Actuarial Underpinnings of the Wisconsin Retirement System

State of Wisconsin Investment Board

Asset/Liability Study

October 2005

PRESENTED BY

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50 Year Actuarial Projection

- Quantifies commitments by projecting year by year cash flows
- Demonstrates how the plan for meeting cash flows is expected to work
- Discloses emerging patterns
- Not a prediction

Demographic Changes Expected Over the Ensuing 50-Year Period

Comments

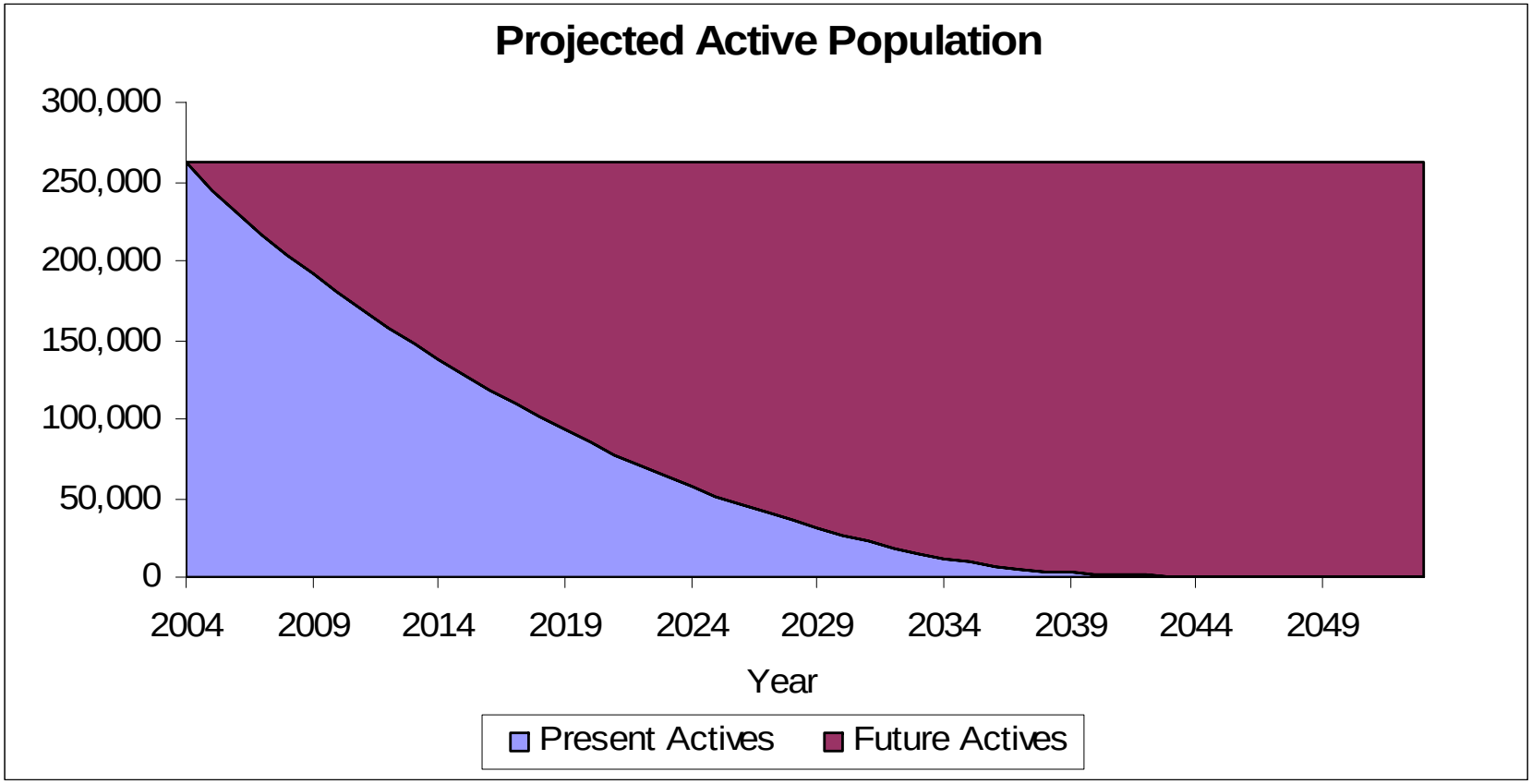
- In the first phase of the study, the development of the active and retired groups in coming decades is forecast.
- The results of the projection from 2005 through 2054 are based on a continuation of present demographic patterns.

WRS Population at 12/31/2004

Active	262,085*
Retired	126,211
Inactive	125,649
Total	513,945

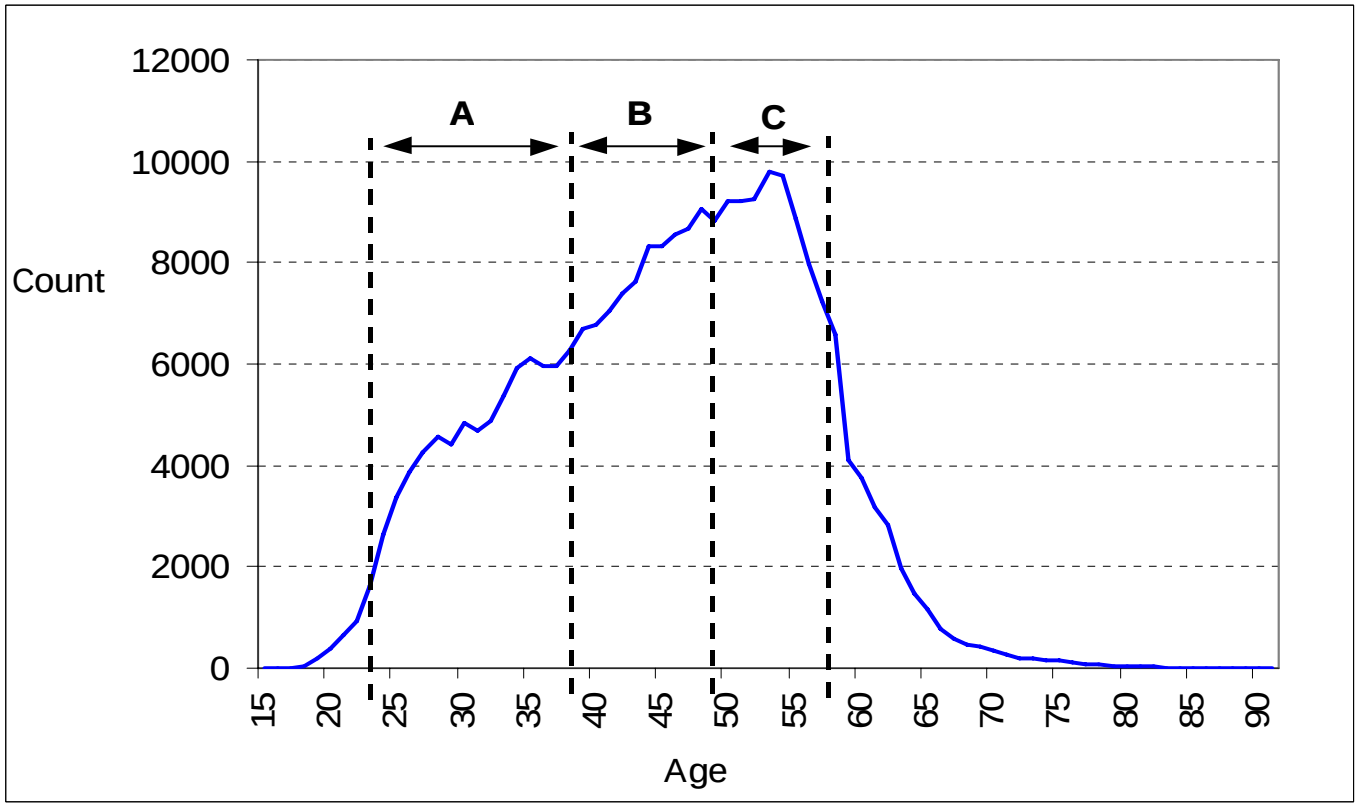
* *The projection assumes that the number of active members remains constant.*

Present & Future Actives



The present population has a “half life” of about 10 years.

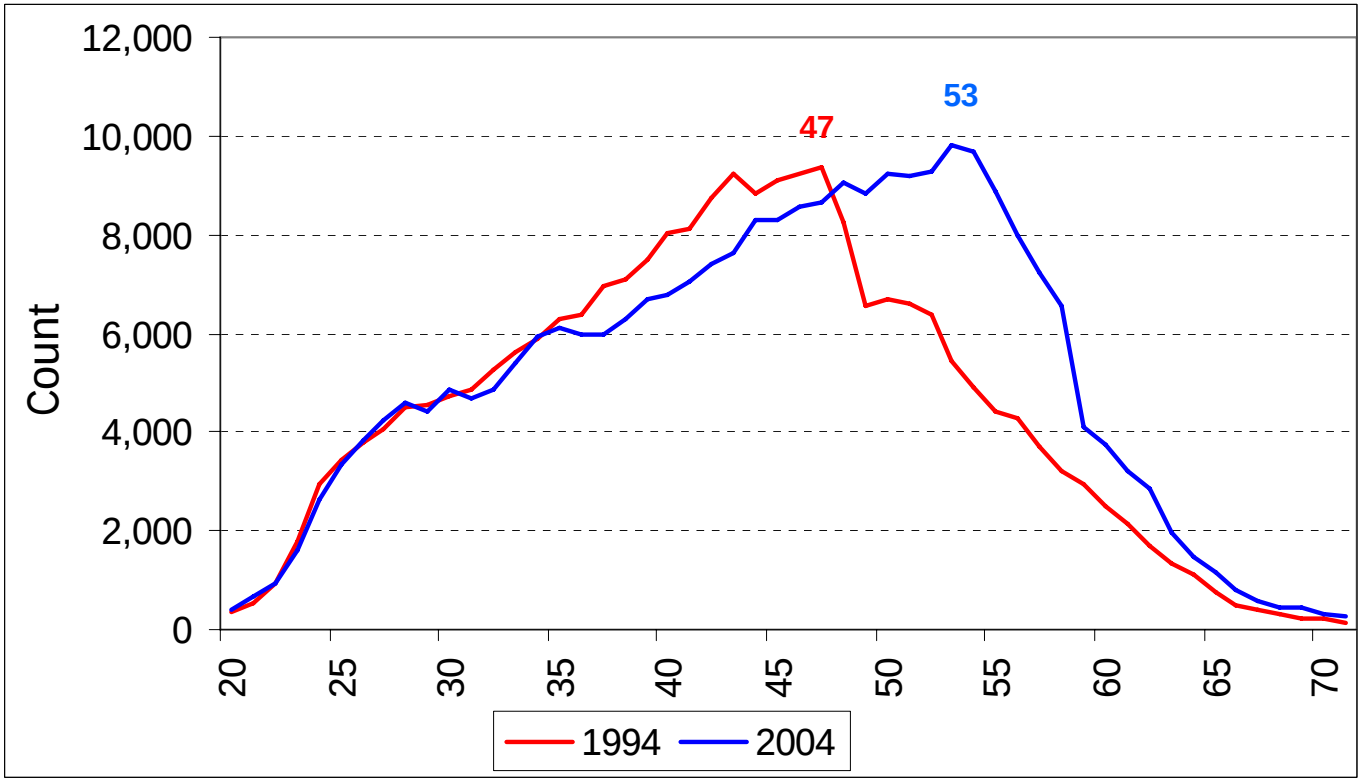
WRS Active Population



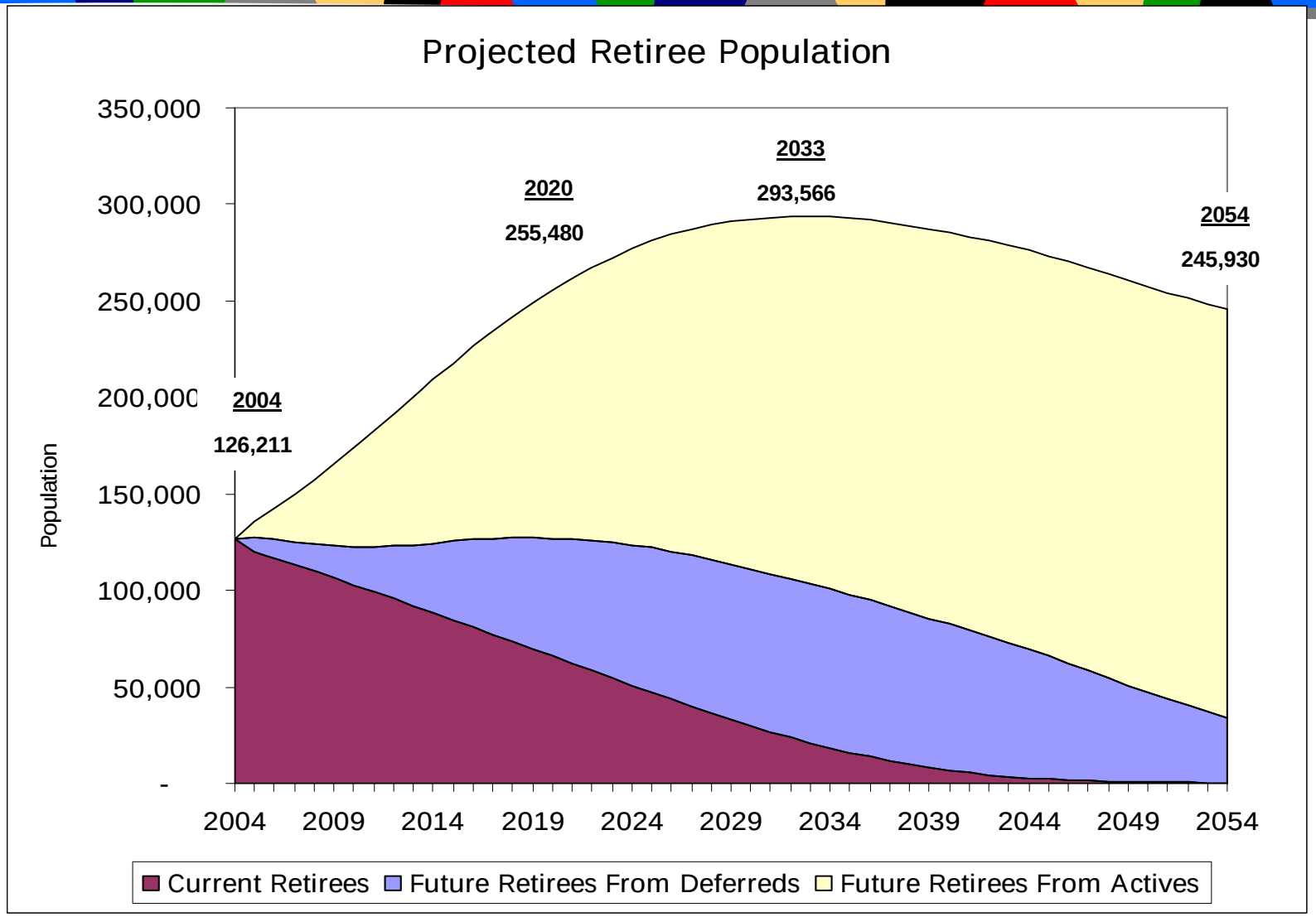
Total	262,085	100%	
A. Generation Xer's	83,405	32%	(age 25-40)
B. Early Baby-Boomers	82,308	31%	(age 41-50)
C. Late Baby-Boomers	67,934	26%	(age 51-58)
Other	28,438	11%	(age 24- or 59+)
	262,085	1	

<u>Where will future workers come from?</u>

WRS Active Population
1994 vs. 2004



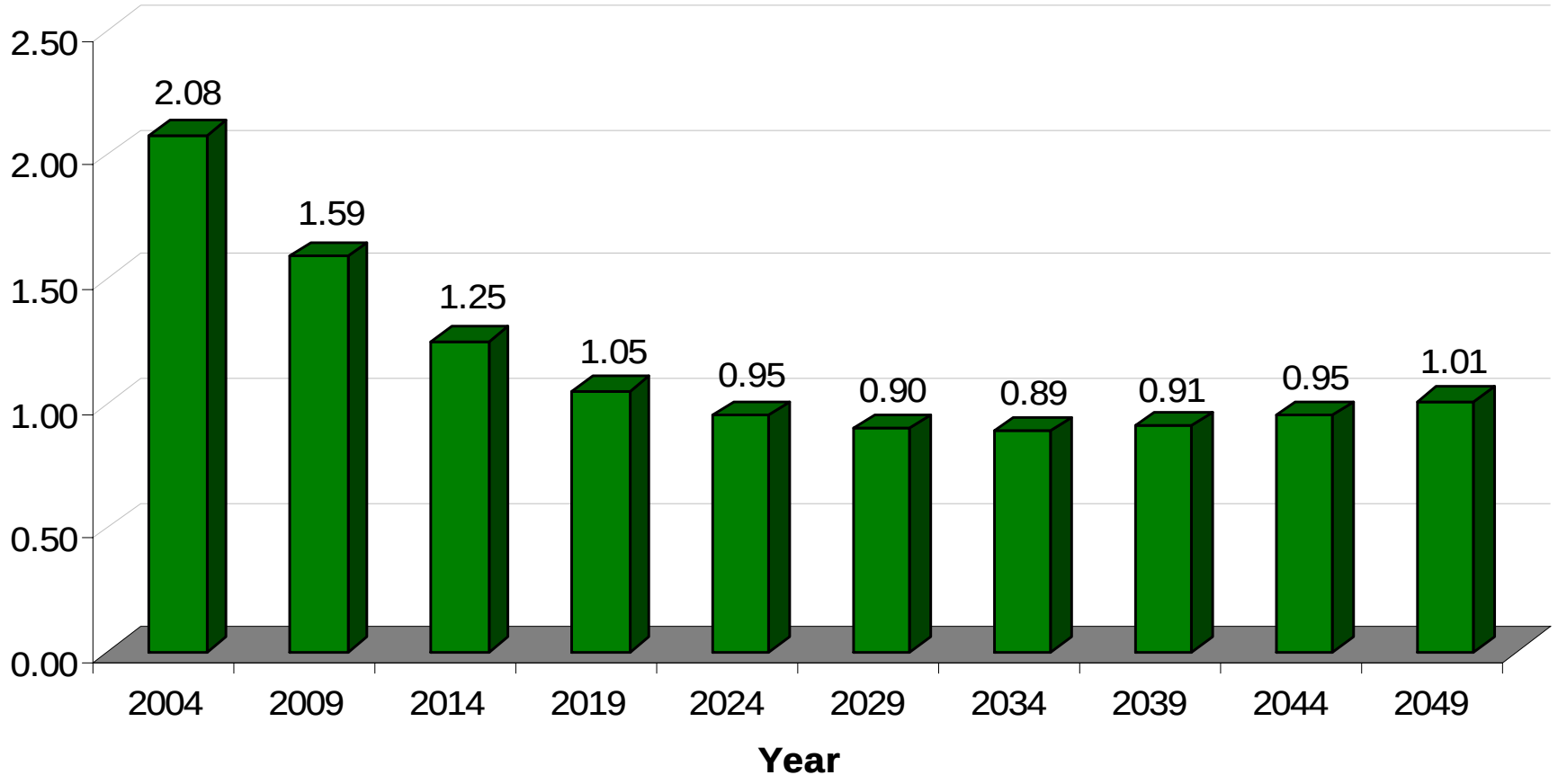
Retiree Population Present and Future



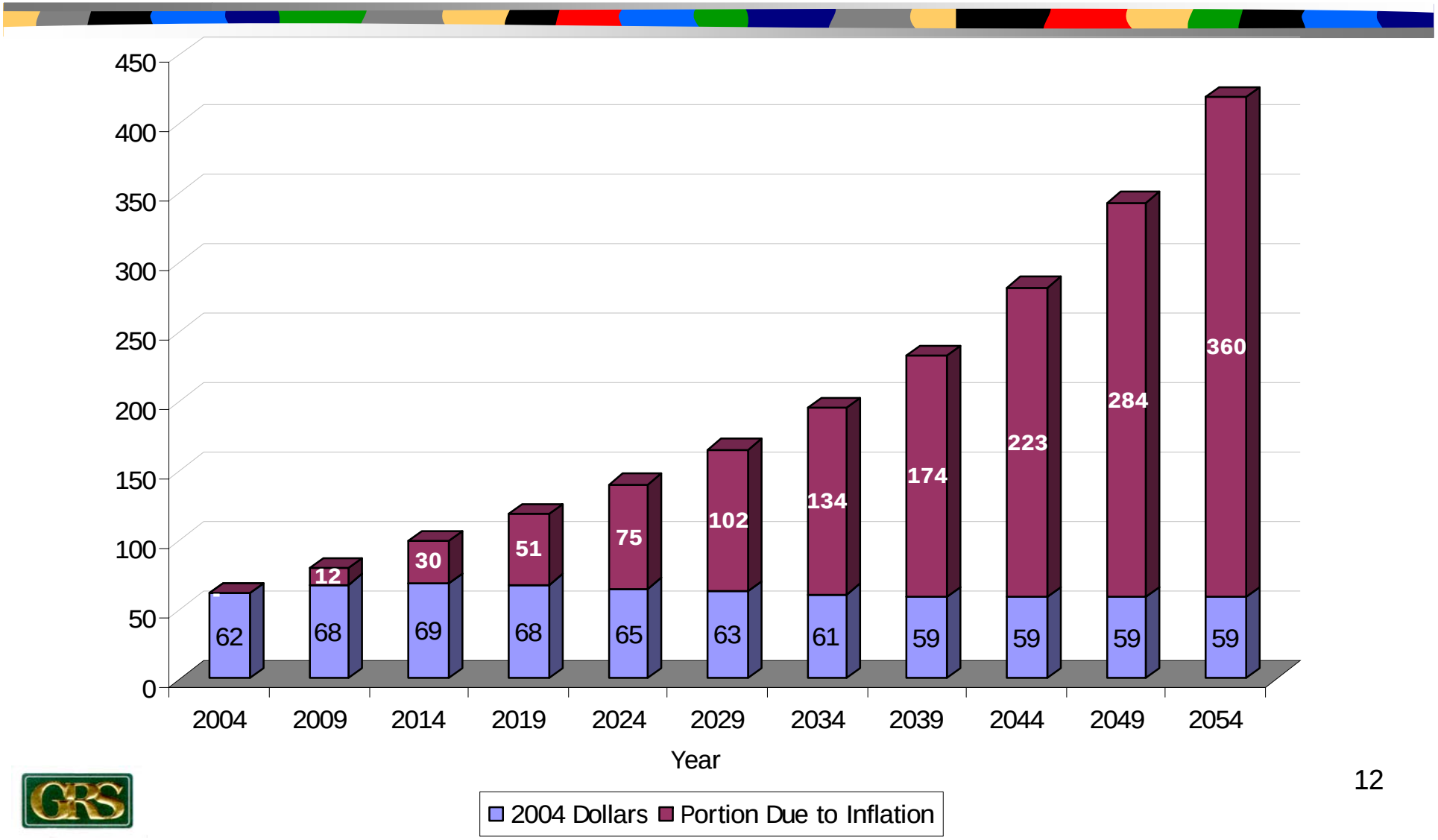
Observations

- A few present retirees will probably draw benefits for more than 50 years
- Baby boomers are beginning to retire
- The number of retirees will double in less than 20 years

Ratio of Active Members to Retirees



Projected Fixed Investment Trust Fund Assets ($Billions)



Observations

- In nominal terms, assets will increase by a factor of 6.8 during the projection period
- In real terms, assets need to grow a little to cover the peak of the baby boom retirements
- They may decline slightly after that

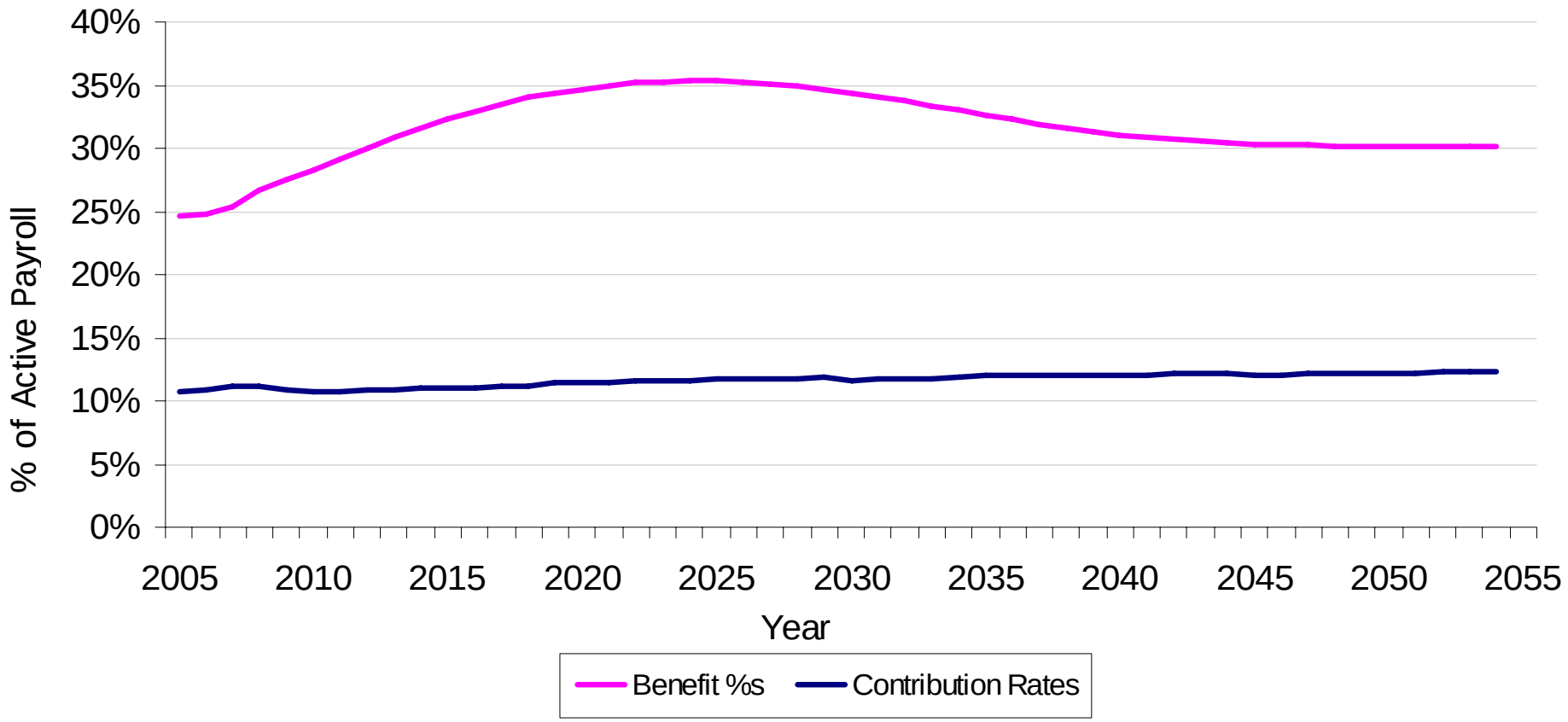
Projected Net External Cash Flow*
Valuation Assumptions

$Millions

Year	$	% of Assets
2005	$ (1,554)	(2.5)%
2015	(3,558)	(3.6)%
2025	(6,009)	(4.2)%
2035	(8,009)	(4.0)%
2045	(10,711)	(3.6)%
2055	(15,588)	(3.6)%

**Contribution income minus benefit payout.*

Projected Contributions and Benefits as a % of Active Payroll



Comments

- Liquidity needs (i.e., contributions less benefits) increase to about 4% of fund assets
- Benefit payout peaks at about 35% of payroll – more than 3 times the level of contribution income
- More than 2/3^{rds} of benefit payout will come from investment income

Monte Carlo Simulations

Monte Carlo Simulations

- Based on 1,000 random trials
- Assumes long-term net rate of return is 7.8%
- Assumes two sets of standard deviations
  - 12.4% - Expected volatility of Fixed Trust Fund
  - 10.3% - Historical volatility of Fixed Trust Fund

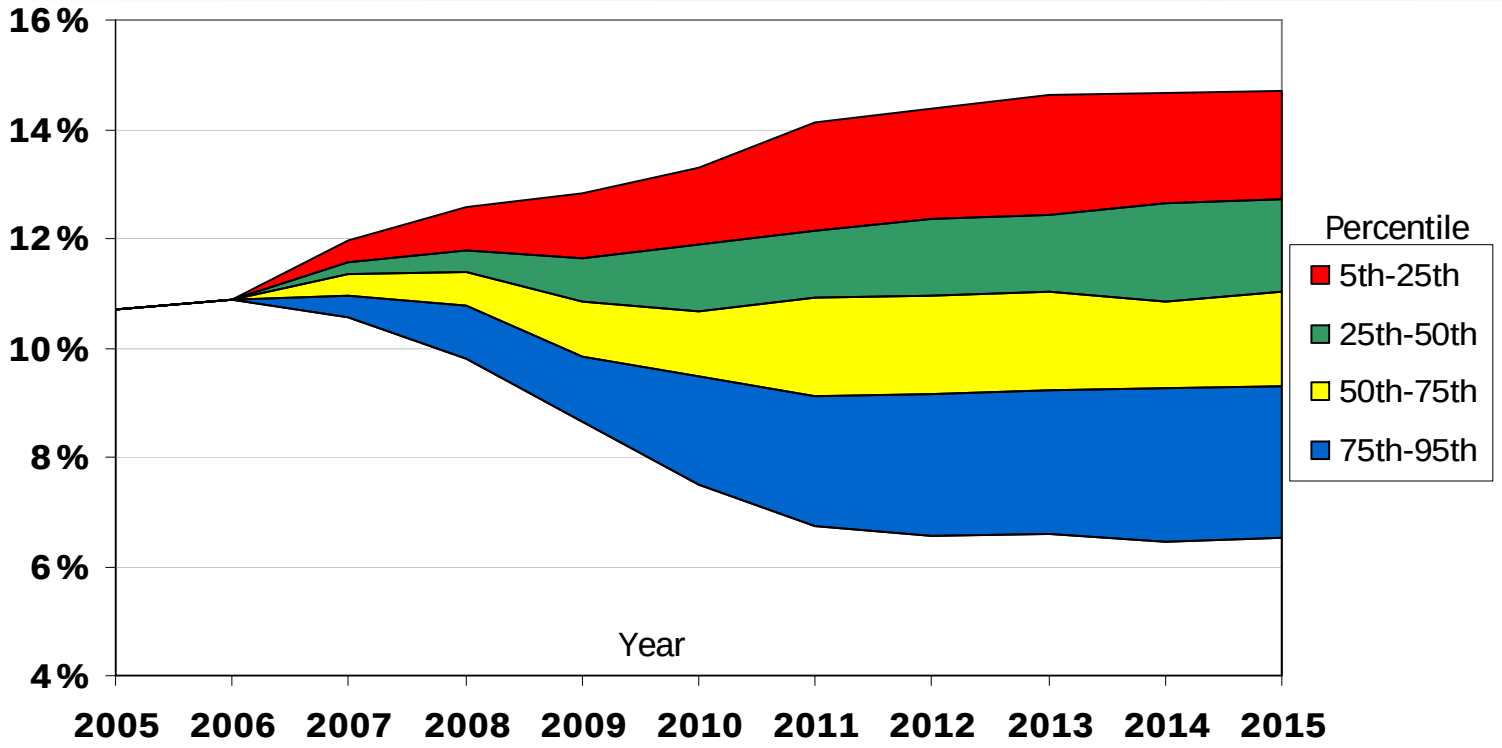
Comments on Monte Carlo Simulations

- Based on normal market fluctuations, there is a wide range of probable outcomes – even if the long term average rate of return is exactly as assumed.
- The probable range of contribution rates and dividend percents narrows significantly if volatility can be reduced.

Comments on Monte Carlo Simulations

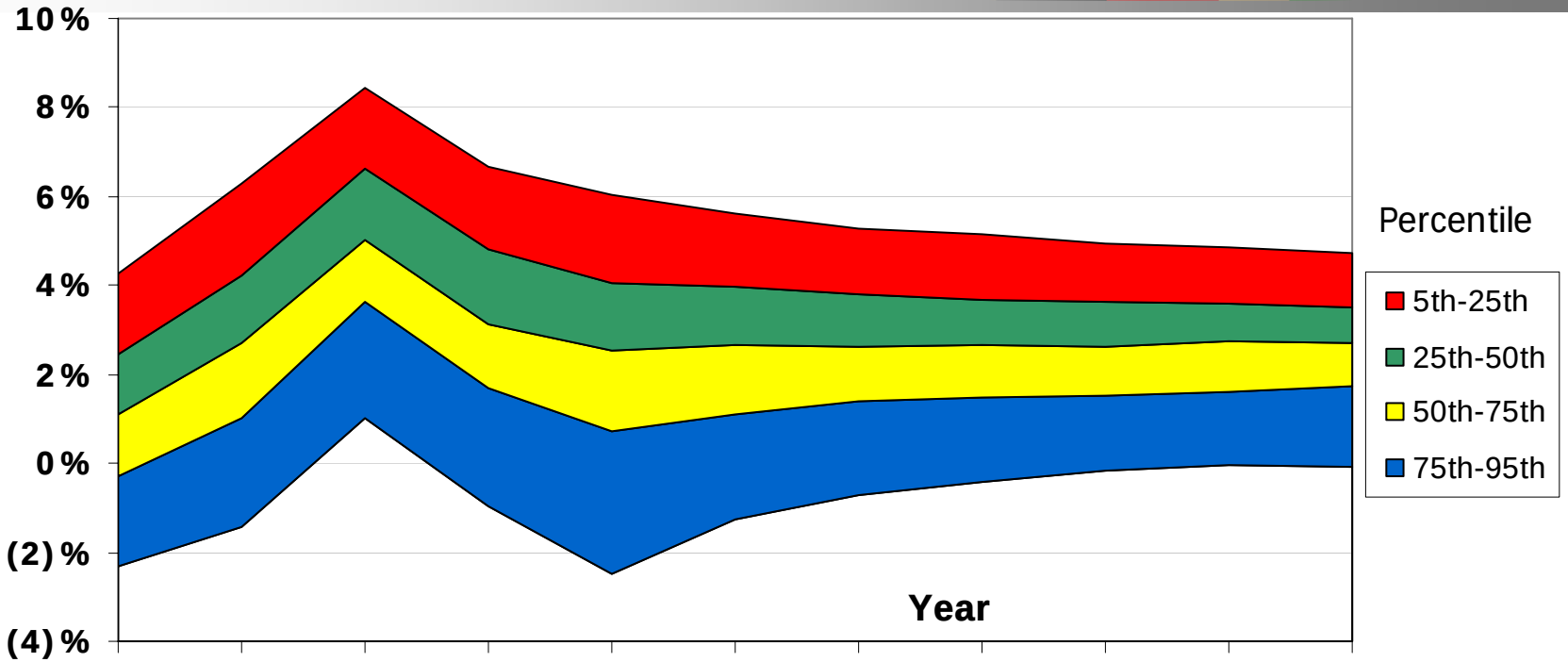
- Real world events are not normally distributed.
- The market environment experienced from 2000 to 2002 would have seemed exceedingly improbable had it not actually happened.
- Some “worst case scenarios” are often better understood with deterministic projections.

Contribution as a Percentage of Pay
10.3% Standard Deviation



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
5th Percentile	10.7%	10.9%	12.0%	12.6%	12.8%	13.3%	14.1%	14.4%	14.6%	14.7%	14.7%
25th Percentile	10.7%	10.9%	11.6%	11.8%	11.6%	11.9%	12.1%	12.4%	12.4%	12.7%	12.7%
Median	10.7%	10.9%	11.4%	11.4%	10.8%	10.7%	10.9%	11.0%	11.0%	10.9%	11.0%
75th Percentile	10.7%	10.9%	11.0%	10.8%	9.8%	9.5%	9.1%	9.2%	9.2%	9.3%	9.3%
95th Percentile	10.7%	10.9%	10.6%	9.8%	8.6%	7.5%	6.7%	6.6%	6.6%	6.5%	6.5%

Dividend Rates
10.3% Standard Deviation



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
5th Percentile	4.3 %	6.3 %	8.4 %	6.7 %	6.0 %	5.6 %	5.3 %	5.2 %	4.9 %	4.9 %	4.7 %
25th Percentile	2.5 %	4.2 %	6.6 %	4.8 %	4.1 %	4.0 %	3.8 %	3.7 %	3.6 %	3.6 %	3.5 %
Median	1.1 %	2.7 %	5.0 %	3.1 %	2.5 %	2.7 %	2.6 %	2.7 %	2.6 %	2.7 %	2.7 %
75th Percentile	(0.3)%	1.0 %	3.6 %	1.7 %	0.7 %	1.1 %	1.4 %	1.5 %	1.5 %	1.6 %	1.7 %
95th Percentile	(2.3)%	(1.4)%	1.0 %	(1.0)%	(2.5)%	(1.3)%	(0.7)%	(0.4)%	(0.1)%	(0.0)%	(0.1)%

Observations

and

Conclusions

Observations

- WRS continues to mature with more boomers retiring
- Negative cash flow is 2.5% of assets and continuing to rise steadily
- Cash flow needs will affect investment policy to a greater extent over the next two decades
- Uncertainty cannot be eliminated, but controlling volatility continues to be a worthy goal

Observations

- WRS continues to be one of the best funded systems in the country
- Its unique benefit structure gives it an advantage over other public retirement systems with respect to achieving financial objectives