

Reversing Course from Defined Contribution to Defined Benefit Plans  
– An Analysis of Retirement Plan Choice among Faculty

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## – An Analysis of Retirement Plan Choice among Faculty

### ABSTRACT

Investing for retirement is simply transferring a fraction of one's present resources for consumption in the future. The challenge to this simplicity arises from the two critical concerns 'sufficiency' and 'certainty'. This paper analyzes the two contrasting choices offered to the faculty by Massachusetts state retirement system, a defined benefit plan (SERS) versus the defined contribution plan (ORP). The annuity payments made in the retirement years from the SERS is a conservative option for the employees since they are transferring the risk to State hence addresses the *certainty* concern. The ORP option is riskier since all the risk is borne by the employee but has a potential to generate higher annuity payments in retirement as all the contributions are held in an individual account and the account owner can benefit from higher returns on the invested portfolio – thus addressing the *sufficiency* concerns. We compute and compare the annuity streams from these two retirement options and conclude that when the faculty has thirty or more years in employment, even a moderate return of eight percent annually will make them better off with the defined contribution option.

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*Key Words:* Retirement plans, Defined Benefits, Defined Contributions, Retirement Plan Choice  
*JEL classification:* G28, H75, I23, J26

# **Reversing Course from Defined Contribution to Defined Benefit Plans**

## **– An Analysis of Retirement Plan Choice among Faculty**

### **Introduction**

*“There is a minute and twenty-one seconds left on the clock in the 2002 Super Bowl, and the score is tied. The New England Patriots have the ball on their own 17-yard line. They are playing against the heavily favored St. Louis Rams. They have no time-outs left. Everyone assumes that the Patriots will kneel down and take the game into overtime<sup>1</sup>.....*In relative sense this would seem like a storyline experienced by all new faculty joining Massachusetts state colleges. These new hires find themselves facing a strict deadline to take a decision between two very contrasting retirement choices – a choice that will define their lives in retirement.

Retirement systems both in the private as well as public sector, once dominated by defined benefit (DB) pensions have been transitioning towards defined contribution (DC) plans in the last three decades. Although DB plans still exist in many federal, state and local governments and agencies, most of them have either added DC plans in addition to the DB plans or eliminated DB plans altogether in the last thirty years. Membership in the Massachusetts State Employee Retirement System (SERS) is mandatory for all employees with the exception of full-time teaching faculty, vice presidents, presidents and deans who have the option of participating in either SERS or the Optional Retirement Program (ORP). The Optional Retirement Plan (ORP) is administered by the Board of Higher Education. New hires in these job categories are given 90 days in which to decide which retirement plan they wish to enroll in. The decision to join either

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<sup>1</sup> Adapted from the Book “How we Decide” by Jonah Lehrer. The Patriots went on to win the Super Bowl in regulation time – considered as one of the biggest upsets in NFL history.

the Optional Retirement Plan or the State Employees' Retirement plan in most instances is an "irrevocable" choice.

Massachusetts State Employee Retirement System (SERS) is a defined-benefit type of pension plan. This plan promises a specified benefit at retirement. On the other hand, the Optional Retirement Program (ORP) is a defined-contribution plan and the retirement benefits are based on contributions into individual accounts and the value of these accounts at the time of retirement. Prior research has looked into the aspect of decision making between these two choices by focusing on the characteristics of various workers such as their age and expected working span. The logic dictates that an individual when faced with such a choice of enrolling in a defined-benefit plan or a define-contribution plan will assess the present value of being in each plan and opt for the one with highest expected return after adjusting for risk.

The motivation for our paper originated when we observed the developments in regards to the progress of Senate Bill 1173 (SB 1173<sup>2</sup>) and its impact on retirement benefits of faculty and staff at Massachusetts state colleges and universities. SB 1173, 'The Opportunity for an Informed Choice between the Optional Retirement Plan (ORP) and The State Employees Retirement System', is a bill that would allow employees enrolled in the ORP a one-time opportunity to join the State Employees Retirement System (SERS). The buyback would be completed at no cost to the state and would require participants to buy into SERS by paying in ORP retirement funds with interest. Members of the optional retirement program who make application for transfer into the state retirement system shall, subject to the rules and regulations of the state board of retirement, be notified by the state board of their eligibility for transfer and if eligible shall have 180 days from notification to (1) transfer all assets held in the optional

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<sup>2</sup> Senate Docket, NO. 496 Filed on 1/12/2009

retirement program (2) pay in one lump sum or enter into an installment agreement to pay any amount owed for purchase of creditable service not covered by the transfer of ORP assets.

### ***The Debate***

Various studies including ‘Promises with a Price’ by PEW research provide alarming indications with respect to increasing long term costs of state DB pension programs. Novy-Marx and Rauh (2009) address the same issue and indicate that, as of December 2008 all fifty states had in aggregate \$1.94 trillion in DB pension assets and were underfunded by \$3.23 trillion<sup>3</sup>. Research<sup>4</sup> of individual retirement accounts, during the same period, has shown that market volatility, inadequacy of investment options and investor choices have resulted in below par performance of DC accounts leaving retirees vulnerable with smaller and insufficient nest eggs. In context of such research we observe the developments in regards to the progress of Senate Bill 1173 (SB 1173<sup>5</sup>) and its impact on retirement benefits of faculty at Massachusetts state colleges and universities.

The objective of this paper is to compute the returns based on historical averages and make both concrete predictions and recommendations as to which of these two choices is more appropriate for an individual contingent on age and expected years of service. This paper expands on the work done by Clark and Pitts (1999). They too look at a similar situation at North Carolina State University (NCSU) but differ in their goal and methodology. Based on the actual data collected from the school administrative records about the decisions made by new hires on

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<sup>3</sup> The underfunded pensions – the gap between pension assets and liabilities is off-balance-sheet government debt. This “pension-debt” dwarfs the States’ publicly traded debt of \$0.94 trillion (Novy-Marx, Rauh (2009))

<sup>4</sup> A recent study by Fidelity Investments highlights that 75% of the growth in 401(K) accounts is on account of employee contributions and only 25% of the growth is on account of investment performance over the 1999 – 2009 period.

<sup>5</sup> Senate Docket, NO. 496 Filed on 1/12/2009

the choice of enrollment in retirement plans they measure the probability of an individual choosing a defined-contribution type plan versus a defined-benefit plan. Their results indicate a strong trend towards individuals increasingly choosing defined-contribution type plan. They conclude that in the academic labor market the most likely reason for this preference is the avoidance of the mobility risk associated with the loss of pension benefits that is inherent in the defined-benefit plan.

If the choice of retirement plan was trending towards defined-contribution type of retirement plans then why is a law such as SB 1173 gathering momentum. Papke (2004) studies the pension plan choice of Michigan state employees. In 1998, Michigan gave the public employees in its second largest defined-benefit pension plan an opportunity to transfer vested benefits to an individual account in a portable 401(k) plan. Papke found that the take-up rate was fairly low – about 5.5 percent of about 58,000 state employees switched to the DC plan. Results such as these and demand for laws such as SB 1173 raises a question – do new hires choose correctly between the defined-benefit plan and the defined-contribution plan, or is it that the nervousness they sense about the defined contribution plan mid-way through their career is an erroneous anxiety.

Clark and Pitts work provides further motivation to explore the decision making process. In their paper they also survey the new hires to NCSU faculty and discover that less than five percent of new hires consulted with financial planners before making a choice and a super majority of them consulted only one other person before making decision – their respective spouse. These survey results add to the ambiguousness of decision making process when selecting the type of retirement plan.

## **Methodology**

The Commonwealth of Massachusetts requires that all employees enroll in a qualified retirement plan. The State Board of Retirement administers the State Employees Retirement System (DB plan) and the Board of Higher Education provides the Optional Retirement Plan (DC plan) for its members in accordance with section 401(a) of the Internal Revenue Code. Both choices are made available to faculty and administrators at all state colleges and universities.

The choice between a DB (Defined Benefit) and a DC (Defined Contribution) plan is essentially a choice of responsibility of risk. In a DB plan, the employer - in this case the state of Massachusetts, bears the investment risk, the longevity risk and much of the inflation risk, however the employee – in this case the faculty members, bear the mobility (or portability of plan) risk. In a DC plan, the employee bears all the investment risk, longevity risk, and inflation risk, but has the advantage of portability of plan.

### *Salary levels and career path*

Table 1 reflects the average salaries based on the MSCA Faculty survey (2007). We use the average salaries for the Associate and Full Professor as the current level of salaries. Since our goal is to try to fit the projection model with most generic career pattern for the faculty at the Massachusetts state system we make certain key assumptions. Our starting point for all the faculty is at least five years of service which is when we expect them to be at the Associate level. Our next key assumption regarding the career path is to expect all Associate faculty to be promoted to Full Professor in another five year time frame when we expect the salary to jump by a five percent level. Using historical averages we assume annual salary increases of four percent.

Based on the above assumptions we compute the salary projections for faculty expected to continue working until the age of retirement. Table 2, Panel A reflects projected salary levels with assumption that the faculty is currently at Associate level, and Panel B reflects projected salary levels with assumption of Full Professor as the current faculty status (in this scenario there is no five percent jump in the salary levels, just the four percent annual growth is considered).

Under ORP (DC plan), the amount of annuity income received at retirement will depend on the amount contributed to the retirement annuity contracts, the investment experience of those funds, the employee's age at the time they begin receiving benefits, and the form of annuity payment that was chosen. Participants in a DC plan choose the distribution method in conjunction with the plan provider and Required Minimum Distribution (RMD) laws.

Appendix A displays the SERS Group 1 retirement chart for Massachusetts which helps in computing annuity values for retirees. The annuity value is computed using the below expression:

$$\text{Annual Benefit} = \text{Length of service} * \left( \frac{S_1 + S_2 + S_3}{3} \right) * \left( \frac{\text{Age} - 40}{10} \right) \%$$

Since it is common practice in teaching community for faculty to work until full retirement age, all of the annuity values are computed using the retirement age as 65. This assumption yields the last term in the above expression to be 2.5%. Further, as reflected in the retirement chart in appendix A, the maximum annuity compensation during retirement is capped off at eighty percent of the average of the final three years salary, hence adjustments are made for faculty retiring with higher numbers in length of service by using the minimum amount between the amounts computed by the above expression or the eighty percent of average of last three years of service. Table 3 Panel A shows the annuity compensation for faculty retiring at age 65 with



various years of service – the range of service is between minimum of fifteen years to a maximum of forty years of service – starting at Associate level. Panel B repeat similar computation using salary levels starting at full professor as the current state. These life annuity payments are based on option A which do not have survivor benefits. The State Retirement system also allows for options B and C which are a hybrid version of reduced life annuity payments with varying survivorship benefits. The details on these additional options is provided in Appendix B.

#### *Defined-contribution plan choice*

Next we focus on the defined-contribution plan which faculty choose by enrollment in optional retirement plan (ORP). Here again we make same key assumptions that fits in with a generic faculty profile for both the career path and salary growth concerns. All faculty is expected to be in service until the age of retirement, i.e. 65 years and have two different starting points, one as associate professor (with an expected bump in salary level of five percent upon promotion to the position of full professor) and the other starting as a full professor with at least five years of service in both cases. The years to retirement is again considered within the range of ten years to thirty-five years. Table 2, panels A and B reflect the projected salaries at retirement depending upon the number of years of service for the two situations defined above.

The expected annuity payouts under the ORP (DB plan) plan would depend on two critical factors. The first factor is the amount of contributions and the second one is the performance of portfolio. The Massachusetts retirement system requires all employees to contribute nine percent of the first \$30,000 and eleven percent of the difference between the salary and \$30,000 to the retirement account. Only in case of ORP, the State contributes

additionally five percent of the employee's salary to the respective individual retirement accounts. For employees choosing SERS option, their contribution amounts are co-mingled into a pension fund. For employees choosing ORP (DC plan) their contributions are made into individual retirement accounts where in the respective individuals have investment choices amongst a group of mutual funds and index funds to allocate these funds to.

We choose five different rates of return between six and ten percent as an expected average return over the life of fund investments to compute the ending balances at retirement. The contributions are not treated as annuities since we need to accommodate for the annual increases in the salary level. Table 4, Panels A and B reflect the data computed using the seven percent return assumption on the retirement portfolio during the years of contributions. These ending balances are then annuitized using information from life expectancy table, with the first payment being made at the beginning of retirement at age 65 and the rest of the balances now invested in a more conservative manner thus expected to yield only a five percent return through the retirement years. These annuity payments are now comparable to the Option A of SERS plan.

Table 5, panel A and B collates all the data with regard to annuity payments under SERS plan and under ORP plan with six, seven, eight, nine and ten percent returns on the portfolio. These numbers appear under the respective columns and are juxtaposed with the SERS projected annuity payments for both the cases of current position of Associate and Full professor respectively. As seen in these tables we can make strong conclusions about the appropriate choice of retirement options depend on the length of service and the expected rate of return on investment.

## **Results**

Market returns are volatile especially in short term horizons. Table 6, panel A reflects compounded annual returns by decades, starting with 1920s for various sets of categories of securities. The large company stocks yielded highest annualized returns in 1850s (19.4%) and the lowest annualized returns were recorded in 2000s (-0.9%). Long-term corporate bonds yielded highest returns in 1980s (13%) and the lowest returns in 1950s (1%). The last column reflects the geometric averages for each of the security classes over the 1920-2000 time frames. Large Company stock portfolios on average yielded 10.54% return and average Long-term Corporate bonds yield is 5.7% over the same time period. Panel B gives a closer insight within the most recent decade – the 2000s. The Large company stocks fluctuated wildly between highs of 2003 (26.8%) and lows of 2008 (-37%). The average for the decade was -0.9%. The long-term corporate bonds fluctuated between the highs of year 2002 (16.33%) and lows of 2006 (2.6%) averaging out at 7.6% for the entire decade.

Table 5 reflects annuity payments under ORP using assumptions of annualized returns in the range of 6% to 10% with 1% increments. A comparison of these ORP annuity payments with those under the SERS option reflect that if an employee stays with Massachusetts State system for thirty years or longer, even a moderate annualized expected return of 8% will result in higher annuity payments under the ORP plan. The benefits increase exponentially as expected returns increase. The benefits are larger for employees joining as Associate Professor as they get an additional bump of five percent upon being promoted to the Full professorship.

## **Conclusion**

The paper's implications go beyond highlighting the differences between the two classes of retirement plans offered. It adds to the scant literature on benefits to beneficiaries of DC plan

participants as compared to beneficiaries of DB plan participants when the time frame of working in this career is longer and more importantly when the portfolio returns are reasonably modest. Previous research has indicated that retirement age of professors is lower for participants in DB plans than in DC plans. Results of this study also have implications for future hiring in state colleges and universities, because while the level of benefit will determine the choice of switching, it will also determine the age of retirement of the faculty member and hence the hiring of a new faculty member.

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Massachusetts State Board of Retirement Benefit Guide for State Employees' Retirement System

## Tables

Table 1      **Average Salary (based on MSCA Faculty Salary Survey, 2007)\***

### State college Average Salary

Dept	Associate Professor	Full Professor
Visual and Performing Arts	\$60,313	\$73,614
Biology	\$58,212	\$75,291
Business Administration	\$70,123	\$76,979
Comp and Info Systems	\$72,114	\$81,426
Education	\$64,912	\$78,304
English	\$60,182	\$75,527
Foreign Language	\$59,939	\$68,851
History	\$61,573	\$78,484
Math and Statistics	\$64,981	\$78,543
Philosophy	\$66,358	\$75,128
Physical Sciences	\$61,129	\$79,280
Psychology	\$59,744	\$72,707
Social Studies	\$62,690	\$75,883
Communications/Journalism	\$54,302	\$75,656
Security and Protective Services	\$63,721	\$75,022
Health and Clinical Studies	\$63,316	\$76,431
<b>AVERAGE</b>	<b>\$62,726</b>	<b>\$76,070</b>

\* Source: <http://mscaunion.org/news/080229.pdf>

Table 2

Panel A:

**Projected Salary (Associate Professor)**

Current Salary                    62725.5625  
 Rate of increase                    4%  
 Increase at  
 Professorship                    5%

		Years to retirement					
		10	15	20	25	30	35
Years of service	5	\$97,491.61	\$118,613.45	\$144,311.40	\$175,576.89	\$213,616.13	\$259,896.68
	10	\$97,491.61	\$118,613.45	\$144,311.40	\$175,576.89	\$213,616.13	XXX
	15	\$97,491.61	\$118,613.45	\$144,311.40	\$175,576.89	XXX	XXX

(Assumption: Associate Professor will attain a 'full professor' status within five years)

Panel B:

**Projected Salary (Full Professor)**

Current Salary                    76070.375  
 Rate of increase                    4%

A full professor must have been on the job for at least ten years, so only 35 additional years of service considered

		Years to retirement				
		10	15	20	25	30
Years of service	5	\$112,602.74	\$136,998.45	\$166,679.56	\$202,791.17	\$246,726.46
	10	\$112,602.74	\$136,998.45	\$166,679.56	\$202,791.17	\$246,726.46
	15	\$112,602.74	\$136,998.45	\$166,679.56	\$202,791.17	XXX

Table 3

Panel A: Presently as Associate Professor

**Projected Annuity (SERS plan) - Option A**

Assumption: Retiree is at least 65 years of age

<b><u>IMPOSING A MAXIMUM LIMIT OF 80% OF THE LAST SALARY ON RETIREMENT ANNUITY</u></b>							
		<b>Years to retirement</b>					
		<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>	<b>30</b>	<b>35</b>
<b>Years of service</b>	<b>5</b>	\$35,171.25	\$57,054.94	\$86,770.08	\$126,682.88	\$170,892.90	\$207,917.35
	<b>10</b>	\$46,895.00	\$71,318.68	\$104,124.09	\$140,461.51	\$170,892.90	XXX
	<b>15</b>	\$58,618.76	\$85,582.41	\$115,449.12	\$140,461.51	XXX	XXX

Panel B: Presently as Full Professor

**Projected Annuity (SERS plan) - Option A**

Assumption: Retiree is at least 65 years of age

<b><u>IMPOSING A MAXIMUM LIMIT OF 80% OF THE LAST SALARY ON RETIREMENT ANNUITY</u></b>						
		<b>Years to retirement</b>				
		<b>10</b>	<b>15</b>	<b>20</b>	<b>25</b>	<b>30</b>
<b>Years of service</b>	<b>5</b>	\$40,622.77	\$65,898.42	\$100,219.37	\$146,318.63	\$197,381.17
	<b>10</b>	\$54,163.69	\$82,373.02	\$120,263.25	\$162,232.94	XXX
	<b>15</b>	\$67,704.62	\$98,847.62	\$133,343.65	XXX	XXX



Table 4

Panel A: Beginning Retirement Balance (Associate Professor)

Assumption 1: Zero balance in system at start of service

Assumption 2: Salaries have continued to increase at an average rate of 4% per year

Contribution rate has been 9% of first 30000 and 11% of amount over 30000

Average Return 7%

Compound Return 0.1128

		Salary at start of service	Contributions in 1 <sup>st</sup> year	Balance to date
Years of service	<b>5</b>	\$51,555.84	\$7,648.93	\$47,902.04
	<b>10</b>	\$42,375.14	\$6,180.02	\$104,746.16
	<b>15</b>	\$34,829.28	\$4,972.68	\$174,963.55

**Expected Balance at Retirement**

		Years to retirement					
		10	15	20	25	30	35
Years of service	<b>5</b>	\$299,417.99	\$570,026.67	\$1,031,798.36	\$1,819,774.18	\$3,164,390.81	\$5,458,869.68
	<b>10</b>	\$464,940.36	\$852,477.14	\$1,513,777.11	\$2,642,231.70	\$4,567,847.64	XXX
	<b>15</b>	\$669,403.90	\$1,201,377.52	\$2,109,147.23	\$3,658,182.37	XXX	XXX

**Maximum Annuity Payout ( In this scenario Option A, B and C are all the same)**

Assumption: After retirement risk averseness increases, so average return =5%

Average Return 5%

Years in Retirement 30

Annuity Payments at beginning of year

		Years to retirement					
		10	15	20	25	30	35
Years of service	<b>5</b>	\$18,550.07	\$35,315.29	\$63,923.78	\$112,741.83	\$196,045.87	\$338,197.44
	<b>10</b>	\$28,804.80	\$52,814.15	\$93,784.16	\$163,696.16	\$282,995.28	XXX
	<b>15</b>	\$41,472.08	\$74,429.84	\$130,669.58	\$226,638.11	XXX	XXX

Panel B: Beginning Retirement Balance (Full Professor)

Assumption: Zero balance in system at start of service

Assumption 2: Salaries have continued to increase at an average rate of 4% per year

Contribution rate has been 9% of first 30000 and 11% of amount over 30000

Average Return 7%

Compound Return 0.1128

		Salary at start of service	Contributions in 1 <sup>st</sup> year	Balance to Date
Years of service	5	\$62,524.30	\$6,277.67	\$39,314.41
	10	\$51,390.42	\$5,052.95	\$85,643.16
	15	\$42,239.18	\$4,046.31	\$142,369.12

**Expected Balance at Retirement**

		Years to retirement				
		10	15	20	25	30
Years of service	5	\$310,601.30	\$602,481.75	\$1,100,551.99	\$1,950,468.32	\$3,400,781.39
	10	\$445,504.35	\$832,682.83	\$1,493,371.40	\$2,620,782.69	XXX
	15	\$610,682.65	\$1,114,546.16	\$1,974,348.23	\$3,441,530.51	XXX

**Maximum Annuity Payout ( In this scenario Option A, B and C are all the same)**

Assumption: After retirement risk averseness increases, so average return =5%

Average Return 5%

Years in Retirement 30

Annuity Payments at beginning of year

		Years to retirement				
		10	15	20	25	30
Years of service	5	\$19,242.91	\$37,326.00	\$68,183.32	\$120,838.82	\$210,691.15
	10	\$27,600.66	\$51,587.82	\$92,519.96	\$162,367.31	XXX
	15	\$37,834.08	\$69,050.31	\$122,318.27	XXX	XXX

Table 5

Panel A: Faculty starting as Associate Professor after a minimum of five years of experience

Comparison of expected Annuity payout for employees who choose SERS (DB plan) – Option A with the expected annuity payouts under the choice of ORP (DC plan). Since the annuity payouts under ORP plan depend on market performance we choose a range of expected market returns to compute the payouts.

		Faculty with 5 Years of Service					
		SERS	ORP @6%	ORP @7%	ORP @8%	ORP @9%	ORP @10%
Years to Retirement	10	35171.25	17130.92	18550.07	20101.16	21796.44	23649.25452
	15	57054.94	31477.95	35315.29	39671.65	44617.85	50234.13183
	20	86770.08	54837.16	63923.78	74657.08	87338.87	102325.3823
	25	126682.88	92869.59	112741.8	137199.2	167311.4	204394.6279
	30	170892.90	154792.3	196045.9	249003.4	317017.6	404392.3398
	35	207917.35	255612.2	338197.4	448871.6	597263.5	796274.1896

		Faculty with 10 Years of Service					
		SERS	ORP @6%	ORP @7%	ORP @8%	ORP @9%	ORP @10%
Years to Retirement	10	46895	25788.14	28804.8	32226.18	36107.75	40512.3844
	15	71318.68	45573.26	52814.15	61347.1	71408.21	83276.28249
	20	104124.1	77786.52	93784.16	113405.5	137489.7	167069.2186
	25	140461.5	130234.7	163696.2	206468.2	261192.2	331255.7509
	30	170892.9	215628.6	282995.3	372833	492759.9	652968.0415
	35	XXX	XXX	XXX	XXX	XXX	XXX

		Faculty with 15 Years of Service					
		SERS	ORP @6%	ORP @7%	ORP @8%	ORP @9%	ORP @10%
Years to Retirement	10	58618.76	35871.77	41472.08	48081.36	55886.18	65107.09955
	15	85582.41	61990.98	74429.84	89690.81	108432.9	131467.9462
	20	115449.1	104517.1	130669.6	164074.4	206798.7	261497.4904
	25	140461.5	173756.3	226638.1	297047.2	390936.8	516281.4969
	30	XXX	XXX	XXX	XXX	XXX	XXX
	35	XXX	XXX	XXX	XXX	XXX	XXX

Panel B: Faculty starting as Full Professor after a minimum of five years of experience

Comparison of expected Annuity payout for employees who choose SERS (DB plan) – Option A with the expected annuity payouts under the choice of ORP (DC plan). Since the annuity payouts under ORP plan depend on market performance we choose a range of expected market returns to compute the payouts.

		Faculty with 5 Years of Service					
		SERS	ORP @6%	ORP @7%	ORP @8%	ORP @9%	ORP @10%
Years to Retirement	10	40622.77	17882.08	19242.91	20723	22332.97	24084.37
	15	65898.42	33512.41	37326	41629.02	46485.58	51968.07
	20	100219.4	58961.04	68183.32	79001.92	91698.57	106604.3
	25	146318.6	100395.4	120838.8	145812	176336	213660.2
	30	197381.2	167856.9	210691.2	265246	334774.8	423428.9

		Faculty with 10 Years of Service					
		SERS	ORP @6%	ORP @7%	ORP @8%	ORP @9%	ORP @10%
Years to Retirement	10	54163.69	24936.56	27600.66	30606.73	34000.67	37834.53
	15	82373.02	44998.21	51587.82	59297.78	68327.18	78910.56
	20	120263.2	77661.72	92519.96	110587.7	132585.4	159396.2
	25	162232.9	130843	162367.3	202276.8	252875	317102.4
	30	XXX	XXX	XXX	XXX	XXX	XXX

		Faculty with 15 Years of Service					
		SERS	ORP @6%	ORP @7%	ORP @8%	ORP @9%	ORP @10%
Years to Retirement	10	67704.62	33077.57	37834.08	43422.75	49995.97	57733.85
	15	98847.62	58253.04	69050.31	82208.51	98269.93	117901.9
	20	133343.6	99242.64	122318.3	151544.3	188637.4	235797.1
	25	XXX	XXX	XXX	XXX	XXX	XXX
	30	XXX	XXX	XXX	XXX	XXX	XXX

Table 6

Panel A: Compounded Annual Rates of Return by Decade (%)

	1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	AVG
Large Company Stocks	19.2	-0.1	9.2	19.4	7.8	5.9	17.6	18.2	-0.9	0.104271
Small Company Stocks	-4.5	1.4	20.7	16.9	15.5	11.5	15.8	15.1	6.3	0.106832
LT Corporate Bonds	5.2	6.9	2.7	1	1.7	6.2	13	8.4	7.6	0.057967
LT Government Bonds	5	4.9	3.2	-0.1	1.4	5.5	12.6	8.8	7.7	0.053816
IT Government Bonds	4.2	4.6	1.8	1.3	3.5	7	11.9	7.2	6.2	0.052562
Treasury Bills	3.7	0.6	0.4	1.9	3.9	6.3	8.9	4.9	2.8	0.036793
Inflation	-1.1	-2	5.4	2.2	2.5	7.4	5.1	2.9	2.5	0.027276

Panel B: Annual Rates of Return IN THE 2000s Decade (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	AVG
Large Company Stocks	-9.1	-11.89	-22.1	28.68	10.88	4.91	15.79	5.49	-37	26.46	-0.010
Small Company Stocks	-3.59	22.77	-13.28	60.7	18.39	5.69	16.17	-5.22	-36.72	28.09	0.063
LT Corporate Bonds	12.87	10.65	16.33	5.27	8.72	5.87	3.24	2.6	8.78	3.02	0.076
LT Government Bonds	21.48	3.7	17.84	1.45	8.51	7.81	1.19	9.88	25.87	-14.9	0.077
IT Government Bonds	12.59	7.62	12.93	2.4	2.25	1.36	3.14	10.05	13.11	-2.4	0.062
Treasury Bills	5.89	3.83	1.65	1.02	1.2	2.98	4.8	4.66	1.6	0.1	0.028
Inflation	3.39	1.55	2.38	1.88	3.26	3.42	2.54	4.08	0.09	2.72	0.025

Source: Morningstar Ibbotson Associates

Appendix: A

**MASSACHUSETTS GROUP 1 RETIREMENT PERCENTAGE CHART**

	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
10						15	16	17	18	19	20	21	22	23	24	25
11						16.5	17.6	18.7	19.8	20.9	22	23.1	24.2	25.3	26.4	27.5
12						18	19.2	20.4	21.6	22.8	24	25.2	26.4	27.6	28.8	30
13						19.5	20.8	22.1	23.4	24.7	26	27.3	28.6	29.9	31.2	32.5
14						21	22.4	23.8	25.2	26.6	28	29.4	30.8	32.2	33.6	35
15						22.5	24	25.5	27	28.5	30	31.5	33	34.5	36	37.5
16						24	25.6	27.2	28.8	30.4	32	33.6	35.2	36.8	38.4	40
17						25.5	27.2	28.9	30.6	32.3	34	35.7	37.4	39.1	40.8	42.5
18						27	28.8	30.6	32.4	34.2	36	37.8	39.6	42.4	43.2	45
19						28.5	30.4	32.3	34.2	36.1	38	39.9	41.8	43.7	45.6	47.5
20	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50
21	21	23.1	25.2	27.3	29.4	31.5	33.6	35.7	37.8	39.9	42	44.1	46.2	48.3	50.4	52.5
22	22	24.2	26.4	28.6	30.8	33	35.2	37.4	39.6	41.8	44	46.2	48.4	50.6	52.8	55
23	23	25.3	27.6	29.9	32.2	34.5	36.8	39.1	41.4	43.7	46	48.3	50.6	52.9	55.2	57.5
24	24	26.4	28.8	31.2	33.6	36	38.4	40.8	43.2	45.6	48	50.4	52.8	55.2	57.6	60
25	25	27.5	30	32.5	35	37.5	40	42.5	45	47.5	50	52.5	55	57.5	60	62.5
26	26	28.6	31.2	33.8	36.4	39	41.6	44.2	46.8	49.4	52	54.6	57.2	59.8	62.4	65
27	27	29.7	32.4	35.1	37.8	40.5	43.2	45.9	48.6	51.3	54	56.7	59.4	62.1	64.8	67.5
28	28	30.8	33.6	36.4	39.2	42	44.8	47.6	50.4	53.2	56	58.8	61.6	64.4	67.2	70
29	29	31.9	34.8	37.7	40.6	43.5	46.4	49.3	52.2	55.1	58	60.9	63.8	66.7	69.6	72.5
30	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75
31	31	34.1	37.2	40.3	43.4	46.5	49.6	52.7	55.8	58.9	62	65.1	68.2	71.3	74.4	77.5
32	32	35.2	38.4	41.6	44.8	48	51.2	54.4	57.6	60.8	64	67.2	70.4	73.6	76.8	80
33	33	36.3	39.6	42.9	46.2	49.5	52.8	56.1	59.4	62.7	66	69.3	72.6	75.9	79.2	80
34	34	37.4	40.8	44.2	47.6	51	54.4	57.8	61.2	64.6	68	71.4	74.8	78.2	80	80
35	35	38.5	42	45.5	49	52.5	56	59.5	63	66.5	70	73.5	77	80	80	80
36						54	57.6	61.2	64.8	68.4	72	75.6	79.2	80	80	80
37						55.5	59.2	62.9	66.6	70.3	74	77.7	80	80	80	80
38						57	60.8	64.6	68.4	72.2	76	79.8	80	80	80	80
39						58.5	62.4	66.3	70.2	74.1	78	80	80	80	80	80
40						60	64	68	72	76	80	80	80	80	80	80

Multiply the indicated percentage by the average of your highest three (3) consecutive years' salary

## Appendix: B

### Retirement Allowance Options

You have three options from which to choose how your retirement benefits will be paid. Review these options carefully and determine which is best for you and your family. You cannot change your option after your retirement date. If upon retirement, you do not select an option, the law provides that you will be retired with Option B. Your retirement allowance must be paid to you in lifetime monthly payments. The amount of the payments will depend upon your selection. The option you choose will also determine what benefits, if any, will be paid to survivors after your death.

There are no restrictions on an election of an option. All members are free to select one of 3 options: Option A, Option B, or Option C. With your first check you will receive information about direct deposit. If a member is married, the member's spouse is required to sign the Option form consenting to this choice and verifying that the spouse understands the option.

#### Option A

Option A will provide you with your full retirement allowance in monthly payments as long as you live. However, all allowance payments stop when you die and no benefits are provided to survivors.

#### Option B

Option B provides a lifetime allowance to you that is 1% to 5% less per month than Option A.\* The annuity portion of your allowance is reduced to allow a benefit for your beneficiary. Upon your death, your surviving beneficiary of record, or if there is no beneficiary living, the person or persons appearing in the judgment of the State Retirement Board to be entitled, will be paid the remaining balance of your accumulated total deductions from your annuity reserve account.

*Approximate Reduction	1%	3%	5%
Age of Member	50	60	70

### RETIREMENT ALLOWANCE

During your retirement, the balance in your annuity savings account decreases by an amount equal to the annuity portion of your pension. In most cases, your annuity savings account will be depleted after 15 years. Upon your death, the balance remaining in your account will be paid in a lump sum to your beneficiary or your estate. If your annuity savings account is depleted while you are receiving your allowance, you will continue to receive your full Option B pension for life; but your beneficiary will not receive any payment upon your death. More than one person may be designated as your Option B beneficiary and your beneficiaries need not be related to you. You may change your Option B beneficiary at any time.

#### Option C

Option C, also known as the joint and last survivor allowance, provides you with a lifetime allowance approximately 7-15% less than that which you would receive under Option A. Upon your death, your designated beneficiary will be paid a monthly allowance for the remainder of his or her life. The survivor benefit will be equal to two-thirds of the allowance that was being paid to you at the time of your death. Your monthly allowance received under Option C depends upon life expectancy factors for you and your designated beneficiary. Eligible beneficiaries under Option C include: spouse, parent, unmarried former spouse, sibling or child. Special circumstances concerning Option C: If you choose Option C and your beneficiary predeceases you, you cannot name a different "Option C beneficiary." However, your monthly benefit will "pop up" to the Option A benefit amount that you would have received on the date of your retirement, plus any cost-of-living adjustments. The new, higher amount is then paid to you as of the date of the death of your beneficiary and until you die.