# Wisconsin Retirement System

## 32nd Annual Actuarial Valuation of Retired Lives

## December 31, 2014

GRS
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# Retirement Plans

# Types of Retirement Plans

- Defined Benefit (DB) Plans
- Defined Contribution (DC) Plans
- Hybrid Plans

# Pure Defined Benefit Plans

- Benefit determined by a formula
- Usually involves Years of Credited Service
- Final Average Salary (FAS)
- A multiplier such as 2%
- 2.0% x 30 years x $50,000 = $30,000 per year



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# Pure Defined Contribution Plans

- A stated percent of earnings is put into an account each year (Example: 6% of pay per year)
- Employee can usually direct the investment of that account
- Balance in the account is available for distribution at retirement (or earlier)

# Defined Benefit Plans

## Risk Characteristics

- Investment Risk
- Mortality Risk
- Inflation Risk

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- Employer bears the risks
- Benefits are predictable (defined)



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# Defined Contribution Plans

## Risk Characteristics

- Investment Risk
- Mortality Risk
- Inflation Risk

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- Employee bears the risks
- Benefits are not predictable



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# Hybrid Plans

## Risk Characteristics

- Investment Risk
- Mortality Risk
- Inflation Risk

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- Employee and Employer share risk
- Some Benefits are predictable



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# Wisconsin Retirement System

WRS is a Hybrid Plan

| | |
|---|---|
| DB Aspect: | Formula benefit equal to 1.6% x FAE x service (general) |
| DC Aspect: | Minimum benefit equal to annuitized value of 2 x accumulated contributions |
| Risk Sharing Aspects: | Employee and Employer contributions shared evenly |
| | Money Purchase minimum |
| | Dividends depend on overall investment performance |



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# Actuarial Mathematics



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# Basic Retirement Funding Equation

$$C + I = B + E$$

Where

- C is Contribution Income
- I is Investment Return
- B is Benefits Paid
- E is Expenses

**"Money In = Money Out"**



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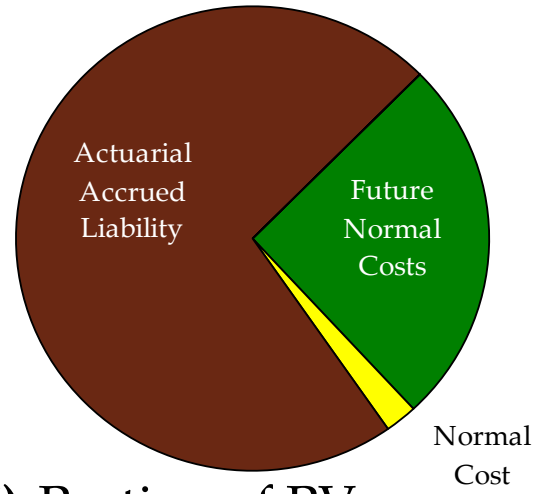
# Components of the Actuarial Valuation

- **Present Value of Future Benefits (PVFB) -** Present Value of all future benefits payable to current participants (active, retired, terminated vested).

- **Accrued Actuarial Liability -** Portion of PV of Future Benefits allocated to prior years.

- **Normal Cost -** Portion of PV of Future Benefits allocated to current year.

- **Present Value of Future Normal Costs (PVFNC)-**Portion of PV of Future Benefits allocated to future years.



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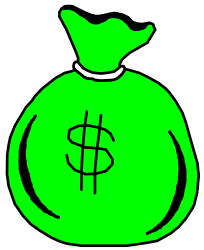
# Funding a $10,000 Annual Pension for a Person

**Present Value of Benefits**

At Retirement Date $90,000



At Valuation Date $25,000

Allocated to Past and Future Service

$17,000
Actuarial Accrued Liability

$8,000
Present Value of
Future Normal Costs

Actuarial Accrued Liabilities
\- Accrued Assets
Unfunded Actuarial Accrued Liabilities



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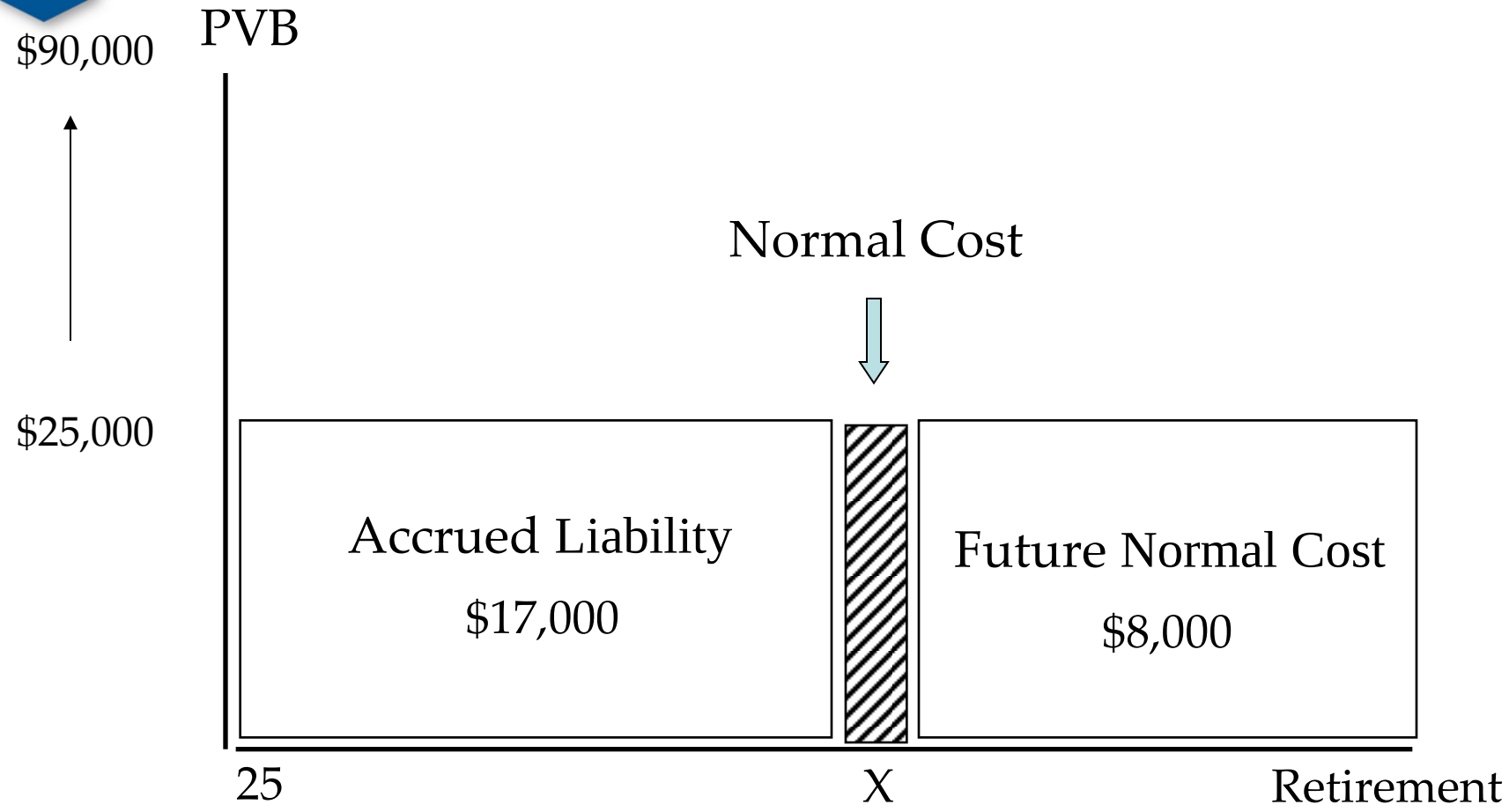
# Completing the Pension Funding




As the person ages, the boxes grow Northward until the PVB becomes $90,000. At the same time, the normal cost layer moves to the right. At retirement, there is one big square box; the accrued liability and the PVB are both $90,000, and the Future Normal Cost is $0.



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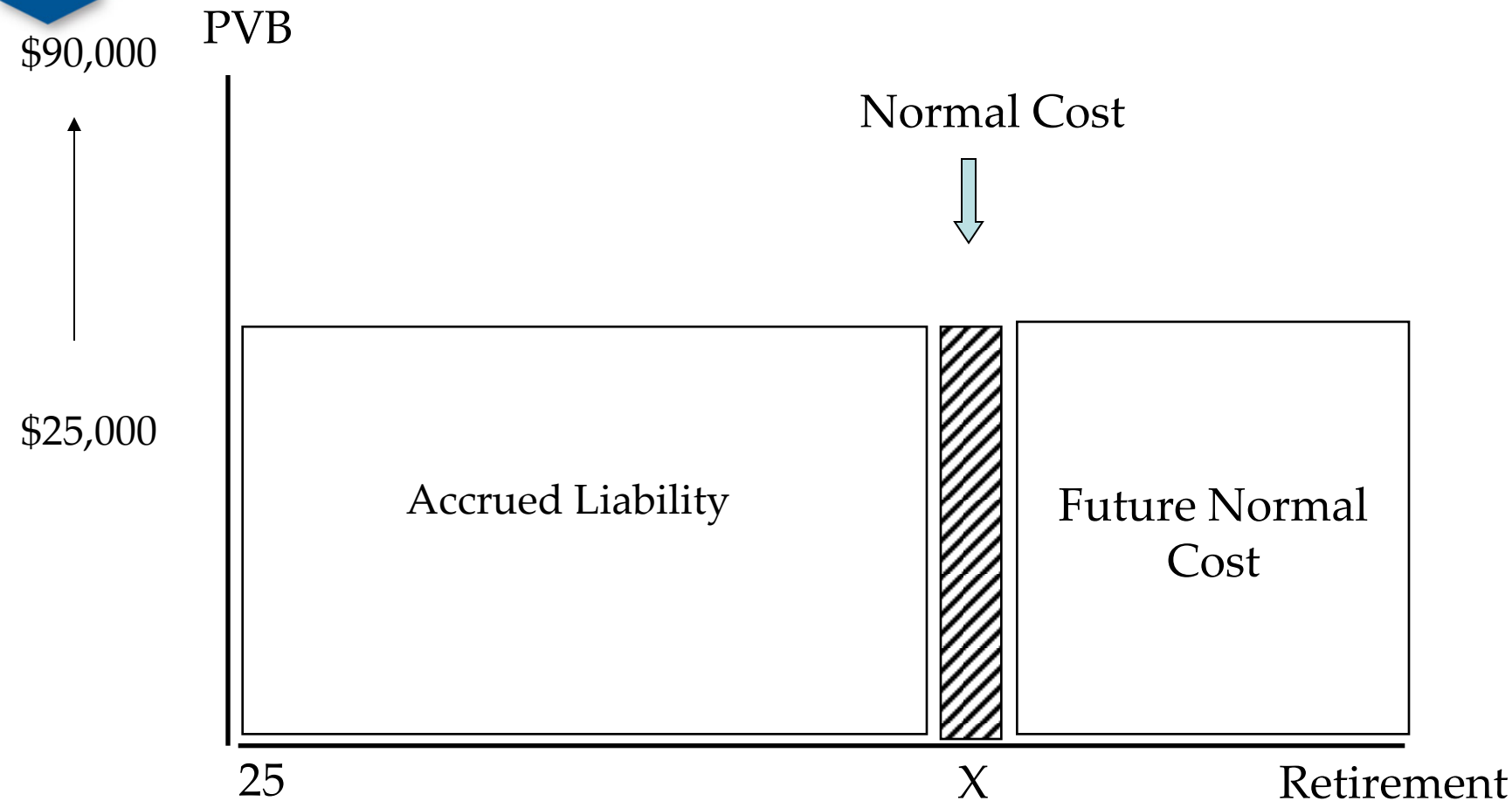
# Completing the Pension Funding

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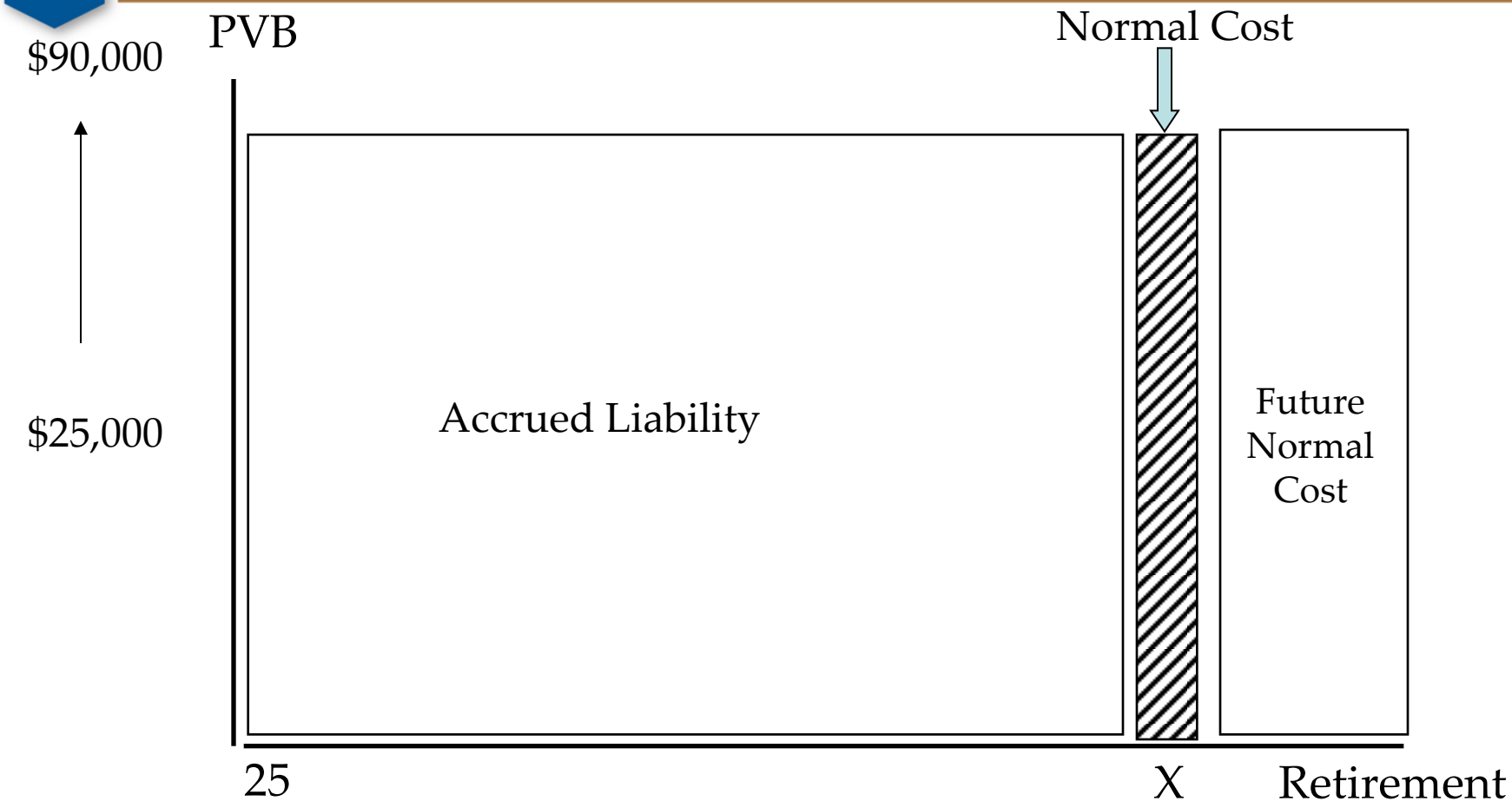


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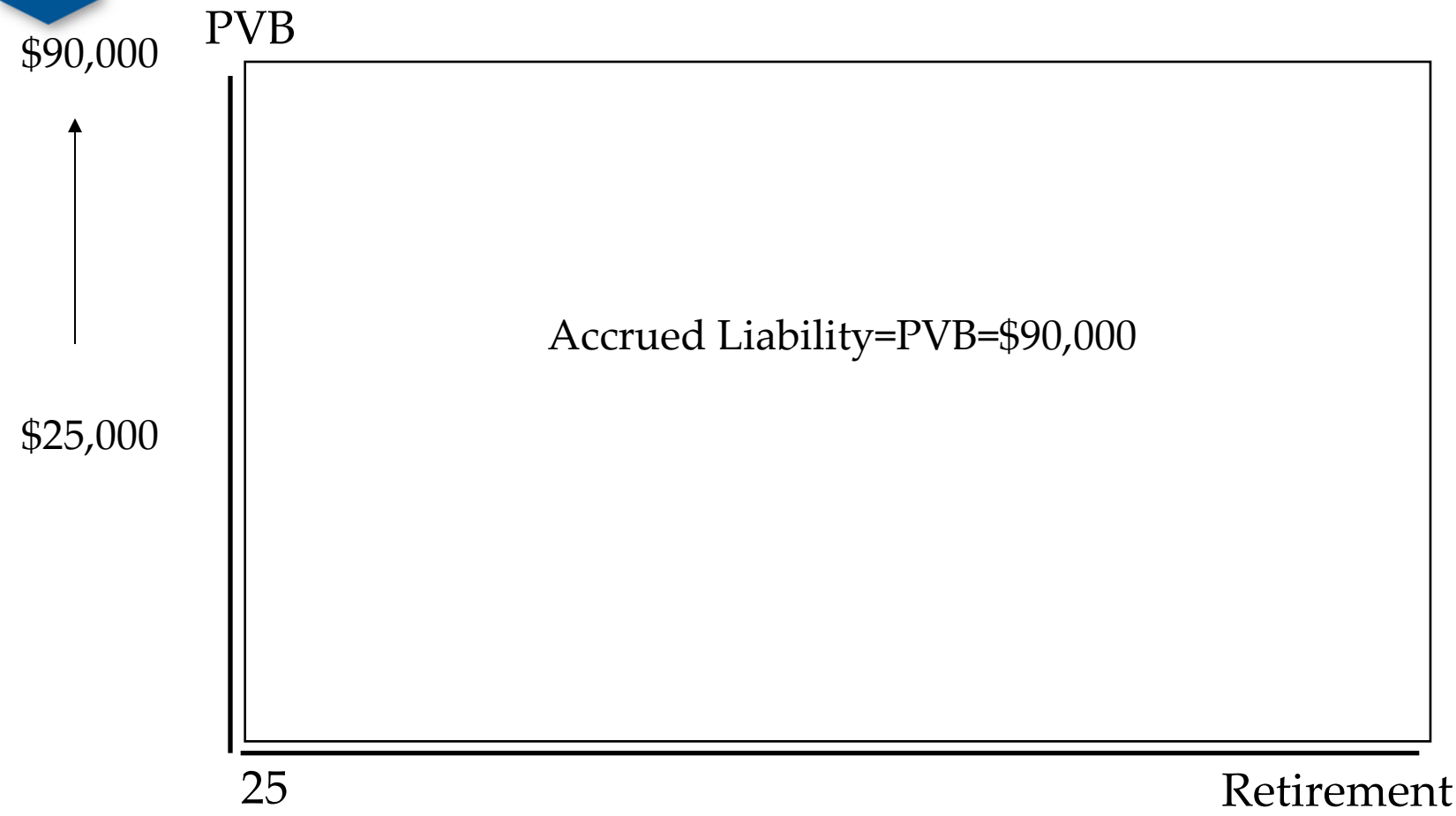


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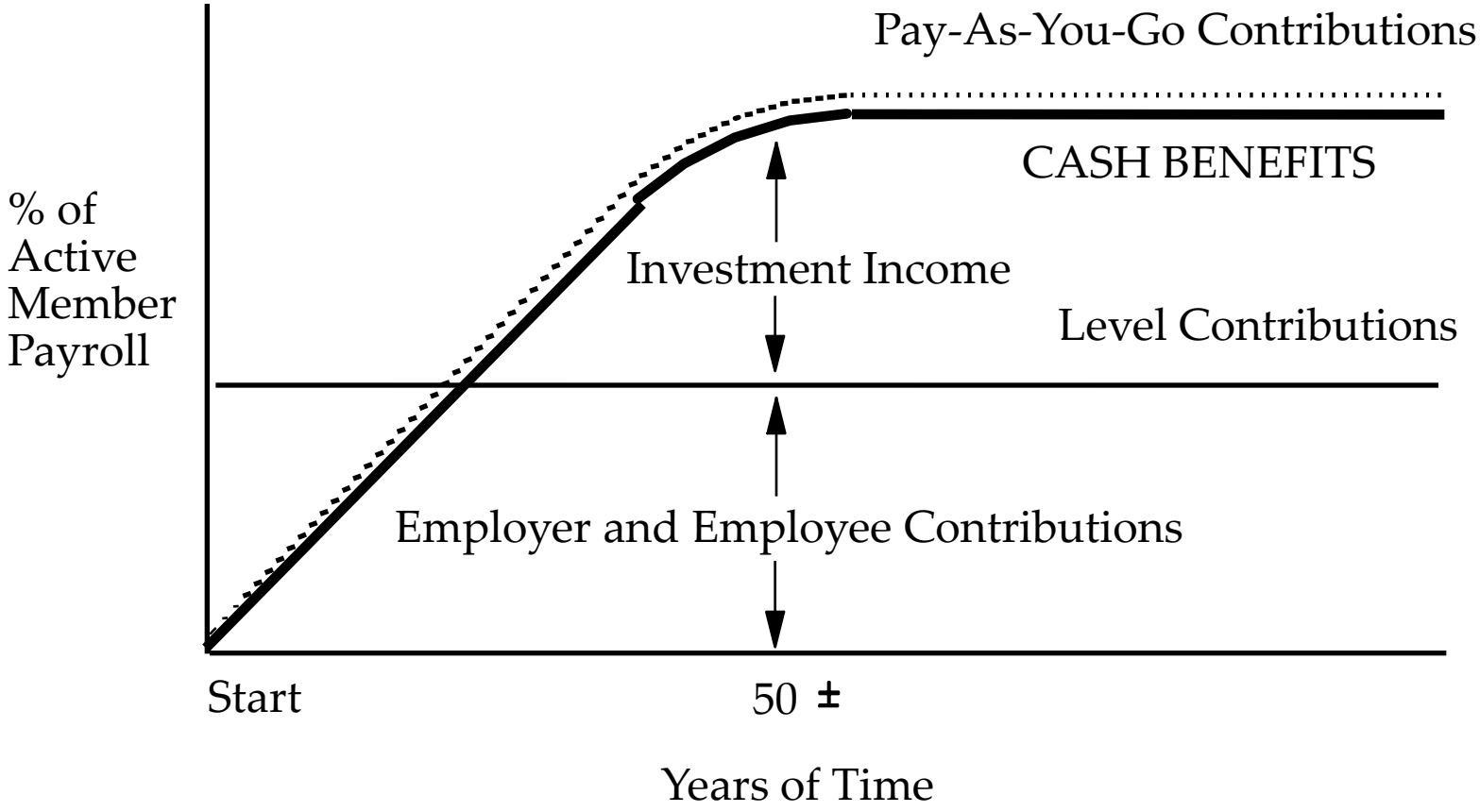
# The Long Term Solution to the Equation



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# Measurement of Assets

# Measurement of Assets at WRS

- In the WRS actuarial work, asset gains and losses above or below the assumed rate of return are smoothed in over the current year, and four future years
- Four years after a valuation date, all asset gains or losses known at that time are fully recognized
- Smoothing method in WRS is referred to as the Market Recognition Account (MRA)

# Operation of Market Recognition Account (MRA) - $ Millions

| | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Actual Investment Return | 10,159 | | | | |
| Assumed Investment Return | 5,393 | | | | |
| Gain/(Loss) to be phased in | 4,766 | | | | |
| | | | | | |
| Phased-in recognition | | | | | |
| • Current year | 953 | ? | ? | ? | ? |
| • First prior year | 793 | 953 | ? | ? | ? |
| • Second prior year | (936) | 793 | 953 | ? | ? |
| • Third prior year | 399 | (936) | 793 | 953 | ? |
| • Fourth prior year | 1,288 | 399 | (936) | 793 | 953 |
| Total recognized gain (loss) | 2,497 | 1,209 | 810 | 1,746 | 953 |



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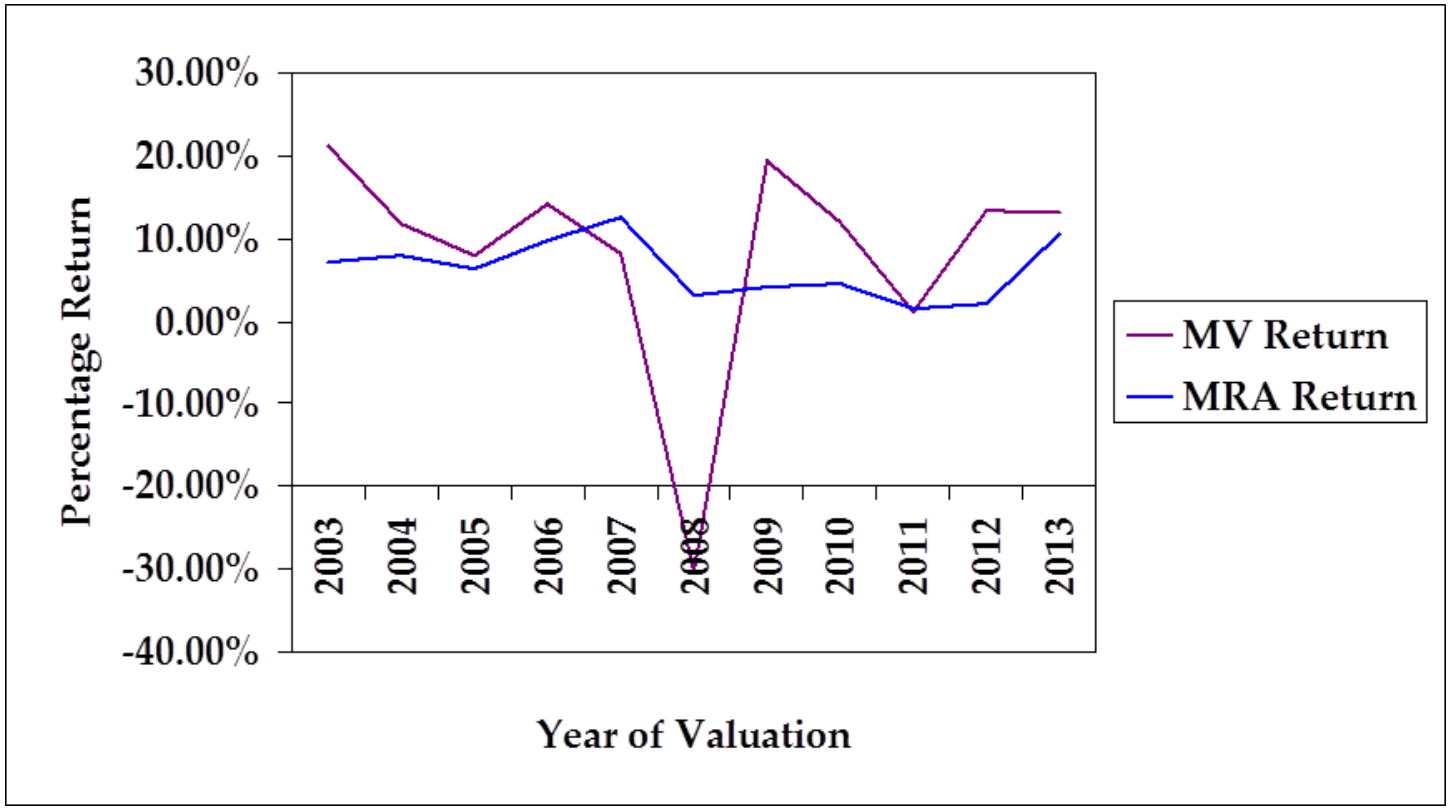
# Market Value Return vs. Market Recognition (Actuarial) Return



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# WRS Cost Sharing of Asset Loss

- Due to the cost sharing nature of WRS, asset losses have been traditionally shared by:
  - Employees (through reduced money purchase benefit)
  - Employers (through increases in contributions)
  - Retirees (through reduced dividends)
- In most Systems, employers pick up entire cost of asset losses (and reap the rewards of gains)
- WRS contribution rates have been more stable when compared to other Systems

# Operation of the System

| | Core Annuities | Variable Annuities |
|---|---|---|
| Investment Return Hurdle to Trigger Annuity Adjustment | Returns over/under 5% | Returns over/under 5% |
| Ratio of Assets to Liabilities | If >0.5%, dividend may be granted<br>If <-0.5%, prior dividends reduced | If > 2%, variable annuity increased<br>If <-2%, variable annuity decreased |
| Increase/Decrease Rounding Conventions | Rounded to nearest 0.1% | Truncated, carried to next year |
| Adjustment Effective Date | April following 12/31 valuation | April following 12/31 valuation |



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# Smoothing Mechanisms - Core

- Undesirable for retirees to experience wide swings in monthly benefits from year to year (especially downward swings)
- Mitigated in Core division by asset smoothing process and portfolio mix
- Asset smoothing has worked well historically, but could not prevent negative dividends in 2009-2013



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# Smoothing Mechanisms - Variable

- Variable fund is marked to market each year and subject to wide swings
- Dropping fractions from the percent is a form of smoothing
- Usually has very little effect due to the magnitude of the gains and losses

# Summary of Results – December 31, 2014

$ Millions

| | Core | Variable |
|---|---|---|
| Number of Annuitants | 185,605 | 39,420 |
| Annual Amount | $ 4,102.3 | $ 386.5 |
| Fund Balance | 47,135.7 | 3,995.4 |
| Actuarial Reserve | 45,790.7 | 3,917.1 |
| **Ratio** | **1.029** | **1.020** |

For Core, the dividend was 2.9%.
For Variable, the adjustment was 2.0%.



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# Summary of Results

- Last year's valuation recognized the last of the scheduled recognition of investment losses from 2008 under the five-year smoothing method
- As of December 31, 2014, there are now approximately $3 billion in unrecognized gains
- Depending on 2015 investment results, a dividend might be expected in 2016



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# Primary Sources of Core Dividend

| | % of APV |
|---|---|
| 1. SWIB published investment return | 5.70% |
| 2. MRA adjustment | 3.00% |
| 3. Published effective earnings rate | 8.70% |
| 4. Adjustment to relate earnings to average core annuity fund balance | (0.40)% |
| 5. Earnings rate based on average balance | 8.30% |
| 6. Expected dividend before adjustments: 1.083/1.05-1 | 3.14% |
| 7. Adjustment to relate average asset to ending liability | 0.04% |
| 8. Carryover from last year due to timing of dividend accounting adjustments and rounding | 0.19% |
| 9. Adjustments for mortality improvement and data reserve | (0.39)% |
| 10. Experience study | 0.00% |
| 11. Experience and other effects | (0.04)% |
| 12. Statutory adjustment to round to nearest one-tenth percent | (0.04)% |
| **13. Computed average dividend rate: (6)+(7)+(8)+(9)+(10)+(11)+(12)** | **2.9%** |
| 14. Adjustment for members at or near the statutory floor | 0.0% |
| **15. Final maximum computed dividend rate: (13)+(14)** | **2.9%** |



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# Liability Attributable to Dividends

| Valuation | Liability for Dividend Remaining (billions) | Liability for Dividend Adjustment (billions) |
|---|---|---|
| 12/31/2009 | $8.1 | $(0.4) |
| 12/31/2010 | 7.2 | (0.3) |
| 12/31/2011 | 6.4 | (1.7) |
| 12/31/2012 | 4.5 | (1.3) |
| 12/31/2013 | 3.0 | 2.0 |
| 12/31/2014 | 4.6 | 1.3 |
| 12/31/2015(est) | 5.7 | |

- Liability for Dividend Remaining represents the value of all previously granted dividends
- If another market event similar to 2008 were to occur again, the complete depletion of the dividend would become a real possibility
- Potential implications of such an event is being investigated



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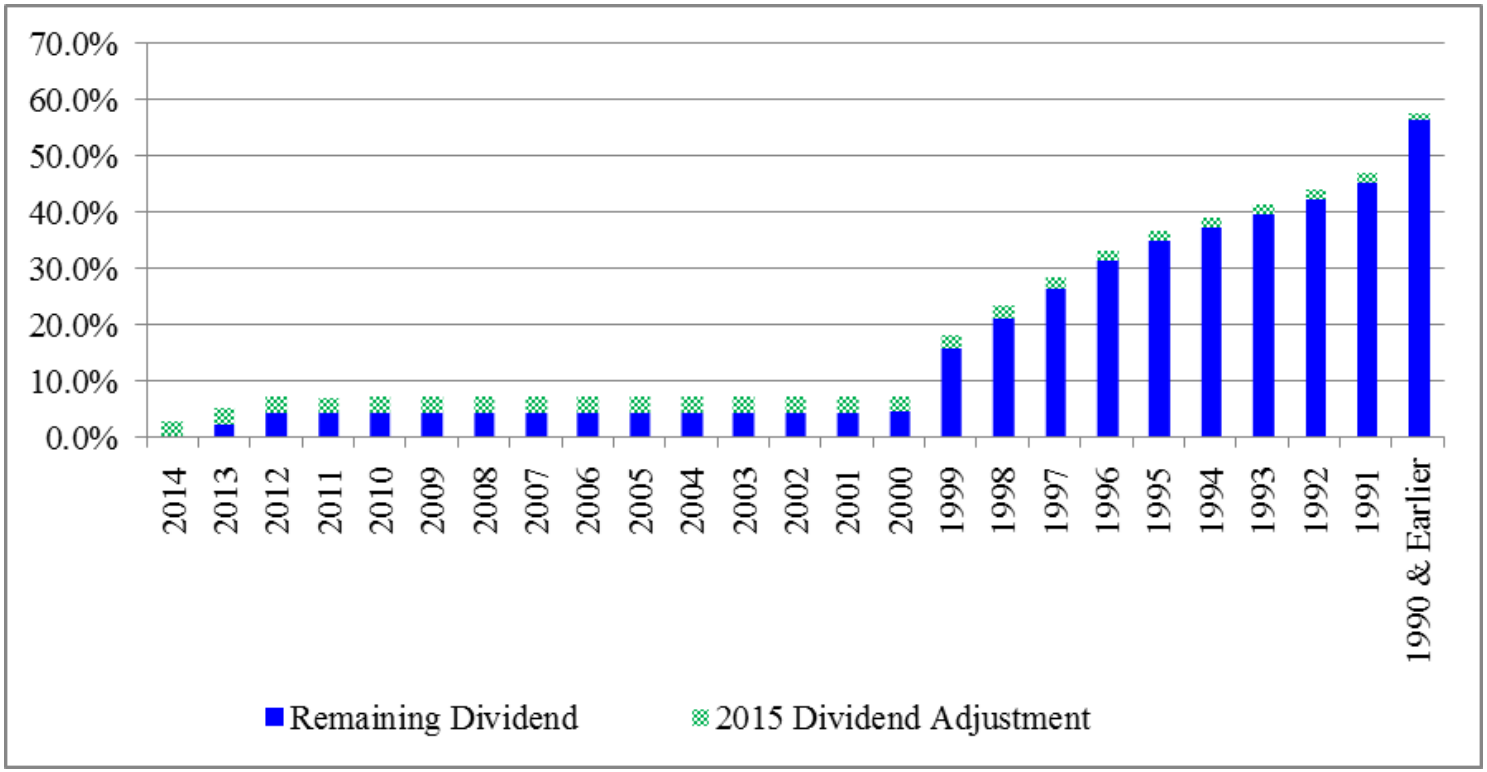
# Dividend Remaining (as a Percentage of Total Benefit) by Year of Retirement



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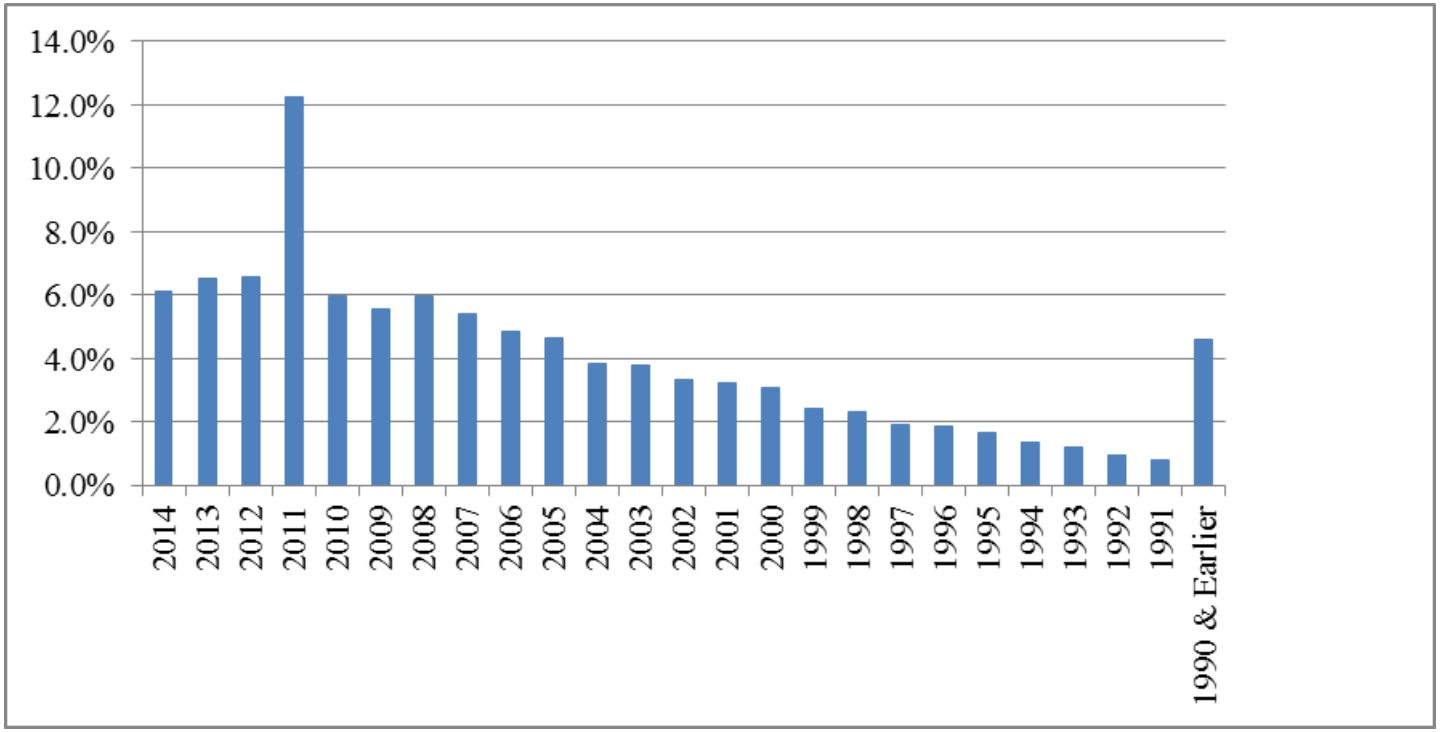
# Liabilities (as a Percentage of Total) by Year of Retirement



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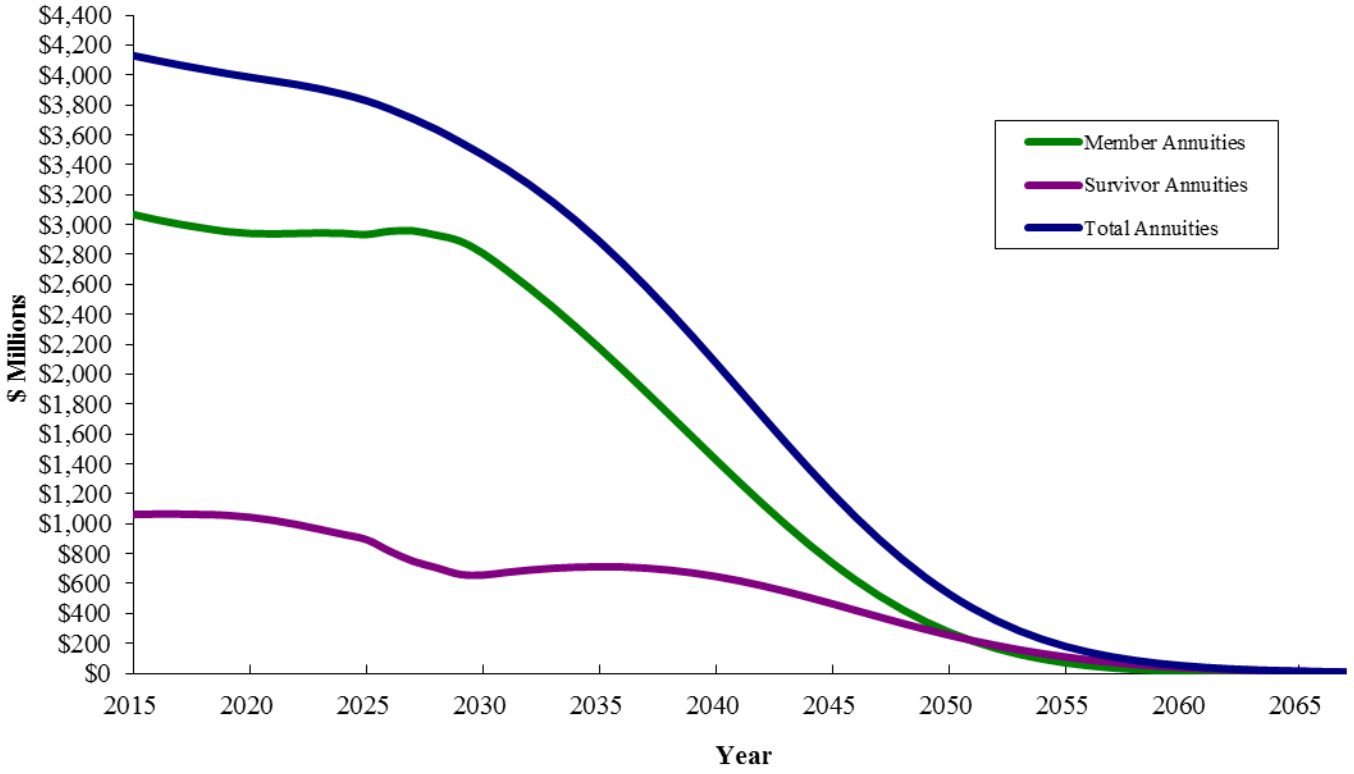
# Projected Future Core Annuities




| | |
|---|---|
| Total Future Payments | $103.4 billion |
| From Present Assets | 47.1 |
| From Investment Return | 56.3 |



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# Primary Sources of Variable Adjustment

| | % of APV |
|---|---|
| 1. SWIB published investment return | 7.3% |
| 2. Adjustment to published effective rate | (0.3)% |
| 3. Published effective earnings rate | 7.0% |
| 4. Adjustment to relate earnings to average variable annuity fund balance | (0.2)% |
| 5. Earnings rate based on average balance | 6.8% |
| 6. Expected change before adjustments: 1.068/1.05-1 | 1.7% |
| 7. Adjustment to relate average asset to ending liability | 0.1% |
| 8. Carryover from last year due to timing of distribution, accounting adjustments and truncation | 0.6% |
| 9. Adjustments for mortality improvement | (0.3)% |
| 10. Experience study | 0.0% |
| 11. Experience and other effects | (0.1)% |
| 12. Statutory adjustment: (truncate to whole percent) | 0.0% |
| **13. Variable annuity change: (6)+(7)+(8)+(9)+(10)+(11)+(12)** | **2.0%** |



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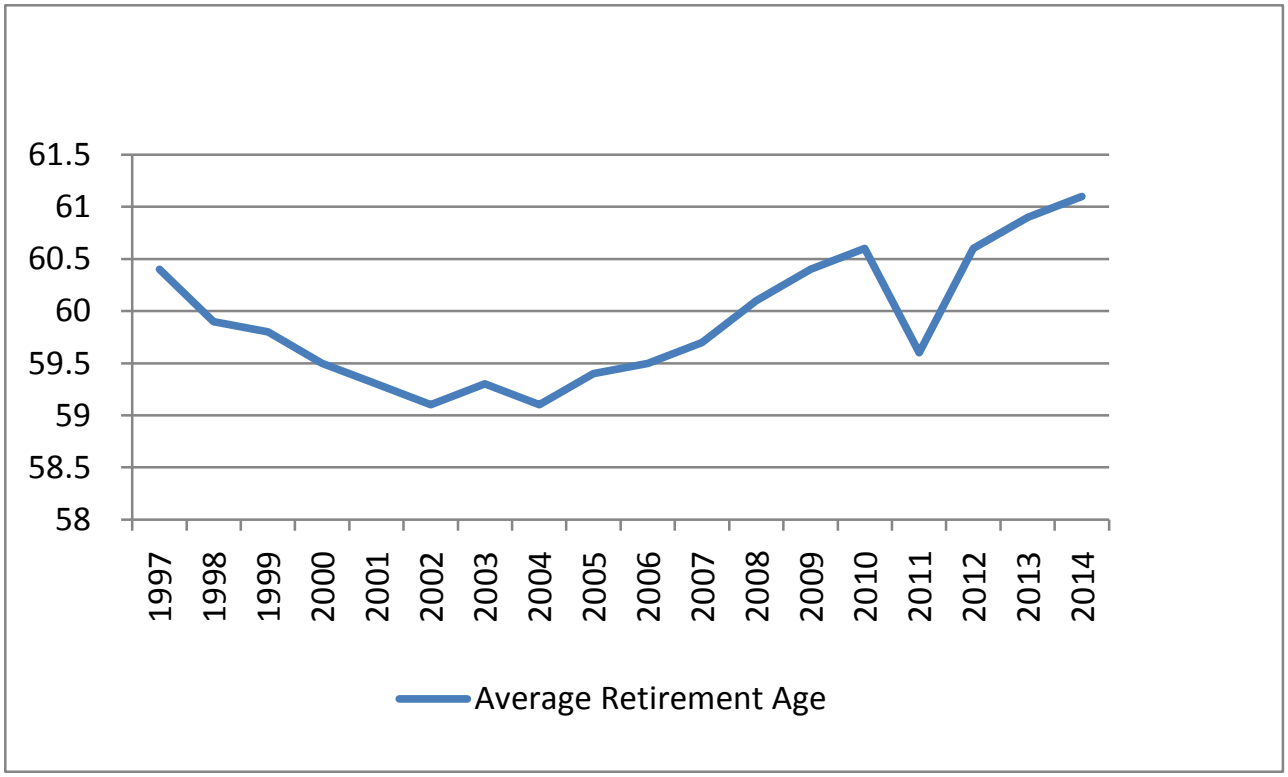
# Average Retirement Age



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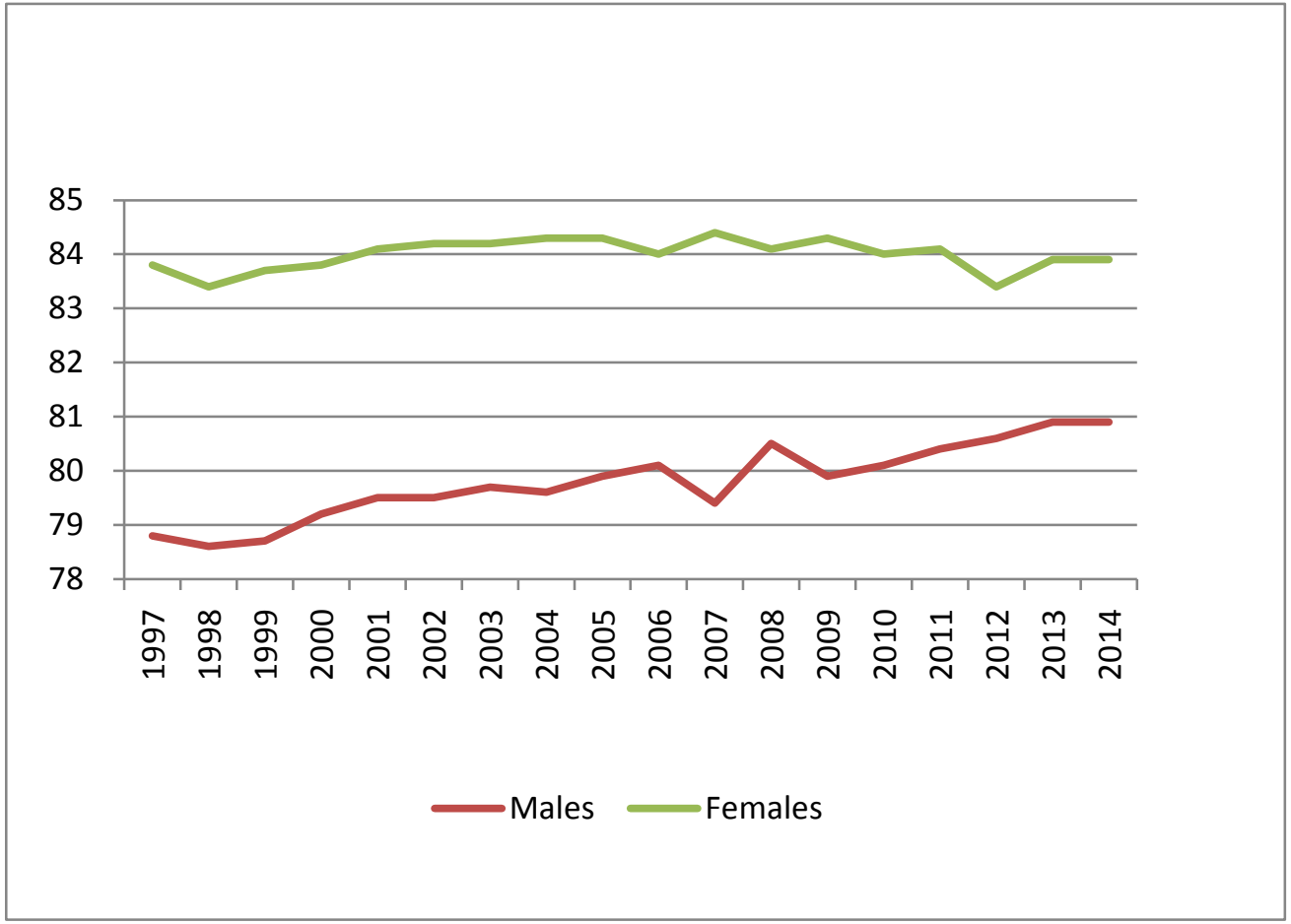
# Average Age at Death




Average age at death, while an interesting statistic, is not a proper measure of life expectancy, because it does not include people who have not yet died. The expected age at death for a 65 year old is 85.1 for males and 87.7 for females.



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# Comparative Statement - Core

| Valuation Date | Number | $ Millions Annual Annuities | $ Millions Fund Balance | $ Millions Actuarial Reserve | Ratio | Change in Annuities Average | Change in Annuities Maximum | CPI* |
|---|---|---|---|---|---|---|---|---|
| 2005 | 131,674 | 2,691.4 | 28,575.3 | 28,359.7 | 1.008 | 0.8 % | 0.8 % | 3.4 % |
| 2006 | 137,117 | 2,843.6 | 31,180.5 | 30,273.9 | 1.030 | 3.0 % | 3.0 % | 2.6 % |
| 2007 | 142,906 | 3,075.3 | 35,050.1 | 32,877.5 | 1.066 | 6.6 % | 6.6 % | 4.1 % |
| 2008 | 144,033 | 3,399.3 | 35,798.1 | 36,551.5 | 0.979 | (2.1)% | (2.1)% | 0.1 % |
| 2009 | 150,671 | 3,449.3 | 36,655.8 | 37,072.7 | 0.989 | (1.1)% | (1.3)% | 2.7 % |
| 2010 | 155,775 | 3,532.4 | 37,798.4 | 38,148.5 | 0.991 | (0.9)% | (1.2)% | 1.5 % |
| 2011 | 167,453 | 3,842.0 | 40,411.5 | 42,078.3 | 0.960 | (4.0)% | (7.0)% | 3.0 % |
| 2012 | 173,655 | 3,806.3 | 40,591.6 | 41,852.4 | 0.970 | (3.0)% | (9.6)% | 1.7 % |
| 2013 | 180,056 | 3,800.7 | 44,273.2 | 42,300.5 | 1.047 | 4.7 % | 4.7 % | 1.5 % |
| 2014 | 185,605 | 4,102.3 | 47,135.7 | 45,790.7 | 1.029 | 2.9 % | 2.9 % | 0.8 % |
| **Life of Program** | | | | | | **4.1 %** | **3.8 %** | **2.8 %** |
| **20 Year Average** | | | | | | **3.1 %** | **2.5 %** | **2.3 %** |
| **10-Year Average** | | | | | | **0.6 %** | **(0.4)%** | **2.1 %** |

**Based on December CPI-U67 index.*



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# Comparative Statement - Variable

| Valuation Date | Number | $ Millions Annual Annuities | Fund Balance | Actuarial Reserve | Ratio | Change in Annuities | Change in CPI* |
|---|---|---|---|---|---|---|---|
| 2005 | 31,499 | 376.5 | 4,092.7 | 3,970.7 | 1.031 | 3.0 % | 3.4 % |
| 2006 | 32,683 | 391.8 | 4,594.2 | 4,145.2 | 1.108 | 10.0 % | 2.6 % |
| 2007 | 33,880 | 432.6 | 4,625.0 | 4,563.7 | 1.013 | 0.0 % | 4.1 % |
| 2008 | 34,927 | 427.0 | 2,574.5 | 4,491.0 | 0.573 | (42.0)% | 0.1 % |
| 2009 | 34,836 | 240.3 | 3,078.4 | 2,512.7 | 1.225 | 22.0 % | 2.7 % |
| 2010 | 35,866 | 288.4 | 3,340.6 | 3,005.4 | 1.111 | 11.0 % | 1.5 % |
| 2011 | 38,949 | 330.3 | 3,197.9 | 3,462.9 | 0.924 | (7.0)% | 3.0 % |
| 2012 | 39,873 | 304.6 | 3,463.9 | 3,169.6 | 1.093 | 9.0 % | 1.7 % |
| 2013 | 40,317 | 324.5 | 4,187.3 | 3,347.0 | 1.251 | 25.0 % | 1.5 % |
| 2014 | 39,420 | 386.5 | 3,995.4 | 3,917.1 | 1.020 | 2.0 % | 0.8 % |
| **Life of Program** | | | | | | **4.6 %** | **2.8 %** |
| **20 Year Average** | | | | | | **3.2 %** | **2.3 %** |
| **10-Year Average** | | | | | | **1.4 %** | **2.1 %** |

**Based on December CPI-U67 index.*



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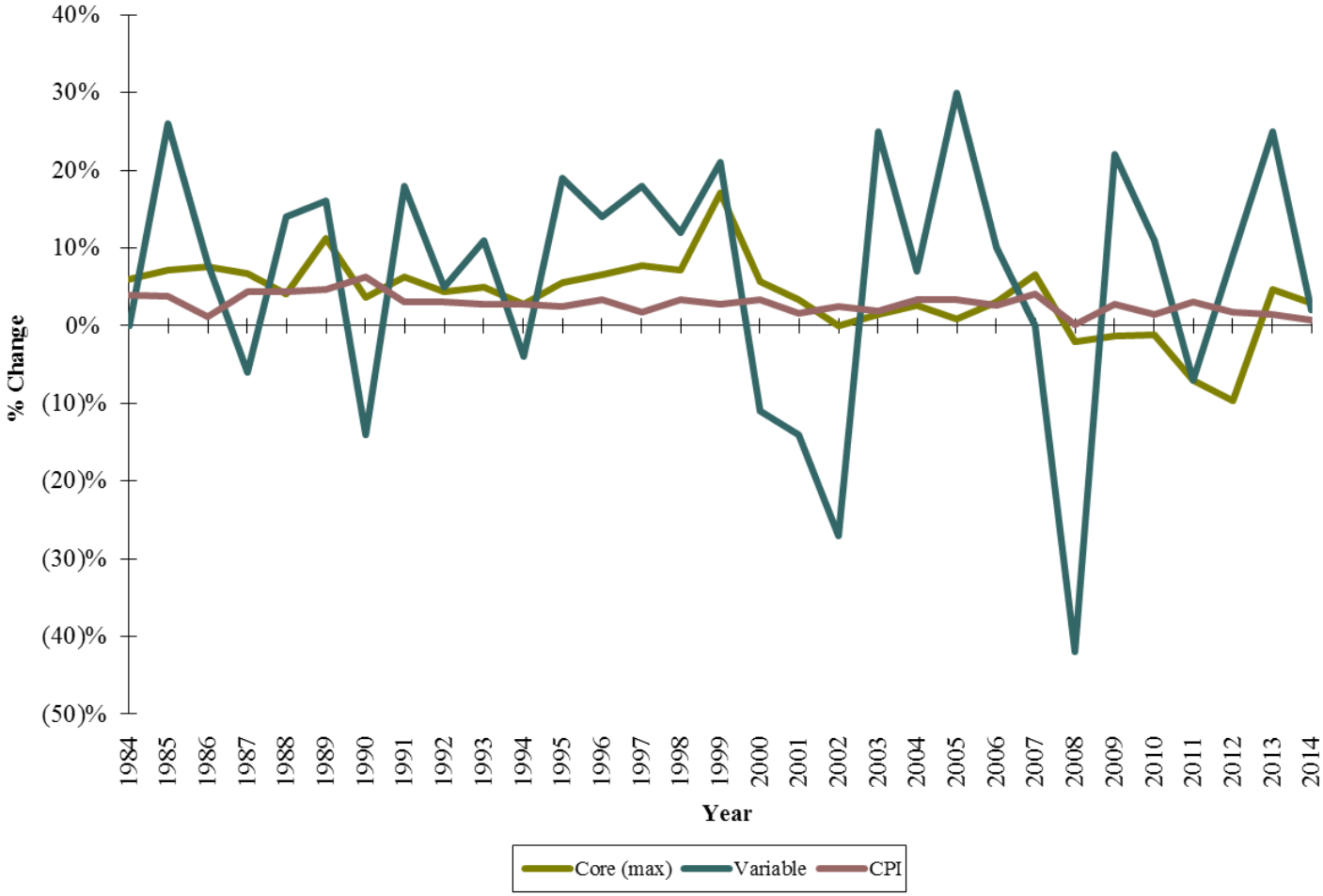
# History of % Changes



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# Looking Ahead

- As of the December 31, 2012 valuation, the 2008 market losses have been fully recognized
- As of the December 31, 2014 valuation, there are about $3 billion in unrecognized asset gains
- Next year, another positive dividend is possible provided the Core fund does not have a poor investment year (i.e., negative return)



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- This presentation shall not be construed to provide tax advice, legal advice or investment advice.

- This presentation is intended to be used in conjunction with the actuarial valuation report for retired lives issued on March 12, 2015. This presentation should not be relied on for any purpose other than the purpose described in the valuation report.



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