Managing Volatility in a Mark-to-Market World: The Stochastic Funding Method

Howard Winklevoss
Mark Ruloff
Steve Strake

Abstract

Measuring assets and liabilities at market will increase the volatility of pension contributions. In this paper we analyze the likely increase in volatility for a representative plan and then consider the implications of adopting a hedged portfolio as a means of reducing the increased volatility. The hedged portfolio approach, while effective, has another undesirable attribute: namely, substantially higher pension costs over time. We then analyze the effect of adopting a stochastic funding method, which represents a simple extension of traditional expected value funding methods. This method allows the use of market assets and liabilities without increasing contribution volatility. Additionally, the stochastic funding method brings into the funding equation yet another interesting component that is absent in traditional funding methods: an investment risk premium whereby contributions are increased—at least initially—for the increased risk associated with higher equity allocations.

1. Background

After nearly two decades of favorable capital market returns, followed by the inevitable "bad patch" when capital markets were not as favorable for a few years, we find our defined benefit pension system in a funding crisis, with many plans substantially less than 100 percent funded. How can something going so well turn so badly so quickly? There are undoubtedly a number of factors that led up to the funding crisis, but the following scenario was probably applicable to many plans.

During the 1980s and 1990s, we saw higher equity allocations, leading to higher returns, leading to higher valuation interest rates, leading to low (or no) contributions, all of which led to funded ratios falling toward 100 percent (of a liability based on relatively high interest rates). When the "bad patch" occurred, interest rates dropped dramatically, causing pension liabilities to increase dramatically without a commensurate increase in plan assets, hence, the funding crisis.

Now—in the midst of this funding crisis—we have a movement toward transparency, calling for the adoption of market assets and liabilities, and the stripping away of various actuarial smoothing devices that have long been part of pension funding. In spite of its merits, this "market value" movement will increase the volatility of pension contributions and could not come at a worse time. The termination of defined benefit pension plans has been significant in recent years, and the "market value" movement—on top of a funding crisis—could provide a significant impetus to this trend.

One approach being considered in conjunction with the "market value" concept is allocating most, if not all, of the plan's assets to fixed income securities: financial instruments that react to interest rate fluctuations much like the plan's liabilities themselves. Yet, walking away from asset mixes that will likely have higher returns over time is a tough decision for many pension fund managers to make.

In this paper we take a look at the increased volatility that might occur if assets and liabilities are measured at market in calculating pension contributions, and the effects that a hedged portfolio might have in reducing the added volatility. We then analyze the adoption of a funding method based on a stochastic methodology as a replacement for the traditional funding methods based on expected value calculations. This method may allow the adoption of market values without causing a noticeable increase in the volatility of pension contributions.

Finally, we look at the implications of investing in asset mixes other than a hedged portfolio. Historically, as the equity exposure for a plan was increased, the interest rate was likely to be increased as well to reflect the higher expected return. This, of course, led to lower contributions. Hence, one observes the anomaly that "the riskier the asset mix, the lower the required contributions," which, of course, is counterintuitive. One would think that as more investment risk is taken on, contributions—at least initially—would be higher to reflect the increased risk. As it turns out, the stochastic funding method offers a solution to this incongruity as well.

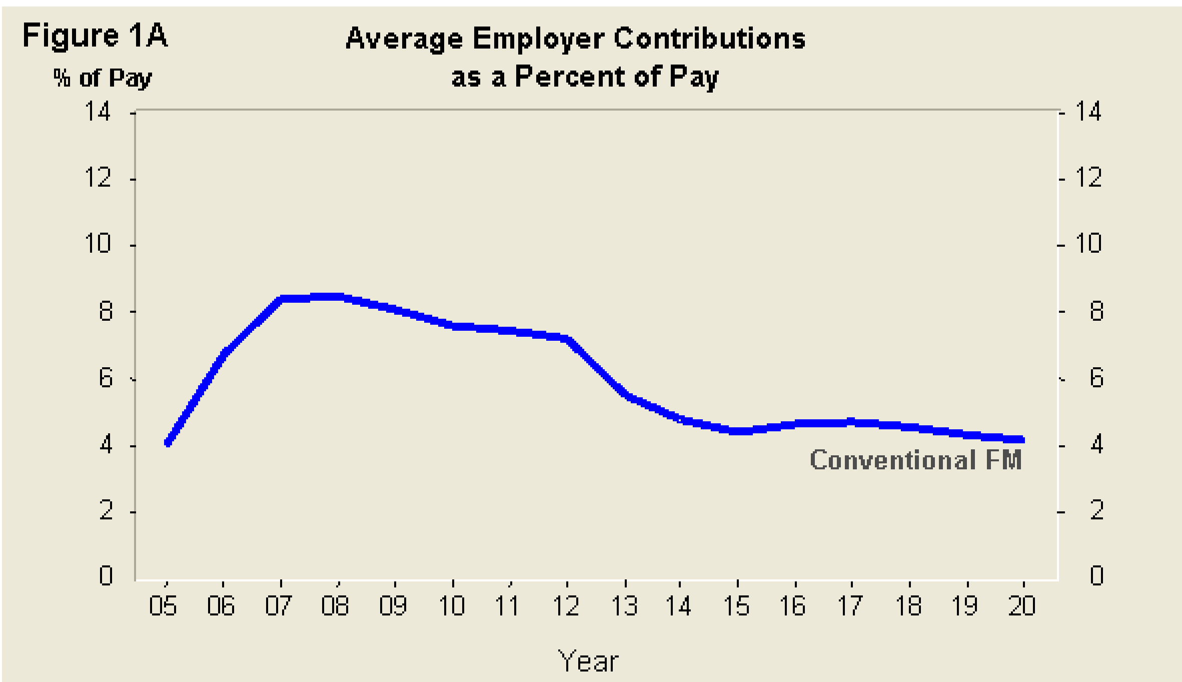
2. Conventional Funding Method

Figure 1A shows the average contribution of our baseline pension plan over a 20-year period. Appendix A contains the distribution of such costs using a Monte Carlo projection, along with distribution of the plan's funded ratio. The plan's valuation interest rate was assumed to be 7.5 percent, its assets were smoothed over five years, and the asset allocation was assumed to be 65 percent equities and 35 percent fixed income. The capital market assumptions used in the simulation are given in Appendix B.

Figure 1B shows the standard deviation of employer contributions as a percentage of pay. The standard deviation starts out at zero and climbs to an ultimate level of about 6 percent of pay.

3. Adopting Market Value Methodology

Figures 2A and 2B show these same statistics—the average contributions and standard deviation of contributions—if the market value approach to funding were adopted. Although the initial contribution is higher, the average contributions are not significantly affected by this change, as would be expected, because the underlying investment returns of the plan are unchanged. The standard deviation of employer contributions, on the other hand, increases by over 50 percent. This increased volatility occurs because assets and liabilities are now measured at market, where liabilities fluctuate with changes in interest rates. It is this volatility, on top of a pension funding crisis, that is of considerable concern to those interested in the well-being of the defined benefit pension system.



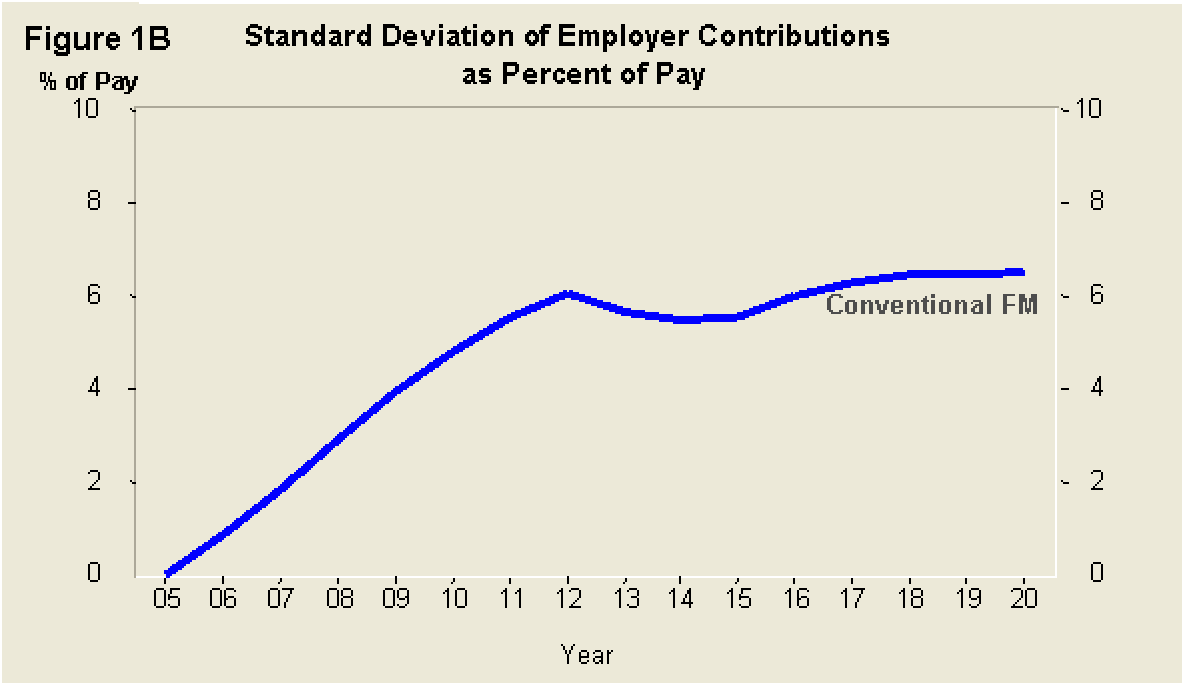


Figure 1B
Standard Deviation of Employer Contributions
as Percent of Pay
% of Pay
10
8
6
4
2
0
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
Year
Conventional FM

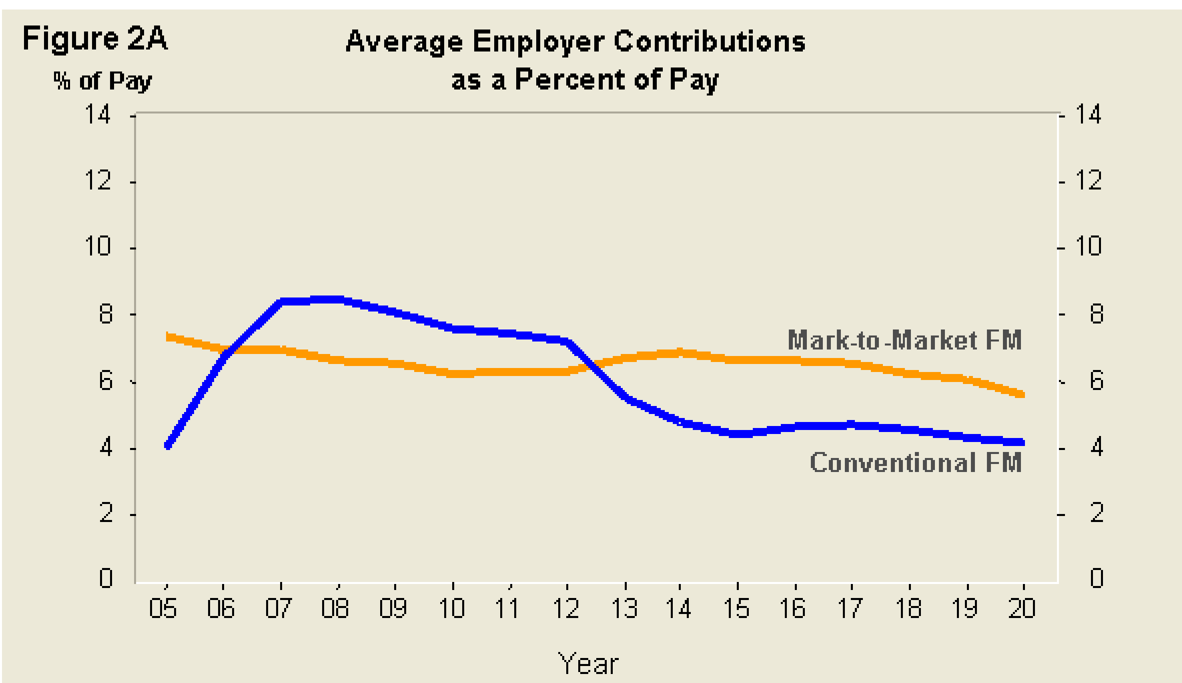
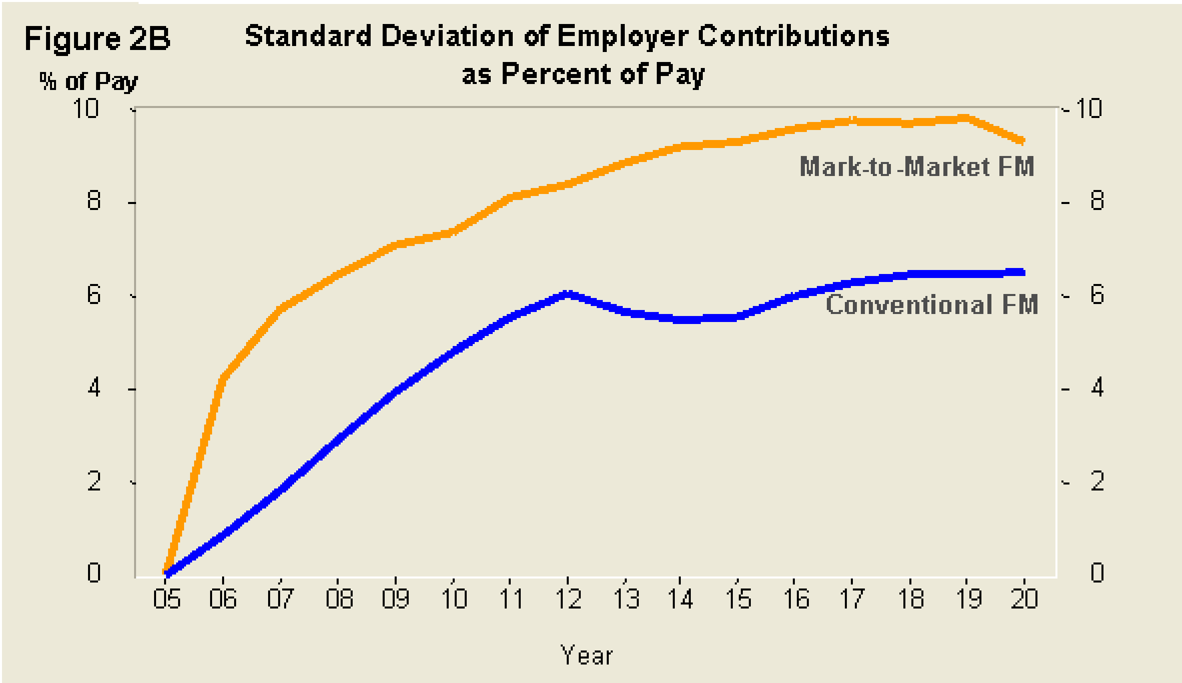


Figure 2A
Average Employer Contributions
as a Percent of Pay
% of Pay
14
12
10
8
6
4
2
0
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
Year
Mark-to-Market FM
Conventional FM



4. Hedging the Plan

Figures 3A and 3B show the average contributions and standard deviation of contributions for a plan that has hedged its liabilities with assets that have nearly the same reaction to changes in interest rates as the plan's liabilities themselves. The lower simulated returns for the hedged asset mix, as compared to the 65/35 stock/bond mix, cause the plan's costs to increase significantly. The standard deviation of contributions is indeed lower and roughly equal to the volatility of the baseline projection. The higher contributions, however, make this an expensive "fix" to the contribution volatility associated with adopting market values.

5. Stochastic Funding Method

Conventional funding methods are based on expected value calculations. Prior to ERISA it was common for consulting actuaries to build a degree of conservatism into the plan's actuarial assumptions, with the interest rate being the most frequently used assumption to accomplish this task. Even if the expectation might have been that the plan's assets would earn 7 or 8 percent, an interest assumption of 5 or 6 percent would nevertheless be used. This had the effect of overfunding the plan (or at least heading toward an overfunded status for plans not yet fully funded). One effect of this conservatism was that the plan could more likely withstand a "bad patch" in capital markets—not to mention the use of asset smoothing methods, which would further add to the plan's robustness during unfavorable economic times.

ERISA, as well as current actuarial standards of practice, mandate that all assumptions be best estimates, and, even though this mandate was not initially embraced by all consulting actuaries, over time the interest rate assumption has become more realistic. In fact, some would argue that the interest rate assumptions became a little too aggressive due to the favorable capital markets of the 1980s and 1990s.

In any event, it hardly seems prudent to calculate contributions on the basis of a 50–50 chance of being either too high or too low. In fact, the authors found that over 100 plan sponsors, when asked what degree of conservatism they would ideally like to have in the calculation of pension contributions, uniformly expressed a confidence level above the 70th percentile. The most common level selected was the 75th, which implied that such plan sponsors, generally speaking, wanted a 75 percent chance that the calculations would ultimately overfund the plan or, conversely, would underfund the plan only 25 percent of the time. It is not possible, however, to achieve such conservatism with (1) "expected value" funding methods and (2) best estimate assumptions because, by definition, such calculations are at the 50th percentile confidence level.

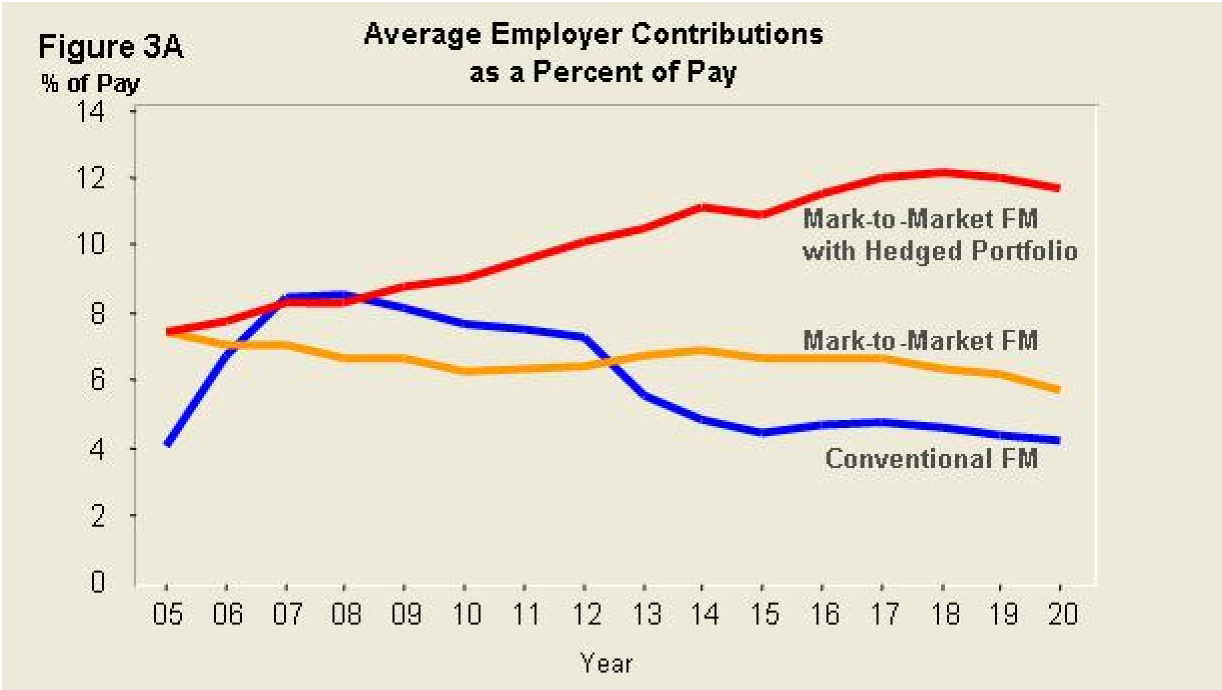


Figure 3A
Average Employer Contributions
as a Percent of Pay
% of Pay
14
12
10
8
6
4
2
0
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
Year
Mark-to-Market FM
with Hedged Portfolio
Mark-to-Market FM
Conventional FM

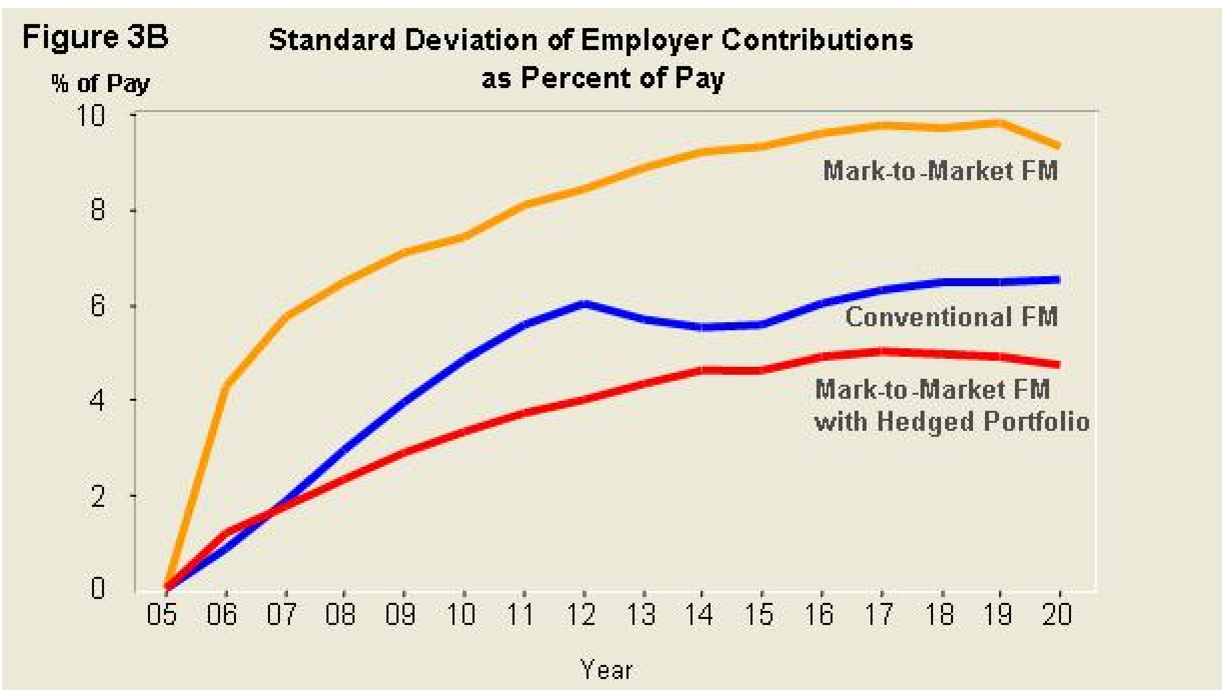


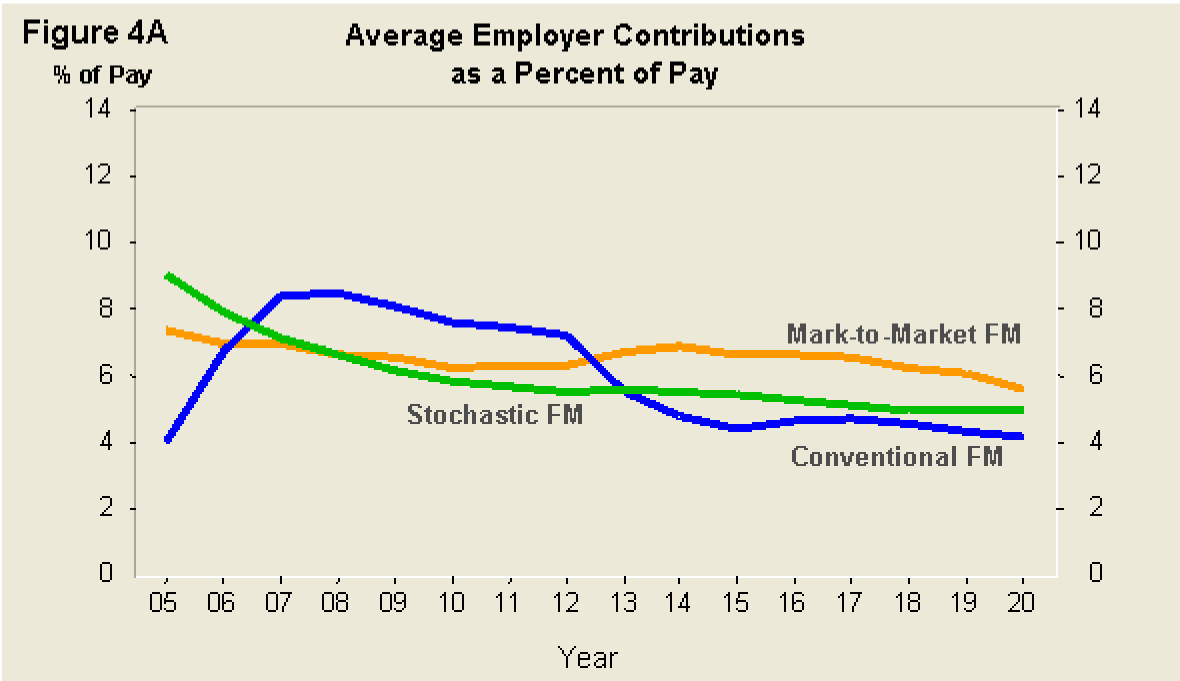
Figure 3B
Standard Deviation of Employer Contributions
as Percent of Pay
% of Pay
10
8
6
4
2
0
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
Year
Mark-to-Market FM
Conventional FM
Mark-to-Market FM
with Hedged Portfolio

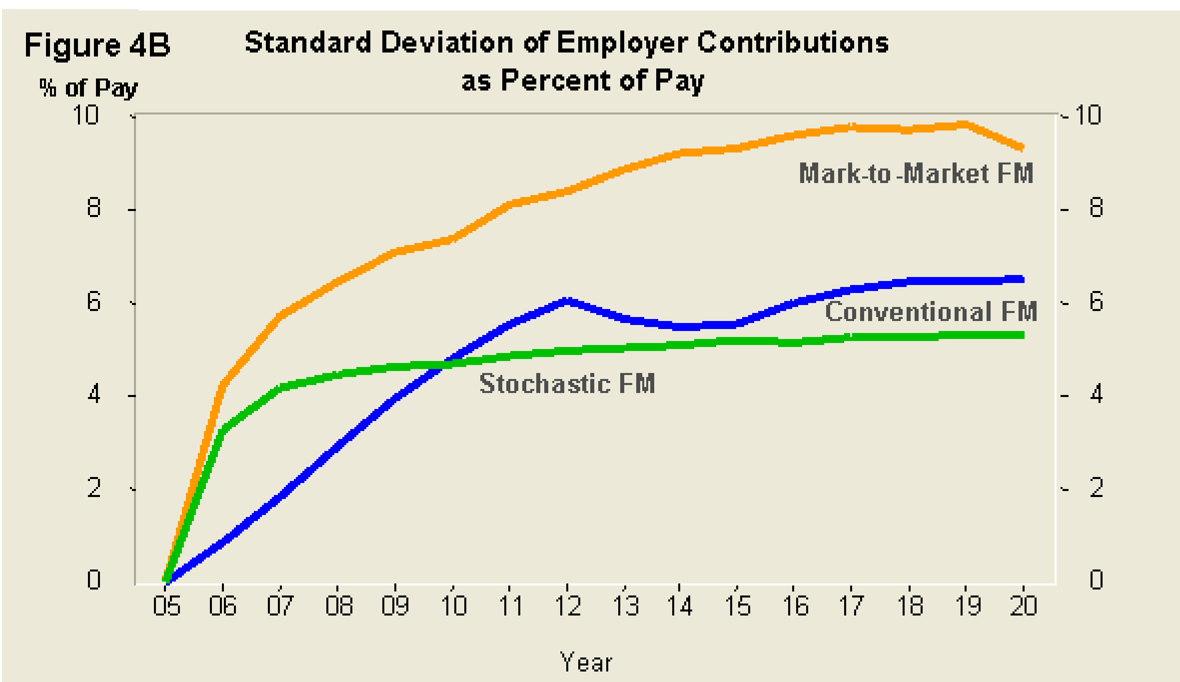
Moreover, with the so-called "market value" movement, it would seem all the more imperative to adopt a stochastic funding methodology whereby the consulting actuary and/or plan sponsor can explicitly determine the degree of conservatism built into pension contributions. Measuring assets and liabilities at market and using these values in the calculation of contributions is one thing, but to have such contributions based on a 50–50 chance of being too high or too low is quite another. And besides, those arguing for "mark-to-market" assets and liabilities aren't really speaking to the issue of whether a plan's contributions could, or should, be determined with a degree of conservatism. What they want is the use of, and reporting of, market assets and liabilities in accounting and any test of insolvency.

It is a straightforward procedure to extend a conventional funding method, which is based on expected value calculations, to calculations based on a stochastic methodology. First, a stochastic (or Monte Carlo) simulation of the cost method's actuarial liability is performed over the desired funding interval, say, 10 years. Second, for each of the trials in the stochastic projection, a contribution is determined (generally as a level percentage of payroll) such that the current level of assets will accumulate to that trial's actuarial liability by the end of the funding interval. If there are 10,000 Monte Carlo trials in the stochastic simulation, then this methodology produces 10,000 different contributions. Finally, the consulting actuary and/or plan sponsor selects the contribution associated with the desired confidence level. As noted earlier, many plan sponsors seem to be comfortable with the 75th percentile confidence level.

The stochastic calculations presented in this paper are based on the plan's accrued benefits (i.e., the actuarial liability under the unit credit funding method or, equivalently, the accumulated benefit obligation). The liability is based on stochastic interest rates that vary by year and by Monte Carlo trial. Thus, the methodology simulates the market value of the plan's liability over time. Assets are also simulated at market. The funding interval was selected at seven years. Finally, to duplicate what might actually occur in practice from year to year, contributions are recalculated annually with the funding interval held at seven years (this amortization approach is sometimes referred to as a "fresh start" amortization period).

The average contribution and standard deviation of contributions for the stochastic funding method are shown in Figures 4A and 4B. Again, since the underlying investment returns of the plan are unchanged, the average contribution pattern is not significantly affected. The volatility of contributions is seen to be similar to the volatility of the conventional funding method, which is an interesting finding inasmuch as it appears that the adoption of a stochastic funding method could allow pension plans to use market assets and liabilities without having a dramatic affect on the volatility of annual contributions. One can't help but wonder whether this methodology might not be readily acceptable to the appropriate governmental authorities as it represents a simple extension of the classical "expected value" funding methods.





6. Confidence Level Sensitivity Analysis

The contributions previously developed under the stochastic funding method were based on the 75th percentile confidence level. Figure 5A shows the sensitivity of average contributions to different confidence levels. The initial costs under the 90th percentile confidence level would be nearly 16 percent of pay, whereas, for the 50th percentile, the average cost would be less than 4 percent of pay. All of the average cost patterns trend downward toward the plan's expected normal cost of about 4 percent.

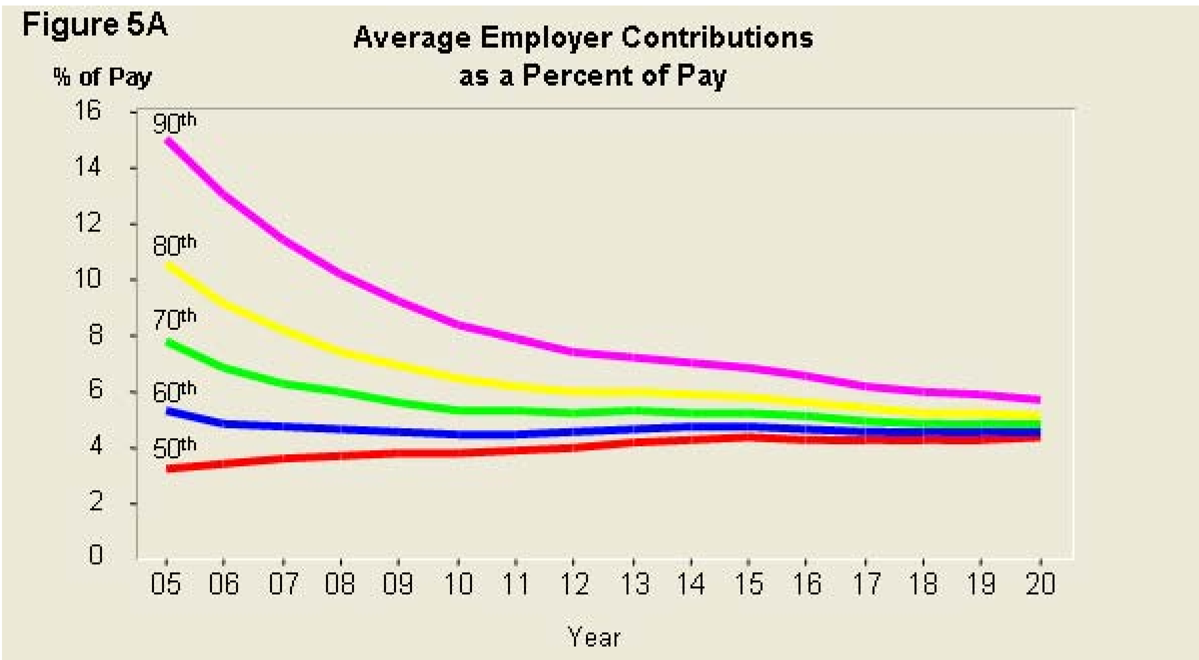
Figure 5B shows the average funded ratio for the different confidence levels. For the 50th confidence level, contributions tend to fund toward 115 percent of the plan's liability, as opposed to 100 percent as one might expect. The 15 percent surplus under this confidence level is due to the fact that the actual contributions simulated to go into the plan were never permitted to be negative. The method, however, does generate negative contributions in some scenarios. As a result, assets on average exceed 100 percent because of this constraint. Figure 5B also provides some idea of the size of the surplus assets (or "reserves") that are required to provide the given confidence level under the plan's asset mix. In this case, a 70th percentile confidence level requires a surplus of about 35 percent, whereas a 90th percentile confidence level requires a surplus of over 75 percent of the plan liability.

7. Investment Risk Premium

We have noted previously the anomaly that, as the plan's equity exposure increases, the expected return increases and the use of higher interest rates seems appropriate. Yet the increased interest rate assumption lowers the plan's contributions; hence, we find the plan sponsor making lower contributions as investment risk increases. What is missing in the traditional calculation of contributions is an "investment risk premium" that reflects the fact that the plan has more risk in its asset allocation. The stochastic funding method offers a solution to this problem as well.

Figure 6A shows the 75th and 95th confidence levels for two different portfolios, one that hedges the plan's liabilities and another with a 65/35 percent stock/bond mix. Coincidentally, at the 75th confidence level, both asset mixes require the same contributions. At higher confidence levels, the portfolio with the greater risk requires larger contributions initially. This is a desirable attribute of the stochastic funding method: namely, that it includes an "investment risk premium" that is dependent on the level of portfolio risk. Under conventional funding methods, contributions will decrease if the interest rate is increased to reflect higher expected returns on portfolios with a greater equity allocation. The stochastic funding method, however, is capable of taking the plan's investment risk into account in calculating annual contributions.

Figure 6B shows the 75th and 95th confidence levels for the average funded ratio of the baseline plan under each asset allocation scenario. The target surplus is greater as the confidence level is increased for a given asset mix, and, of course, the target surplus is significantly affected by the underlying asset mix itself.



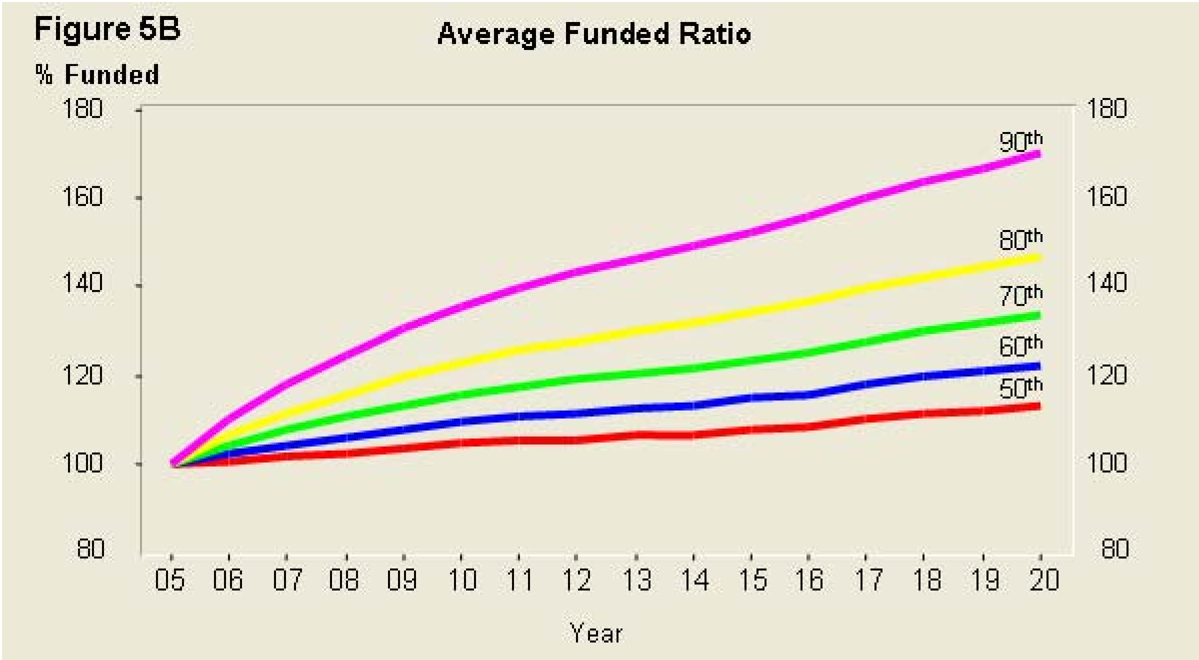


Figure 5B
Average Funded Ratio
% Funded
180
160
140
120
100
80
90th
80th
70th
60th
50th
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
Year

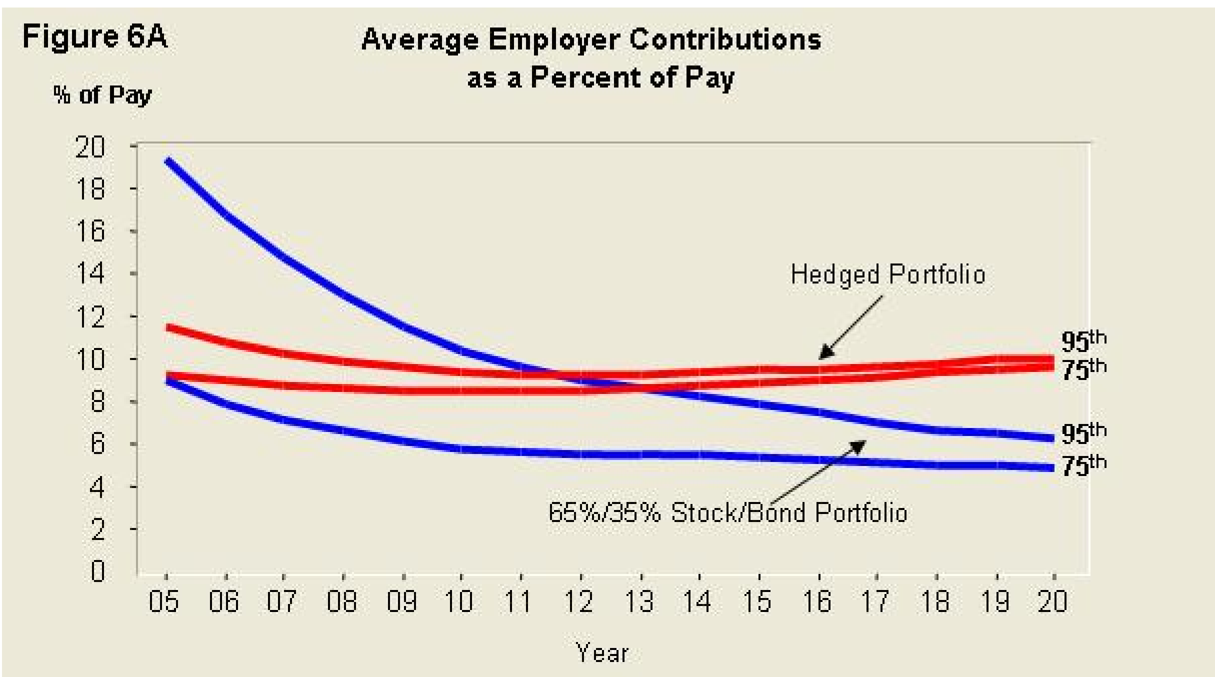
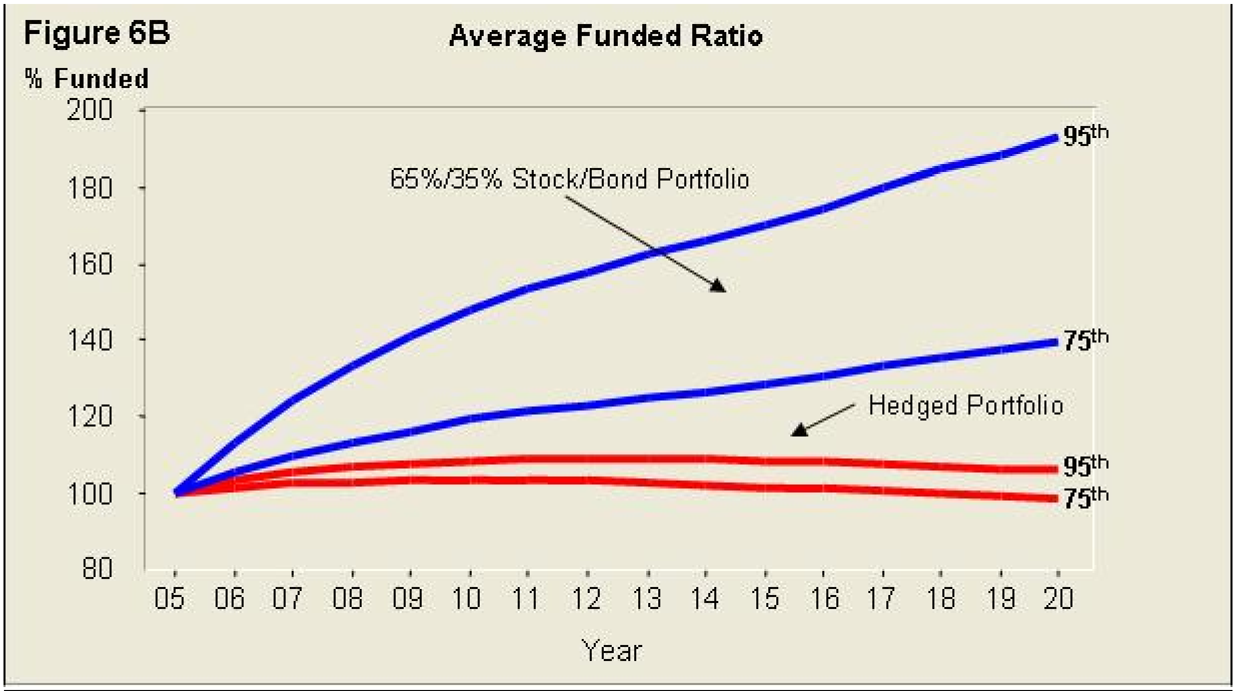


Figure 6A
Average Employer Contributions
as a Percent of Pay
% of Pay
20
18
16
14
12
10
8
6
4
2
0
Hedged Portfolio
95th
75th
95th
75th
65%/35% Stock/Bond Portfolio
05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20
Year



8. Summary

The stochastic funding method may offer two interesting attributes that are not associated with traditional funding methods. First, it might allow the adoption of assets and liabilities valued at market without increasing the volatility typically associated with traditional funding methods. Second, by selecting confidence levels in excess of 50 percent, the stochastic funding method incorporates an "investment risk premium" in the calculation of annual contributions, causing initial contributions to be appropriately higher for portfolios having increased investment risk.

Appendix A
Contribution Distributions
Under Alternative Scenarios

Traditional Funding Method

Year	Mean	SD	5th	25th	50th	75th	95th
2005	4.04	-	4.04	4.04	4.04	4.04	4.04
2006	6.76	0.89	5.75	6.28	6.67	7.10	7.72
2007	8.42	1.87	5.35	7.51	8.47	9.47	10.94
2008	8.54	2.96	3.00	6.91	8.78	10.48	12.86
2009	8.11	3.96	0.61	5.47	8.27	10.92	14.14
2010	7.68	4.85	-	3.87	7.66	11.18	15.68
2011	7.47	5.56	-	2.71	7.16	11.58	16.98
2012	7.26	6.06	-	1.20	6.74	11.83	18.01
2013	5.53	5.68	-	-	4.16	9.51	16.28
2014	4.81	5.53	-	-	2.77	8.64	15.48
2015	4.43	5.59	-	-	1.64	8.01	15.55
2016	4.67	6.04	-	-	0.89	8.46	16.75
2017	4.74	6.33	-	-	0.34	8.61	17.98
2018	4.61	6.50	-	-	-	8.37	18.48
2019	4.40	6.51	-	-	-	8.23	18.67
2020	4.21	6.54	-	-	-	7.38	18.48

Mark-to-Market Funding Method

Year	Mean	SD	5th	25th	50th	75th	95th
2005	7.43	-	7.43	7.43	7.43	7.43	7.43
2006	7.01	4.27	0.01	3.79	6.78	9.83	14.57
2007	7.03	5.75	-	2.10	6.37	10.76	17.51
2008	6.66	6.47	-	0.48	5.21	10.56	19.36
2009	6.61	7.10	-	-	4.86	10.65	20.38
2010	6.28	7.43	-	-	3.84	10.59	20.86
2011	6.36	8.13	-	-	2.92	10.62	22.81
2012	6.38	8.45	-	-	2.22	10.88	23.70
2013	6.74	8.89	-	-	2.33	11.53	24.94
2014	6.90	9.24	-	-	1.99	11.84	24.90
2015	6.68	9.34	-	-	0.93	11.58	25.58
2016	6.66	9.61	-	-	-	11.82	26.09
2017	6.62	9.81	-	-	-	11.58	26.50
2018	6.32	9.76	-	-	-	10.58	26.64
2019	6.14	9.84	-	-	-	10.40	26.81
2020	5.67	9.33	-	-	-	9.57	26.17

Mark-to-Market Funding Method with Hedged Portfolio

Year	Mean	SD	5th	25th	50th	75th	95th
2005	7.43	0	7.43	7.43	7.43	7.43	7.43
2006	7.73	1.18	5.97	6.86	7.64	8.5	9.84
2007	8.28	1.79	5.74	6.99	8.05	9.34	11.5
2008	8.33	2.33	5.16	6.6	8.03	9.69	12.83
2009	8.78	2.88	4.92	6.66	8.36	10.27	14.34
2010	8.99	3.35	4.65	6.56	8.48	10.69	15.42
2011	9.58	3.73	4.81	6.88	8.93	11.42	16.83
2012	10.09	4.04	5.01	7.15	9.43	12.06	17.6
2013	10.53	4.33	5.04	7.33	9.76	12.79	18.73
2014	11.11	4.62	5.38	7.79	10.3	13.5	19.88
2015	10.89	4.64	5.1	7.48	10.05	13.19	19.5
2016	11.51	4.93	5.43	7.98	10.52	13.83	20.72
2017	11.99	5.01	5.85	8.45	11	14.46	21.18
2018	12.18	5	5.99	8.55	11.25	14.72	21.66
2019	12.03	4.9	6.02	8.51	11.1	14.48	20.89
2020	11.71	4.77	5.82	8.24	10.93	13.99	20.87

Stochastic Funding Method

Year	Mean	SD	5th	25th	50th	75th	95th
2005	9.11	-	9.11	9.11	9.11	9.11	9.11
2006	7.97	3.26	2.57	5.78	7.99	10.29	13.18
2007	7.18	4.17	-	4.12	7.20	10.18	13.89
2008	6.66	4.50	-	3.22	6.55	10.03	14.32
2009	6.23	4.67	-	2.05	6.11	9.67	14.41
2010	5.86	4.74	-	1.29	5.63	9.36	14.06
2011	5.70	4.91	-	0.68	5.14	9.31	14.62
2012	5.58	4.98	-	0.04	5.05	9.25	14.47
2013	5.61	5.07	-	-	4.96	9.44	14.50
2014	5.57	5.12	-	-	5.06	9.52	14.52
2015	5.49	5.22	-	-	4.70	9.43	14.84
2016	5.35	5.18	-	-	4.49	9.42	14.50
2017	5.15	5.27	-	-	4.07	9.24	14.66
2018	5.03	5.29	-	-	3.73	8.99	14.91
2019	5.03	5.36	-	-	3.48	9.05	15.06
2020	4.99	5.35	-	-	3.36	9.13	15.21

Funded Ratio Distributions
Under Alternative Scenarios

Conventional Funding Method

Year	Mean	SD	5th	25th	50th	75th	95th
2005	100.0	-	100.0	100.0	100.0	100.0	100.0
2006	101.5	14.7	78.1	91.1	101.3	111.1	125.4
2007	104.9	20.9	73.0	90.3	104.1	118.3	142.1
2008	109.3	25.4	70.7	91.4	107.6	124.4	155.0
2009	113.9	29.3	70.0	93.5	110.7	132.1	166.9
2010	118.2	32.0	71.7	95.2	114.2	138.3	176.4
2011	121.7	35.7	70.9	96.6	117.4	142.6	189.4
2012	124.7	38.2	71.2	97.1	119.4	146.5	196.4
2013	127.9	42.1	71.4	97.6	121.2	150.8	208.9
2014	129.3	44.5	70.5	97.0	122.3	152.7	212.3
2015	131.4	48.2	69.9	97.1	123.0	156.1	222.0
2016	132.9	50.5	70.4	97.7	124.3	158.6	225.8
2017	135.6	53.7	69.9	98.5	124.7	162.1	233.8
2018	138.0	57.0	68.8	99.6	126.6	164.8	243.2
2019	139.6	60.5	70.7	99.5	128.7	165.3	247.2
2020	141.8	63.1	69.5	99.0	128.7	168.7	260.6

Mark-to-Market Funding Method

Year	Mean	SD	5th	25th	50th	75th	95th
2005	100.0	-	100.0	100.0	100.0	100.0	100.0
2006	104.1	15.0	80.1	93.4	103.9	114.0	128.6
2007	107.5	20.0	76.6	93.6	106.6	120.1	141.9
2008	110.7	22.9	75.2	94.5	109.4	124.2	152.7
2009	113.6	25.4	76.2	95.5	111.3	128.2	159.3
2010	116.5	27.2	77.7	97.3	113.4	131.5	166.1
2011	118.8	30.3	76.4	97.6	115.4	135.0	174.0
2012	120.6	32.3	77.9	97.9	115.3	137.1	181.5
2013	122.8	36.3	76.4	97.9	116.0	141.2	196.0
2014	124.5	38.8	77.1	97.6	117.3	142.5	202.4
2015	127.1	42.2	76.1	98.0	119.1	145.2	208.5
2016	129.5	44.8	77.9	100.2	119.8	148.1	212.6
2017	132.8	47.9	78.3	101.2	123.3	153.1	222.2
2018	135.8	51.4	78.0	103.0	124.3	156.5	231.6
2019	138.0	55.3	78.6	102.4	125.4	158.2	242.6
2020	140.9	58.1	77.6	102.4	126.5	162.3	251.1

Mark-to-Market Funding Method with Immunization

Year	Mean	SD	5th	25th	50th	75th	95th
2005	100.0	-	100.0	100.0	100.0	100.0	100.0
2006	100.0	0.2	99.6	99.9	100.0	100.1	100.3
2007	100.0	0.3	99.5	99.8	100.0	100.2	100.4
2008	100.0	0.3	99.5	99.8	100.0	100.2	100.5
2009	100.0	0.3	99.4	99.8	100.0	100.2	100.5
2010	100.0	0.3	99.4	99.8	100.0	100.2	100.5
2011	100.0	0.3	99.5	99.8	100.0	100.2	100.5
2012	100.0	0.3	99.4	99.8	100.0	100.2	100.5
2013	100.0	0.3	99.4	99.8	100.0	100.2	100.5
2014	100.0	0.3	99.5	99.8	100.0	100.2	100.5
2015	100.0	0.3	99.5	99.8	100.0	100.2	100.5
2016	100.0	0.3	99.4	99.8	100.0	100.2	100.5
2017	100.0	0.3	99.4	99.8	100.0	100.2	100.6
2018	100.0	0.3	99.5	99.8	100.0	100.2	100.6
2019	100.0	0.3	99.5	99.8	100.0	100.2	100.6
2020	100.0	0.4	99.4	99.8	100.0	100.2	100.6

Stochastic Funding Method

Year	Mean	SD	5th	25th	50th	75th	95th
2005	100.0	-	100.0	100.0	100.0	100.0	100.0
2006	105.3	15.2	81.1	94.6	105.2	115.4	130.2
2007	109.6	20.7	77.9	95.0	108.8	123.1	145.7
2008	113.1	24.0	75.8	95.7	111.8	127.2	156.3
2009	116.2	26.9	75.4	97.4	113.8	132.6	163.7
2010	119.2	29.1	77.0	98.8	116.1	136.1	170.9
2011	121.4	32.4	74.5	99.1	118.4	139.0	180.3
2012	123.1	34.6	75.2	99.3	118.7	141.8	186.9
2013	125.1	38.6	75.0	98.3	119.2	145.2	200.3
2014	126.5	41.1	74.6	98.1	118.6	145.7	206.0
2015	128.6	44.6	73.4	98.5	120.4	150.0	213.9
2016	130.5	47.1	74.9	98.6	121.3	151.0	216.9
2017	133.3	50.2	74.2	99.4	123.3	155.3	223.3
2018	135.8	53.8	73.1	100.5	124.8	158.1	229.8
2019	137.5	57.7	72.5	100.3	125.9	159.5	243.5
2020	139.9	60.5	71.8	99.9	126.5	164.7	254.9

Appendix B
Capital Market Assumptions

	Mean	Std Dev.								
Portfolio Statistics:										
65/35 Stock/Bond Portfolio	9.1%	13.6%								
Hedged Portfolio	6.1%	12.7%								
Asset Class Stastistics:										
T-Bills	3.9%	2.5%								
30-Year Treasury Bond	6.2%	9.2%								
U.S. Large Cap Stocks	10.9%	20.4%								
U.S. Small Cap Stocks	12.0%	33.7%								
Long-Term Corporate Bonds	6.5%	8.5%								
Intermediate Government Bonds	6.2%	6.3%								
International Stock	12.4%	22.7%								
Real Estate	11.2%	16.6%								
Hedged Portfolio	6.1%	12.7%								
Nominal Correlations:										
	Inflation	T-Bills	30-Year Treasury Bond	U.S. Large Cap Stocks	U.S. Small Cap Stocks	Long-Term Corporate Bonds	Intermediate Government Bonds	Inter-national Stock	Real Estate	Hedged Portfolio
Inflation	1.00	−0.08	0.37	0.05	0.01	0.35	0.25	0.03	−0.02	0.38
T-Bills		1.00	−0.09	−0.06	−0.1	−0.09	0.11	−0.11	0.16	−0.05
30-Year Treasury Bond			1.00	0.14	0.01	0.93	0.68	0.08	−0.04	0.86
U.S. Large Cap Stocks				1.00	0.62	0.16	−0.11	0.54	0.19	0.12
U.S. Small Cap Stocks					1.00	0.09	−0.03	0.35	0.62	0.00
Long-Term Corporate Bonds						1.00	0.77	0.06	−0.04	0.80
Intermediate Government Bonds							1.00	−0.13	−0.11	0.59
International Stock								1.00	0.09	0.06