Actuarial Techniques to Manage Pension Risk

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Defining and Understanding Risk

- A typical retirement system faces a number of risks
- In common usage, the risk most often refers to an outcome with undesirable results
  - An occurrence that gets in the way of achieving your goals
- The greatest risk facing a retirement system is its depletion of funds
  - This may create a risk for the payment of benefits
  - This, in turn, creates legal risk/litigation risk which can create an economic risk to taxpayers
- There is a risk of benefit decreases
  - Legislatures/taxpayers may opt to decrease benefits

What Events Increase the Probability of These Risks?

- We have seen that significant investment losses increase the probability of "ruin" in some situations
- Volatile contribution rates increase the likelihood of benefit decreases
  - As trustees, we want to avoid making permanent changes to impermanent problems
- Unsustainable costs may lead to benefit reductions
- Political backlash may also lead to benefit reductions

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Analyze a Range of Expectations

- Many times an actuarial cost or savings analysis will be provided, along with a caveat "if all assumptions are met"
  - What if they are not?
- Deterministic cost analysis can hide an unmanageable outcome until it is too late
  - Sometimes risk can create opportunity
  - Sometime risk has a cost
- Multiple scenarios or stochastic modeling can show the good outcomes and the negative outcomes so that decision makers can manage the risk
  - Otherwise known as scenario testing or sensitivity analysis

First Step, Assess the Risk

- A number of tools are available for use in the valuation process that aid in managing risk
  - These tools do not hide risk, or hide results, but rather are used to provide a longer term picture of the soundness of the plan
- Using projections, modeling, and stress testing, assess the risks to the plan
  - Look for "ruin", or unsustainable contribution rates
  - Model under a variety of economic and demographic scenarios
  - Stress test with the very volatile variables such as investment return, inflation, etc.
- The objective is to match long term funding decisions with the long term needs of the plan
  - And not to create long term solutions to short term issues

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Example:
Modifying Asset Smoothing Methods

- Recent investment performance has focused decision makers on smoothing methods/techniques
- Specifically, some pressure has been growing to extend smoothing periods or widen/remove corridors to lessen the impact on the short term budgets
  - Corridors increase the volatility in the contribution rate by recognizing asset gains/losses more quickly

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Impact of Changing Smoothing Periods/Corridors

Client/ Smoothing Method	ARC* from Prior Valuation	ARC from Current Valuation	ARC Eliminating Corridor	ARC Extending Smoothing Period**
A: 5 Year, 20% Corridor	6.11%	8.88%	7.11%	6.63%
B: 4 Year, No Corridor	13.66%	15.02%	NA	14.17%
C: 5 Year, No Corridor	15.68%	18.19%	NA	17.97%
D: 3 Year, 20% Corridor	9.98%	12.51%	11.35%	10.14%
E: 5 Year, 20% Corridor	19.20%	27.14%	22.14%	20.93%

*ARC: Annual Required Contribution

** Includes Eliminating Corridor if Applicable

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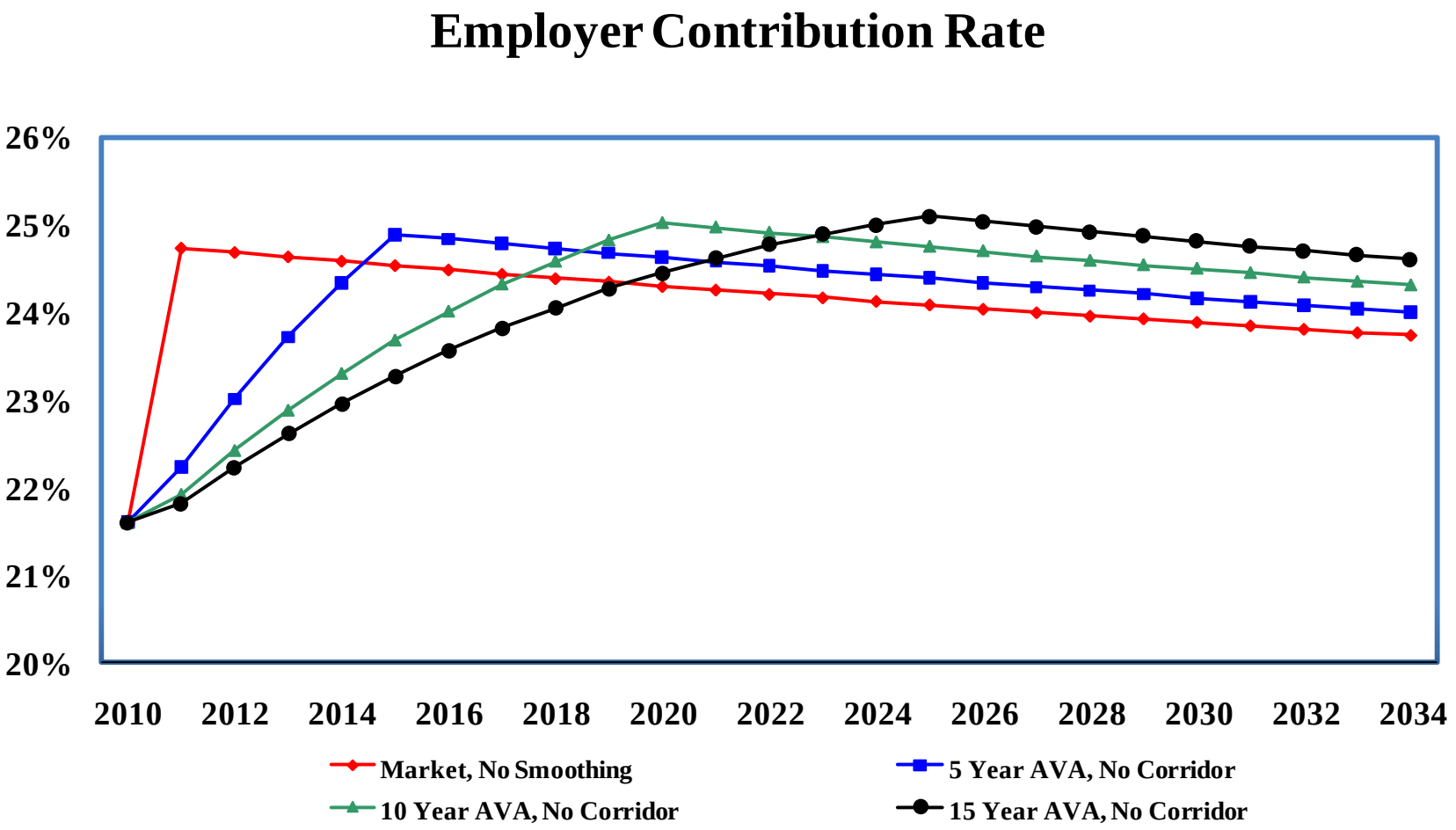
Sample Retirement Rystem

(-30% return in 2008, assumption exactly met each year thereafter)



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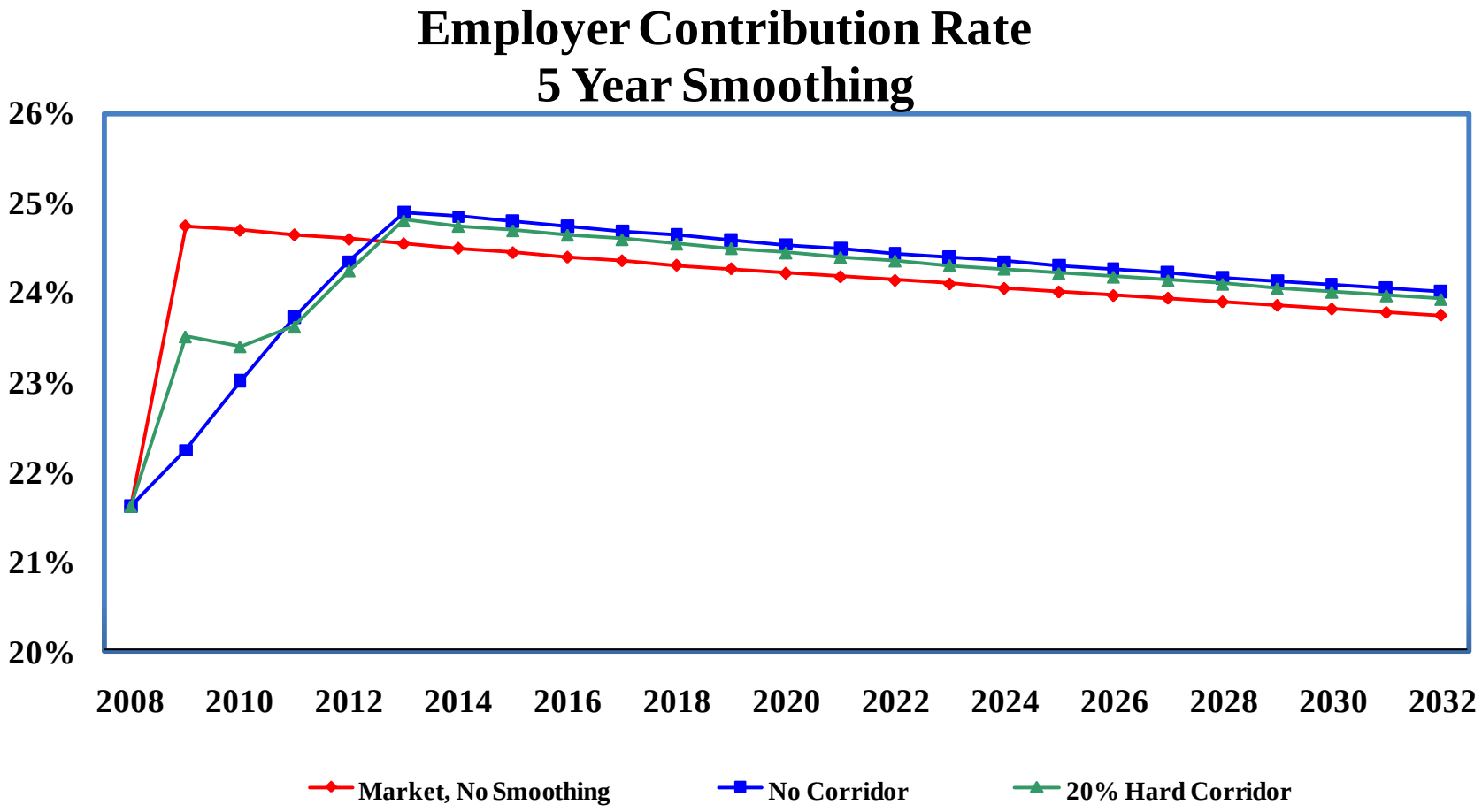
Sample Retirement System

(-30% return in 2008, assumption exactly met each year thereafter)



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Reward vs. Risk/Cost

- In choosing a smoothing method, the *reward* is less volatility in the contribution rate and disclosed funded status
- The *cost*, as shown in slide 7 & 8, is higher ultimate contributions
  - Pay now or pay more later
- But what is the financial *risk*?

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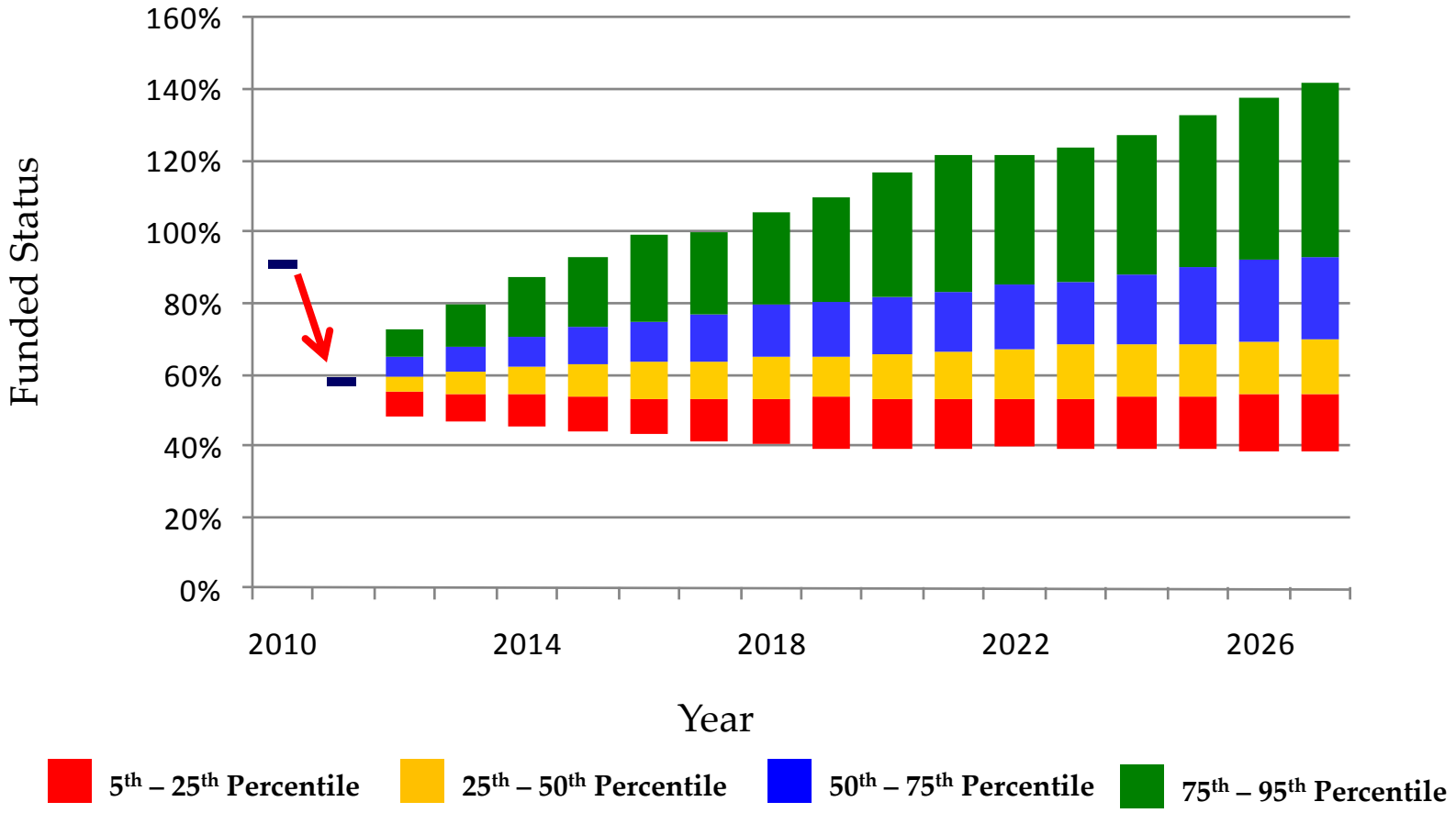
Projected Funded Status
Example System



Assumptions
- Projected liabilities based on current assumptions
- Assumes employer contributions based on current amortization policy
- Investment returns based current capital market assumptions and asset allocation

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Volatility

- Future investment returns are uncertain, therefore, future funding outcomes are also uncertain
- For risk management, we want to focus on downside risk, and the bottom ¼ of possibilities
  - Red Squares
- Corridors provide some protection on the downside

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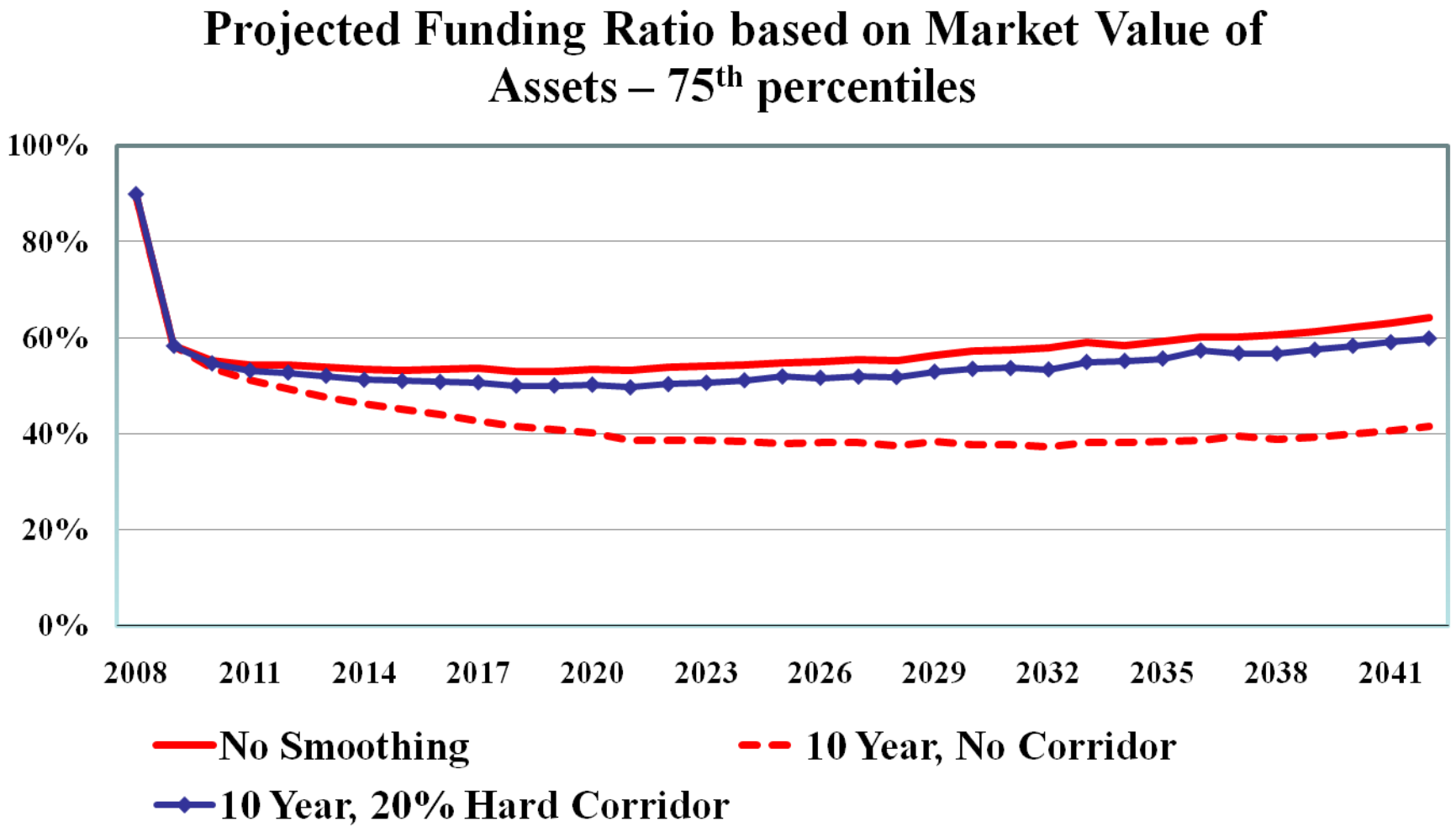
Impact of Periods/Corridors Combinations
(Sample Retirement System)



Assumes ARC is met each year

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Corridor

- The Corridor clearly provides downside protection
  - Helps to manage downside risk
- However, it does so by creating spikes in the contribution requirements
  - Can the annual budget absorb these increases?
- Also has disadvantages in the years following the application of the corridor

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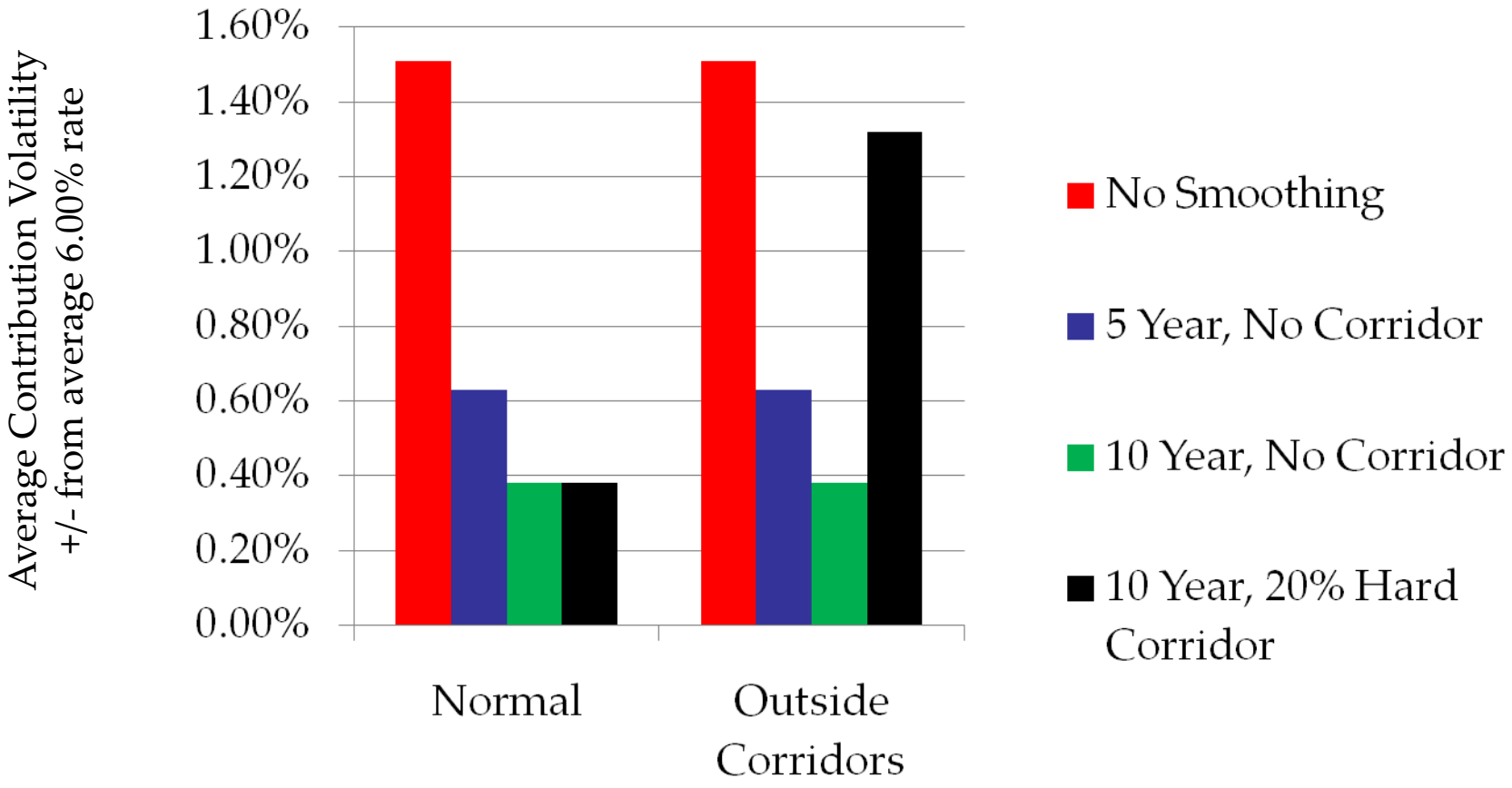
Projected Contribution Volatility

Sample Retirement System – Average ARC of 6.00%



Assumptions
- Projected liabilities based on current assumptions
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Is There Something In-Between?

- Another alternative we have been modeling is known as a "Soft Corridor"
- A "Soft Corridor" applies a shorter smoothing period for variances outside the range, but not immediate recognition
  - For example 3 year smoothing outside the corridor
- This has been producing promising results
  - Provides downside protection
  - Provides advanced recognition
  - Lowers immediate contribution volatility
  - Eliminates most of the "bounce back" volatility

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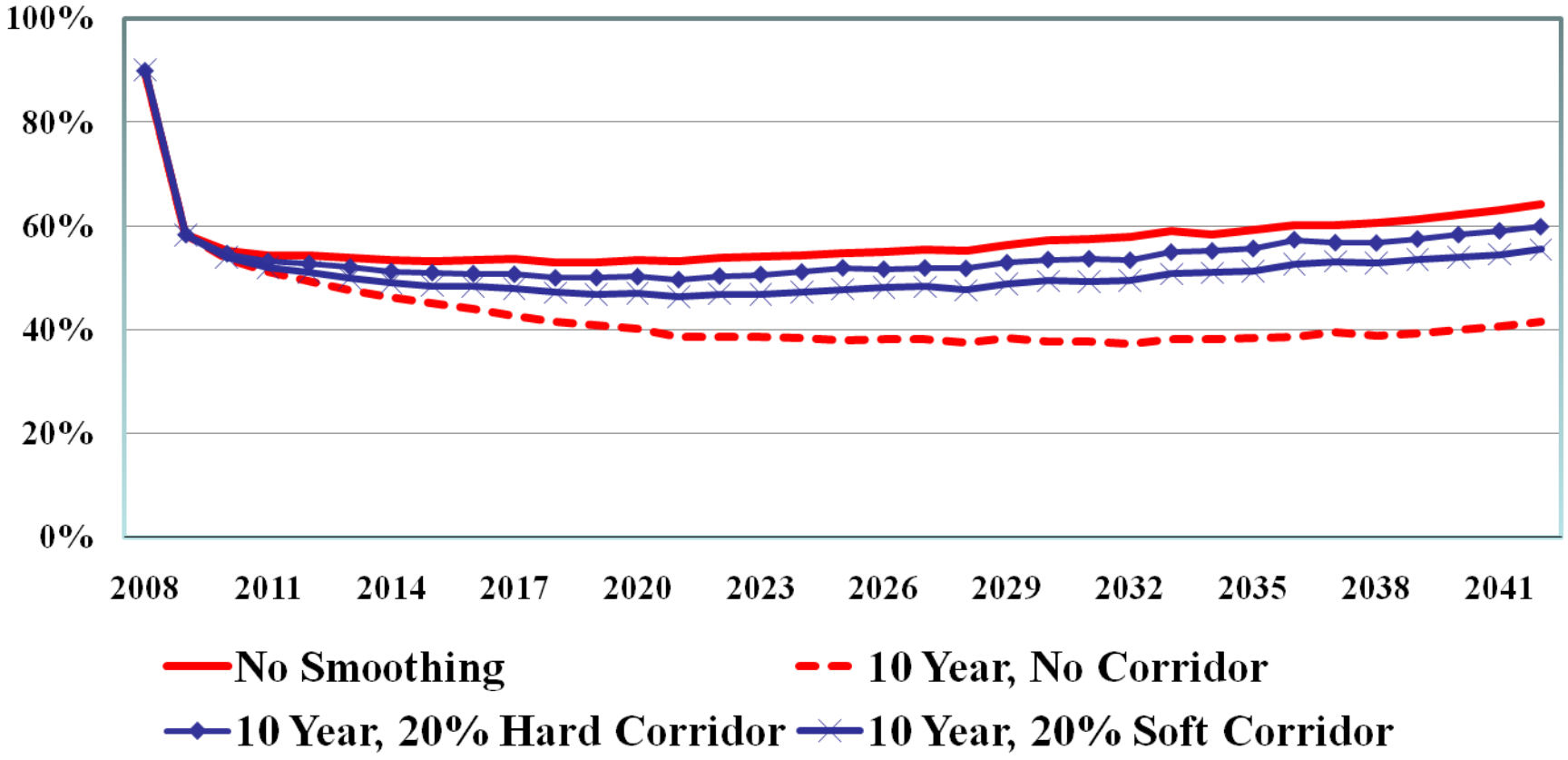
Impact of Periods/Corridors Combinations
(Sample Retirement System)

Projected Funding Ratio based on Market Value of Assets – 75th percentiles



Assumes ARC is met each year

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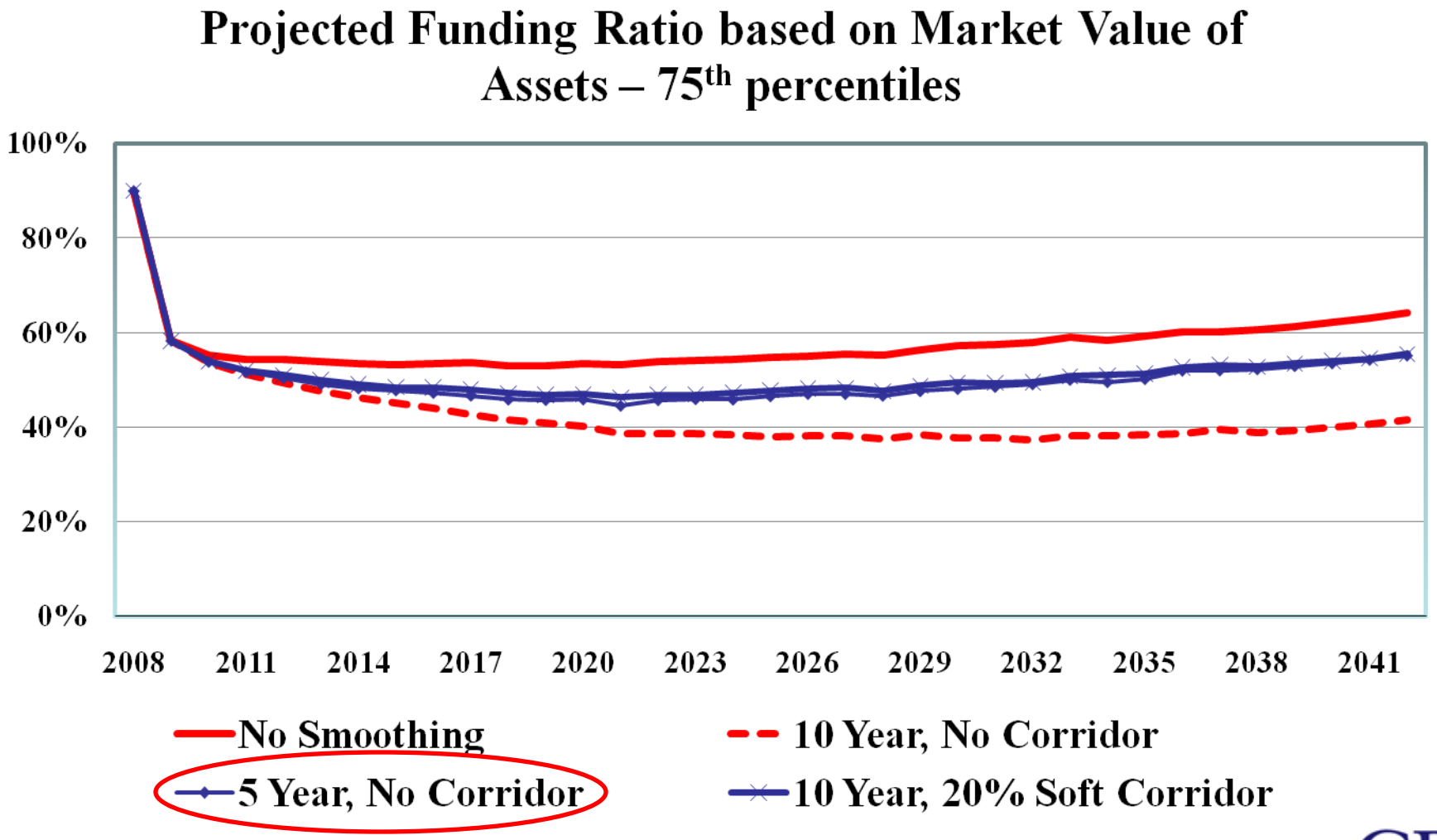
Impact of Periods/Corridors Combinations
(Sample Retirement System)



Assumes ARC is met each year

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Reward vs. Risk
(Sample Retirement System)

Smoothing Period	Corridor	Average Rate Volatility (Normal)	Average Rate Volatility (At Corridor)	75th Percentile of Funded Ratio	95th Percentile of Funded Ratio
None	None	+/- 1.51%	+/- 1.51%	40%	31%
10 Year	20% Hard	+/- 0.38%	+/- 1.32%	38%	28%
10 Year	20% Soft	+/- 0.38%	+/- 0.85%	36%	26%
5 Year	None	+/- 0.63%	+/- 0.63%	34%	24%
10 Year	None	+/- 0.38%	+/- 0.38%	28%	17%

Using the above objective measurements, methods can be compared for their risk/reward characteristics.

A Hard corridor recognizes gains/losses outside the range immediately, a Soft corridor does not recognize gains/losses outside the range immediately, but does speed up the recognition (3 years for example).

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Other Risk Decisions

- Investment Return Assumption
- Amortization Period
  - Closed/Open Period
  - Including Gain/(Loss) Amortization
- Lag in Contribution Timing
- Contribution Corridors
  - Limits on contribution increases
- Payroll Growth Rate

Individual Solutions for Individual Circumstances

- These methods and assumptions should be considered in combination to ensure the optimal strategy is used for financing the benefits provided by the pension plan
- Some considerations to include:
  - Investment policy and strategy
  - Contribution stability versus flexibility
  - The desired target funded status of the plan

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