

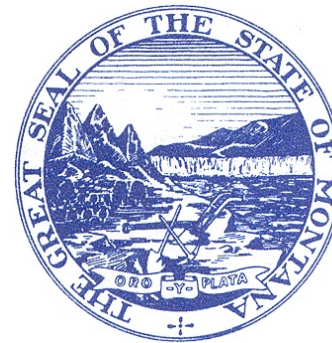


**Cavanaugh Macdonald**

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## Teachers' Retirement System of Montana Valuation as of July 1, 2009



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**Todd Green, ASA**

**Presented to SAVVA Committee**

**October 29, 2009**



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# Actuary 101



# Cash Flow Characteristics and Need for Actuarial Valuations



# Basic Retirement Funding Equation



$$C + I = B + E$$

C = Contributions

I = Investment Income

B = Benefits Paid

E = Expenses (administration)



# Two Fundamentally Different Methods of Financing Retirement Benefits



Social Security: Pay-As-You-Go

Current generation pays benefits of prior generation.

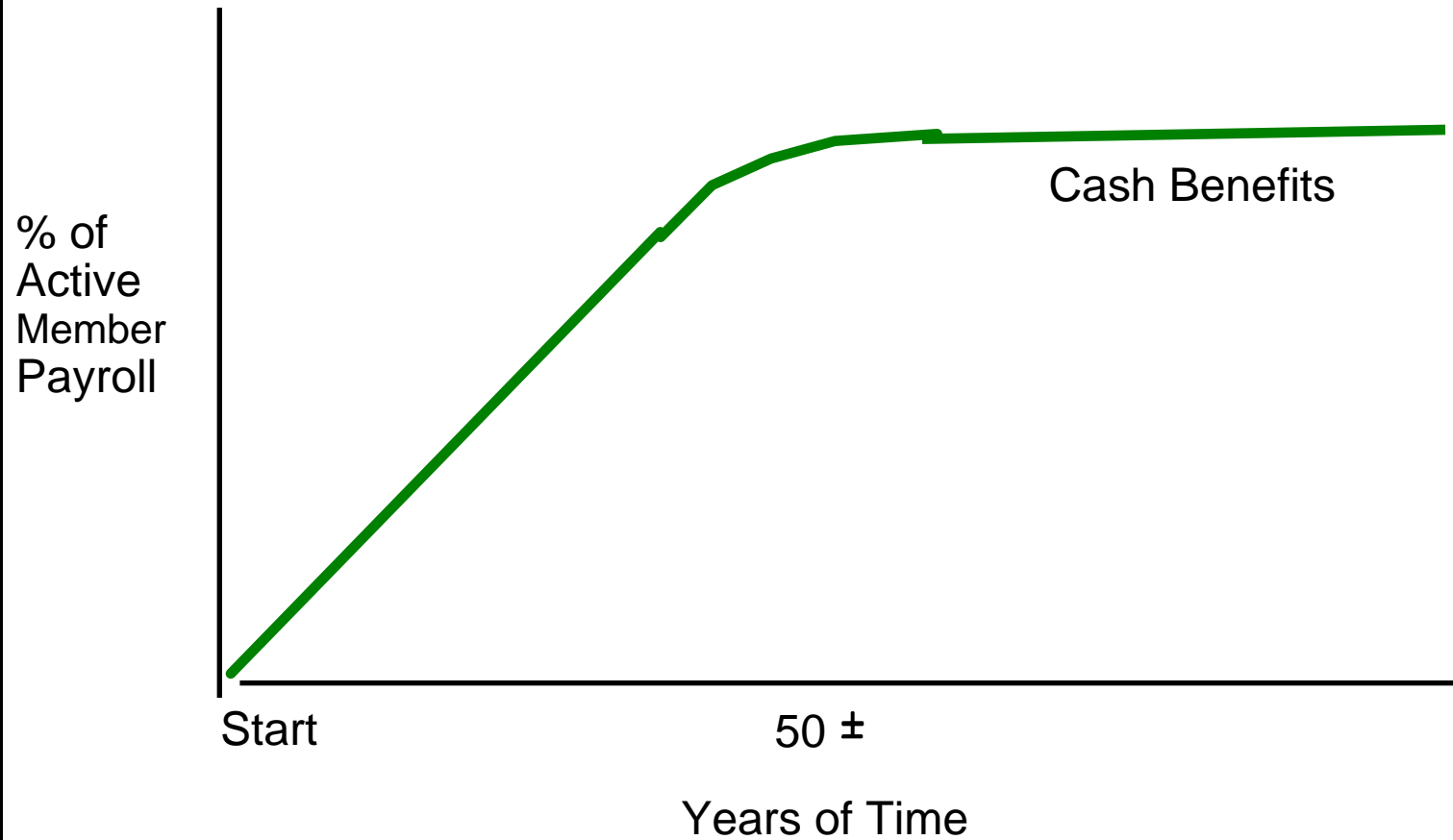
Most Public Systems:

Prefunded

Current generation saves money for its own retirement; prior generation did the same.

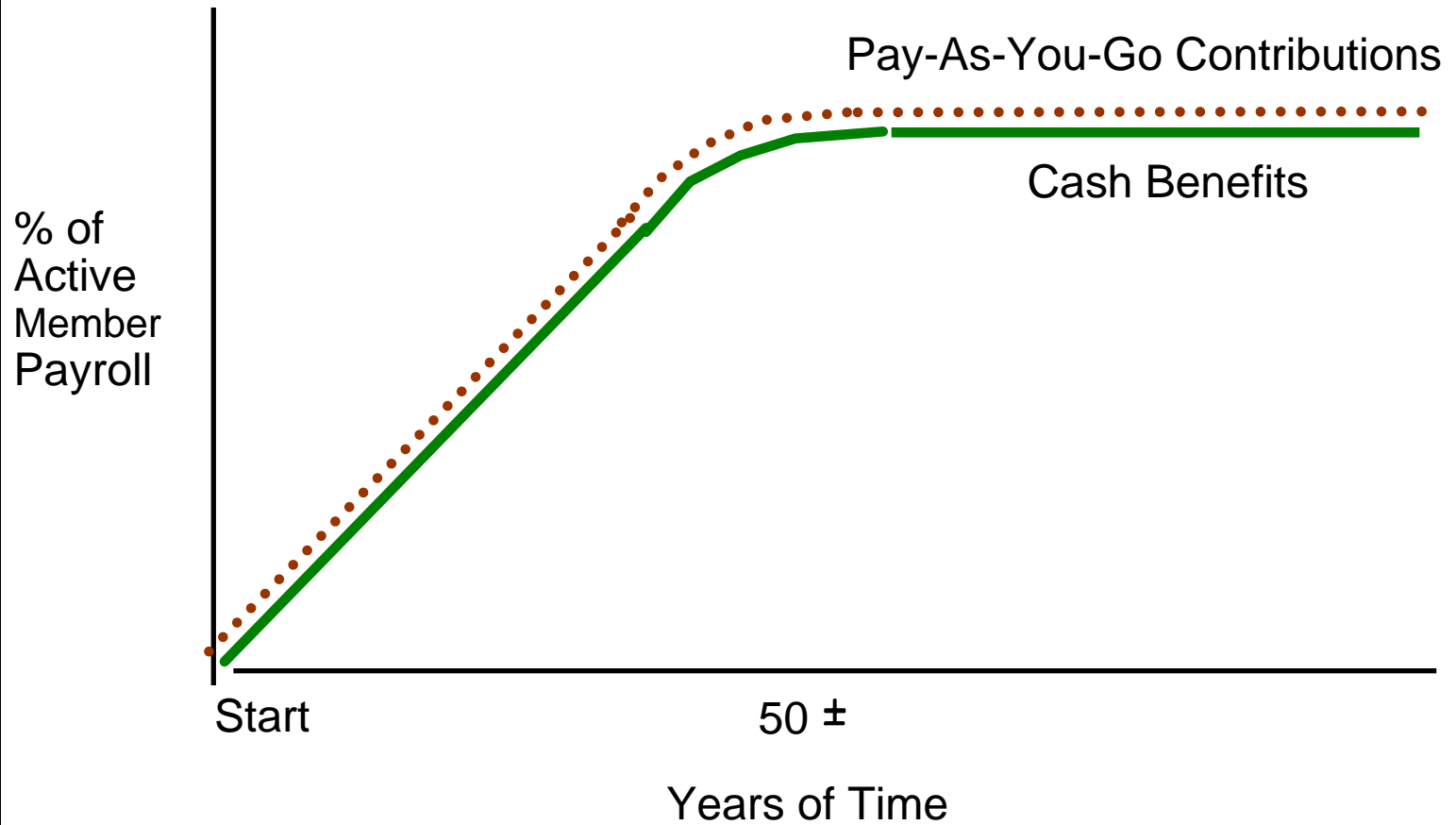


# Pay-As-You-Go





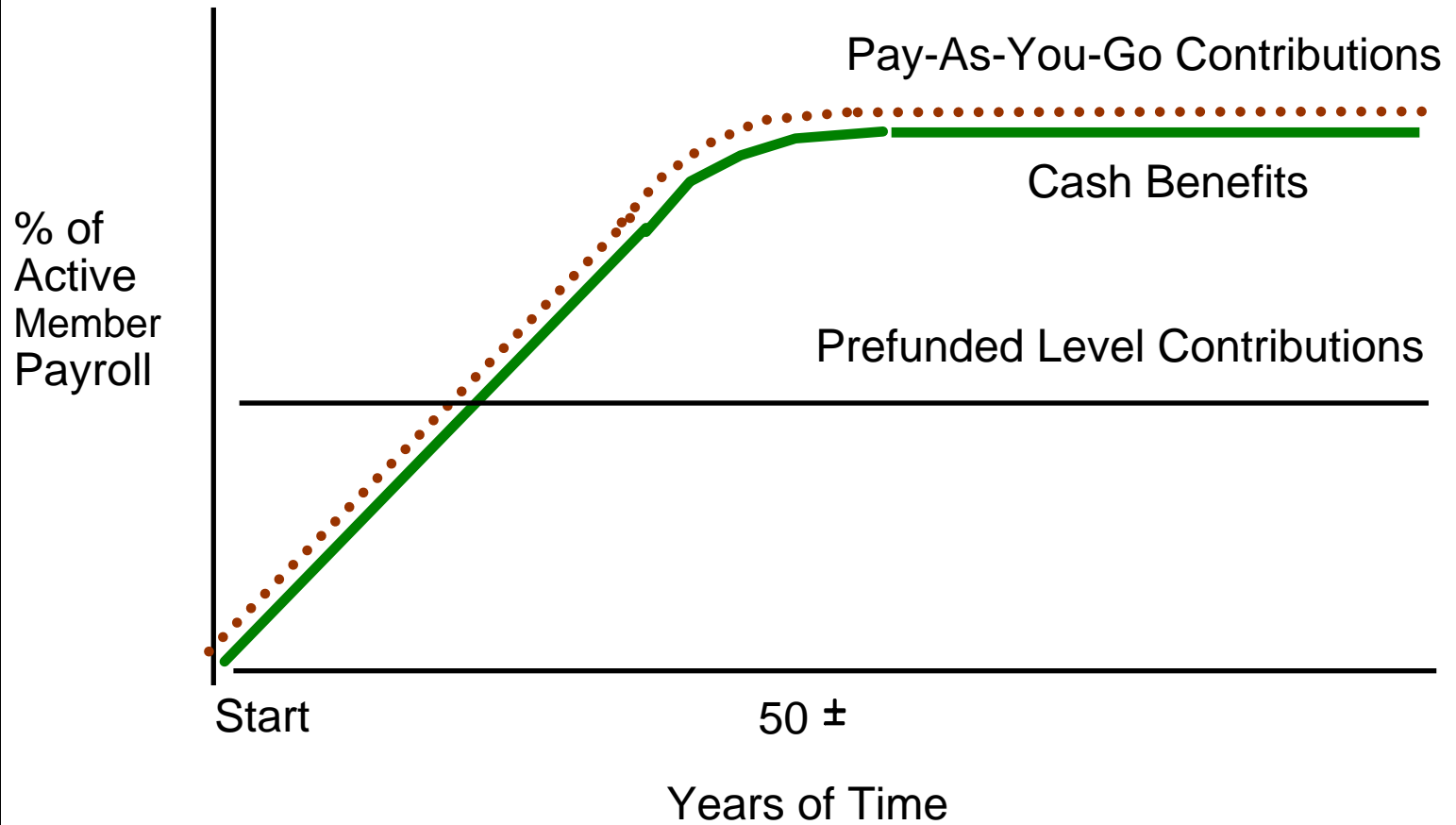
# Pay-As-You-Go





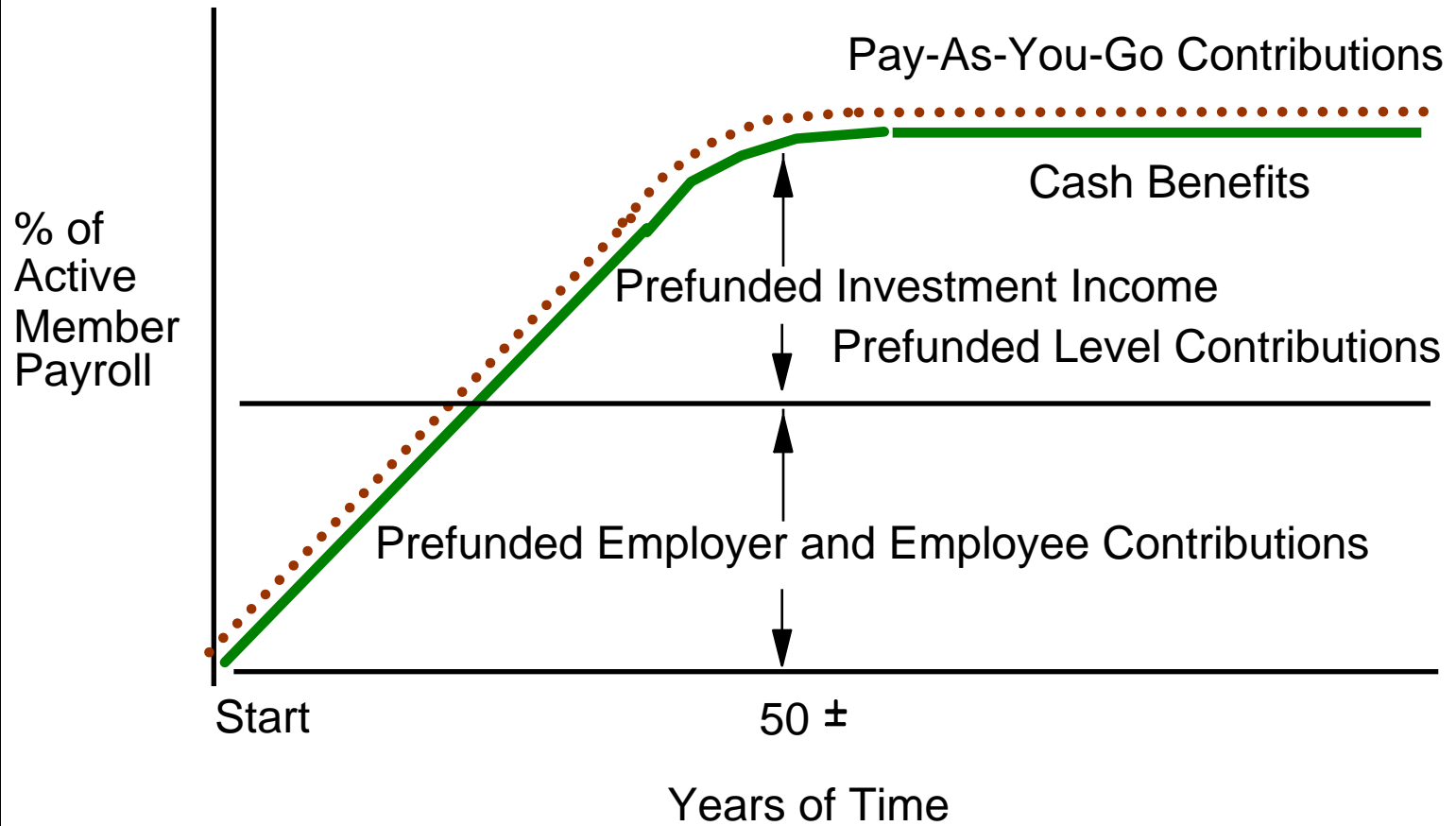


# Prefunding





# Prefunding





# Selecting Assumptions About Future Events



# Decremental



- Withdrawal
- Death while active
- Disability
- Retirement
- Death after retirement



# Economic



- Inflation
- Real return for assets
- Salary increases
- COLA's



# Understanding Economic Assumptions



$$\begin{array}{r} \text{Interest Rate} \qquad 7.75\% \\ - \text{ Inflation Rate } \qquad \text{ 3.50\% } \\ = \text{ Real Rate of Return } \quad 4.25\% \end{array}$$

Interest rate determines how much money we think we'll have.

Inflation rate tells us what we think it will buy.



# Fundamentals of Actuarial Valuations & Plan Sponsor Liabilities



# Census Data



VALUATION DATE	July 1, 2009	July 1, 2008
Active members		
Number		
Full-Time Members	12,673	12,694
Part-Time Members	5,783	5,598
Annual compensation	\$ 683,235	\$ 657,435
Retired members and beneficiaries		
Number	12,036	11,788
Annual allowances	\$ 219,267	\$ 208,985
Inactive Members		
Vested Terminated Members	1,640	1,649
Non-Vested Terminated Members	9,868	9,574





# Present Value



The present value of an amount of money payable in the future is the amount of money that, if we had it today, would accumulate to the amount that will be payable considering

- Investment Return
- Probability that money will be paid



# Present Value of Future Benefits



	<u>July 1, 2009</u> Total	<u>July 1, 2008</u> Total
<b>A. Active Members</b>		
Service Retirement	\$ 2,330.4	\$ 2,187.6
Disability Retirement	16.6	15.8
Survivors' Benefits	52.7	47.4
Vested Retirement	27.9	26.0
Refund of Member Contributions	27.9	27.5
Total	\$ 2,455.5	\$ 2,304.3
<b>B. Inactive Members and Annuitants</b>		
Service Retirement	\$ 2,256.4	\$ 2,161.3
Disability Retirement	19.8	18.8
Beneficiaries	139.6	132.9
Vested Terminated Members	56.6	58.1
Refund of Member Contributions	16.1	15.6
Total	\$ 2,488.4	\$ 2,386.7
<b>C. Grand Total</b>	<b>\$ 4,943.9</b>	<b>\$ 4,691.0</b>



# Normal Cost



## Contribution For

Normal Cost

## Description

Value of this year's expected benefit accruals



# Normal Cost



	<u>July 1, 2009</u> <u>Total</u>	<u>July 1, 2008</u> <u>Total</u>
Service retirement	8.74%	8.85%
Disability retirement	0.11%	0.11%
Survivors' benefits	0.29%	0.26%
Vested retirement	0.44%	0.45%
Refund of member contributions	<u>1.11%</u>	<u>1.20%</u>
Total Normal Rate	<u><u>10.69%</u></u>	<u><u>10.87%</u></u>
Employee Normal Rate	7.15%	7.15%
Employer Normal Rate	3.54%	3.72%



# Market Value of Assets



	<u>TOTAL TRS 2009</u>	<u>TOTAL TRS 2008</u>
<b>ADDITIONS</b>		
Contributions:		
Employer	\$ 66,850,644	\$ 67,930,235
Plan Member	57,256,365	59,560,549
Other	14,147,324	13,492,375
Total Contributions	<u>\$ 138,254,333</u>	<u>\$ 140,983,159</u>
Misc Income	\$ 15,421	\$ 15,654
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	\$ (671,716,604)	\$ (236,359,446)
Investment Earnings	70,040,815	96,731,693
Security Lending Income (Note A)	4,318,004	9,544,163
Investment Income/(Loss)	<u>\$ (597,357,785)</u>	<u>\$ (130,083,590)</u>
Less: Investment Expense	13,562,768	15,425,847
Less: Security Lending Expense (Note A)	1,897,208	7,802,791
Net Investment Income/(Loss)	<u>\$ (612,817,761)</u>	<u>\$ (153,312,228)</u>
Total Additions	<u>\$ (474,548,007)</u>	<u>\$ (12,313,415)</u>
<b>DEDUCTIONS</b>		
Benefit Payments	\$ 209,942,663	\$ 196,060,216
Withdrawals	5,170,028	5,694,601
Administrative Expense (Note D)	1,853,873	1,750,765
OPEB Expenses	49,496	47,478
Total Deductions	<u>\$ 217,016,060</u>	<u>\$ 203,553,060</u>
<b>NET INCREASE (DECREASE) IN PLAN NET ASSETS</b>	<u>\$ (691,564,067)</u>	<u>\$ (215,866,475)</u>
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS BEGINNING OF YEAR</b>	<u>\$ 2,993,392,632</u>	<u>\$ 3,209,259,107</u>
<b>END OF YEAR</b>	<u>\$ 2,301,828,565</u>	<u>\$ 2,993,392,632</u>



# Actuarial Value of Assets



Valuation Date July 1:	2008	2009	2010	2011	2012
A. Actuarial Value Beginning of Year	\$ 3,006,232,625	\$ 3,159,134,766			
B. Market Value End of Year	2,993,392,632	2,301,828,565			
C. Market Value of Beginning of Year	3,209,259,107	2,993,392,632			
D. Cash Flow					
D1. Contributions	140,983,159	138,254,333			
D2. Benefit Payments	(201,754,817)	(215,112,691)			
D3. Net	\$ (60,771,658)	\$ (76,858,358)			
E. Investment Income					
E1. Market Total: B. - C. - D3.	\$ (155,094,817)	\$ (614,705,709)			
E2. Assumed Rate	7.75%	7.75%			
E3. Amount for Immediate Recognition	246,362,679	229,009,668			
E4. Amount for Phased-in Recognition	(401,457,496)	(843,715,377)			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	\$ (100,364,374)	\$ (210,928,844)	\$ -	\$ -	\$ -
F2. First Prior Year	67,675,494	(100,364,374)	(210,928,844)	-	-
F3. Second Prior Year	-	67,675,494	(100,364,374)	(210,928,844)	-
F4. Third Prior Year	-	-	67,675,494	(100,364,374)	(210,928,844)
F5. Total Recognized Investment Gain	\$ (32,688,880)	\$ (243,617,724)	\$ (243,617,724)	\$ (311,293,218)	\$ (210,928,844)
G. Preliminary Actuarial Value End of Year A. + D3. + E3. + F5.	\$ 3,159,134,766	\$ 3,067,668,352			
H. Corridor					
H1. 80% of Market Value	\$ 2,394,714,106	\$ 1,841,462,852			
H2. 120% of Market Value	3,592,071,158	2,762,194,278			
I. Actuarial Value End of Year G. Not Less than H1. or Not Greater than H2	\$ 3,159,134,766	\$ 2,762,194,278			
J. Difference Between Market & Actuarial Values	\$ (165,742,134)	\$ (460,365,713)			



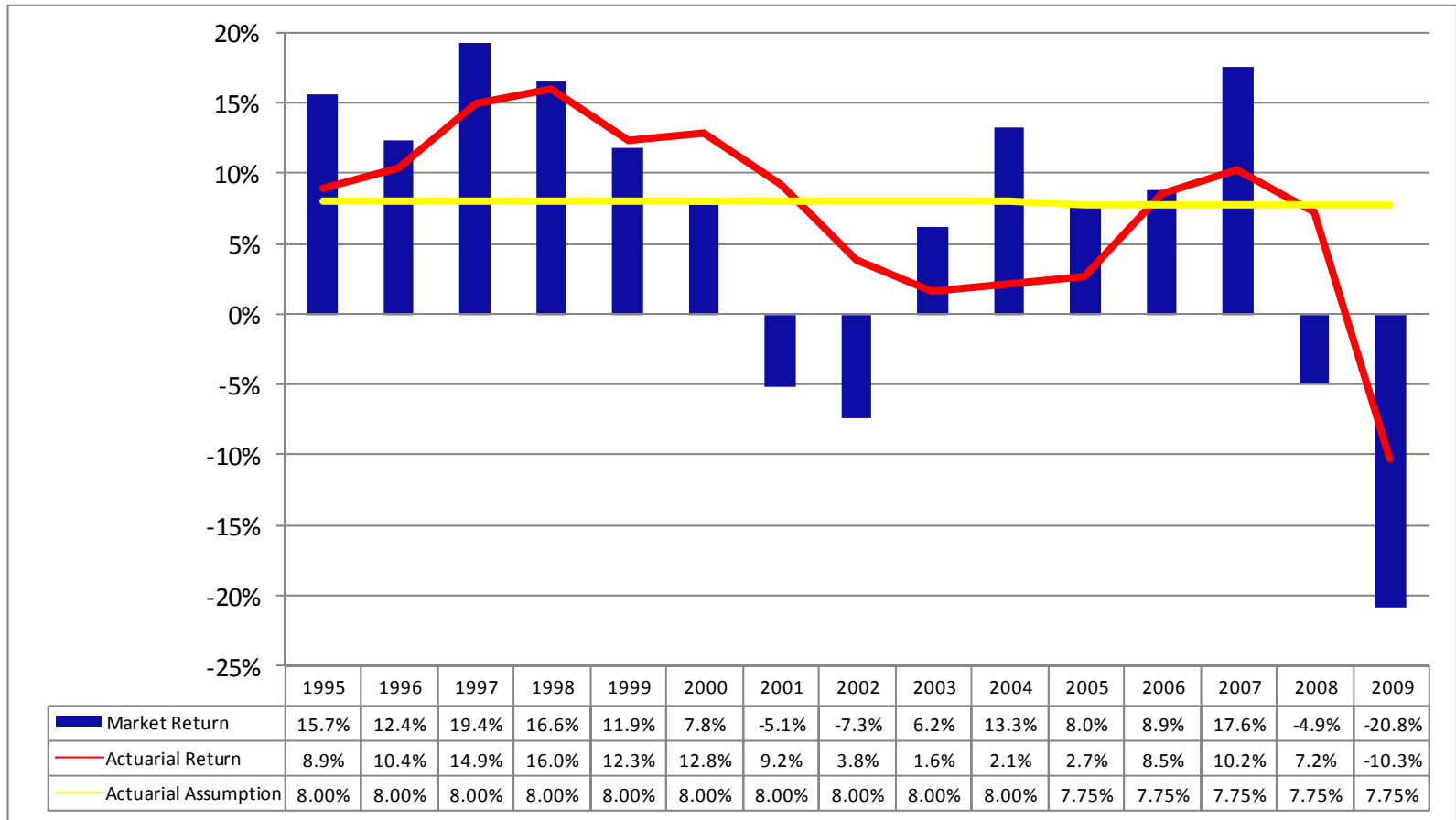
# Historical Investment Returns



<u>Fiscal Year Ending</u>	<u>Market Returns</u>	<u>Actuarial Returns</u>	<u>Actuarial Return Over 8.00% Assumption</u>
June 30, 1995	15.7%	8.9%	0.9%
June 30, 1996	12.4%	10.4%	2.4%
June 30, 1997	19.4%	14.9%	6.9%
June 30, 1998	16.6%	16.0%	8.0%
June 30, 1999	11.9%	12.3%	4.3%
June 30, 2000	7.8%	12.8%	4.8%
June 30, 2001	(5.1)%	9.2%	1.2%
June 30, 2002	(7.3)%	3.8%	(4.2)%
June 30, 2003	6.2%	1.6%	(6.4)%
June 30, 2004	13.3%	2.1%	(5.9)%
<u>Fiscal Year Ending</u>	<u>Market Returns</u>	<u>Actuarial Returns</u>	<u>Actuarial Return Over 7.75% Assumption</u>
June 30, 2005	8.0%	2.7%	(5.0)%
June 30, 2006	8.9%	8.5%	0.7%
June 30, 2007	17.6%	10.2%	2.5%
June 30, 2008	(4.9)%	7.2%	(0.6)%
June 30, 2009	(20.8)%	(10.3)%	(18.0)%
15 Year Average	6.0%	7.2%	(0.8)%



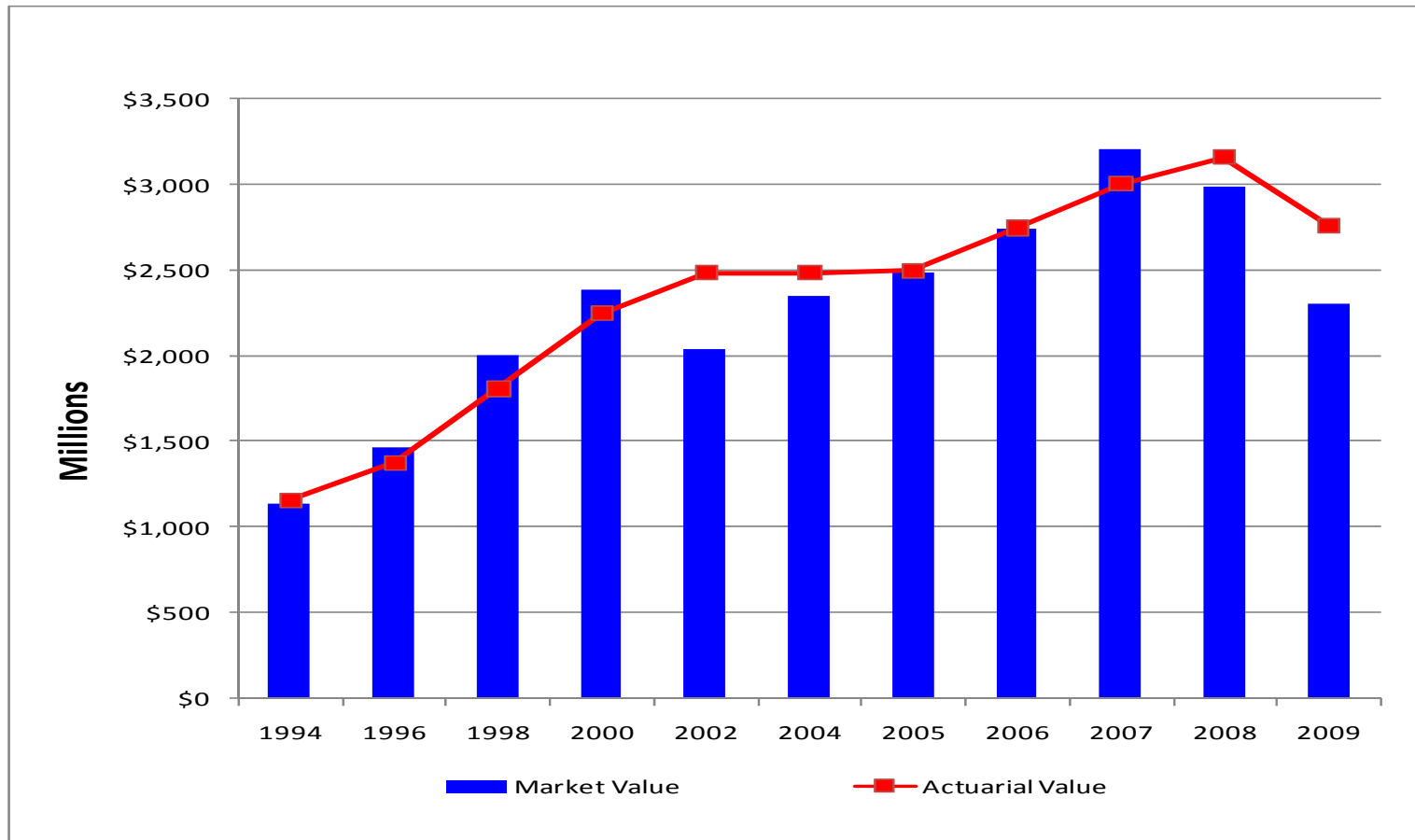
# Historical Investment Returns







# Market Value Vs. Actuarial Value





# Unfunded Accrued Liability Contribution Rate



## Contribution For

Unfunded Accrued  
Liability  
(UAL)

## Description

Accrued Liability –  
Actuarially Valued Assets

"Unfunded Accrued Liabilities" are a natural part of retirement system funding, comparable to a mortgage on a home. A plan which is 100% funded is required to contribute the normal cost.



# Unfunded Actuarial Accrued Liability



	July 1, 2009	July 1, 2008
A. Actuarial present value of all future benefits for present and former members and their survivors (Table 6)	\$ 4,943.9	\$ 4,691.0
B. Less actuarial present value of total future normal costs for present members	<u>612.9</u>	<u>580.2</u>
C. Actuarial accrued liability	\$ 4,331.0	\$ 4,110.8
D. Less present value of future university supplemental contributions	157.2	\$ 157.1
E. Less assets available for benefits	<u>2,762.2</u>	<u>3,159.1</u>
F. Unfunded actuarial accrued liability	\$ 1,411.6	\$ 794.6



# Actuarial (Gains)/Losses



	June 30, 2009	June 30, 2008	June 30, 2007
<b>Investment Income</b>			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ 561.9	\$ 17.0	\$ (67.7)
<b>Pay Increases</b>			
Pay increases were (less) greater than expected.	(4.4)	4.8	2.5
<b>Age &amp; Service Retirements</b>			
Members retired at (older) younger ages or with (less) greater final average pay than expected	6.3	(1.0)	(0.9)
<b>Disability Retirements</b>			
Disability claims were (less) greater than expected	0.4	0.2	0.2
<b>Death-in-Service Benefits</b>			
Survivor claims were (less) greater than expected	(0.2)	0.3	(1.0)
<b>Withdrawal From Employment</b>			
(More) less reserves were released by withdrawals than expected	4.7	1.7	7.2
<b>Death After Retirement</b>			
Retirees (died younger) lived longer than expected	(2.8)	(6.3)	0.5
<b>Other</b>			
Miscellaneous (gains) and losses	12.0	2.5	(1.6)
<b>Total (Gain) or Loss During Period From Financial Experience</b>	\$ 577.9	\$ 19.2	\$ (60.8)
<b>Non-Recurring Items.</b>			
Changes in actuarial assumptions caused a (gain) loss.	-	(10.6)	-
Changes in benefits caused a (gain) loss.	-	-	-
<b>Composite (Gain) Loss During Period.</b>	\$ 577.9	\$ 8.6	\$ (60.8)



# Schedule of Funding Progress



Actuarial Valuation Date	Actuarial Value of Assets	Actuarial Accrued Liabilities (AAL)	Present Value of Future University Supplemental Contributions	Unfunded Actuarial Accrued Liabilities (UAAL)	Funded Ratio	Covered Payroll	UAAL as a Percentage of Covered Payroll
July 1, 1998	1,809.0	2,123.3	90.6	223.7	89.0%	529.8	42.2%
July 1, 1998	1,809.0	2,342.7	90.6	443.1	80.3%	529.8	83.6%
July 1, 2000	2,247.5	2,648.3	96.4	304.4	88.1%	537.5	56.6%
July 1, 2000	2,247.5	2,652.0	96.4	308.1	87.9%	537.5	57.3%
July 1, 2002	2,484.8	2,980.1	111.8	383.5	86.6%	563.2	68.1%
July 1, 2004	2,485.7	3,359.2	115.7	757.8	76.6%	600.7	126.2%
July 1, 2005	2,497.5	3,527.0	126.2	903.3	73.4%	612.6	147.5%
July 1, 2006	2,745.8	3,733.6	124.7	863.1	76.1%	636.0	135.7%
July 1, 2007	3,006.2	3,928.5	153.4	768.9	79.6%	664.1	115.8%
July 1, 2008	3,159.1	4,110.8	157.1	794.6	79.9%	689.5	115.2%
July 1, 2009	2,762.2	4,331.0	157.2	1,411.6	66.2%	683.2	206.6%



# Annual Required Contribution (ARC)



## CONTRIBUTIONS FOR FISCAL YEARS ENDING

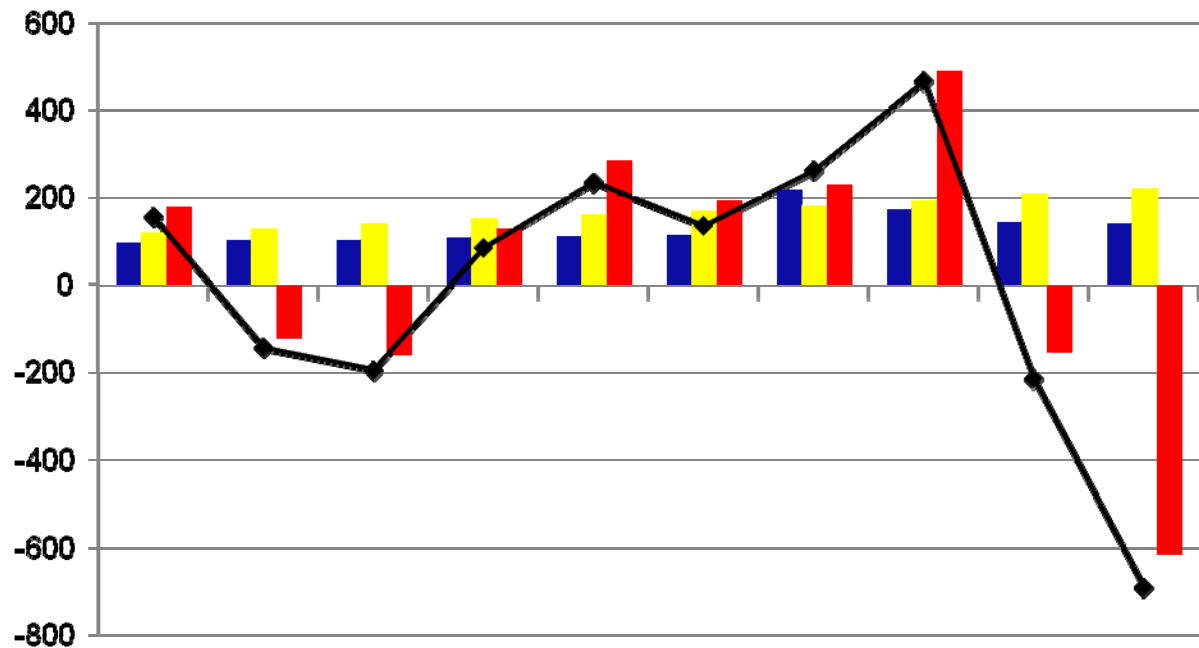
	2012	2010 and 2011
Total Normal Rate	10.69%	10.87%
Employee Contribution Rate	<u>7.15%</u>	<u>7.15%</u>
Employer Normal Rate	3.54%	3.72%
Employer Statutory Contribution Rate		
Normal Rate	3.54%	3.72%
UAL Rate	<u>6.42%</u>	<u>6.24%</u>
Total Rate	9.96%	9.96%
Amortization Period	Infinite	31.3
Required Increase in Statutory Contribution Rate	4.11%	0.17%
Employer ARC under GASB		
Normal Rate	3.54%	3.72%
UAL Rate	<u>10.53%</u>	<u>6.41%</u>
Total Rate	14.07%	10.13%
Amortization Period	30	30



# Cash Flow



## Historical



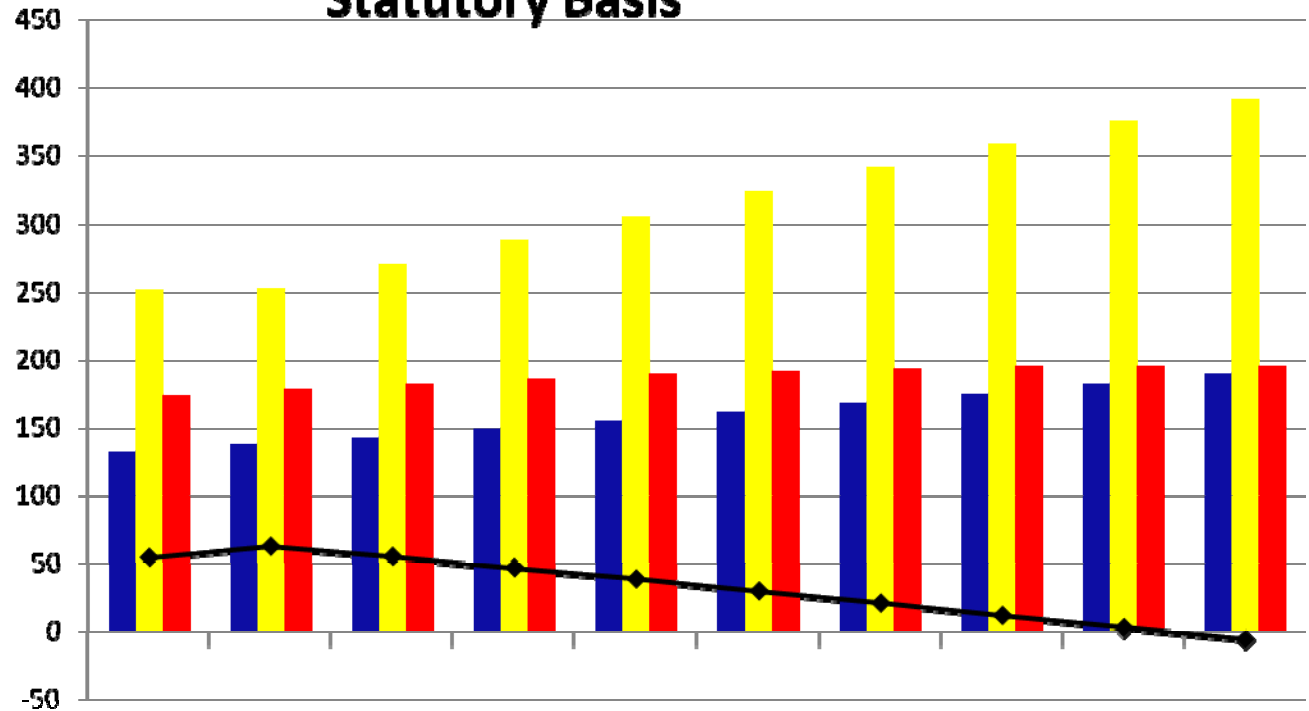
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Contributions	94.1	99.9	100.2	104.3	107.9	110.7	212.3	169.2	141.0	138.3
Benefits & Adm. Expenses	115.8	126.0	138.1	148.6	158.5	167.1	178.4	190.4	203.6	217.0
Investment Income	175.2	-119.1	-159.6	126.2	281.8	188.7	224.8	484.5	-153.3	-612.8
Net Cash Flow	153.5	-145.2	-197.5	81.9	231.2	132.3	258.7	463.3	-215.9	-691.5



# Cash Flow Projection



## Statutory Basis



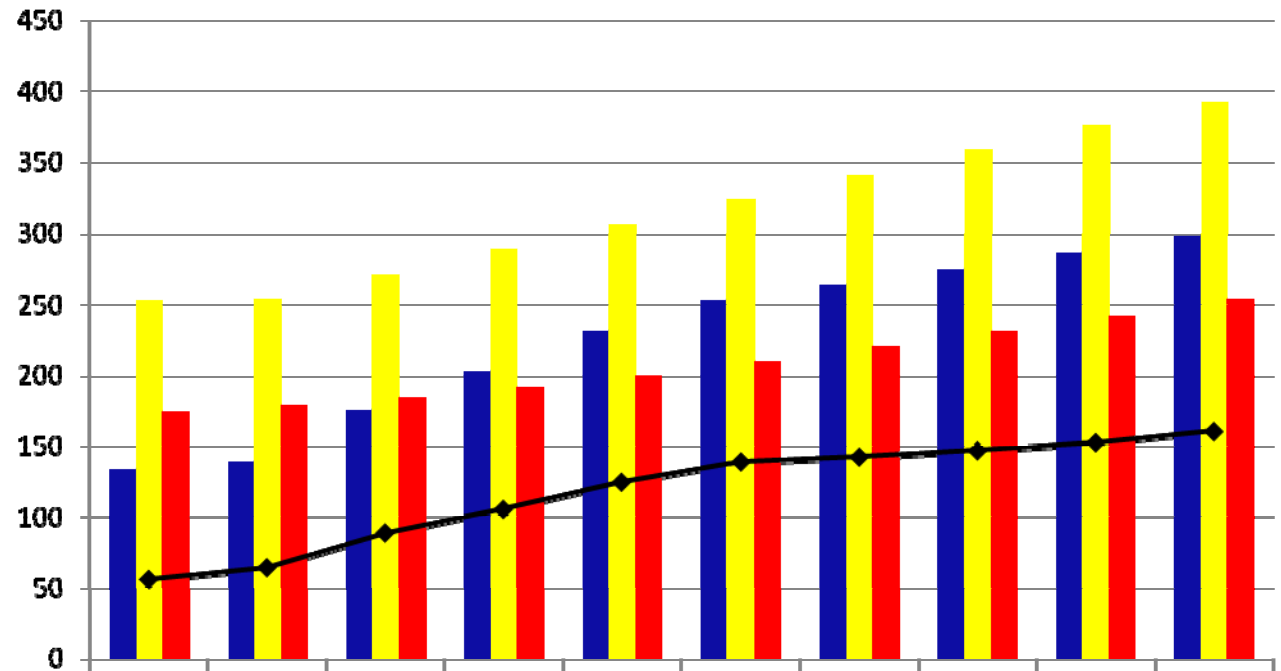
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Contributions	132.4	137.4	142.9	148.6	154.6	160.9	167.6	174.6	182.0	189.7
Benefits & Adm. Expenses	252.1	253.2	270.5	288.3	305.8	323.5	341.1	358.4	375.3	391.3
Investment Income	173.8	178.1	182.5	186.2	189.4	191.9	193.8	194.9	195.4	195.3
Net Cash Flow	54.1	62.3	54.8	46.5	38.2	29.3	20.3	11.2	2.1	-6.4





# Cash Flow Projection

## ARC Basis



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Contributions	133.7	138.7	174.9	202.2	230.5	252.9	263.3	274.4	285.9	298.0
Benefits & Adm. Expenses	252.1	253.2	270.5	288.3	305.8	323.5	341.1	358.4	375.3	391.3
Investment Income	173.8	178.2	183.9	191.1	199.7	209.5	220.0	230.8	241.9	253.6
Net Cash Flow	55.4	63.7	88.3	105.0	124.3	138.9	142.3	146.7	152.5	160.2



# Estimated Projected Employer ARC



<u>Fiscal Year Ended</u>	<u>Employer ARC</u>
2010	10.13%
2011	10.13%
2012	14.07%
2013	16.56%
2014	18.95%
2015	20.43%