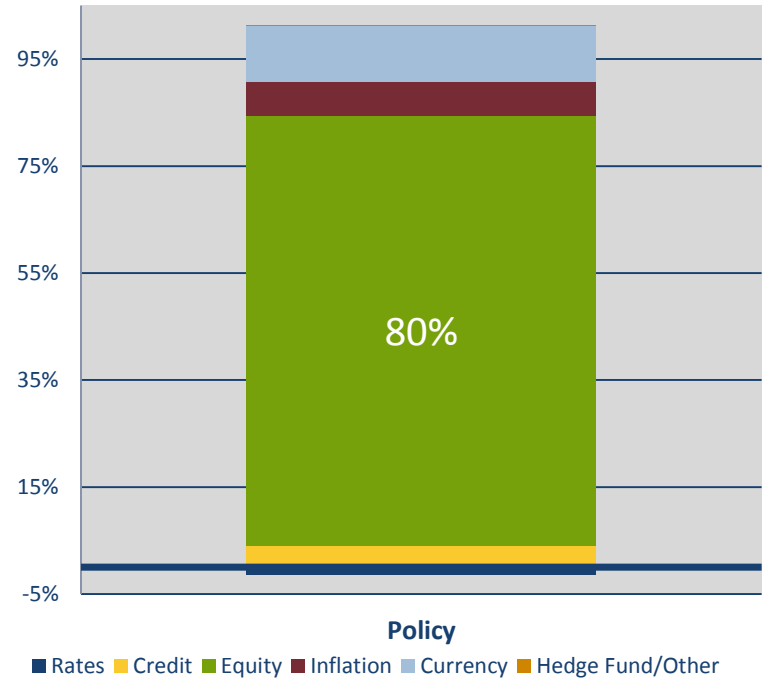
1. Understand the sources of risk.
2. “**Win by not losing**” i.e., mitigate large drawdowns.
3. Supplement MVO with other methods of forecasting portfolios:
 - Risk Decomposition.
 - Economic Diversification.
 - Stress-testing & Scenario Analysis.
4. The alternative: **A Risk-Diversified Portfolio.**

DIVERSIFICATION OF RISKS

TCERA's Policy Targets



TCERA's Risk Decomposition



Asset-diversified, but...

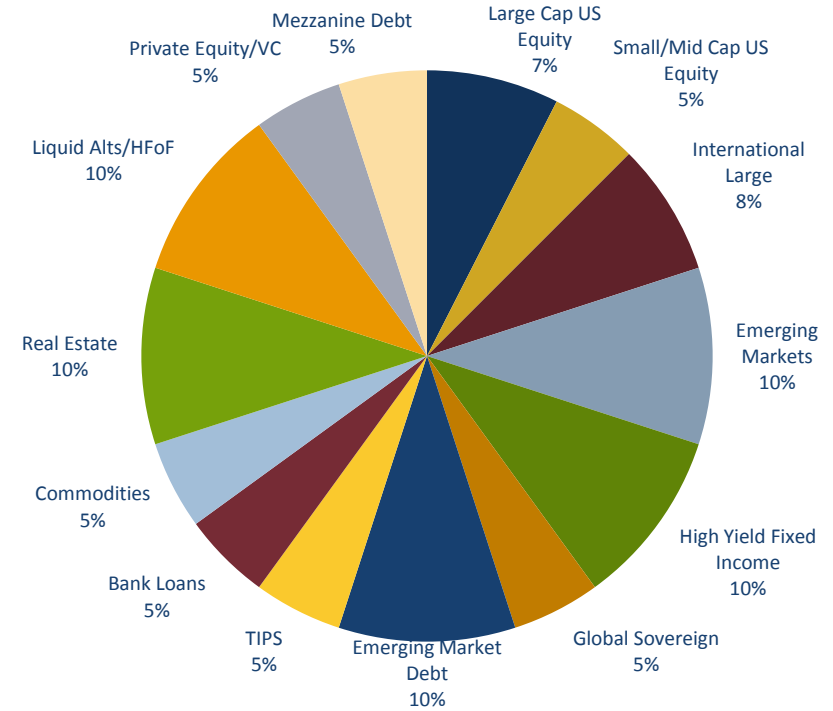
Risk diversified?

Because many assets are inextricably tied to the risks embedded in global equity markets and that risk is greater than other types of risk, an MVO-constructed portfolio derives the majority of its risk from equities.

- The MVO Portfolio is constructed to be diversified by assets but not risk factors.
- Here we consider the effect of a risk-diversified portfolio that is projected to achieve the same rate of return as the current portfolio.
- Key tenets of a risk-diversified approach include:
 - Effectively reduction of equity risk.
 - Reduction in the absolute level of expected volatility.
 - Diversified sources of return (beta) that are more dependent on contractual cash flows and less dependent on capital appreciation.
 - Lower susceptibility to large drawdowns.

THE RISK-DIVERSIFIED PORTFOLIO

	Current Policy	Risk Diversified	CMA's (10 Yr.)
Large Cap US Equity	20.0	7.5	6.3
Small/Mid Cap US Equity	5.0	5.0	6.9
Total Domestic Equity	25.0	12.5	
International Large Emerging Markets	19.0	7.5	8.0
Emerging Markets	6.0	10.0	9.6
Total Int'l Equity	25.0	17.5	
Total Equity	50.0	30.0	
US Core Fixed Income	17.0		2.0
High Yield Fixed Income	3.0	10.0	4.9
Global Sovereign		5.0	2.2
Global Credit	5.0		3.7
Emerging Market Debt		10.0	5.7
TIPS	5.0	5.0	2.2
Bank Loans		5.0	4.1
Total Fixed Income	30.0	35.0	
Commodities	5.0	5.0	4.3
Real Estate	5.0	10.0	5.6
Total Real Assets	10.0	15.0	
Liquid Alts/HFoF	5.0	10.0	5.4
Private Equity/VC	5.0	5.0	9.9
Mezzanine Debt		5.0	5.9
Total Non-Public Investments	10.0	20.0	
Total Allocation	100.0	100.0	



Mean Variance Optimizer Analysis		
10 Year Forecast		
	Current Policy	Risk Diversified
Forecast 10 Year Return	6.5	6.5
Standard Deviation	10.6	9.5
Sharpe Ratio	0.43	0.48

* See appendix for details regarding Wurts' Capital Market Assumptions.

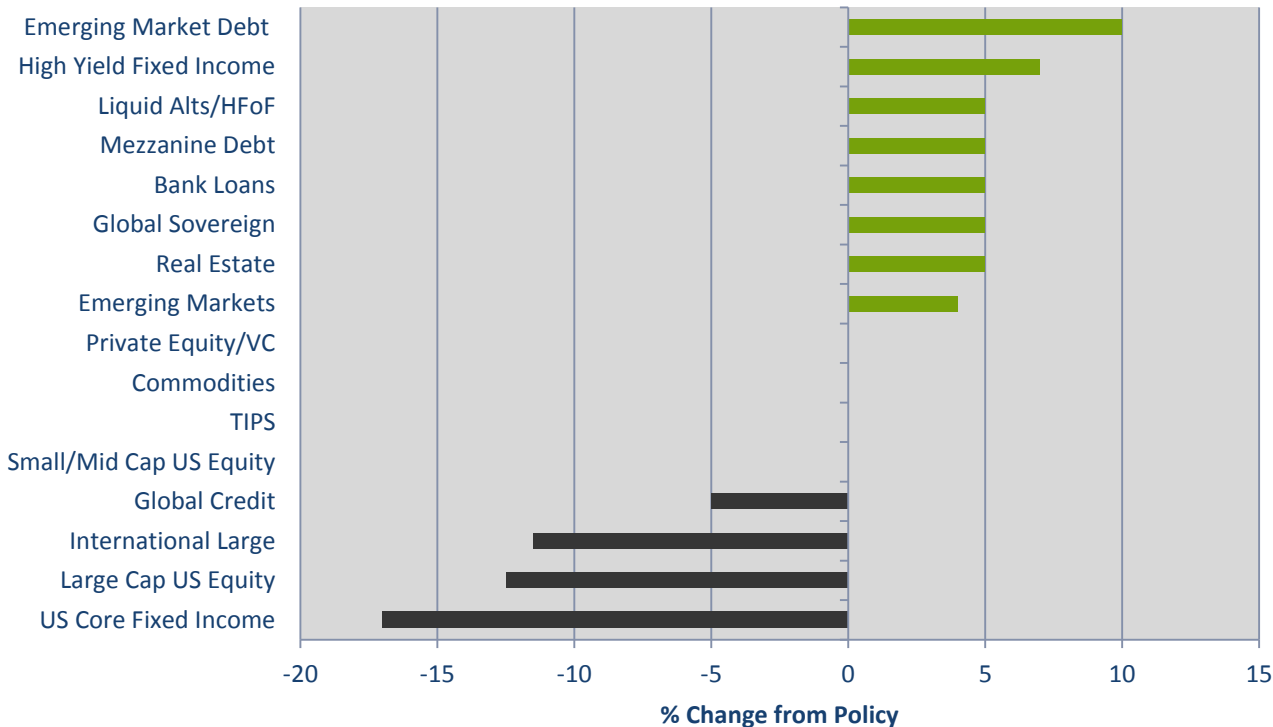
A RELATIVE COMPARISON

- The new portfolio has the same expected return, but achieves a **11% reduction** in the expected volatility of returns.
- Some asset class exposures are eliminated completely. Likewise, the risk-diversified mix includes new asset classes.

Relative to policy targets, the risk-diversified mix has:

Less exposure

More exposure



New Asset Classes*

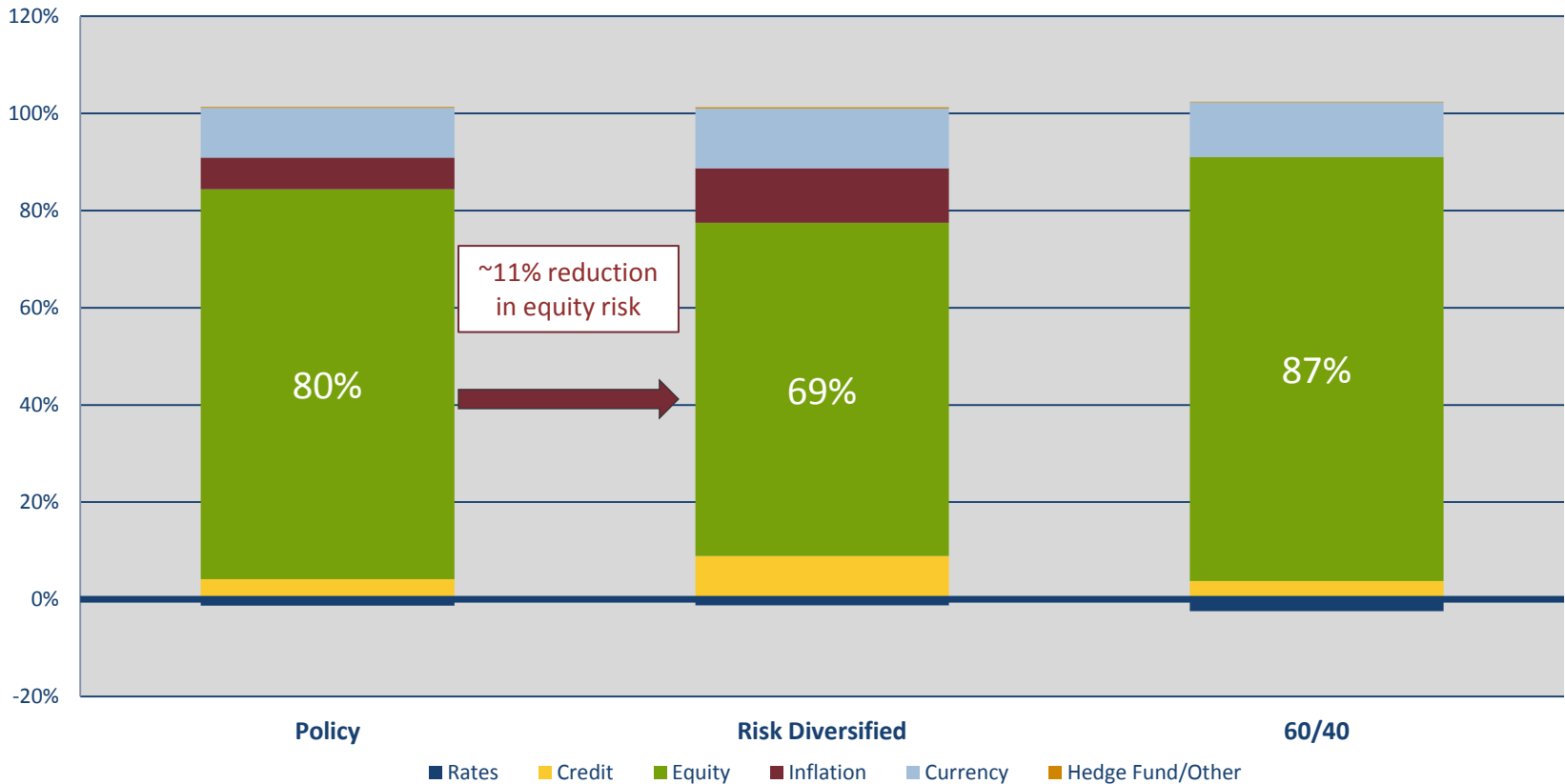
- + Emerging Market Debt
- + Mezzanine Debt
- + Bank Loans
- + Global Sovereign Debt

Eliminated Asset Classes

- U.S. Core Fixed Income
- Global Credit


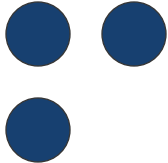
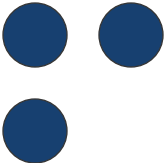
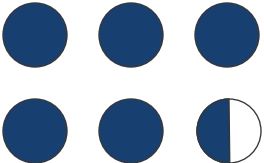
* Note that this distinction applies to the policy allocation. TCERA may have exposure to these asset classes, either as an opportunistic investment, subset of the private equity allocation, or as a result of the underlying tactical allocations made by investment managers.

Risk Contribution by Risk Factor


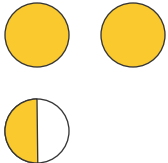
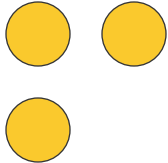
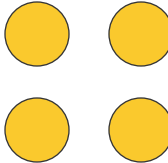


Because of the need to earn a reasonable return we still need a significant exposure to the equity risk factor. Still, the direct exposure to equities is meaningfully reduced.

TCERA's Policy Portfolio

<p><i>Falling Growth</i> <i>Rising Inflation</i></p> 	<p><i>Rising Growth</i> <i>Rising Inflation</i></p> 
<p><i>Falling Growth</i> <i>Falling Inflation</i></p> 	<p><i>Rising Growth</i> <i>Falling Inflation</i></p> 

Diversified Risk Portfolio

<p><i>Falling Growth</i> <i>Rising Inflation</i></p> 	<p><i>Rising Growth</i> <i>Rising Inflation</i></p> 
<p><i>Falling Growth</i> <i>Falling Inflation</i></p> 	<p><i>Rising Growth</i> <i>Falling Inflation</i></p> 

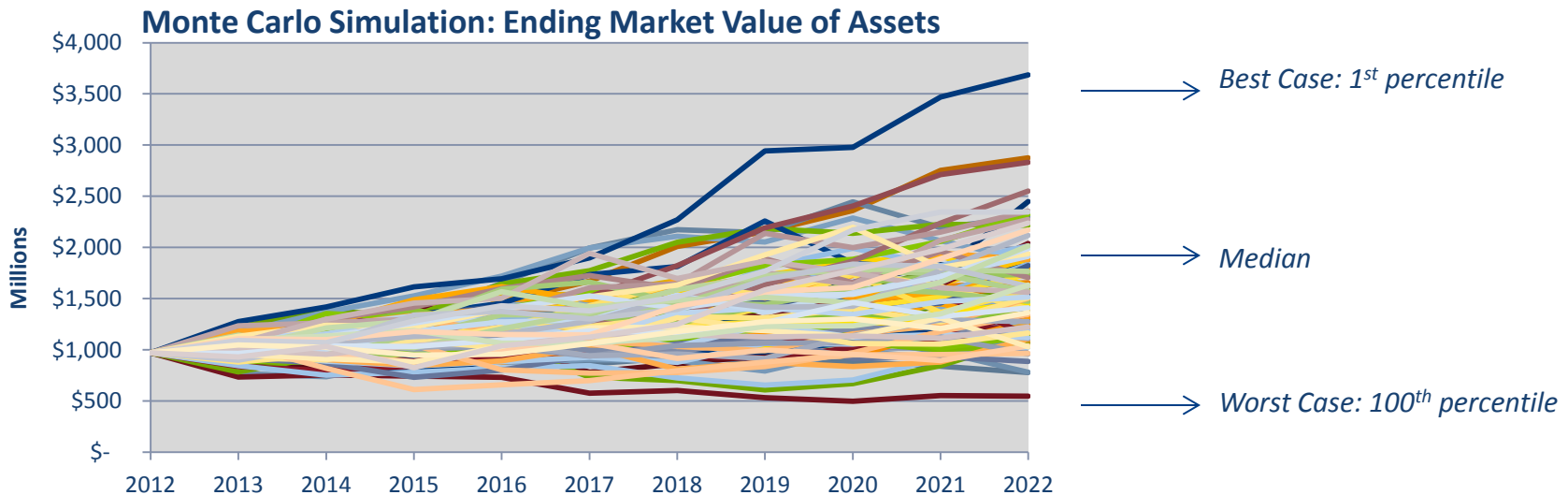
By holistically examining how different assets behave in different economic regimes, we can build a portfolio that relies less on economic growth and prosperity for success.

This is achieved not only through a focus on cash-flows, but also through greater geographic diversification. The portfolio is less directly impacted by the ebbs & flows of the U.S. economy.

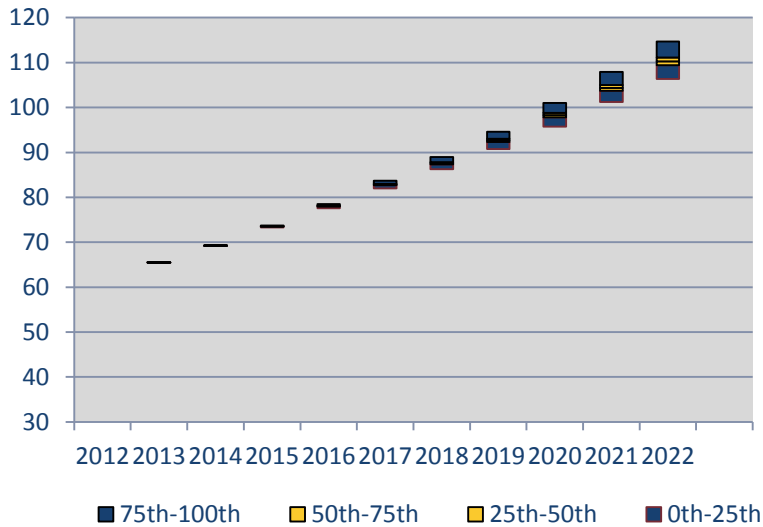
STOCHASTIC MODELING

AN INTRODUCTION TO STOCHASTIC MODELING

- Wurts & Associates partnered with Winklevoss Technologies to generate forecasts of TCERA's' key metrics.
- The model incorporates:
 - Wurts & Associates' 2013 capital market assumptions
 - Liabilities as calculated by Buck Consultants
 - TCERA's contribution & benefit policies
- By compiling the results, we can compare the 1st, 25th, 50th, 75th, & 100th percentile outcome for each year, for each of the two strategies under consideration, with 5,000 independent trials.
- **An important caveat:** *Each trial is a simulated random outcome; the randomness is determined by a normal distribution curve. As we have previously discussed, while this may help us determine a “most likely outcome”, it understates the magnitude or probability of tail risk.*

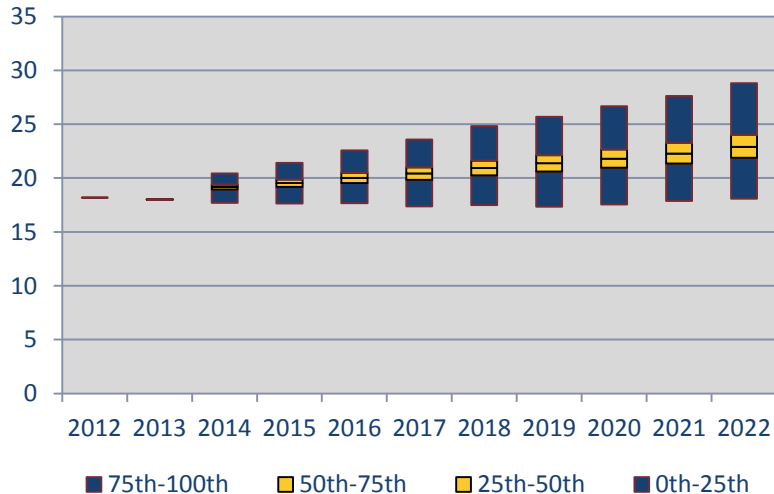


Benefit Payments(\$Million)



- Regardless of the asset allocation, benefit payments are expected to increase.
- Benefit payments were \$62 million for the 2012 plan year.
- Depending on inflation and demographics, benefits are expected to be around \$110 million in 2022 (roughly double the current levels).
- Member contributions are also independent of the asset allocation.
- Member contributions were about \$18 million for the 2012 Plan year.
- The potential variance in member contributions is driven by future annuity costs as well as final year compensation (refer to slide 7 for the contribution policy).

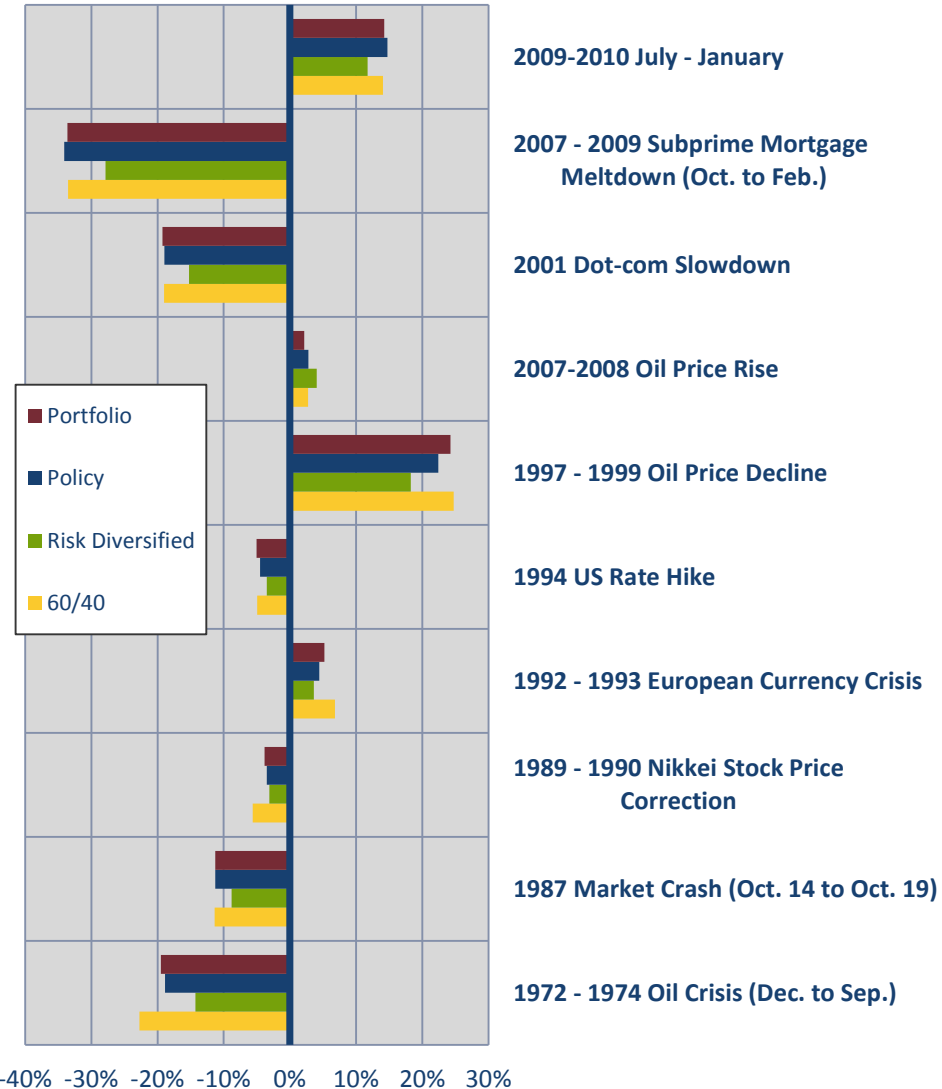
Employee Contributions (\$Millions)



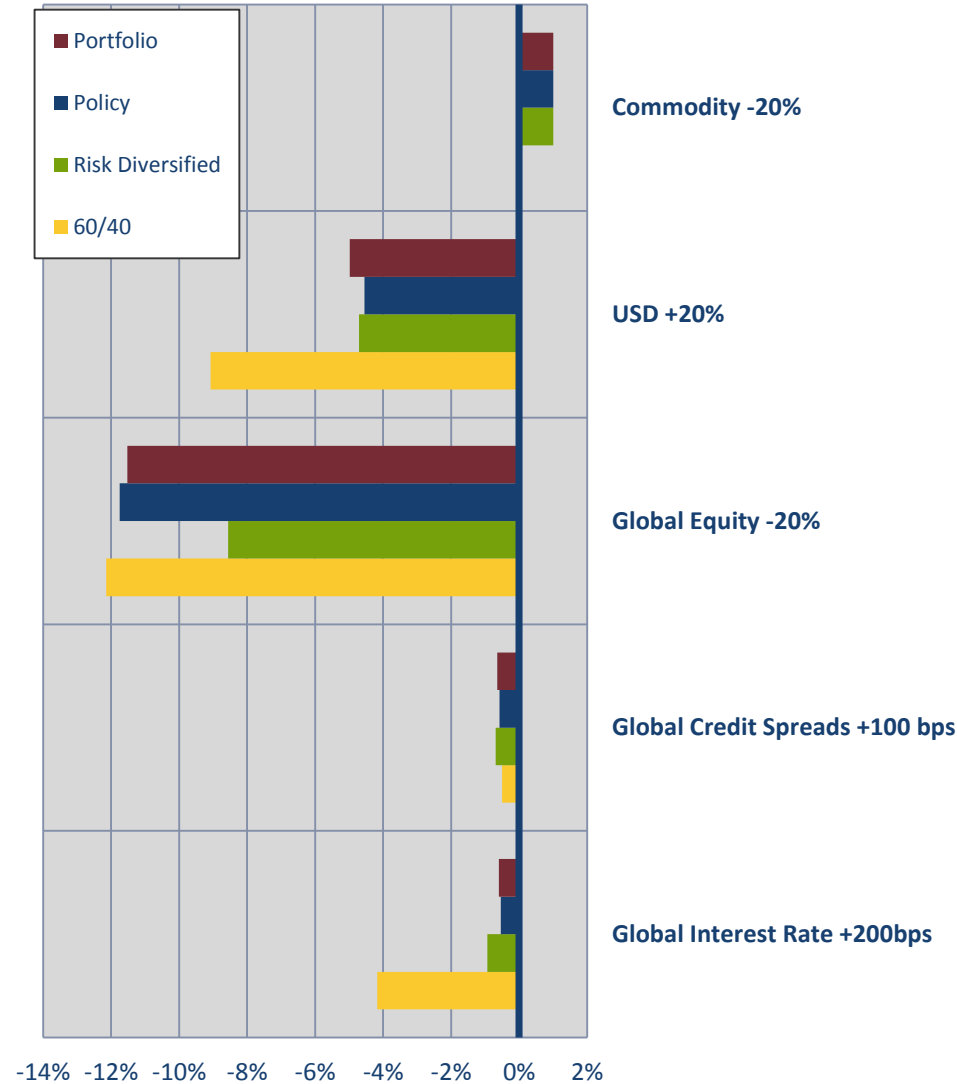
STOCHASTIC MODELING: RESULTS

		TCERA Current Policy	Risk Diversified Portfolio	Forecasted Difference	Forecasted Improvement
Annual Total Contributions					
2017 Forecast	Best Case	\$3,963,451	\$17,360,011	-\$13,396,560	-338%
	Median	\$48,752,181	\$49,008,263	-\$256,082	-1%
	Worst Case	\$75,464,794	\$72,513,037	\$2,951,757	4%
2022 Forecast	Best Case	\$0	\$0	\$0	-
	Median	\$62,920,251	\$63,850,985	-\$930,734	-1%
	Worst Case	\$129,771,504	\$122,929,241	\$6,842,263	5%
Actuarial Funded Status (%)					
2017 Forecast	Best Case	114.07	107.06	-7.01	-6%
	Median	81.29	81.08	-0.21	0%
	Worst Case	61.49	63.99	2.5	4%
2022 Forecast	Best Case	176.86	145.16	-31.7	-18%
	Median	79.29	78.76	-0.53	-1%
	Worst Case	42.86	47.25	4.39	10%

Tail Risk - Scenario Analysis



Tail Risk - Stress Tests



County Contributions:

- The median outcomes are relatively consistent across both portfolios.
- The worst-case scenarios are improved, reducing the maximum potential contribution by 5% in 2022.

Funded Status:

While the actuarial funded status forecasting does differ under different investment portfolios, there are two additional considerations:

- A poor investment return is amortized through actuarial smoothing policies.
- A poor investment return can be subsidized through higher contributions.

Still, we do observe some differences in the range of outcomes under each scenario:

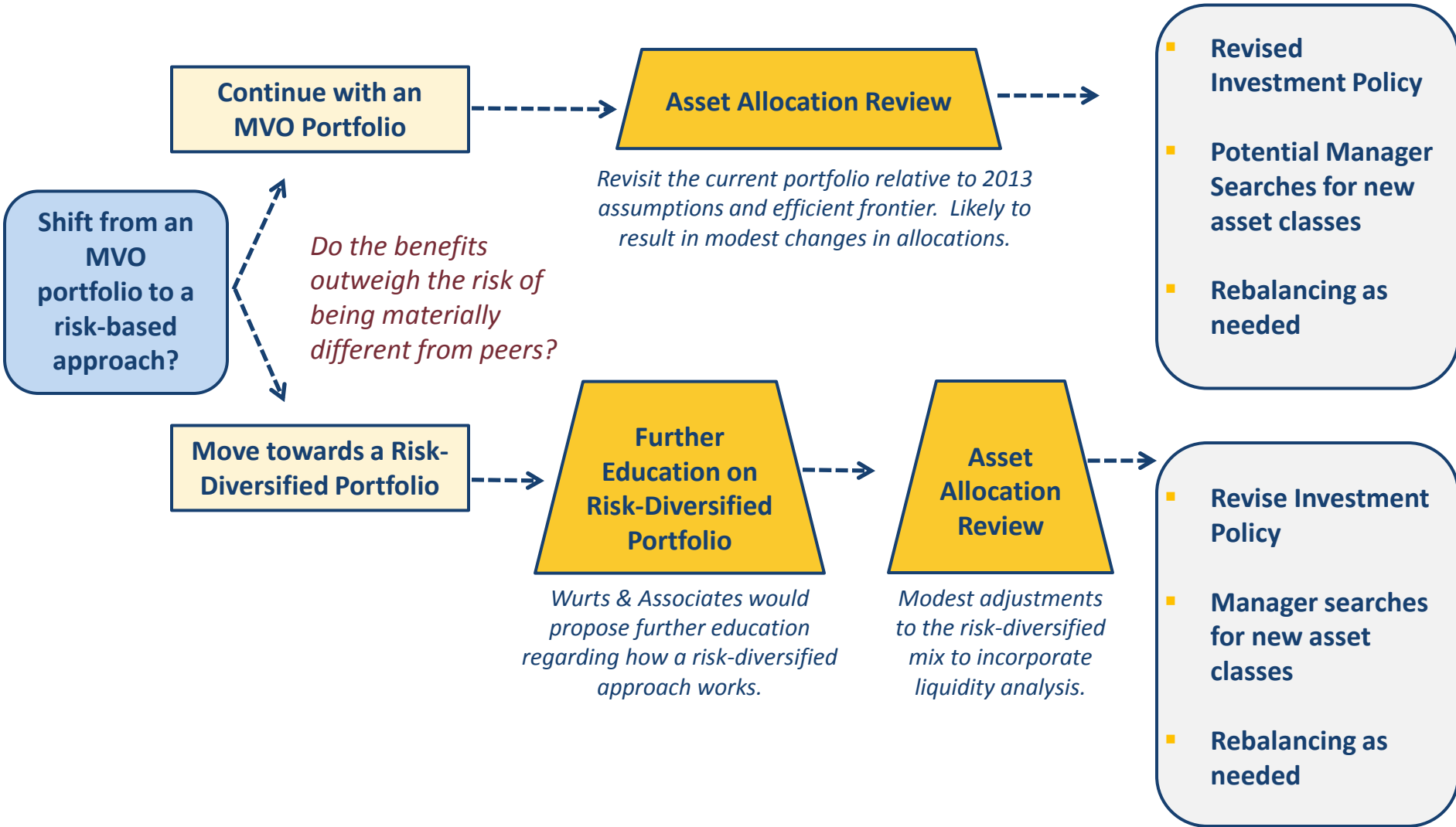
- Under worst-case scenarios, funded status improves about 10%.
- The median outcome under the different portfolios is relatively homogeneous.
- Because the risk-diversified portfolios benefit less from very large equity rallies, we do sacrifice upside potential.

CONCLUSION & NEXT STEPS

PROS & CONS

Issue	TCERA Current Portfolio	Risk-Diversified Portfolio
Expected return	6.5%	6.5%
Standard deviation of returns	10.6%	9.5% (10% reduction)
Diversification	Asset-diversified	Risk-Diversified. Reduction in equity-risk, focus on cash-flow investments, and greater geographic diversification
Up-Market Capture	Strong performance in bull markets.	The portfolio should perform well, but not to the extent of the current portfolio.
Down-Market Capture	Large drawdowns in bear markets.	Underperform by less than current portfolio.
Employer Contributions	Very volatile	Range of potential outcomes is reduced. The worst-case contribution level is reduced by 4% in 5 years and 5% in 10 years.
Peer Risk	Minimal. Portfolio is relatively consistent with other SACRS counties.	Significant. Board may be uncomfortable with a new approach, which is materially different from peers. Risk of "failing unconventionally."
Funded Status	Highly volatile	The worst-case funded status expected to improve by about 2.5% in 5 years and 4.4% in 10 years.

NEXT STEPS



2013 CAPITAL MARKETS ASSUMPTIONS

SUMMARY OF ASSUMPTIONS: RETURNS

Asset Class	Index Proxy	2012 Ten Year Forecast	2013 Ten Year Return Forecast	2013 Ten Year Annual Standard Deviation Forecast	Change in Return Expectations '12-'13
<u>Equities</u>					
US Large	S&P 500	7.0	6.3	16.8	-0.7
US Small	Russell 2000	5.5	6.9	21.1	1.4
International Developed	MSCI EAFE	7.6	8.0	19.1	0.4
International Small	MSCI EAFE Small Cap	6.4	8.3	22.8	1.9
Emerging Markets	MSCI EM	8.6	9.6	27.6	1.0
Private Equity	Cambridge Private Equity	10.0	9.9	32.8	-0.1
<u>Fixed Income</u>					
Cash	30 Day T-Bills	2.7	1.7	1.0	-1.0
US TIPS	Barclays US TIPS Index	2.6	2.2	4.6	-0.4
Core Fixed Income	Barclays US Aggregate Bond	2.2	2.0	3.8	-0.2
Investment Grade Corp. Credit	Barclays US Credit	3.5	3.0	5.2	-0.5
High Yield Corp. Credit	Barclays High Yield	5.7	4.9	9.9	-0.8
Global Sovereign	Barclays Global Treasury ex US	2.9	2.2	3.5	-0.7
Global Credit	Barclays Global Credit	4.4	3.7	7.0	-0.7
Emerging Markets Debt (Hard)	JPM EMBI Global Diversified	5.8	5.0	12.8	-0.8
Emerging Markets Debt (Local)	JPM GBI EM Global Diversified	6.5	5.7	11.3	-0.8
<u>Other</u>					
Commodities	S&P GSCI	5.4	4.3	16.6	-1.1
Hedge Funds	HFR Fund of Funds	5.6	5.4	11.5	-0.2
Core Real Estate	NCREIF Property	6.0	5.6	10.9	-0.4
REITs	Wilshire REIT	6.0	5.6	21.8	-0.4
<u>Inflation</u>	Blend	2.7	2.6		-0.1

Estimated returns are gross of manager fees.

Historic standard deviations are based on the last 20 years or since inception of the index if 20 years of data is not available.

Hedge Funds' standard deviations was subjectively increased 50% in order to more accurately reflect the volatility of this asset class.

We apply our US Small Sharpe ratio estimate of 0.25 to our Private Equity return forecast to calculate a standard deviation for Private Equity.

Core Real Estate standard deviation was subjectively assumed to be 50% of the REIT standard deviation.

WURTS' CORRELATION ASSUMPTIONS

	S&P 500	Russell 2000	MSCI EAFE	MSCI EAFE Small Cap	MSCI EM	Private Equity	Cash	US TIPS	Core Fixed Income	Investment Grade Corporate Credit	High Yield Corporate Credit	Global Sovereign	Global Credit	Emerging Market Debt	Emerging Market Debt Local	Commodities	Hedge Funds	Core Real Estate	REITS	Inflation
S&P 500	1.0																			
Russell 2000	0.8	1.0																		
MSCI EAFE	0.8	0.7	1.0																	
MSCI EAFE Small Cap	0.8	0.8	0.9	1.0																
MSCI EM	0.7	0.7	0.8	0.9	1.0															
Private Equity	0.2	0.1	0.3	0.2	0.2	1.0														
Cash	0.1	0.0	0.0	-0.1	-0.1	0.1	1.0													
US TIPS	0.0	0.0	0.1	0.2	0.1	-0.2	-0.1	1.0												
Core Fixed Income	0.1	-0.1	0.0	0.1	0.0	-0.1	0.1	0.7	1.0											
Investment Grade Corporate Credit	0.3	0.2	0.3	0.4	0.2	-0.1	0.0	0.7	0.9	1.0										
High Yield Corporate Credit	0.6	0.6	0.6	0.7	0.6	0.1	-0.1	0.3	0.2	0.5	1.0									
Global Sovereign	-0.1	-0.1	-0.1	-0.2	-0.1	-0.1	0.2	0.4	0.7	0.6	0.0	1.0								
Global Credit	0.5	0.4	0.6	0.7	0.6	0.0	-0.1	0.6	0.6	0.8	0.7	0.3	1.0							
Emerging Market Debt	0.5	0.5	0.5	0.6	0.7	0.0	0.0	0.4	0.4	0.5	0.5	0.2	0.8	1.0						
Emerging Market Debt Local	0.6	0.6	0.8	0.7	0.8	0.0	0.0	0.4	0.3	0.5	0.6	0.0	0.8	0.7	1.0					
Commodities	0.3	0.3	0.4	0.5	0.3	0.1	0.0	0.3	0.0	0.1	0.3	-0.1	0.4	0.2	0.4	1.0				
Hedge Funds	0.6	0.6	0.6	0.7	0.7	0.3	0.1	0.1	0.1	0.3	0.5	0.0	0.6	0.6	0.6	0.4	1.0			
Core Real Estate	0.0	0.0	0.0	0.0	0.0	0.6	0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.2	0.0	-0.1	0.1	0.1	1.0		
REITS	0.6	0.6	0.5	0.6	0.5	0.0	0.0	0.2	0.1	0.3	0.6	0.0	0.5	0.4	0.6	0.2	0.3	0.0	1.0	
Inflation	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-0.2	-0.1	0.1	-0.1	0.0	0.1	0.1	0.3	0.2	0.1	0.1	1.0

Note: Correlation assumptions are based on historical observations