



Teachers' Retirement System of the State of Illinois

Principal Results of Actuarial Valuation as of June 30, 2015

Board of Trustees Meeting

Larry Langer and Paul Wilkinson

October 29, 2015

Purpose of the Annual Actuarial Valuation

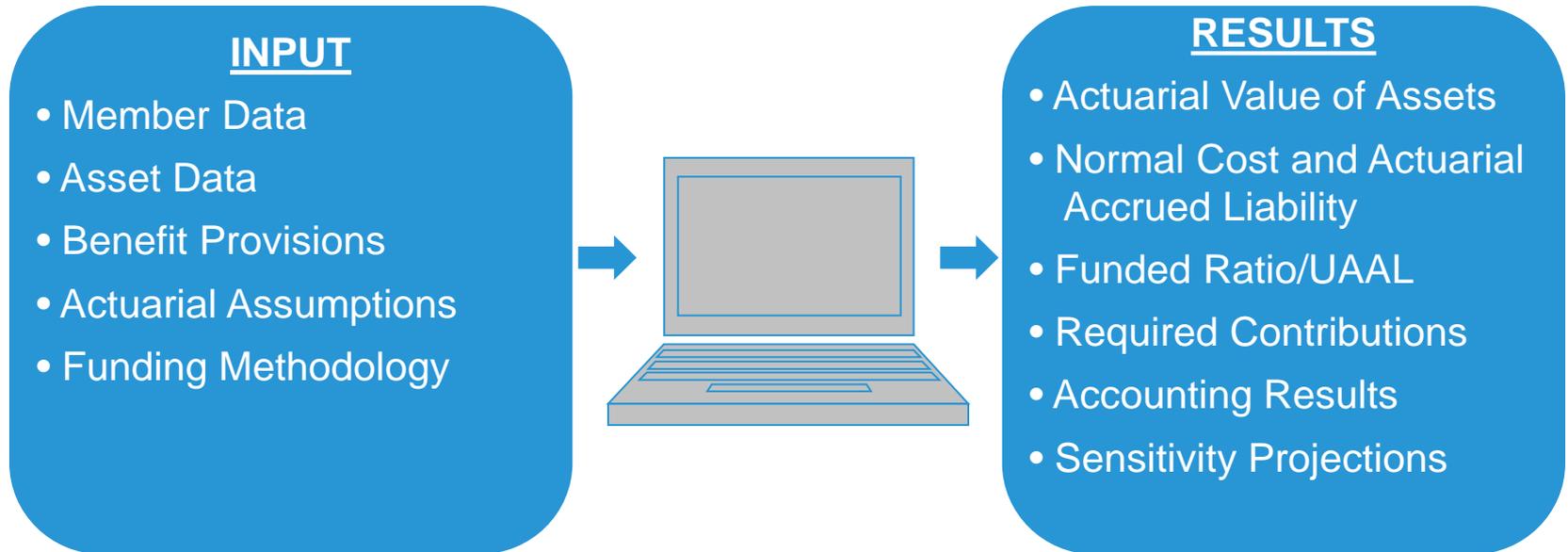
An actuarial valuation is performed on TRS annually as of June 30. Typically, the actuary determines the amount of contributions to be made to a PERS during each member's career that, when combined with investment return, will be sufficient to pay for retirement benefits when the member retires. Under the Illinois Pension Code, the actuary is required to calculate an annual contribution which funds below the level of this standard.

In addition, the annual actuarial valuation is performed to:

- Determine the funding progress of TRS under the Illinois Pension Code's inadequate funding standard,
- Determine the amount of contributions under more standard public sector actuarial practices
- Explore why the results of the current valuation differ from the results of the previous year valuation, and
- Satisfy regulatory and accounting requirements.

The Valuation Process

The following diagram summarizes the inputs and results of the actuarial valuation process.



Over the short term, contributions are determined by the actuarial valuation based upon estimated investment return, benefits and expenses using assumptions and methods recommended by the actuary and adopted by the Board. Over the long term, contributions are adjusted to reflect actual investment return, benefits and expenses.

More detail on the valuation process and a glossary are provided in Sections 6.5 and 6.6 of the actuarial report.

Key Observations

The actuarial valuation is done each year to replace the estimates the actuary assumed for the prior valuation with the actual events that happened. This past year, as expected, events happened that were not anticipated or were expected and materially impacted the results:

- The contribution made by the State of Illinois to TRS under the Illinois Pension Code was insufficient to keep the unfunded actuarial accrued liability from growing; while this was expected in our projections, it is worthwhile to note that this practice continues.
- Market value returns of 3.91% compared to 7.50% assumed
- Payroll increased 1.5%, which was less than the assumed increase
- In August 2015, Buck Consultants prepared a review of the economic and demographic assumptions. At the August 13, 2015 Board meeting, based on that review, the Board of Trustees adopted changes recommended by Buck Consultants for the June 30, 2015 valuation

Key Observations (continued)

When compared to the June 30, 2014 valuation results, the events on the previous slide resulted in:

- A lower funded ratio as of June 30, 2015 based on actuarial value of assets:
 - 42.7% was projected in the June 30, 2014 valuation
 - 42.0% is the actual amount determined in this actuarial valuation
- A higher state contribution under the Illinois Pension Code for fiscal year ending June 30, 2017
 - 34.50% of payroll (\$3.80 billion) was projected in the June 30, 2014 valuation
 - 37.81% of payroll (\$3.99 billion) is the actual amount determined in this actuarial valuation

Key Observations (continued)

The funded ratio for TRS is among the worst in the United States. This is due to:

- A lack of commitment from policy makers to keep TRS well-funded
- A history of appropriating and contributing amounts far below that which a prudent actuary would recommend
- A funding policy that systematically underfunds TRS
- Changes in benefits that were unfunded and granted when the funded ratio of TRS was quite low

Funding reform needs to occur for TRS or the benefits of its membership could be compromised.

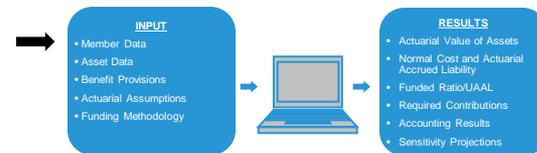
TRS will not invest itself out of its current financial shortfall. More funding is necessary.

A quote from the 1954 valuation report:

“Although State contributions to the fund were increased substantially over the previous year, the rate of State contributions continues to be inadequate. A general revision of the contribution policy of the State is very desirable.”

Valuation Input

Member Data



Data Item	Valuation June 30, 2015	Valuation June 30, 2014	Percentage Change
Active membership:			
• Full-time and regular part-time:			
➤ Number	132,916	132,886	0.0
➤ Annual Salaries	\$ 9,115,480,030	\$ 8,984,852,207	1.5
➤ Average Salaries	\$ 68,581	\$ 67,613	1.4
• Substitute, part-time, hourly paid (limited schedule)			
➤ Number	26,920	28,104	(4.2)
➤ Annual Salaries	\$ 143,897,458	\$ 143,205,393	0.5
➤ Average Salaries	\$ 5,345	\$ 5,096	4.9
• Total Number	159,836	160,990	(0.7)
Inactive Membership:			
• Eligible for deferred annuities	17,575	17,250	1.9
• Eligible for refunds or single sum benefits only	113,012	110,403	2.4
Annuitants (retirees, disabilitants and survivors):			
• Number	112,682	109,448	3.0
• Annual annuities	\$ 5,505,783,524	\$ 5,204,460,272	5.8
• Average annual annuities	\$ 48,861	\$ 47,552	2.8

This table provides a summary of the membership data used in this valuation compared to the prior valuation. Note that the data is as of one year before the valuation date – that is the 2015 counts are as of June 30, 2014.

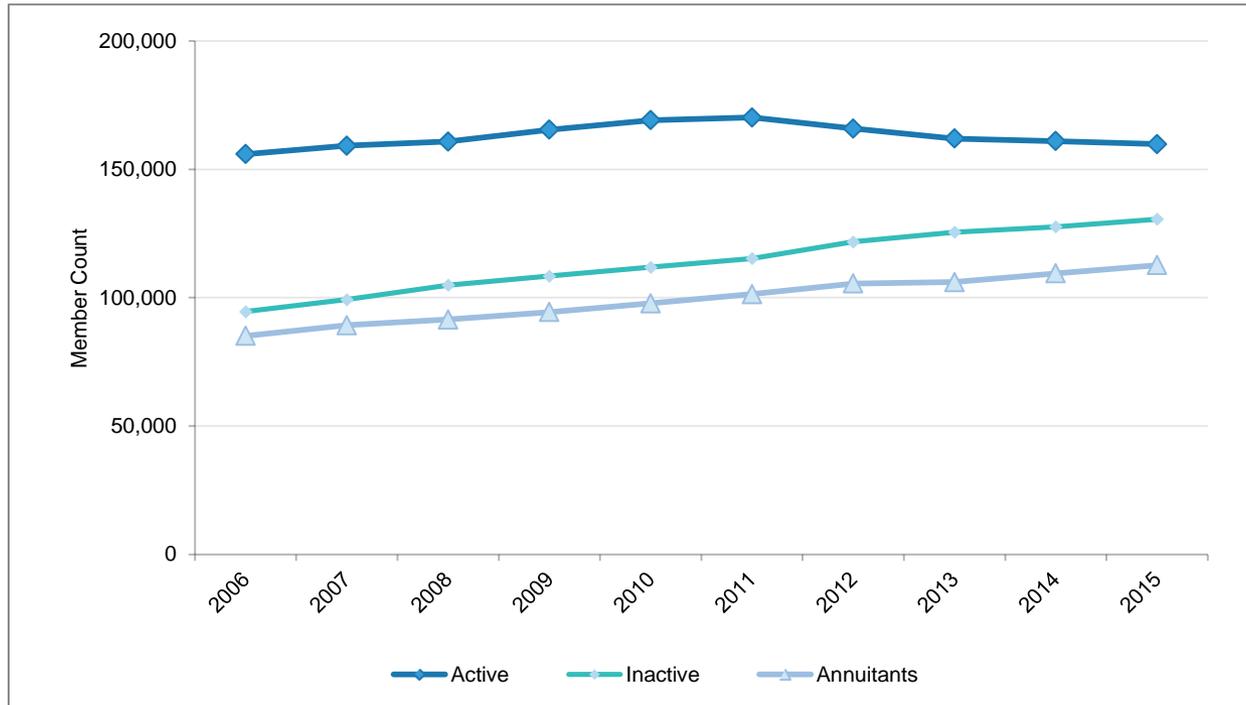
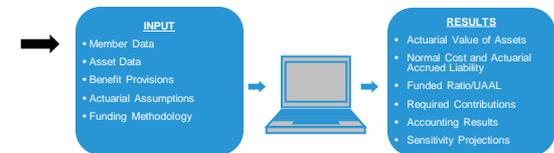
Thank you, TRS Staff, for providing this information.

Note that the 2014 salaries were revised to reflect the reported rate of pensionable salary. Annual annuities are based on the monthly amounts reported as of June 30, 2014 (2013) multiplied by 12.

There was a slight decrease in the number of active members, and a slight increase in the annual compensation. Payroll is expected to increase annually. Over the past several years, salaries have not increased as much as anticipated. As a result, benefits have not increased as much as anticipated over the period, resulting in liability savings (gains). New retirement benefits paid during the year ended June 30, 2014 resulted in an unexpected increase in liabilities. Deaths resulted in less liability than expected.

A detailed summary of the membership data used in this valuation is provided in Section 5 of the actuarial report.

Member Data



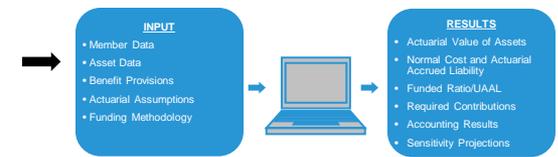
This graph provides a history of membership data submitted for the ten year period ending June 30, 2015.

The number of actives has stayed relatively level over time, with a slight peak in 2011 (June 30, 2010) . The number of annuitants has steadily increased over the period. Both of these trends are in line with expectations.

A detailed summary of the membership data used in this valuation is provided in Section 5 of the actuarial report.

Valuation Input

Asset Data



Market Value of Assets Changes from Last Year	Valuation June 30, 2015
(A) Certified Market Value of Assets as of June 30, 2014	\$ 45,824,382,514
(B) Contributions in Fiscal Year 2015	4,458,707,579
(C) Benefit Payments in Fiscal Year 2015	(5,625,037,173)
(D) Administrative Expense in Fiscal Year 2015	(21,686,860)
(E) Actual Return in Fiscal Year 2015	<u>1,770,549,533</u>
(F) Market Value of Assets as of June 30, 2015	\$ 46,406,915,593
(G) Valuation Interest Rate as of June 30, 2014	7.50%
(H) Expected Market Return on Assets for Fiscal 2015:	\$ 3,392,278,072
(G) x [(A)+ .5 x ((B)+(C)+(D))]	
(I) 2015 Market Basis Asset Gain / (Loss): (E) - (H)	\$ (1,621,728,539)
(J) Market Rate of Return: (E) / [(A) + 0.5 x ((B) + (C) + (D))]	3.91%

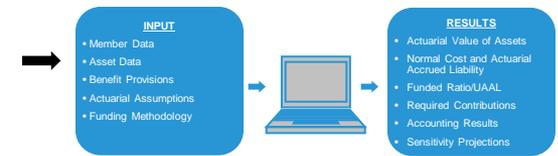
This table shows the market value of assets and the additions and subtractions to it from last year.

The market value of assets increased to \$46.4 billion during the year ended June 30, 2015, lower than the \$48.3 billion anticipated in last year's valuation due to the 3.91% return net of expenses being lower than the 7.50% expected return during the year ended June 30, 2015.

TRS will not invest itself out of its current financial shortfall. More funding is necessary. If State and Federal Fund contributions are held at the FY 2016 levels, TRS is projected to run out of money in FY 2048. Returns of close to 10% are needed to achieve 100% funding by 2045 under that scenario.

The market value of assets is provided in Section 2 of the actuarial report.

Asset Data (continued)

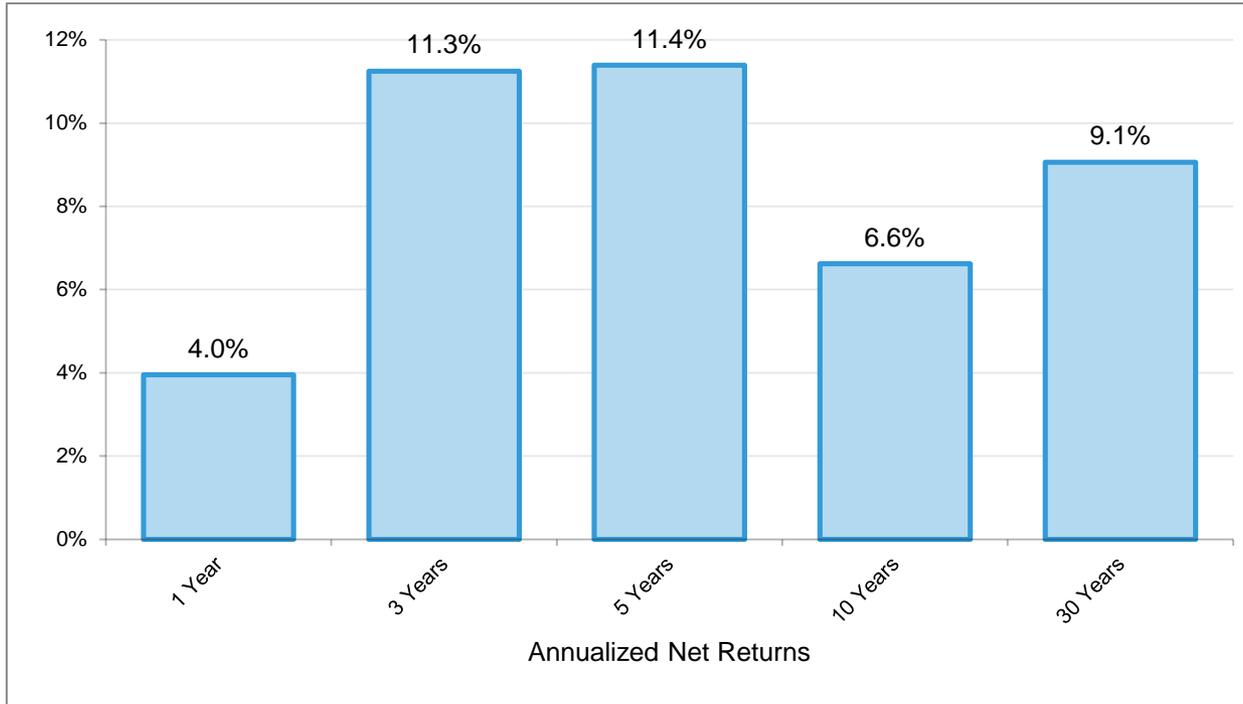
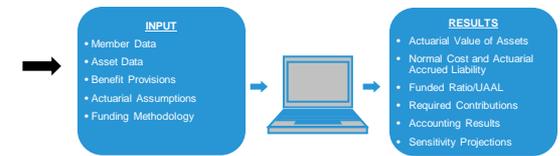


This chart is a history of the market value of assets and the investment return over the last ten years.

Investment returns on a market value basis can be volatile, causing volatility in the funded status and the actuarially determined employer contributions from year to year. TRS uses an actuarial asset method that mitigates (smoothes) the market fluctuations, which in turn mitigates fluctuations in funded status and employer contributions.

The market value of assets is provided in Section 2 of the actuarial report.

Asset Data (continued)

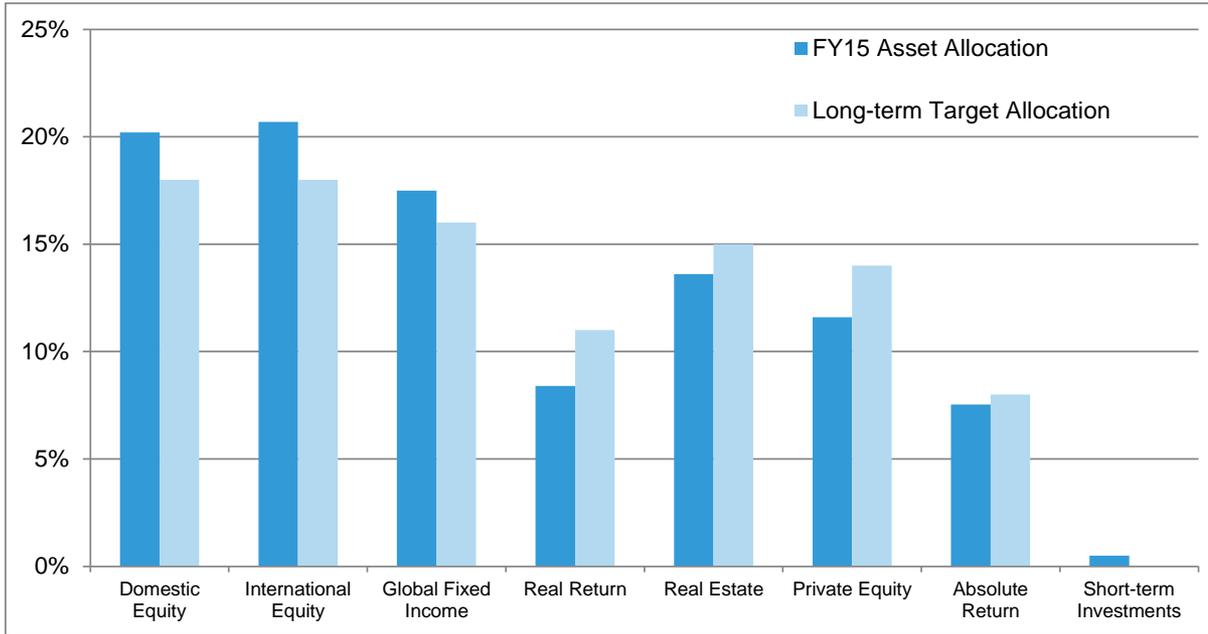
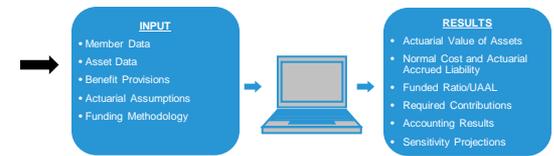


This exhibit contains annualized *net* returns over various periods of time ending June 30, 2015. These amounts are net of expenses, as is the assumed rate of return used for the valuation.

Annualized net returns have been greater than the assumed rate of return of 7.50%, (8.00% from 2012-2013, 8.50% prior to 2012) except for the 10 year period where the returns were dominated by the impact of the Great Recession and the year ending June 30, 2015.

A detailed summary of the market value of assets is provided in Section 2 of the actuarial report.

Asset Data (continued)

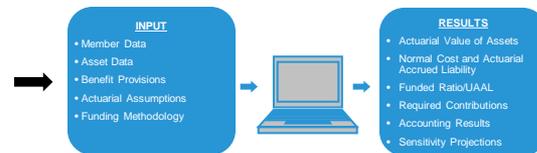


The current and long term target asset allocation is shown here.

The assumed rate of return is based on the target asset allocation and the expectation of future asset returns for each asset class. Based on our review, the 7.50% investment return assumption used in this valuation is reasonable. The return assumption was last reviewed at the August 13, 2015 Board of Trustees meeting in conjunction with an asset allocation study. The current rate was adopted as of June 24, 2014 and reviewed at the August 13, 2015 Board meeting when Buck presented the Experience Review (“Investigation of Demographic and Economic Experience for the Three-Year Period from July 1, 2011 – June 30, 2014.”)

A detailed summary of the market value of assets is provided in Section 2 of the actuarial report.

Benefit Provisions



Benefit provisions are described in Article 16 of the Illinois Pension Code. There were no changes in benefit provisions from the prior year’s valuation.

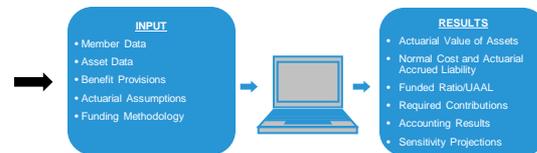
Public Act 96-0889 added a new section to the Pension Code that applied different benefits to anyone who first contributed to TRS on or after Jan. 1, 2011 and does not have any previous service credit with a pension system that has reciprocal rights with TRS. These members are referred to as “Tier II” members. The benefits Tier II members received are generally lower than that of Tier I members, whose benefits were not changed under Public Act 96-0889.

Highlights of the differences in benefit provisions are summarized on the next slide.

Benefit Provisions are a major driver of costs in the actuarial valuation.

A detailed summary of the benefit provisions is provided in Section 6.1 of the actuarial report.

Benefit Provisions (continued)

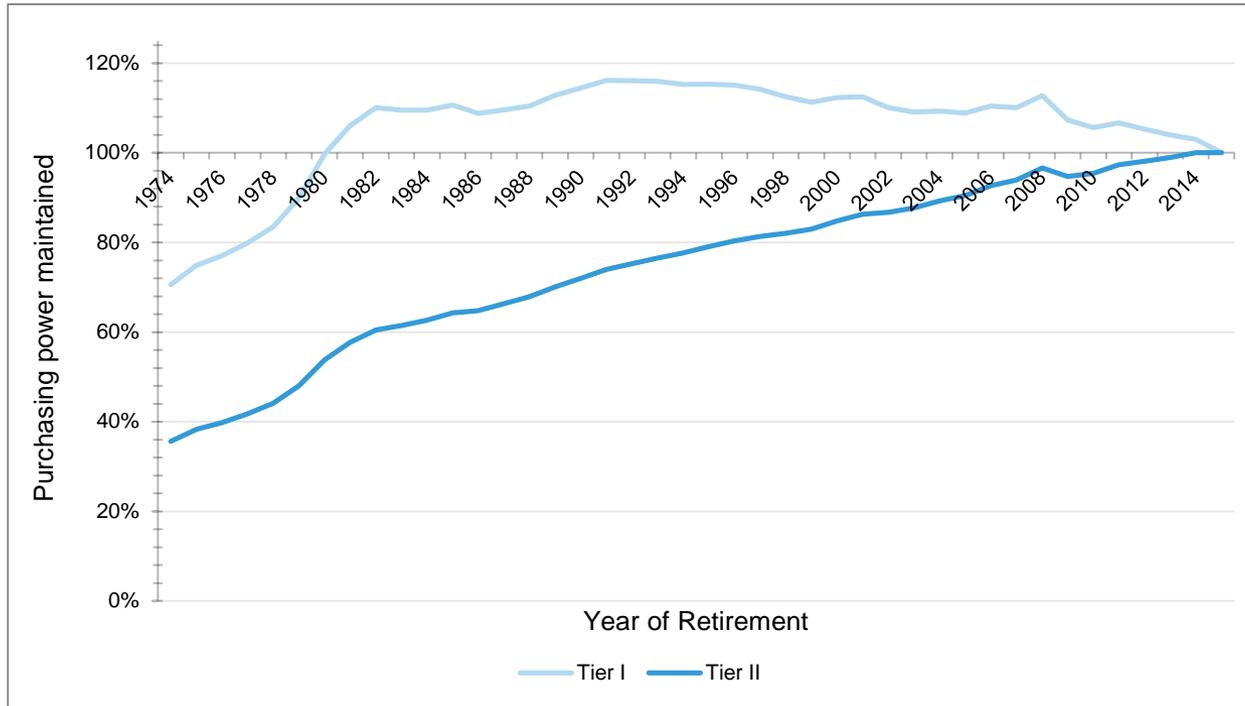
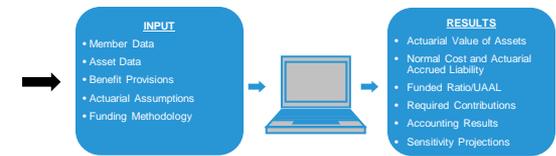


Tier I	Tier II
Benefit Formula	
2.2% multiplied by final average salary multiplied by years of creditable service	
Retirement Eligibility	
<ul style="list-style-type: none"> ◦ Age 55 with 35 years of service if member has elected the 2.2% formula ◦ Age 55 with 20 years of service for a benefit that is reduced by 6% for every year the member is under 60 ◦ Age 60 with 10 years of service ◦ Age 62 with 5 years of service 	<ul style="list-style-type: none"> ◦ Age 67 with 10 years of service ◦ Age 62 with 10 years of service for a benefit that is reduced by 6% for every year the member is under 67
Benefit Caps	
<ul style="list-style-type: none"> ◦ Maximum benefit is 75% of final average salary 	<ul style="list-style-type: none"> ◦ Maximum benefit is 75% of final average salary ◦ In determining final average salary, no member's salary can exceed the Tier II wage cap.
Final Average Salary	
Based on highest average salary during 4 out of the last 10 years of service	Based on highest average salary during 8 out of the last 10 years of service
Cost-of-living adjustments	
3 percent, compounded annually	Lesser of 3 percent or one-half of the Consumer Price Index, with the adjustment applied to the original benefit, i.e. not compounded
Member Contribution Rate	
9.4% of pay	

Despite having the same benefit formula and member contribution rate, the value of the Tier II benefit is lower than that of Tier I. Later retirement, the Tier II wage cap and the lower COLA provided under Tier II when compared to Tier I are the primary reasons that the Tier II benefit is much less valuable than the Tier I benefit.

A detailed summary of the benefit provisions is provided in Section 6.1 of the actuarial report.

Benefit Provisions (continued)

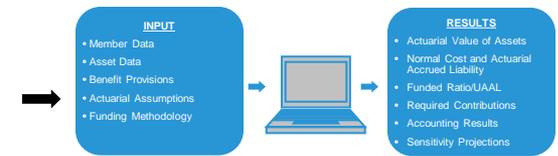


This graph compares the purchasing power of the Tier I and the Tier II COLA had they been in place over the past 40 years.

A purchasing power value of 100% indicates that the COLA results in the pension keeping pace with inflation; values below 100% indicates inflation would have eroded the purchasing power of the pension. The Tier I COLA is more effective against the effects of inflation than the Tier II COLA.

A detailed summary of the benefit provisions is provided in Section 6.1 of the actuarial report.

Actuarial Assumptions

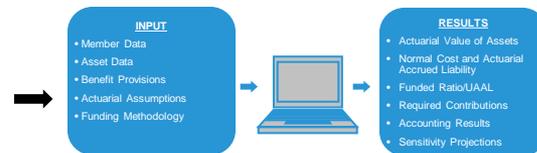


- Actuarial assumptions bridge the gap between the information that we know with certainty as of the valuation date – age, gender, service, pay or benefits of the members – and what may happen in the future.
- In August 2015, Buck Consultants prepared a review of the economic and demographic assumptions. At the August 13, 2015 Board meeting, based on that review, the Board of Trustees adopted the changes in assumptions recommended by Buck Consultants for the June 30, 2015 valuation. Those are summarized on the next slide.
- As a result of those changes:
 - The actuarial accrued liability increased by about 0.5%
 - The normal cost decreased by about 5%
 - The State contribution increased by about 5% as the funding policy pushed more contributions to earlier years due to future salaries being lower

The actuarial assumptions of TRS are reviewed at least every three years in a process known as an Experience Review. The next experience study will be prepared as of June 30, 2017 and presented to the Board in mid-2018. The results of that review will be used with the June 30, 2018 valuation.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

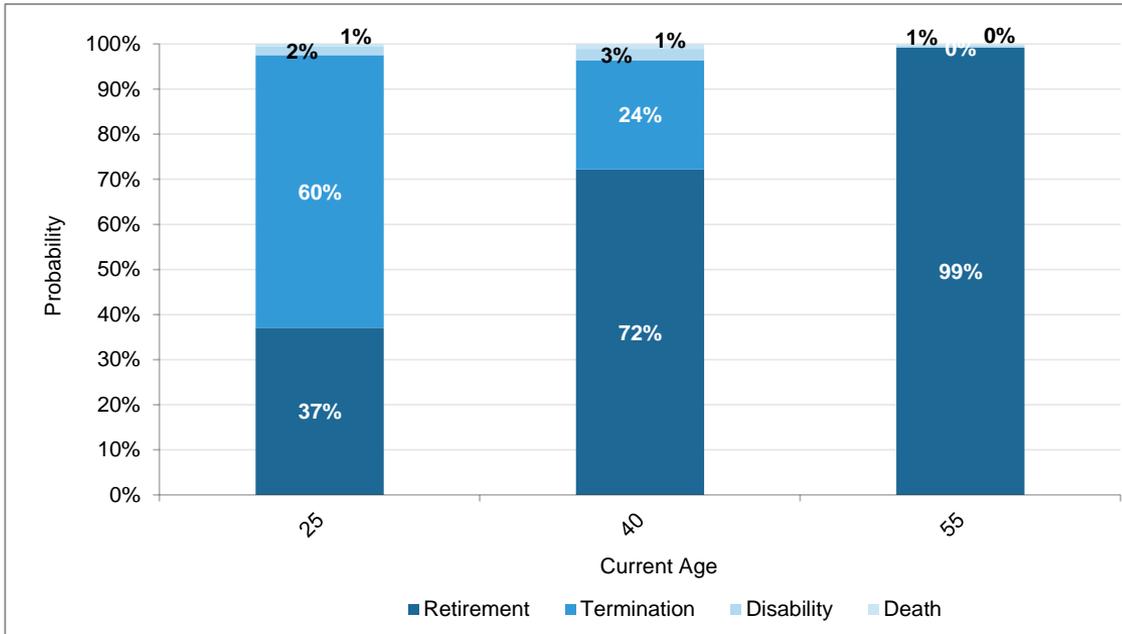
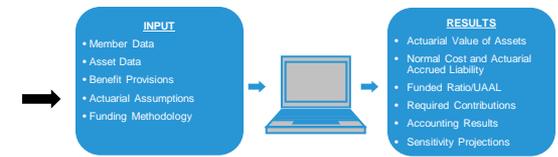
Actuarial Assumptions (continued)



Assumption	Observed experience relative to expectations	Recommendation	Impact on costs
1. Termination from active employment:	More terminations	Increase rates	Decrease
2. Disability retirement:	Fewer disabilities	Decrease rates	Decrease
3. Regular service retirement:	More retirements	Increase rates	Increase
4. Mortality:	Fewer deaths	Decrease rates	Increase
5. Utilization of ERO:	Lower utilization	Decrease rates	Decrease
6. Optional Service and Sick Leave Service:	Lower utilization	Decrease rates	Decrease
7. Salary and Severance:	Lower increases	Decrease rates	Decrease
8. Tier 2 COLA and Pay Cap:	Lower increases	Decrease rates	Decrease
9. Investment return:	N/A	Keep the same	N/A

- Generally, the trends we see above were a continuation of trends that we observed in the last experience review.
- The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies
- The salary and severance assumption was the source of the largest decrease in costs as salaries continued to fall short of the long term assumptions
- We do not recommend a decrease in the current investment return of 7.5%.
- Overall, the net impact on liabilities was an increase.
- Funding Policy should be legislated to Actuarial Math 2.0; Funding Policy is outside of the Board's direct control.

Actuarial Assumptions (continued)

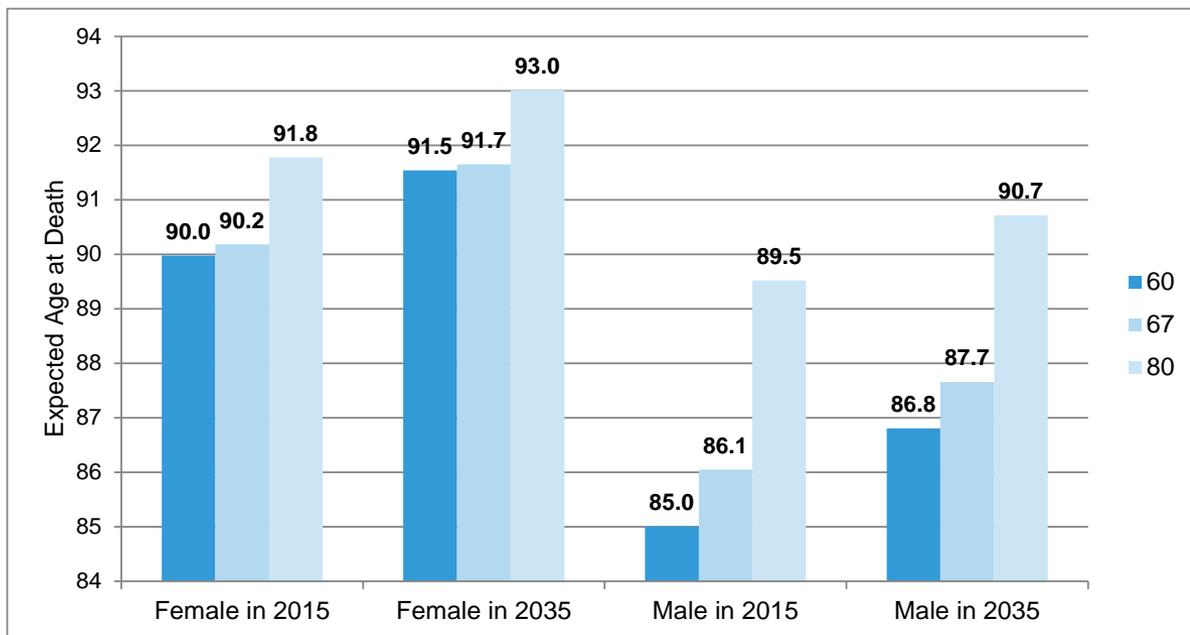
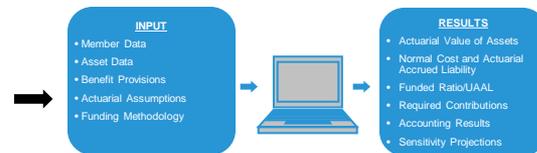


The probability of members retiring, terminating, becoming disabled or dying during their career at illustrative rates is in the exhibit.

Demographic assumptions describe future events that relate to people such as retirement rates, termination rates, disability rates, and mortality rates. Not surprising, as a member ages they are more likely to retire. The rates are developed to model what we expect to occur within TRS.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

Actuarial Assumptions (continued)

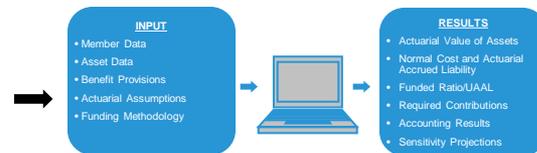


Mortality is a large driver of costs for Retirement Systems. The longer a member is expected to live, the higher the expected costs.

The expected ages at death shown above are based on the assumptions used for this valuation. Note that we show expected age at death in 2015 and 2035 as illustrative values. The valuation uses what is known as generational mortality. Each future generation is expected to live longer than the prior. Finally, females continue to live longer than males, although the gap is shrinking.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

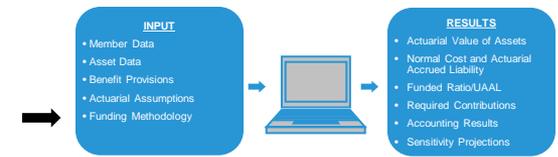
Actuarial Assumptions (continued)



- Economic assumptions describe future events that relate to money such as the interest rate, salary increases, the real return, and payroll growth.
 - The investment return assumption is 7.50% per year. This assumption was adopted for use beginning with the June 30, 2014 actuarial valuation.
 - Salary increases vary by service. Members with one year of service are expected to receive a pay increase of 9.75%; members with 20 years of service and beyond are expected to receive a pay increase of 3.75%. This assumption was adopted for use beginning with the June 30, 2015 actuarial valuation.
 - The inflation assumption is 3.00% annually. This assumption was first adopted with the June 30, 2014 actuarial valuation.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

Funding Methodology

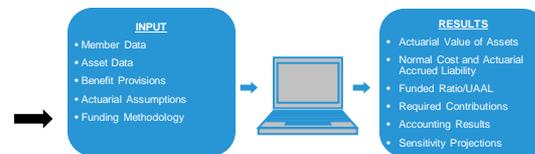


The Funding Methodology is another phrase for the funding policy for a PERS. There are four broad goals when formulating a funding policy for a PERS:

- Sufficiency - the funding target should be the value of benefits based on service accrued to date.
- Intergenerational equity – taxpayers should pay for workers’ pensions while those workers are providing their services – i.e., fund for benefits over the worker’s career.
- Stability of contributions – while stable contributions are easier to budget for, stability should not be achieved at the expense of the first two considerations.
- Accountability and transparency – each component of the funding policy should be clear on the intent and effect

A detailed summary of the actuarial methods is provided in Section 6.2 of the actuarial report.

Funding Methodology (continued)



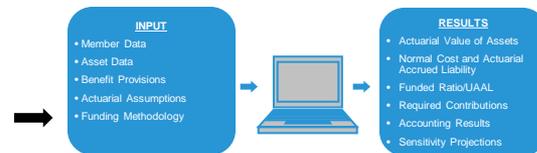
We have broadly referred to funding of a PERS outlined on the previous two slides as “Actuarial Math.” We refer to the current funding policy under the Illinois Pension Code as “Illinois Math,” which does not achieve the three broad goals of an actuarial funding policy. We have shown two versions of Actuarial Math in the past several years:

- *Contribution based on 30-year open level percent of pay amortization of UAAL (formerly called minimum generally accepted actuarial standards)* – since the inception of GASB 25 and 27 in the mid-1990s, the minimum annual required contribution (ARC) contained in those standards has served as the de facto minimum funding standard for a PERS. The basis for this version of Actuarial Math is the projected unit credit cost method, with a 30-year open level percent of pay amortization.
- *Contribution based on keeping the unfunded actuarial accrued liability (UAAL) from growing* – recognizing that the contribution based on Generally Accepted Actuarial Standards is not sufficient to reduce the unfunded liability from year to year, we have shown this amount. This policy would have been a significant improvement and continues to be an improvement over the above for the next several years.

While these are improvements over Illinois Math, neither of these Actuarial Math policies is optimal, primarily because they are not projected to either fully fund the UAAL, and in the case of the first policy, even keep the UAAL from growing. That being said, had the first policy been in place since GASB 25 was adopted 20 years ago, the UAAL would be over \$16 billion lower.

A detailed summary of the actuarial methods is provided in Section 6.2 of the actuarial report.

Funding Methodology (continued)



The funding of TRS by the State of Illinois does not follow even the minimum Actuarial Math. The State has systematically underfunded TRS using Illinois Math by:

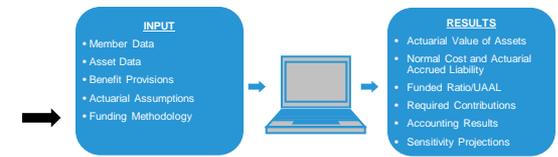
- Initially selecting a 50 year period over which to pay down unfunded actuarial accrued liability
- Back loading the 50 year plan by using a 15 year period to ramp up contributions to the ultimate level
- Establishing 90% of the actuarial accrued liability as the funding target
- Using the projected unit credit cost method which understates the funding target compared to the more common entry age normal cost method
- Imposing a maximum contribution based on POB debt payments; while contributions are potentially reduced by the full value of the debt payments, not all of the POB proceeds were directly deposited
- Reducing contributions for fiscal year ended June 30, 2006 and 2007
- Reducing contributions in fiscal year ended June 30, 2011 by introducing an actuarial value of assets
- Reducing contributions for fiscal year ended June 30, 2011 by fully reflecting the impact of Tier II provisions before the reduction in benefit accruals occurred

As a result of these statutory provisions:

- The unfunded actuarial accrued liability will grow until June 30, 2031
- State contributions are projected to grow at a rate of 3% per year from now until 2045, likely outpacing State revenue expectations.

A detailed summary of the actuarial methods is provided in Section 6.2 of the actuarial report.

Funding Methodology (continued)

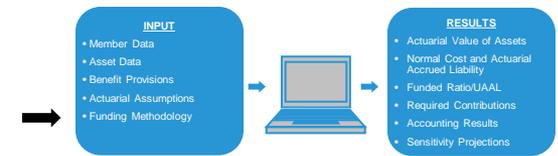


Actuarial Methods describe the funding policy for the System in actuarial terms. Actuarial Methods generally are comprised of the three components below:

- *Actuarial Cost Methods* allocate costs to the actuarial accrued liability (i.e. the amount of money that should be in the System) for past service and normal cost (i.e. the cost of benefits accruing during the year) for current service to allow for systematic payment of the costs over a member's career.
- *Amortization Methods* determine the payment schedule for unfunded actuarial accrued liability (UAAL).
- *Asset Valuation Methods* smooth or average the market value returns over time to alleviate contribution volatility that results from market returns that differ from the investment return assumption used in the actuarial valuation.

A detailed summary of the actuarial methods is provided in Section 6.2 of the actuarial report.

Funding Methodology (continued)



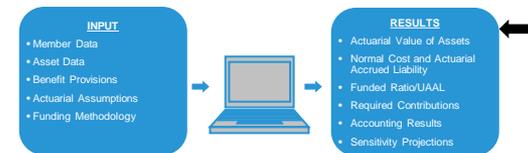
Based on our recommendation presented at the March 30, 2015 Board Retreat, the Board will certify the contribution requirements under the following funding policy:

- Replace the projected unit credit cost method with the entry age normal cost method
- Keep the current asset valuation method (including no corridor)
- Update amortization policy as follows:
 - 20 year closed amortization of UAAL
 - Use layered amortization, with new UAAL being amortized over 20 years regardless of source
 - Amortization payment increase at the rate of future State revenue growth, which is assumed to be 2% for these purposes.
 - Minimum total contribution is no less than the normal cost in any given year

We will refer to this next generation of funding policy as “Actuarial Math 2.0”. Actuarial Math 2.0 will replace the two versions that the Board has previously certified.

Valuation Results

Summary of Funding Results



Summary of Funding Valuation Results with Last Year's Results for Comparison	June 30, 2015 Valuation	June 30, 2014 Valuation
Results as of Valuation Date	June 30, 2015	June 30, 2014
Funded Status		
1. Actuarial Accrued Liability	\$ 108,121,825,171	\$ 103,740,377,267
2. Actuarial Value of Assets (AVA)	45,435,192,645	42,150,765,261
3. Unfunded Actuarial Accrued Liability (AVA basis) (1. - 2.)	\$ 62,686,632,526	\$ 61,589,612,006
4. Funded Ratio (AVA basis): (2. / 1.)	42.0%	40.6%
5. Market Value of Assets (MVA)	46,406,915,593	45,824,382,514
6. Unfunded Actuarial Accrued Liability (MVA basis) (1. - 5.)	\$ 61,714,909,578	\$ 57,915,994,753
7. Funded Ratio (MVA basis): (5. / 1.)	42.9%	44.2%
Actuarial Accrued Liability		
1. Active Members	\$ 34,888,043,374	\$ 35,622,053,592
2. Retired Members and Beneficiaries Receiving Benefits	70,545,782,134	65,614,627,003
3. Inactive Members with Deferred Benefits	2,687,999,663	2,503,696,672
4. Total Actuarial Accrued Liability (1. + 2. + 3.)	\$ 108,121,825,171	\$ 103,740,377,267
Results as of Fiscal Year Ending	June 30, 2017	June 30, 2016
Certified State Contribution under Illinois Pension Code (includes amount to Guaranteed Minimum Annuity Reserve)	\$ 3,986,583,351	\$ 3,742,702,194
Normal Cost		
1. Total Normal Cost	\$ 1,882,004,794	\$ 2,010,002,760
2. Administrative Expenses	23,594,987	24,294,066
3. Expected Member Contribution	1,034,264,612	1,041,807,455
4. Total Employer Normal Cost (1. + 2. - 3.)	\$ 871,335,169	\$ 992,489,371

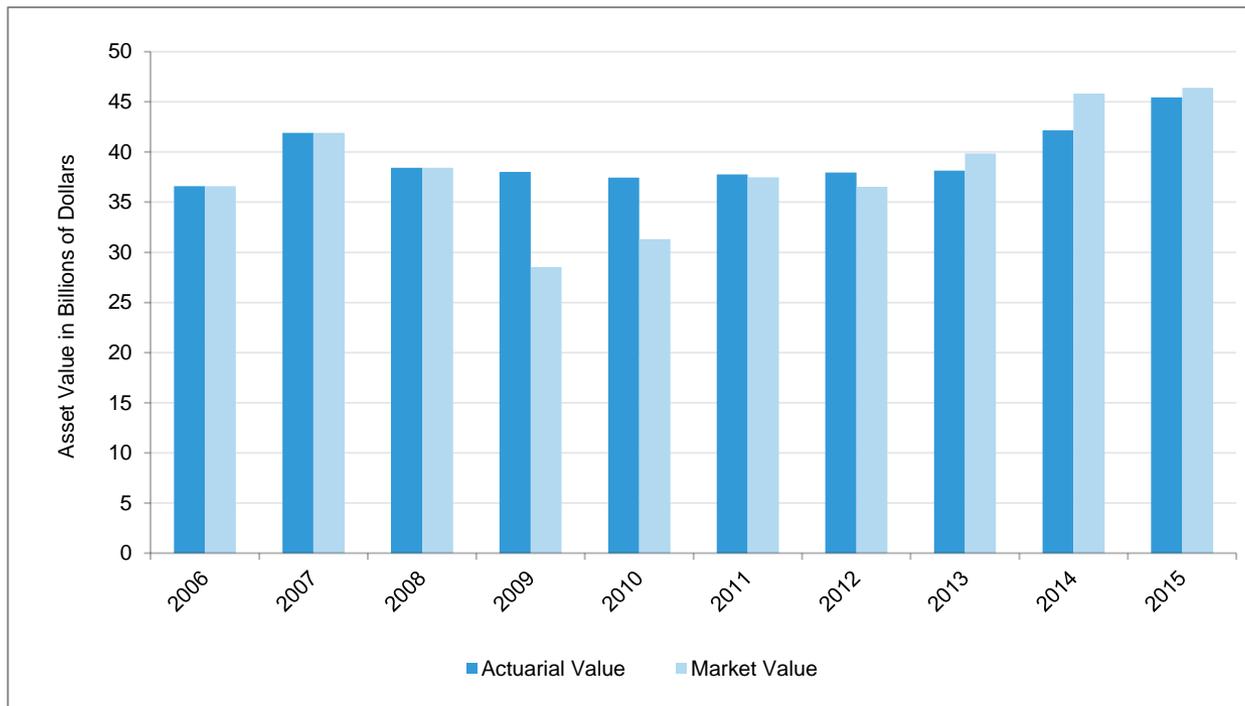
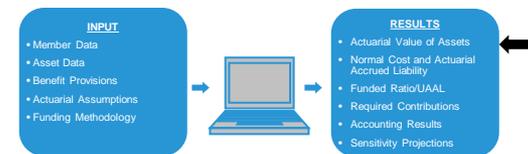
This table summarizes many of the key results of the current funding valuation.

Comparable results from last year's valuation are shown for comparison.

We will discuss these results in more detail in the following slides.

The summary of funding results is provided in Section 1 of the actuarial report.

Actuarial Value of Assets

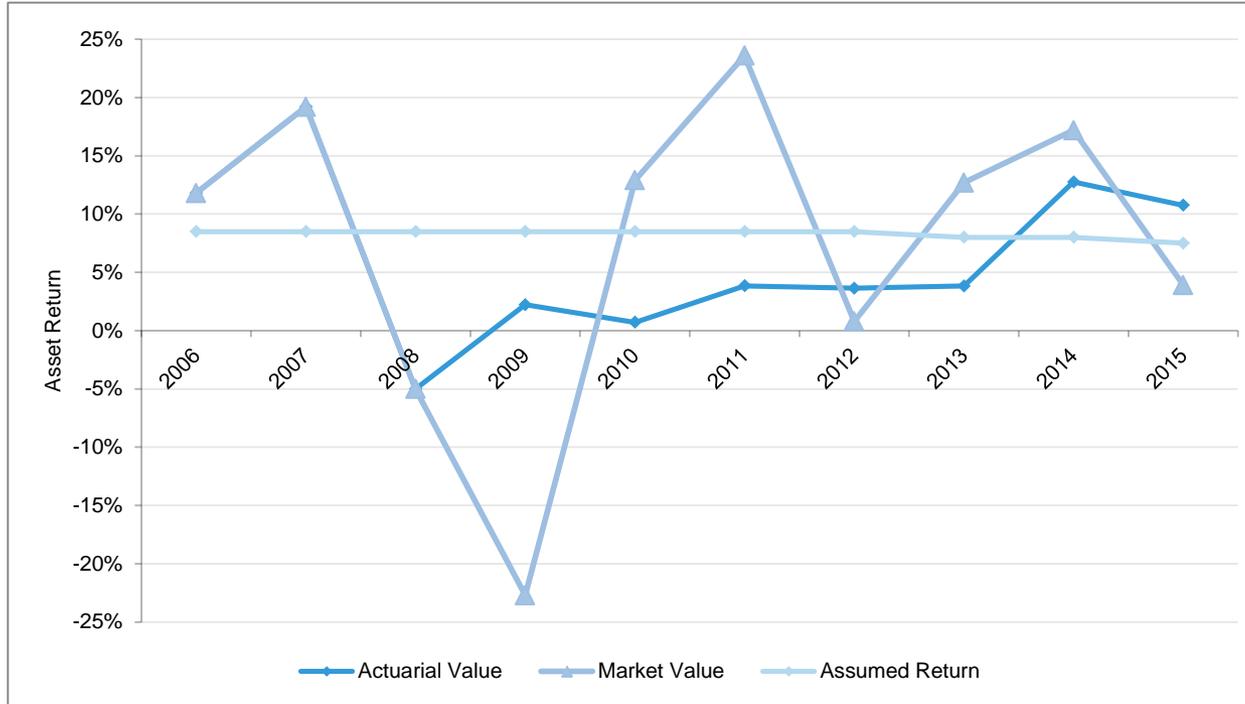
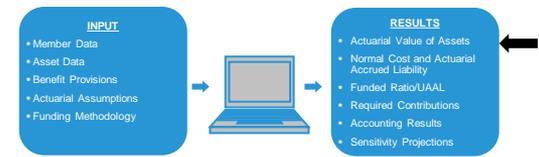


This graph provides a history of the market value and actuarial value of assets *amounts* over the past ten years. Before 2009, the amounts were the same.

The actuarial value of assets smoothes investment gains/losses, resulting in less volatility in the employer contribution. The point of using an actuarial value of assets is to develop employer contributions that are more stable than if the contributions were based solely on market. That being said, when the actuarial value of assets was implemented, the impact was to reduce the year ended June 30, 2011 contribution by \$400 million.

The Actuarial Value of Assets is provided in Section 2 of the actuarial report.

Actuarial Value of Assets

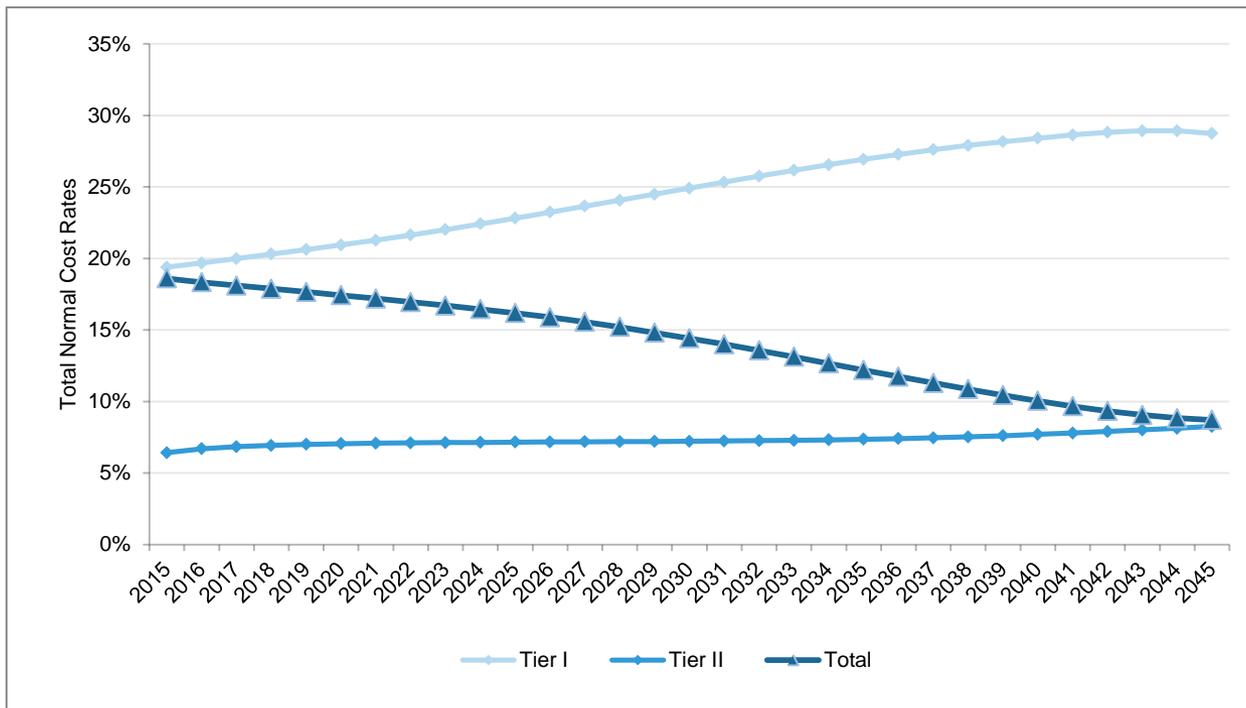
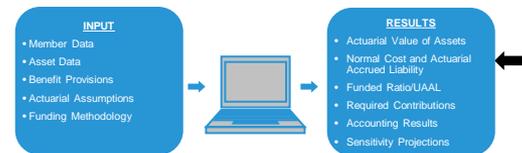


This graph provides a history of the market value and actuarial value of asset *returns* over the past ten years, as well as the assumed return. Before 2009, the amounts were the same.

The returns under the actuarial value of assets do not deviate as much from the assumed rates of returns over the period when compared to the market return. This results in less employer contribution volatility.

The Actuarial Value of Assets is provided in Section 2 of the actuarial report.

Total Normal Cost

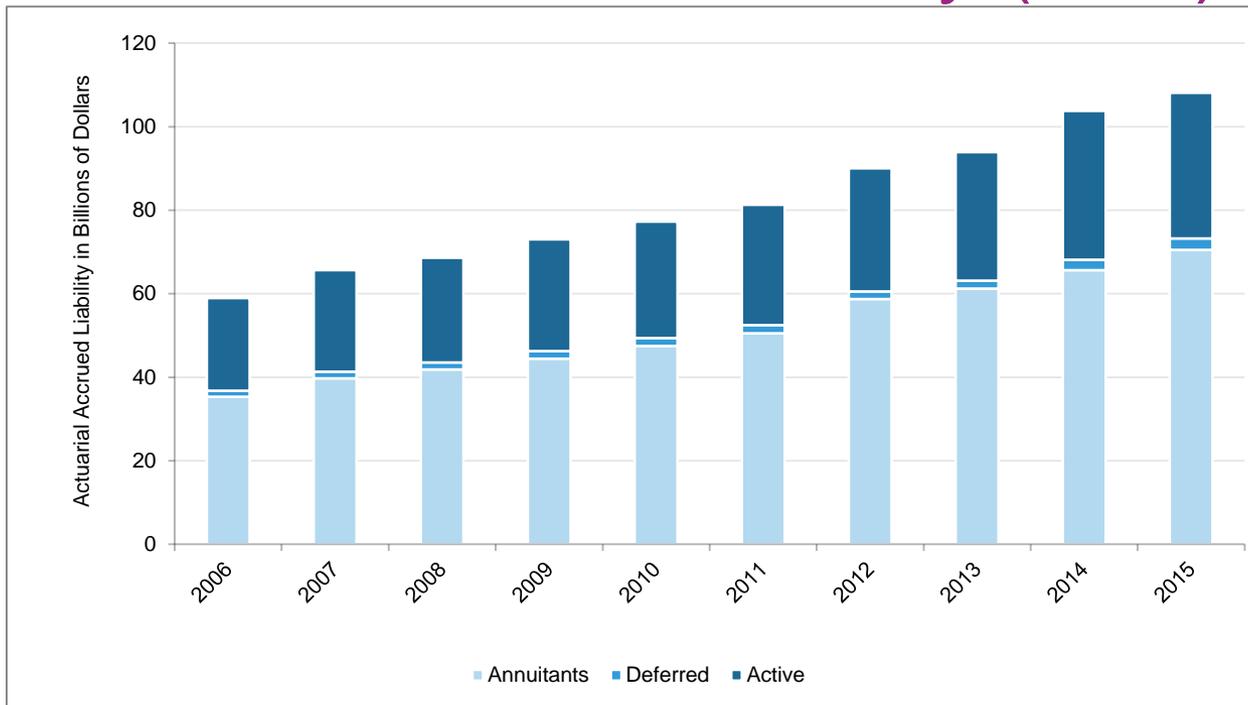
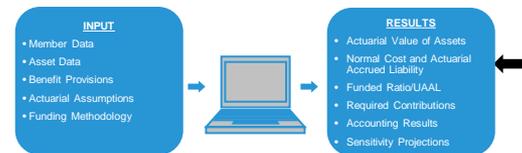


This graph provides a projection of the normal cost as a percent of pensionable payroll, both in total and split by Tier. The normal cost is the cost of benefits accruing during the year.

The normal cost decreased by roughly 5% due to reduction in the salary assumption, offset somewhat by the increase in life expectancy. The normal cost for Tier I is over double that of Tier II. Also, the amounts increase due to the back loading inherent in the projected unit credit cost method mandated by the state as well as future mortality improvements projected in the valuation. Had these rates been based on the more common entry age normal cost method, the normal costs would be lower and not back loaded, and the actuarial accrued liability would be higher.

Details about the normal cost are provided in Section 1 and the projected normal cost in Section 4.

Actuarial Accrued Liability (AAL)

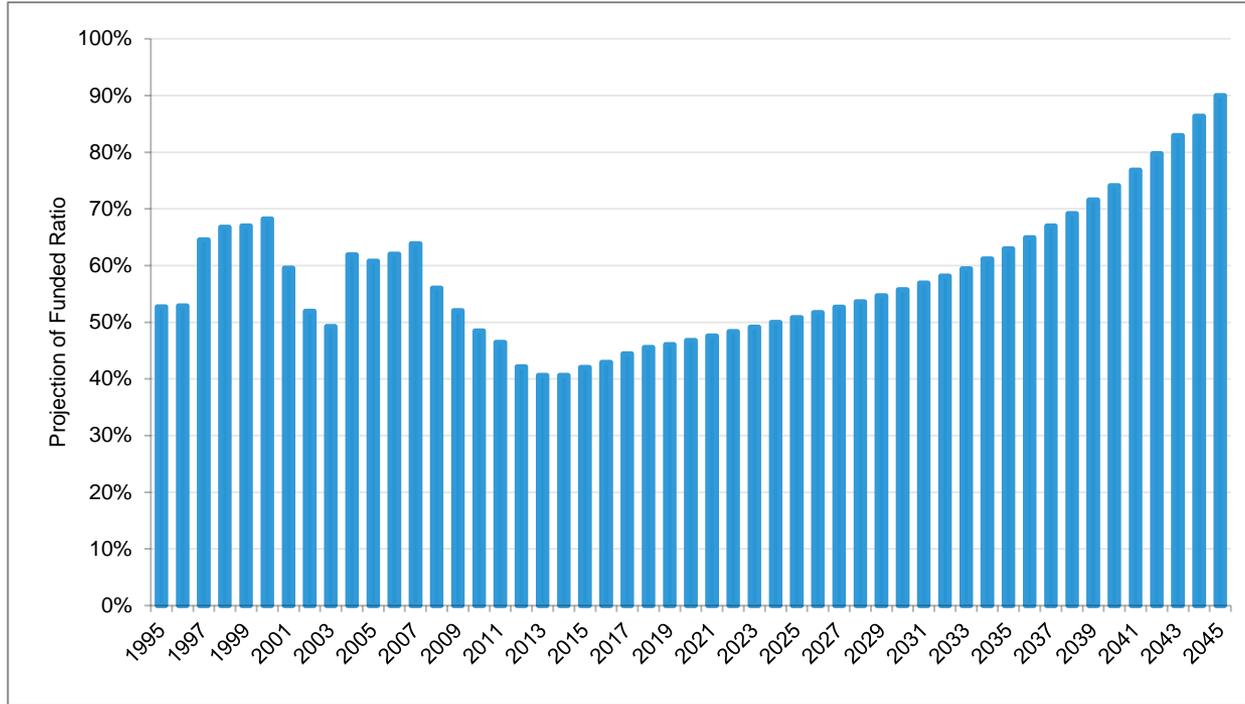
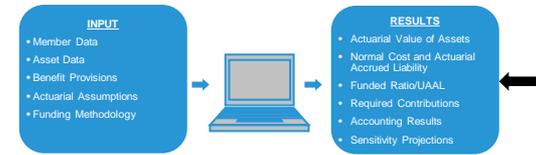


This graph provides a history of the actuarial accrued liability, or AAL. The AAL is the funding target, or the amount of assets TRS should have in the trust as of the valuation date.

In a plan open to new hires such as TRS, the AAL will grow even in the absence of changes to the assumptions, methods and benefit provisions. While the AAL for TRS has grown somewhat steadily over the past several years, 50 bp decreases in the assumed rate of return in 2012 and 2014 resulted in higher than anticipated increases. It is worthwhile to note that over two-thirds of the AAL is for annuitants.

A detailed summary of the AAL is provided in Section 1 of the actuarial report.

Funded Ratio

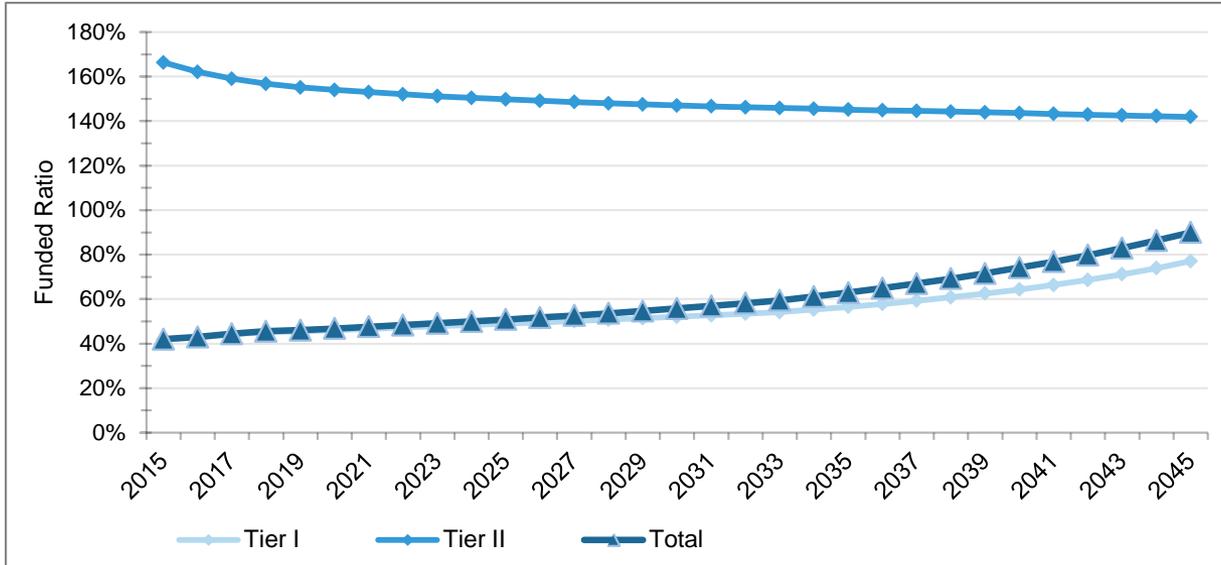
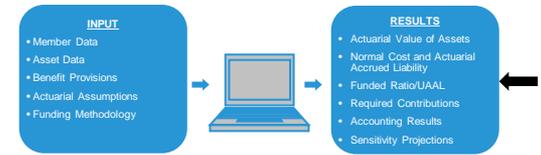


This graph provides a history and a projection of the funded ratio for TRS over the 50 year funding period. The funded ratio is the actuarial value of assets divided by the actuarial accrued liability, or it is the ratio of how much money TRS has in the fund to how much it should have in the fund.

The funded ratio is a measure of the funding progress of TRS. The funded ratio should trend to 100% over a reasonably short period of time – say 15 to 20 years. The 90% target and the 50 year period used by Illinois Math, while an improvement over funding before 1995, are inadequate. We recommend Illinois Math be replaced with Actuarial Math 2.0.

A detailed summary of the funded ratio is provided in Section 1 and a projection in Section 4 of the actuarial report.

Funded Ratio

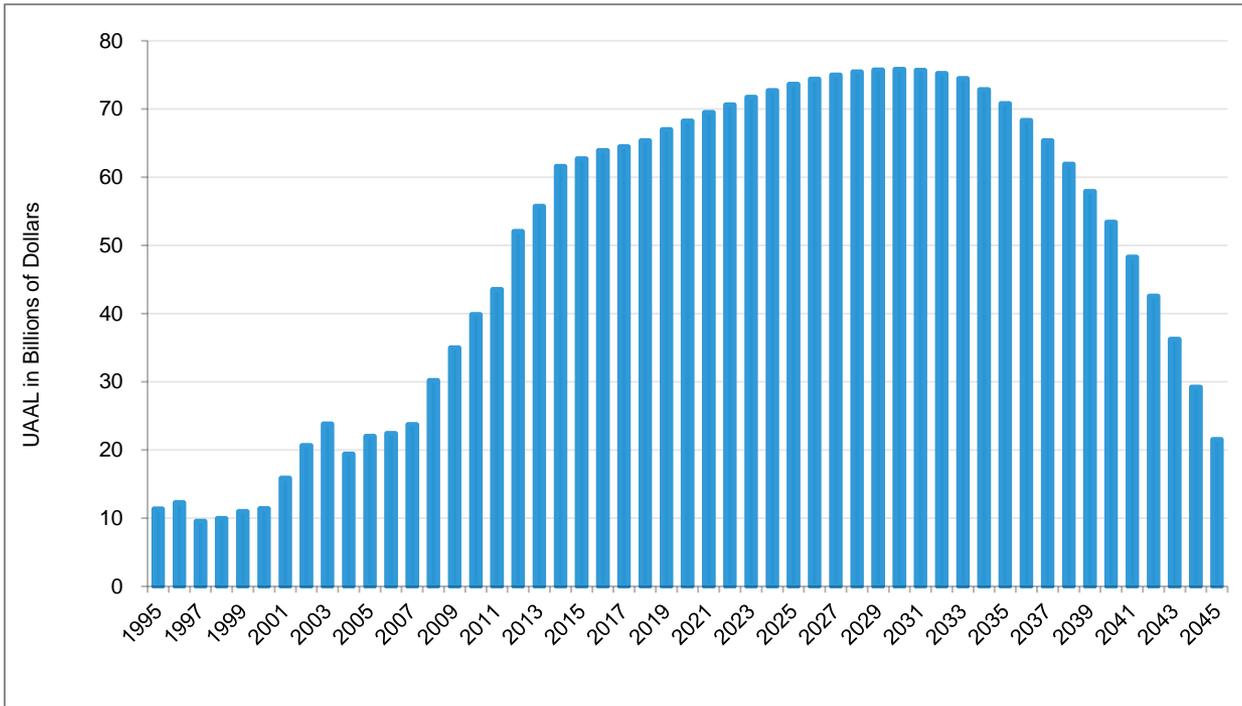
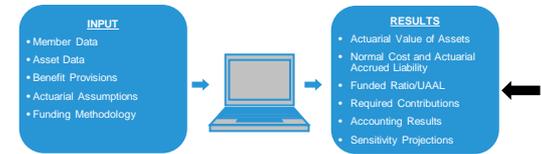


This graph provides a projection of the funded ratio both in total and split by Tier.

While Tier I and Tier II assets are comingled within TRS to determine the funding requirements and funded ratio, this chart projects the funded ratio based on allocating only Tier II member contributions with projected investment returns to the Tier II assets and the remaining contributions – Tier I member, all State, all School District and all Federal Funds – with projected investment returns to the Tier I assets. The bottom line is that Tier II members are subsidizing the State contributions to TRS.

A detailed summary of the projected funded ratio is provided in Section 4 of the actuarial report.

UAAL (Unfunded Actuarial Accrued Liability)

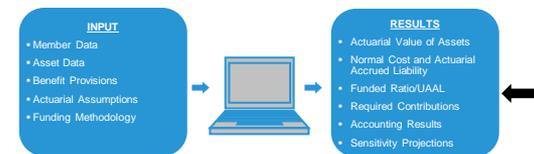


This graph provides a history and a projection of the unfunded actuarial accrued liability, or UAAL, for TRS over the 50 year funding period. The UAAL is the difference between the actuarial value of assets (AVA) and the actuarial accrued liability (AAL), or the pension debt.

The UAAL before the current valuation date has generally increased annually. While System experience has resulted in some of the increases and decreases in UAAL, the State contributions mandated under the Illinois Pension Code were designed to allow the UAAL to grow for more than three decades when the 50 year plan was put in place in 1995. The first year the UAAL is projected to decrease is the year ending June 30, 2031.

A detailed summary of the UAAL is provided in Section 1 and a projection in Section 4 of the actuarial report.

UAAL Reconciliation



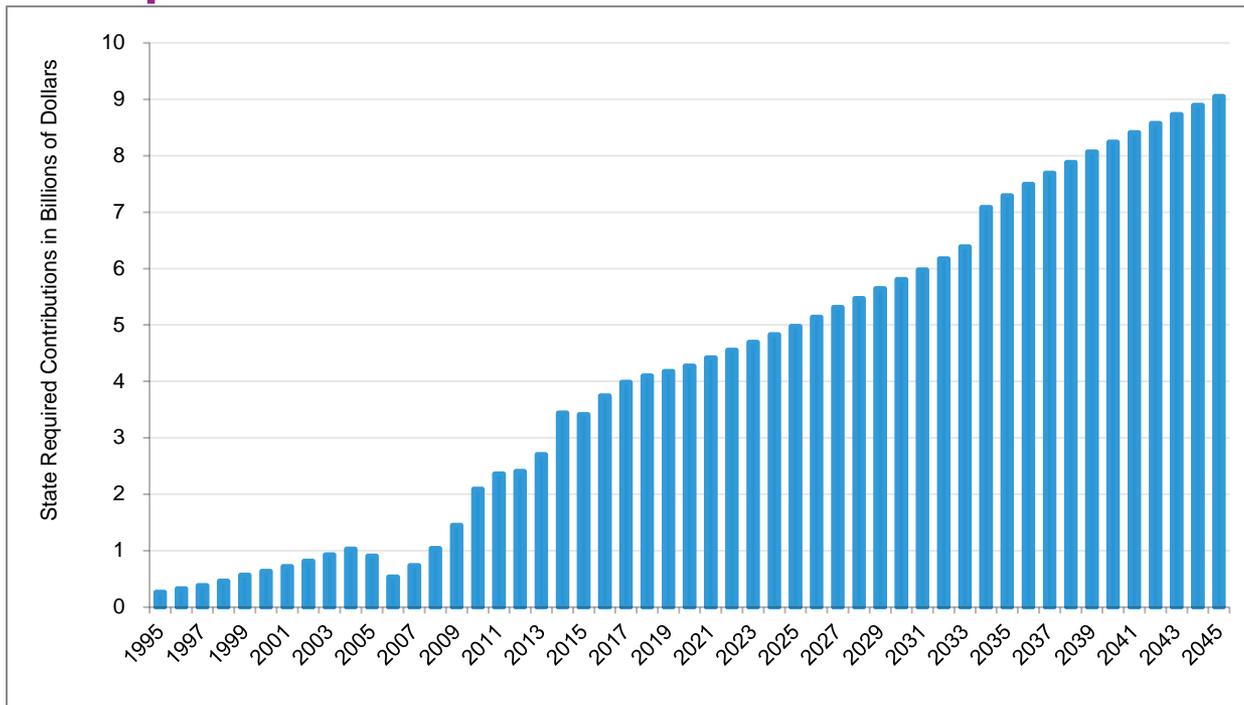
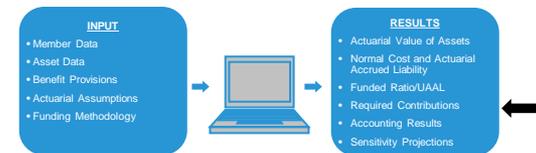
Reconciliation of Unfunded Actuarial Accrued Liability	Year Ended June 30	
	2015	2014
Unfunded Actuarial Accrued Liability at beginning of year	\$ 61,589,612,006	\$ 55,731,797,288
Additions (deductions)		
- Employer cost in excess of contributions	\$ 1,992,652,465	\$ 1,648,042,240
- Change in actuarial assumptions and methods	586,418,960	6,403,256,969
Net additions (deductions)	\$ 2,579,071,425	\$ 8,051,299,209
Actuarial losses (gains) compared to assumptions		
- Salary increases for continuing active members	\$ (468,541,235)	\$ (474,190,195)
- Asset loss (gain) on actuarial value of assets ¹	(1,354,881,665)	(1,791,604,611)
- New entrant loss (gain)	5,168,927	(315,731)
- Mortality other than expected	(45,647,175)	(74,308,199)
- Retirements other than expected	302,761,415	119,675,346
- Disabilities other than expected	(13,393,193)	(3,237,170)
- Terminations other than expected	56,862,195	(4,442,984)
- Rehires	13,630,966	37,754,909
- Repayments of refunded member contributions ²	-	-
- Delayed reporting of retirements (effect on assets)	-	-
- Other ³	21,988,860	(2,815,856)
Net actuarial loss (gain)	\$ (1,482,050,905)	\$ (2,193,484,491)
Unfunded Actuarial Accrued Liability at end of year	\$ 62,686,632,526	\$ 61,589,612,006

This table shows the key reasons for the change in the UAAL from last year's valuation to this year.

At the level of state contributions made for 2015, the UAAL increased as expected by \$1.1 billion. Other key factors were the change in assumptions effective June 30, 2015, which increased the UAAL by \$0.6 billion. These "losses" were partially offset by experience "gains" including salary increases less than assumed and favorable investment returns on the actuarial value of assets.

A detailed summary of the changes in UAAL is provided in Section 1 of the actuarial report.

Required Contributions

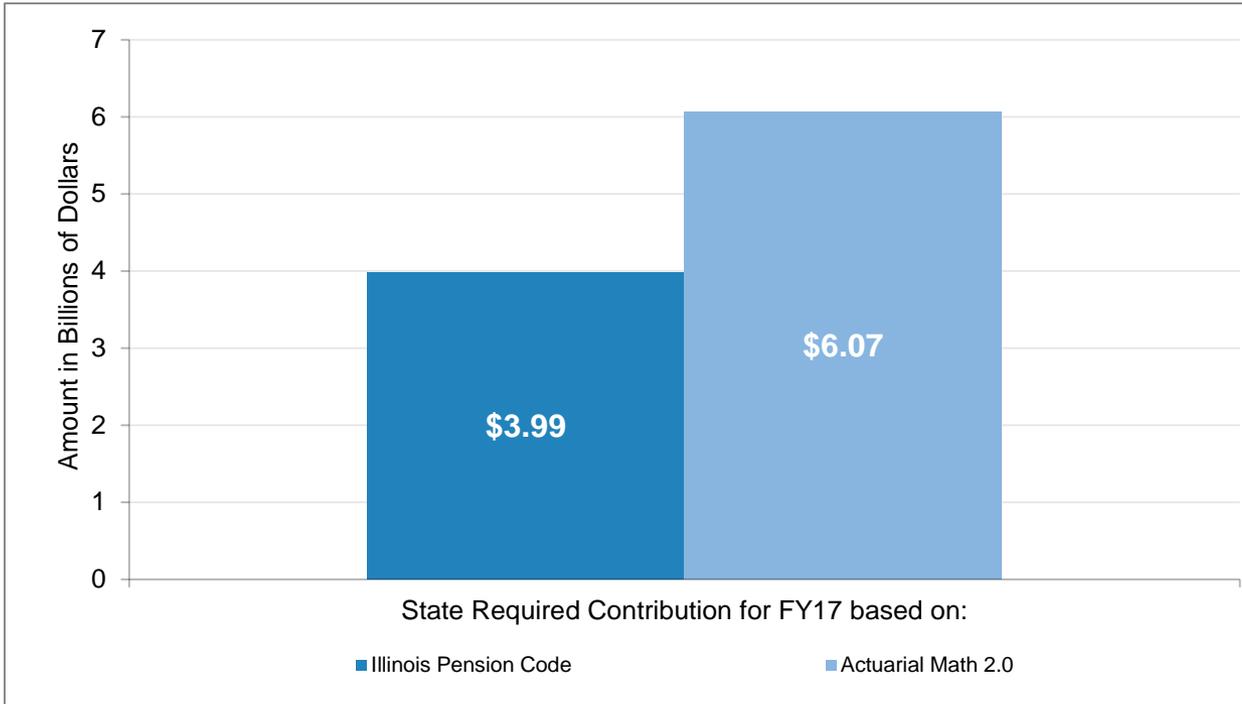
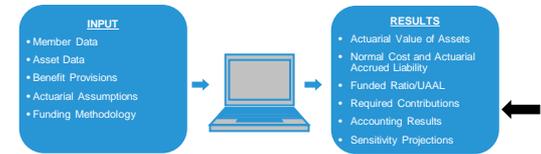


This graph provides a history and projection of the State Required Contribution under the Illinois Pension Code.

In the first several years of the 50 year plan, the State contributions were lower as the contribution ramped up from 1995 through 2010 as required under the Illinois Pension Code. In the future, the increases will continue as payroll increases. A larger increase of almost 10% occurs in 2034 as the constraint of the POB maximum is lifted. The contributions above are a primary driver of the increasing UAAL on the previous two slides.

A detailed summary of the employer required contribution rates is provided in Section 1 of the actuarial report.

Required Contributions

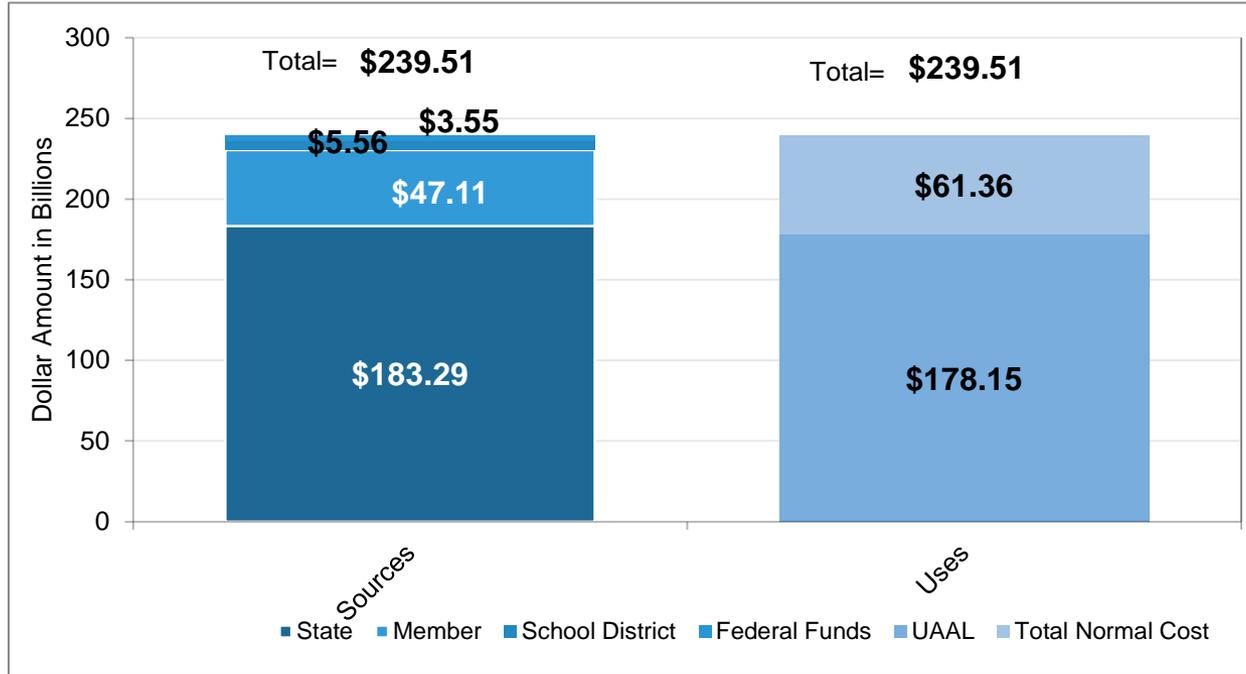
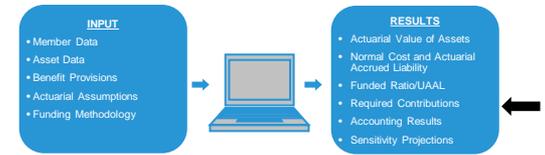


This graph provides the year ended June 30, 2017 State Required Contribution under the Illinois Pension Code, as well a higher threshold. The Board includes this higher threshold in the certification in recognition of the inadequacy of the State contribution requirements under the Illinois Pension Code.

We have recommended Actuarial Math 2.0 to fix deficiencies in the current funding policy. Specifically, Actuarial Math 2.0 will bring TRS to full funding by decreasing the UAAL every year with contributions that are projected to grow at estimated revenue growth of 2%. The UAAL contribution growth of 2% and payment period of 20 years are projected to promote intergenerational equity by not requiring contributions of future generations for past underfunding.

The employer required contribution rates are provided in Section 1 of the actuarial report.

Required Contributions

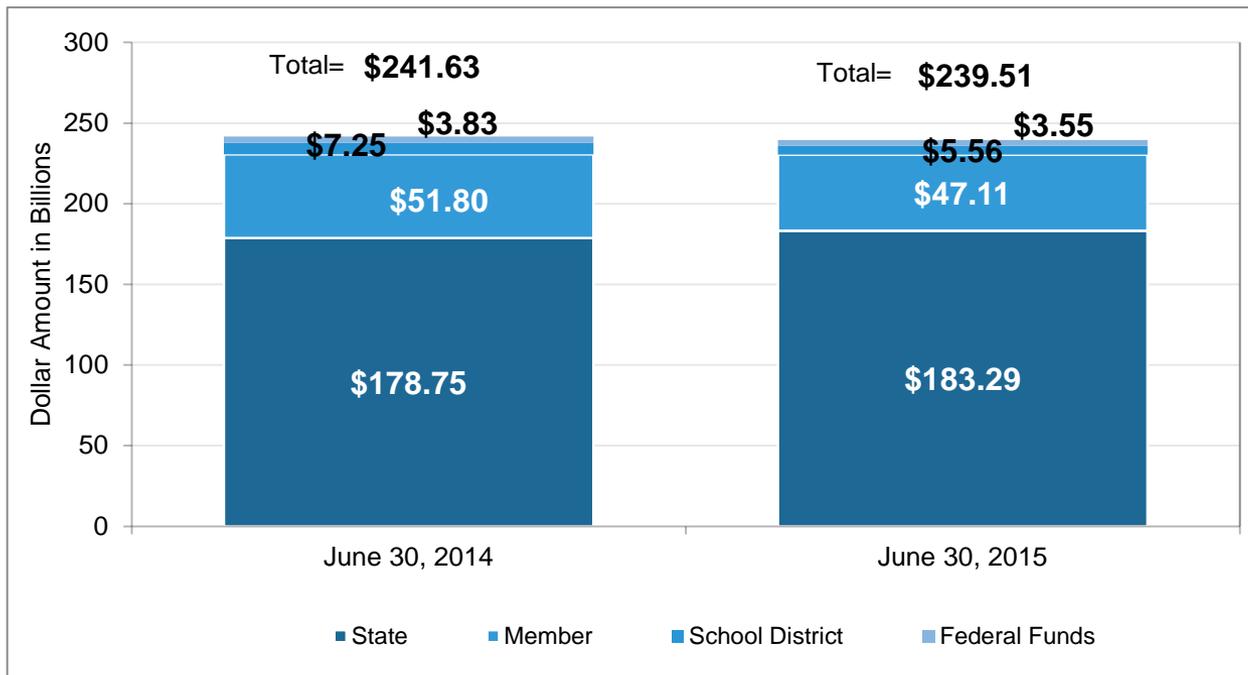
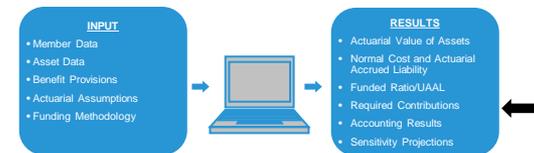


This graph provides a comparison of the Sources and Uses of contributions of the \$239.51 billion in contributions projected to be made from year ended June 30, 2017 through the end of the 50-year funding period of June 30, 2045.

Over 75% of the projected total contributions are being provided by the state and 20% is being provided by teachers. In aggregate, teachers pay for the cost of benefits accruing, and the State pays for the pension debt that has accrued as a result of following inadequate funding policies since the inception of TRS. Much of the contributions over the next 30 years are used to pay down pension debt.

The projected contributions are provided in Section 4 of the actuarial report.

Required Contributions

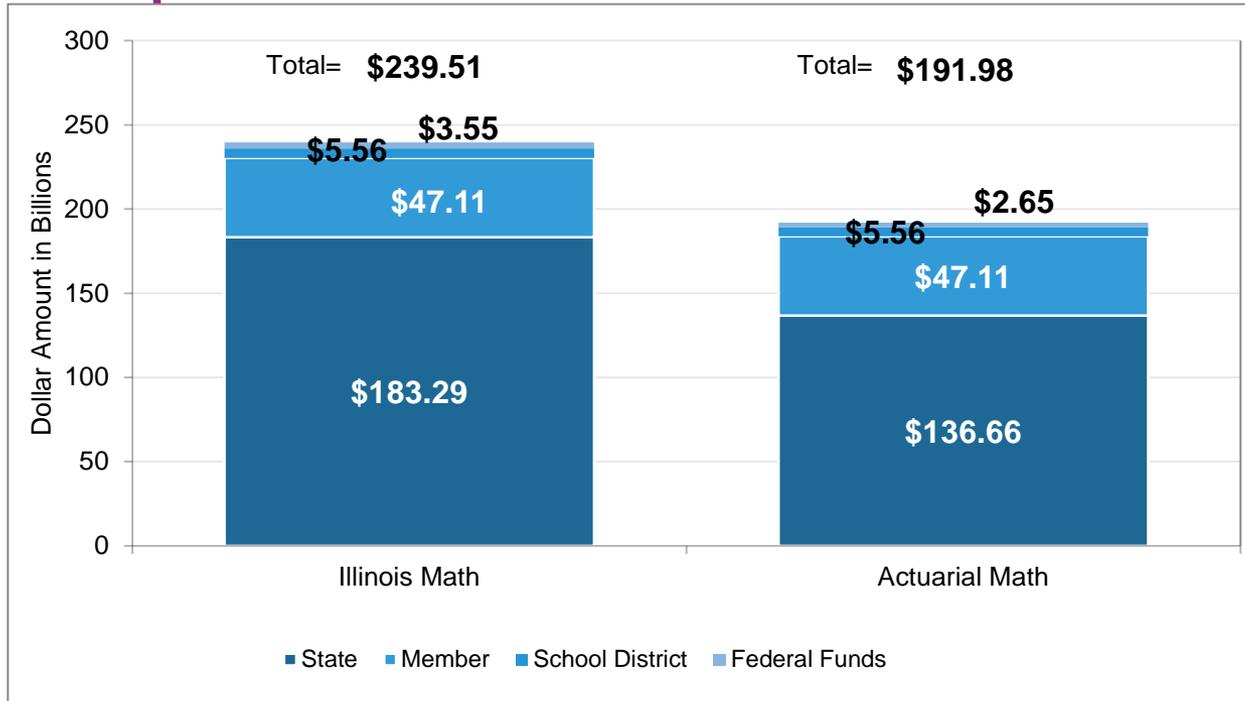
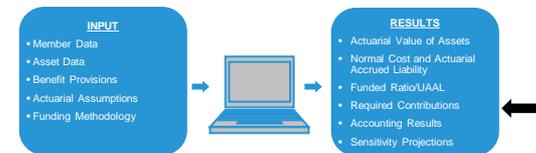


This graph provides a comparison of the Sources from the June 30, 2014 and June 30, 2015 valuations of the contributions projected to be made from year ended June 30, 2017 through the end of the 50-year funding period of June 30, 2045.

The State contribution for 2017 increased from an expected \$3.80 billion to an actual of \$3.99 billion. Federal Funds contributions decreased due to a reduction in the portion of Federal Funds payroll from 2.1% to 1.9%. Over the whole period 2017-2045, total contributions are similar.

The projected contributions are provided in Section 4 of the actuarial report.

Required Contributions

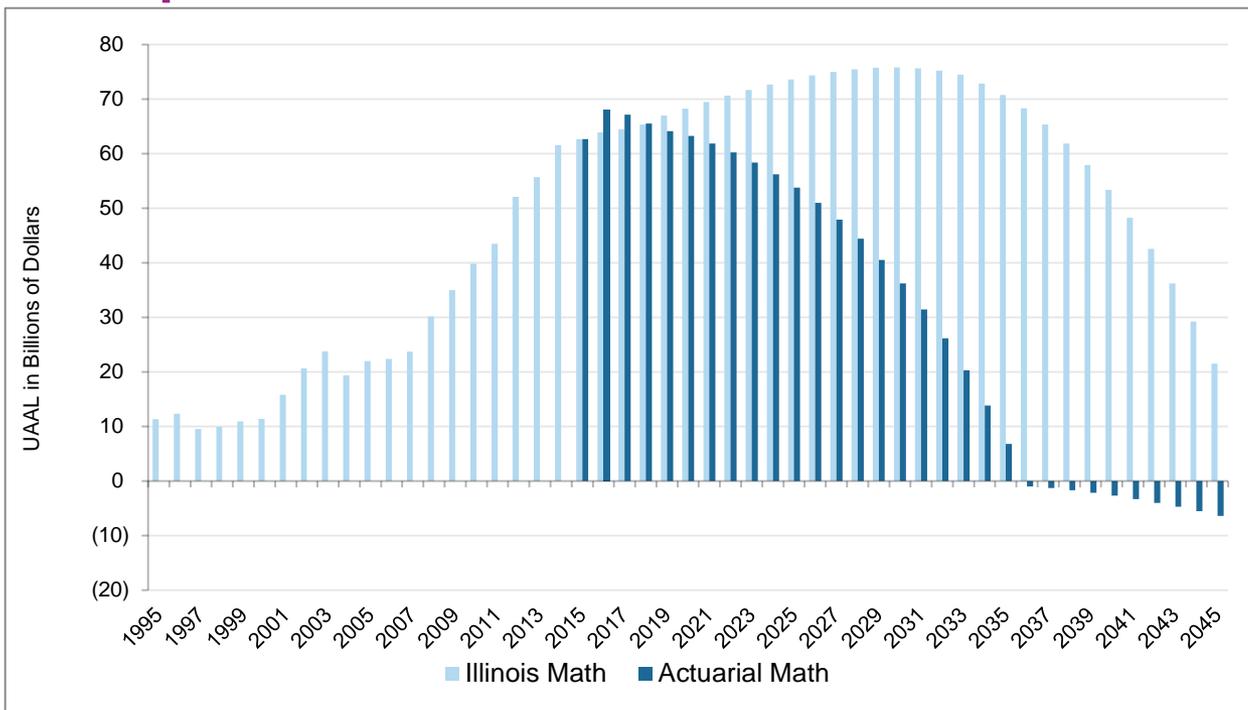
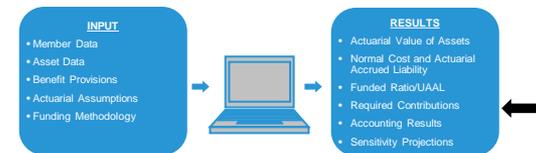


This graph provides a comparison of the sources of contributions projected to be made from year ended June 30, 2017 through the end of the 50-year funding period of June 30, 2045 under Illinois Math and Actuarial Math 2.0.

Most of the State’s contributions will be to pay off the unfunded liability. Under Actuarial Math 2.0, the State contributes more towards the \$61.6 billion unfunded liability earlier, reducing associated future interest costs, while also accumulating \$37 billion more in assets than Under Illinois Math. (This chart illustrates the concept of pay me now or pay me later, with interest.) Under Illinois Math, interest costs are substantially greater and TRS ends up only 90% funded by 2045.

The projected contributions are provided in Section 4 of the actuarial report.

Required Contributions

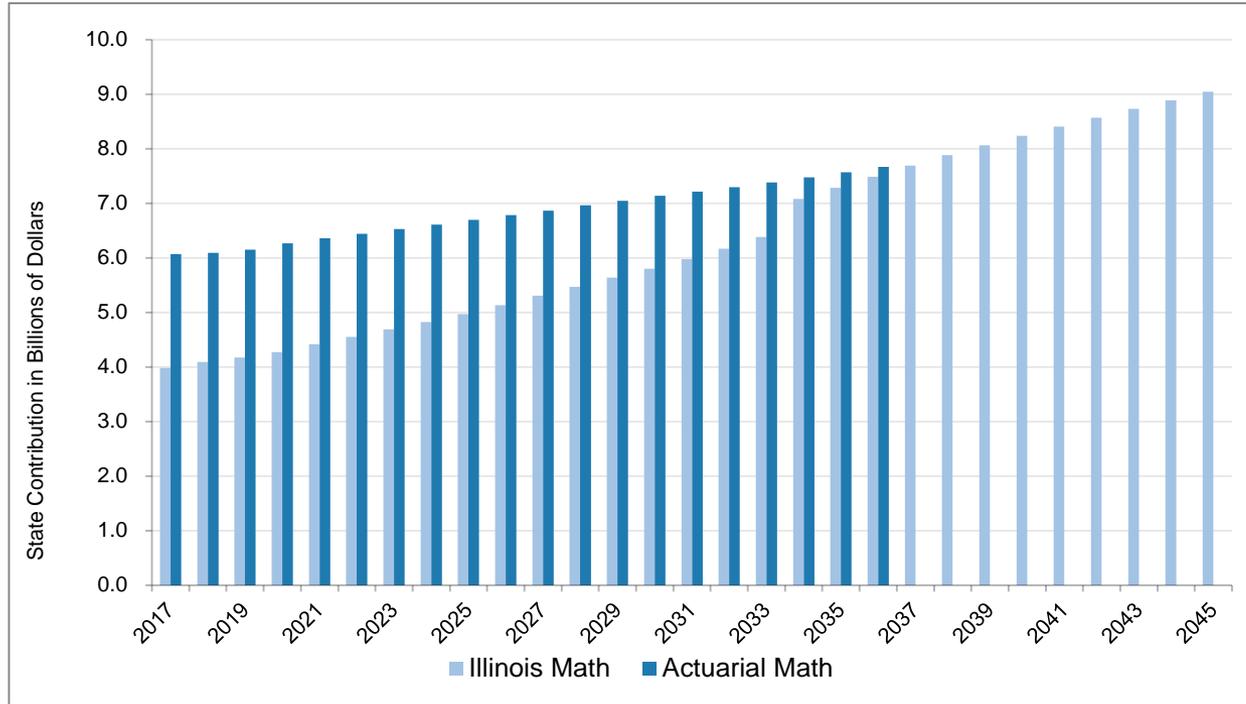
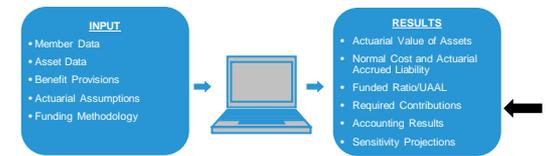


This graph provides a history and a projection of the unfunded actuarial accrued liability, or UAAAL, for TRS over the 50 year funding period under Illinois Math and Actuarial Math 2.0. The UAAAL is the difference between the actuarial value of assets (AVA) and the actuarial accrued liability (AAL), or the pension debt.

The UAAAL before the current valuation date has generally increased annually. While System experience has resulted in some of the increases and decreases in UAAAL, the State contributions mandated under the Illinois Pension Code were designed to allow the UAAAL to grow for more than three decades when the 50 year plan was put in place in 1995. The first year the UAAAL is projected to decrease is the year ending June 30, 2031. Under Actuarial Math 2.0, the UAAAL is projected to decrease immediately and is projected to continue to decrease until no UAAAL exists.

A detailed summary of the UAAAL is provided in Section 1 and a projection in Section 4 of the actuarial report.

Required Contributions

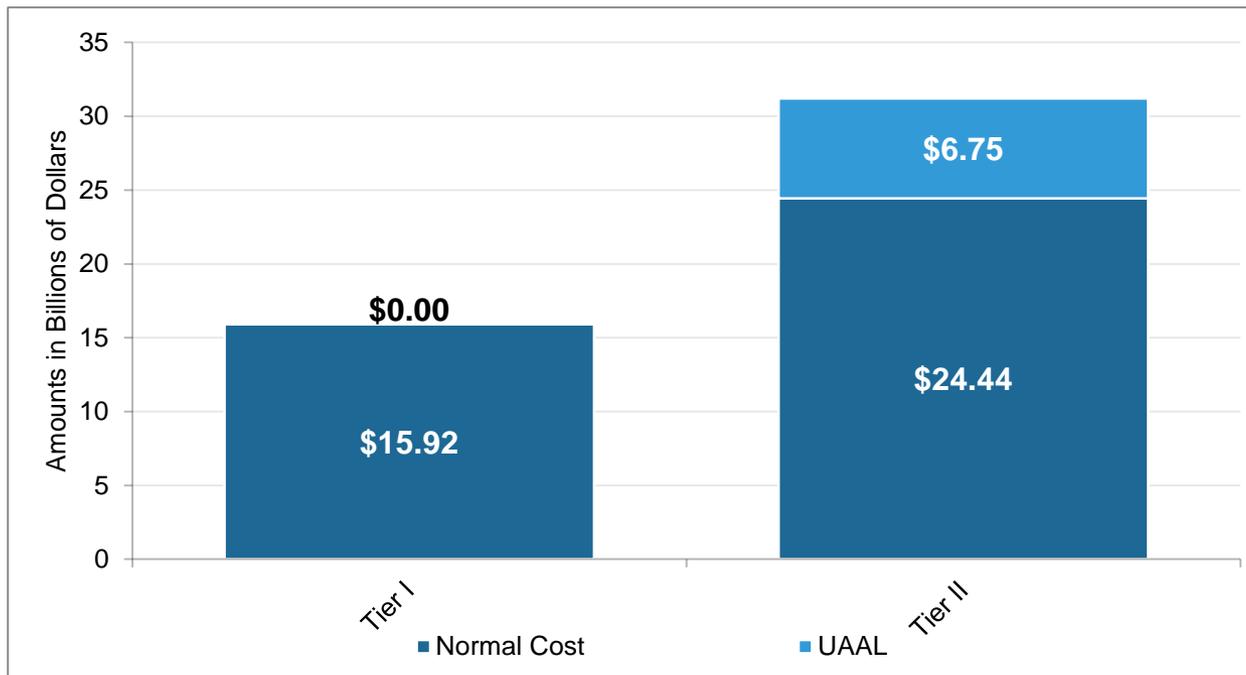
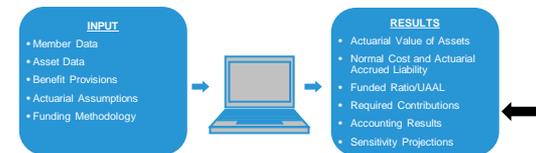


This graph provides a projection of State Contributions under Illinois Math and Actuarial Math 2.0.

Note that after the initial increase in contribution, there is a flatter contribution pattern under Actuarial Math 2.0 because the payment to unfunded liability is projected to increase. In addition, under Actuarial Math 2.0, the contribution is projected to decrease to zero when the unfunded liability is projected to be paid off if Actuarial Math 2.0 is adopted.

The projected contributions are provided in Section 4 of the actuarial report.

Required Contributions

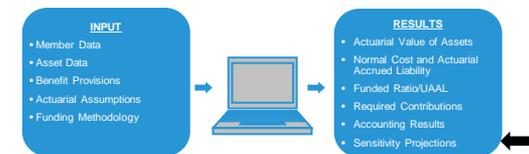


This graph provides a comparison of the Sources and Uses of teacher contributions split by Tier projected to be made from year ended June 30, 2017 through the end of the 50-year funding period of June 30, 2045.

Tier II member contributions are more than sufficient to fund Tier II benefits, and the excess is used to increase the overall funded ratio of TRS. These Tier II excess contributions increase the June 30, 2045 TRS funded ratio from 77% to the 90% target under the Illinois Pension Code. Tier II members are assisting the State by paying for part of the UAAL in addition to paying for all of their benefits.

The projected contributions are provided in Section 4 of the actuarial report.

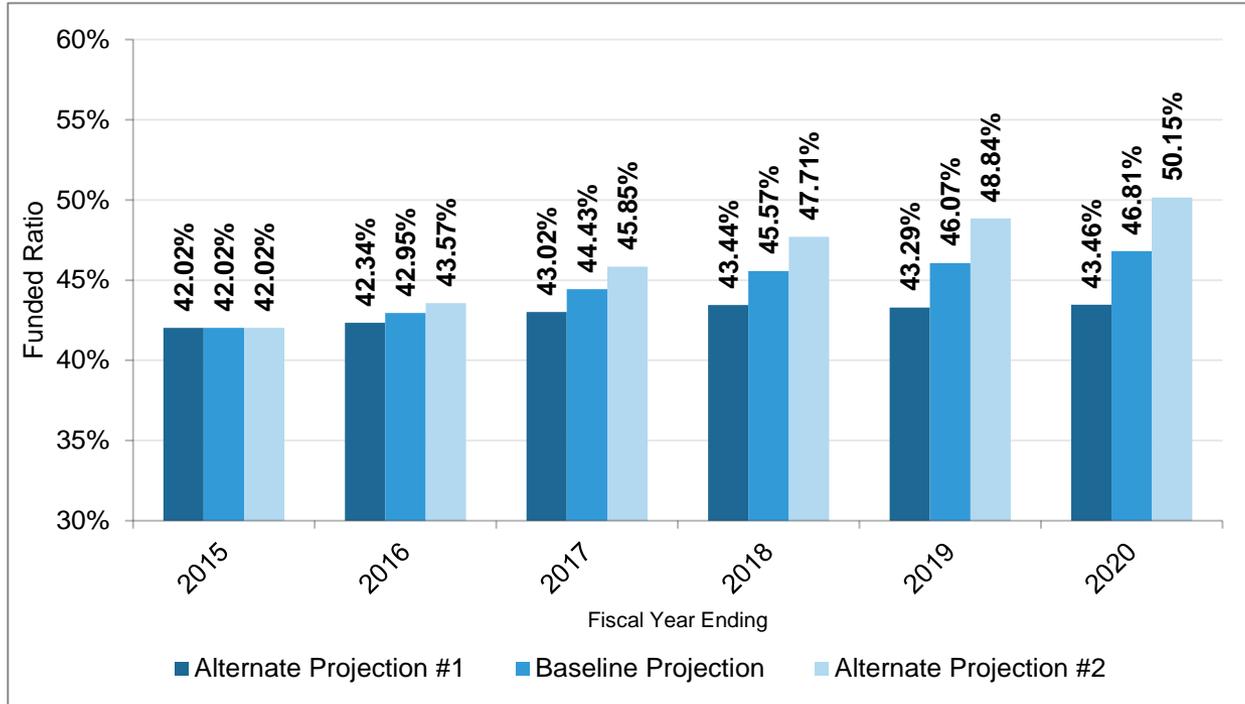
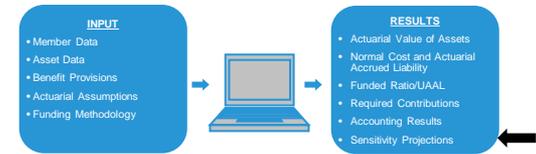
Sensitivity Projections



- Projections of employer contribution requirements and funded status into the future can be helpful planning tools for stakeholders.
- Projections of the actuarial valuation are known as deterministic projections. Deterministic projections are based on one set of assumptions in the future.
- The baseline deterministic projection is based on the valuation assumptions, including the use of an assumed rate of return of 7.50% for all years.
- Two alternate deterministic projections based on the same assumptions as the baseline deterministic projection, except for the following fiscal year ending June 30, 2016 return:
 - 0% asset return for FYE 2016 under Alternate Projection #1
 - 15% asset return for FYE 2016 under Alternate Projection #2

One of the truths of the Actuarial Valuation is that the assumptions rarely are realized from year to year – particularly the assumed asset return. Sensitivity projections can be used to give stakeholders a sense of the range of outcomes that can occur from year to year.

Sensitivity Projections

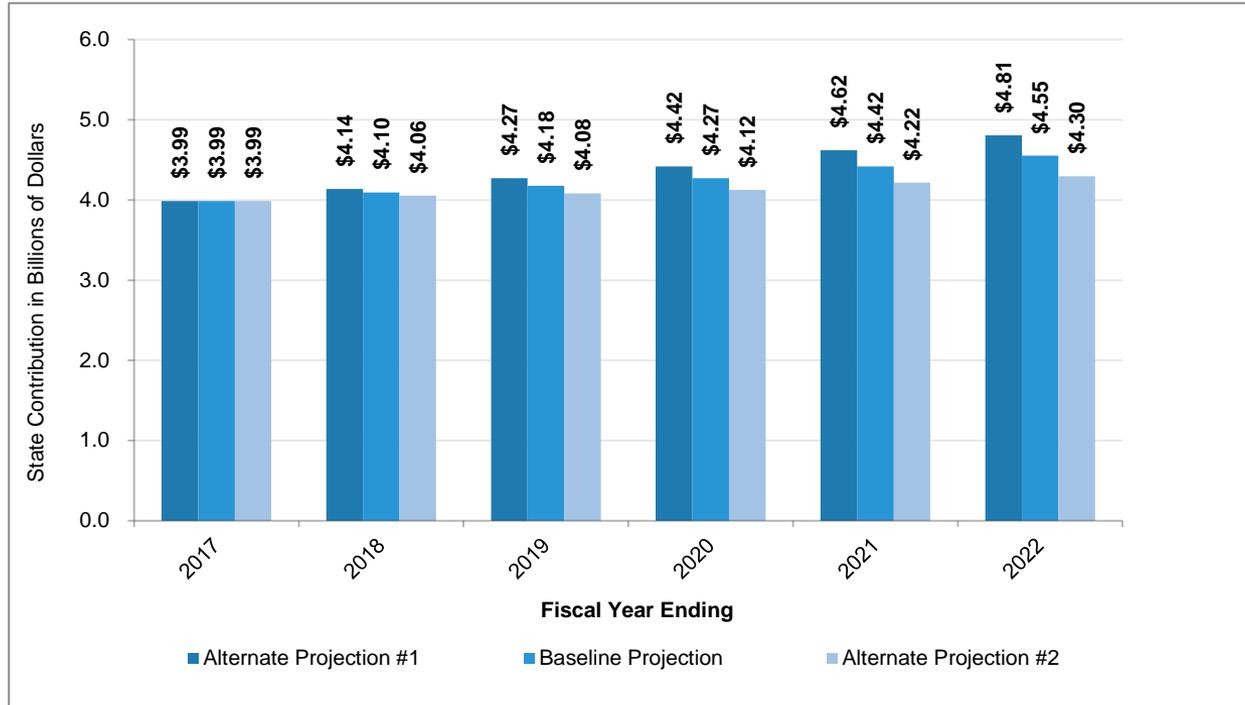
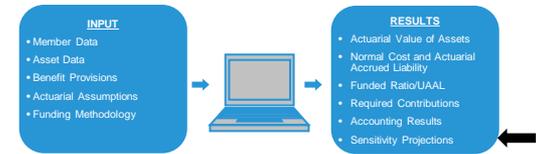


This graph provides a projection of the funded ratio based on the baseline valuation and the two alternate deterministic scenarios discussed on the previous slide.

The impact of investment returns on the valuation results can be significant. The impact in the first year is rather modest because only 20% of the alternate returns are reflected in the actuarial value of assets each valuation. By the fifth year, the returns are fully reflected in the valuation. On the next page we see the impact that these alternate scenarios have on employer contributions.

A summary of the deterministic projections is provided in Section 4 and the Executive Summary of the actuarial report.

Sensitivity Projections

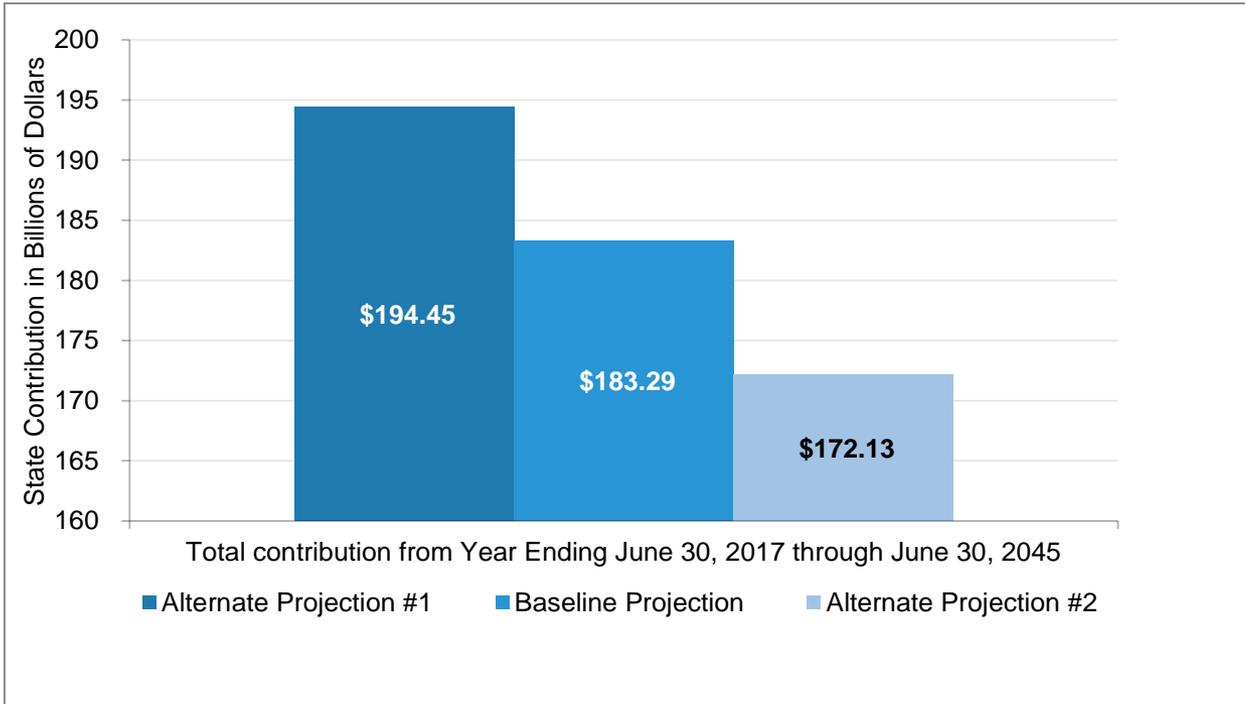
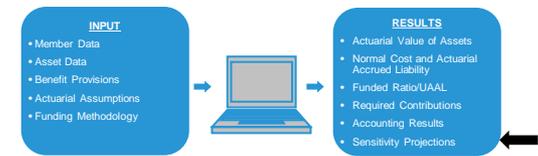


This graph provides a projection of the state required contributions on the baseline valuation and the two alternate deterministic scenarios discussed on the previous slides.

Similar to the impact on the funded ratio, the impact in the first year is rather modest because only 20% of the alternate returns are reflected in the actuarial value of assets each valuation. By the fifth year, the returns are fully reflected in the valuation. On the next page we see the impact on contributions over the funding period under these alternate return scenarios.

A summary of the deterministic projections is provided in Section 4 and the Executive Summary of the actuarial report.

Sensitivity Projections

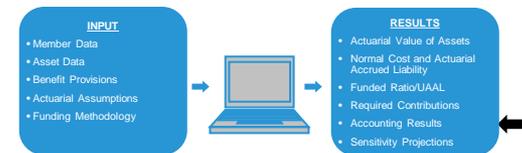


This graph provides the total state required contributions from the year ending June 30, 2017 through June 30, 2045 on the baseline valuation and the two alternate deterministic scenarios on the previous slides.

The total impact on contributions over the funding period is significant. The change in returns in alternative scenarios #1 and #2 is \$3.4 billion less or \$3.4 billion more than the baseline, respectively, yet the impact over time on contributions is over three times those amounts because of the long period of time that this change is funded under Illinois Math.

A summary of the deterministic projections is provided in Section 4 and the Executive Summary of the actuarial report.

Accounting GASB 67/68



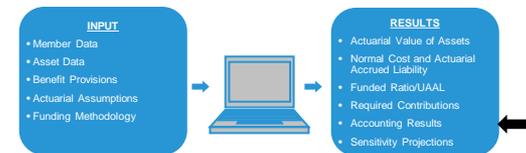
Net Pension Liability (Asset)	June 30, 2015	June 30, 2014
Total Pension Liability	\$ 111,916,989,345	\$ 106,682,654,886
less Plan Fiduciary Net Position	<u>46,406,915,593</u>	<u>45,824,382,514</u>
Net Pension Liability (Asset)	\$ 65,510,073,752	\$ 60,858,272,372
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability (Asset)	41.47%	42.95%

Schedule of Changes in Net Pension Liability as of June 30, 2015	
Total Pension Liability	
Service Cost	\$ 1,948,079,771
Interest	7,864,916,421
Changes of Benefit Terms	-
Difference between Expected and Actual Experience	(90,079,446)
Change of Assumptions	1,136,454,886
Benefit Payments, including Refund of Member Contributions	<u>(5,625,037,173)</u>
Net Change in Total Pension Liability	5,234,334,459
Total Pension Liability - Beginning of Year	\$ 106,682,654,886
Total Pension Liability - End of Year	\$ 111,916,989,345
Plan Fiduciary Net Position	
Employer Contributions	\$ 3,523,256,530
Member Contributions	935,451,049
Net Investment Income	1,720,926,108
Benefit Payments, including Refund of Member Contributions	(5,625,037,173)
Administrative Expenses	(21,794,589)
Other	<u>49,731,154</u>
Net Change in Plan Fiduciary Net Position	582,533,079
Plan Fiduciary Net Position - Beginning of Year	\$ 45,824,382,514
Plan Fiduciary Net Position - End of Year	\$ 46,406,915,593

This exhibit shows TRS's balance sheet and other disclosure information under GASB 67, effective for FYE June 30, 2015.

The accounting information is provided in Section 3 of the actuarial report.

Accounting GASB 67/68 (continued)



Sensitivity of the Net Pension Liability to Changes in the Discount Rate			
	1% Decrease	Current	1% Increase
Discount Rate	6.47%	7.47%	8.47%
Net Pension Liability (Asset)	\$ 80,954,388,749	\$ 65,510,073,752	\$ 52,845,317,289

This exhibit shows the sensitivity of the NPL under GASB 67, effective for FYE June 30, 2015.

Unlike GASB 25, GASB 67 is purely accounting and is not intended to represent a funding policy. GASB 67 prescribes the actuarial cost method, which is entry age normal, and asset method, which is the fair market value (no smoothing). The assumptions are the same for funding except the discount rate (interest rate) may fluctuate annually. As of June 30, 2015, the discount rate is 7.47%, funding is 7.50%. NPL is \$65.5 billion. (UAAL is \$62.7 billion)

The accounting information is provided in Section 3 of the actuarial report.

Key Observations

The actuarial valuation is done each year to replace the estimates the actuary assumed for the prior valuation with the actual events that happened. This past year, as expected, events happened that were not anticipated or were expected and materially impacted the results:

- The contribution made by the State of Illinois to TRS under the Illinois Pension Code was insufficient to keep the unfunded actuarial accrued liability from growing; while this was expected in our projections, it is worthwhile to note that this practice continues.
- Market value returns of 3.91% compared to 7.50% assumed
- Payroll increased 1.5%, which was less than the assumed increase
- In August 2015, Buck Consultants prepared a review of the economic and demographic assumptions. At the August 13, 2015 Board meeting, based on that review, the Board of Trustees adopted changes recommended by Buck Consultants for the June 30, 2015 valuation

Key Observations (continued)

- The annual cost of benefits earned by active teachers in TRS is \$1.9 billion, 18% of pay in FY 2017. This is the total normal cost.
- Teachers contribute about half of this through member contributions.
- Of the total employer contribution of \$4.1 billion for FY 2017 (\$4.0 billion of which is for the State), \$3.2 billion is for UAAL, and the other \$0.9 billion is for the employers' share of the normal cost and expenses.
- Because the employer contribution for UAAL will be less than the \$4.7 billion interest payment, the UAAL is projected to grow. The UAAL is expected to grow until 2031.
- New hires after January 1, 2011 will fully fund the cost of their benefit accruals, and excess contributions reduce the State's contributions toward the UAAL.
- Current funding problems are due to historic noncompliance with generally accepted actuarial principles and standards for determining State contributions.

Key Observations (continued)

- The funded ratio for TRS is among the worst in the United States. This is due to:
 - A lack of commitment from policy makers to keep TRS well-funded
 - A history of appropriating and contributing amounts far below that which a prudent actuary would recommend
 - A funding policy that systematically underfunds TRS
 - Changes in benefits that were unfunded and granted when the funded ratio of TRS was quite low
- Funding reform needs to occur for TRS or the benefits of its membership could be compromised.
- TRS will not invest itself out of its current financial shortfall. More funding is necessary.

A quote from the 2015 valuation report:

“By funding based on Illinois Math instead of Actuarial Math, the State has put the retirement security for the 403,000 current and former educators in the State of Illinois at risk. Meaningful funding reform should be implemented now.”

Presented for Board Certification

Summary of State Contributions under Illinois Pension Code and Actuarial Math 2.0	Fiscal Year 2017
1. Based on Statutory Funding Plan	
Total State Contribution for fiscal year 2017:	
a. Benefit Trust Reserve*:	
i. 39.12% of membership payroll	\$ 4,124,118,869
ii. minus School Districts Contribution (0.58% of membership payroll)	(61,138,899)
iii. minus Federal Funds Contribution State Contribution	<u>(77,196,619)</u>
b. Guaranteed Minimum Annuity Reserve	\$ 3,985,783,351
c. Total State Contribution (current law)	<u>800,000</u> \$ 3,986,583,351
2. Based on Actuarial Math 2.0	
Total State Contribution for fiscal year 2017:	
a. Benefit Trust Reserve*:	
i. normal cost plus amortization	\$ 6,248,879,280
ii. minus School Districts Contribution (0.58% of membership payroll)	(61,138,899)
iii. minus Federal Funds Contribution State Contribution	<u>(117,567,067)</u>
b. Guaranteed Minimum Annuity Reserve	\$ 6,070,173,314
c. Total State Contribution	<u>800,000</u> \$ 6,070,973,314
3. Total Normal Cost and Employer Normal Cost Rate for fiscal year 2017	
a. Total Normal Cost Rate (including administrative expenses)	18.08 %
b. Member Rate**	<u>(9.81)</u>
c. Employer Normal Cost Rate	8.27 %

* Expected fiscal year 2017 membership payroll is \$10,541,189,447

** The member contribution rate above is the projected rate for all member contributions, not just the base 9.40% contribution. Additional member contributions are assumed for optional service and Early Retirement Option.

Actuarial Math 2.0 is based on entry age normal cost method, current asset valuation method and amortization policy as follows:

- 20 year closed amortization of UAAL
- Use layered amortization, with new UAAL being amortized over 20 years regardless of source
- Amortization payment increase at the rate of future State revenue growth (assumed to be 2.0%)
- Minimum total contribution is no less than the normal cost in any given year

Presented for Board Certification (continued)

Item	Fiscal Year 2017
Expected State Contribution for fiscal year 2017 to THIS Fund:	
1. Fiscal Year 2017 Membership Payroll:	
a. Total	\$ 10,541,189,000
b. Minus Members who do not contribute to THIS Fund	(49,313,000)
c. Members who do contribute to THIS Fund	\$ 10,491,876,000
2. Member Contribution Rate (assumed)	1.12%
3. Matching State Contribution	
1.c. x 2.	\$ 117,509,000
4. Adjustment to THIS Fund for overestimating fiscal year 2015 Member THIS Fund Contributions	(7,806,000)
5. Total THIS Fund State Contribution*	\$ 109,703,000

* This certification does not include other State contributions to THIS Fund, which are not part of the statutory certification requirement.

Actuarial Certification

The results were prepared under the direction of Larry Langer and Paul Wilkinson who meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about them.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law.

Larry Langer, FCA, ASA, EA, MAAA
Principal, Consulting Actuary

Paul Wilkinson, ASA, EA, MAAA
Director, Consulting Actuary

Disclosures

- Buck's work product contained herein was prepared exclusively for the Board of Trustees and Staff of TRS. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of TRS.
- No third party recipient of Buck's work product should rely upon Buck's work product absent involvement of Buck or without our approval. Furthermore, because of past experience with previous work we have prepared for TRS, we feel obliged to strongly discourage third party recipients from misstating the results set forth in this work product. Third parties recipients inclined to present our work product should engage TRS and Buck during the presentation process to ensure that this work product is appropriately represented. If this is not desirable, such recipients should engage qualified professionals for advice appropriate to their own specific needs.
- The consultants who worked on this assignment are pension actuaries with significant experience in public funds like TRS. Buck's advice is not intended to be a substitute for qualified legal or accounting counsel.

Questions?

Thank You



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