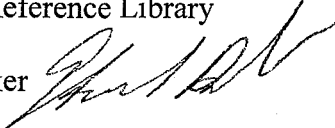


MINNESOTA  
STATE  
BOARD OF  
INVESTMENT

DATE: January 15, 2009

09 - 0097

TO: Legislative Reference Library

FROM: Howard Bicker 

SUBJECT: Investment Consultant Report



**Board Members:**

Governor  
Tim Pawlenty

State Auditor  
Rebecca Otto

Secretary of State  
Mark Ritchie

Attorney General  
Lori Swanson

As required by Laws of Minnesota 2007, Chapter 148, section 2, subdivision 7, attached is the State Board of Investment's Report on Investment Consultant Activities.

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Howard J. Bicker

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STATE  
BOARD OF  
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**DATE:** January 15, 2009

**FROM:** State Board of Investment

**SUBJECT: Report on Investment Consultant Activities**

The provisions of Laws of Minnesota 2007, Chapter 148, section 2, subdivision 7 require the State Board of Investment to file with the Legislative Reference Library a report on investment consultant activities.

The State Board of Investment (SBI) contracts with Richards & Tierney, Chicago, Illinois and PCA, Studio City, California for certain investment consulting services. Richards & Tierney serves as the SBI's general consultant, and PCA serves as the SBI's special projects consultant. The current contracts with these consultants, effective July 1, 2007 to June 30, 2012, call for payment of \$370,000 to Richard & Tierney annually and \$40,000 to PCA annually.

During the period November 1, 2007 through October 31, 2008, Richards & Tierney was involved in the following projects:

- Asset allocation review for the combining of the Basic and Post Funds.
- Availability to the Board, staff and Investment Advisory Council to provide perspective, counsel and input on relevant investment related issues.

During the period November 1, 2007 through October 31, 2008, PCA was involved in the following projects:

- Background information and alternative sources of information about managers in the SBI's alternative investment program.

Attached is an example of the work product provided.

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**Presentation to**  
**Minnesota State Board of Investment**  
**Investment Advisory Council**  
**November 21, 2008**

**Richards & Tierney, Inc.**

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***Richards & Tierney, Inc.***

# **Table of Contents – MNSBI Asset Liability Study**

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<b>Section I:</b>	<b>Background</b>
<b>Section II:</b>	<b>Analytical Process</b>
<b>Section III:</b>	<b>Deterministic Results</b>
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<b>Section V:</b>	<b>Discussion and Recommendation</b>

# MNSBI Asset Liability Study

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## **Policies That Determine The Financial Health of Retirement Funds**

- ◆ **Funding Policy – Cash flow into the Fund**
  - Specification of how and when contributions are made to the fund
  - Specification of amount and timing of contributions
- ◆ **Benefit Policy – Cash flow out of the Fund**
  - Specification of plan benefits
  - Specification of eligibility requirements
- ◆ **Investment Policy – Level and type of investment risk**
  - Financial status of the plan
  - Financial strength of the plan sponsor
  - Risk tolerance/preferences of the plan fiduciaries

# MNSBI Asset Liability Study

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## ◆ Objective –

- To observe a range of future financial outcomes, in context of economic and investment uncertainty
  - ✓ At current investment policy
  - ✓ At alternative investment policies
- To affirm or revise investment policy

## ◆ Examine the Financial Health of MN Retirement Plans in Aggregate

- Within the context of Investment Policy decisions
- Within the context of **existing** Funding Policy
- Within the context of **existing** Benefit Policy

## ◆ Conduct the analysis on a consolidated basis

- Used largest 4 plans (Teachers Retirement Fund, Public Employees Retirement Fund, State Employees Retirement Fund, Public Employees Police & Fire)
- Combine the Basics and the Post
- These plans accounted for approximately 98% of total SBI retirement assets at June 30, 2008

## ◆ Focus on Funded Ratio

- Actuarial Liabilities / Market value of Assets
- Year 2028 and 2033 (20 and 25 year projections)

# MNSBI Asset Liability Study

## Methodology

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- ◆ **Create actuarial model of MN Retirement Plans that is consistent with the valuations by plan actuary (Segal)**
  - Load July 2007 census data, program plan provisions and enter actuarial assumptions
  - Utilize all available financial information
  - Run replication valuation to ensure results within 0-5% tolerance
  - Scale results so starting values exactly match actuary's figures
  - Reflect all new actuarial assumptions effective for July 2008 valuations
  - Reflect merging of Post plan with respective active plans
- ◆ **Create new entrant profiles**
  - Use an open group concept, where departing employees are replaced by presumed new hires
  - Set experience assumptions equal to valuation assumptions (no built-in gains or losses)
  - Achieve overall demographic stability in member counts, average ages, average service, etc.
  - Establish separate profile for each of the four plans modeled
- ◆ **Run 30-year core projection of liabilities**
- ◆ **Run Deterministic and Stochastic Forecasts**

# **MNSBI Asset Liability Study**

## **Deterministic versus Stochastic**

---

### ◆ **Deterministic forecasts**

- Set of financial outcomes over projection period, based on the premise that a set of assumptions will be realized
- Set of assumptions could be variety of scenarios

### ◆ **Stochastic forecasts**

- Set of several thousand deterministic forecasts chosen randomly based on the risk and return characteristics of the investment policy asset classes
- Distribution of financial outcomes over the projection period, based on the premise that assumptions will rarely, if ever, be fully realized
- Measures the range or volatility of selected financial factors over the projection periods
- Measures the probability of a variety of financial outcomes



# Deterministic Forecast

## 8.5% Investment Return

Year	Actuarial Value of Assets (AVA)	Market Value of Assets (MVA)	Actuarial Liability	BOY Funded Ratio	Employer Contributions (% of payroll)	Expected Employee Contributions (% of payroll)	Funding Expected Bft Pymts
2007	46,113,586,941	48,694,008,834	53,810,046,281	0.90	6.30	4.55	2,867,447,173
2008	48,389,334,858	44,778,736,618	56,806,475,924	0.79	6.35	4.44	3,043,635,083
2009	49,933,604,802	46,924,757,387	59,412,133,897	0.79	6.45	4.46	3,229,549,232
2010	51,344,829,890	49,124,724,630	62,061,532,369	0.79	6.55	4.50	3,423,867,842
2011	52,670,463,929	51,374,018,287	64,752,561,165	0.79	6.55	4.54	3,623,351,786
2012	53,654,617,588	53,654,617,588	67,487,005,452	0.80	6.55	4.57	3,832,657,349
2013	55,961,615,892	55,961,615,892	70,259,815,347	0.80	6.55	4.61	4,050,353,022
2014	58,290,518,387	58,290,518,387	73,067,676,716	0.80	6.55	4.64	4,274,917,162
2015	60,638,137,822	60,638,137,822	75,907,648,238	0.80	6.55	4.67	4,505,476,814
2016	63,002,577,616	63,002,577,616	78,778,200,211	0.80	6.55	4.69	4,747,863,077
2017	65,374,779,456	65,374,779,456	81,666,445,605	0.80	6.55	4.72	4,980,771,415
2018	67,766,896,248	67,766,896,248	84,597,180,954	0.80	6.55	4.74	5,222,609,853
2019	70,173,624,077	70,173,624,077	87,566,773,464	0.80	6.55	4.75	5,479,380,684
2020	72,582,664,423	72,582,664,423	90,556,630,690	0.80	6.55	4.77	5,719,934,929
2028	92,811,153,957	92,811,153,957	116,210,113,051	0.80	6.55	4.86	7,721,618,708
2033	107,162,690,052	107,162,690,052	134,688,791,665	0.80	6.55	4.88	8,915,311,886

\*Market Value of Assets at 7/1/09 projected from 7/1/08 using expected 8.5% investment return

\*\*Policy Full Funding Test is determined at end of each plan year

# Deterministic Forecast

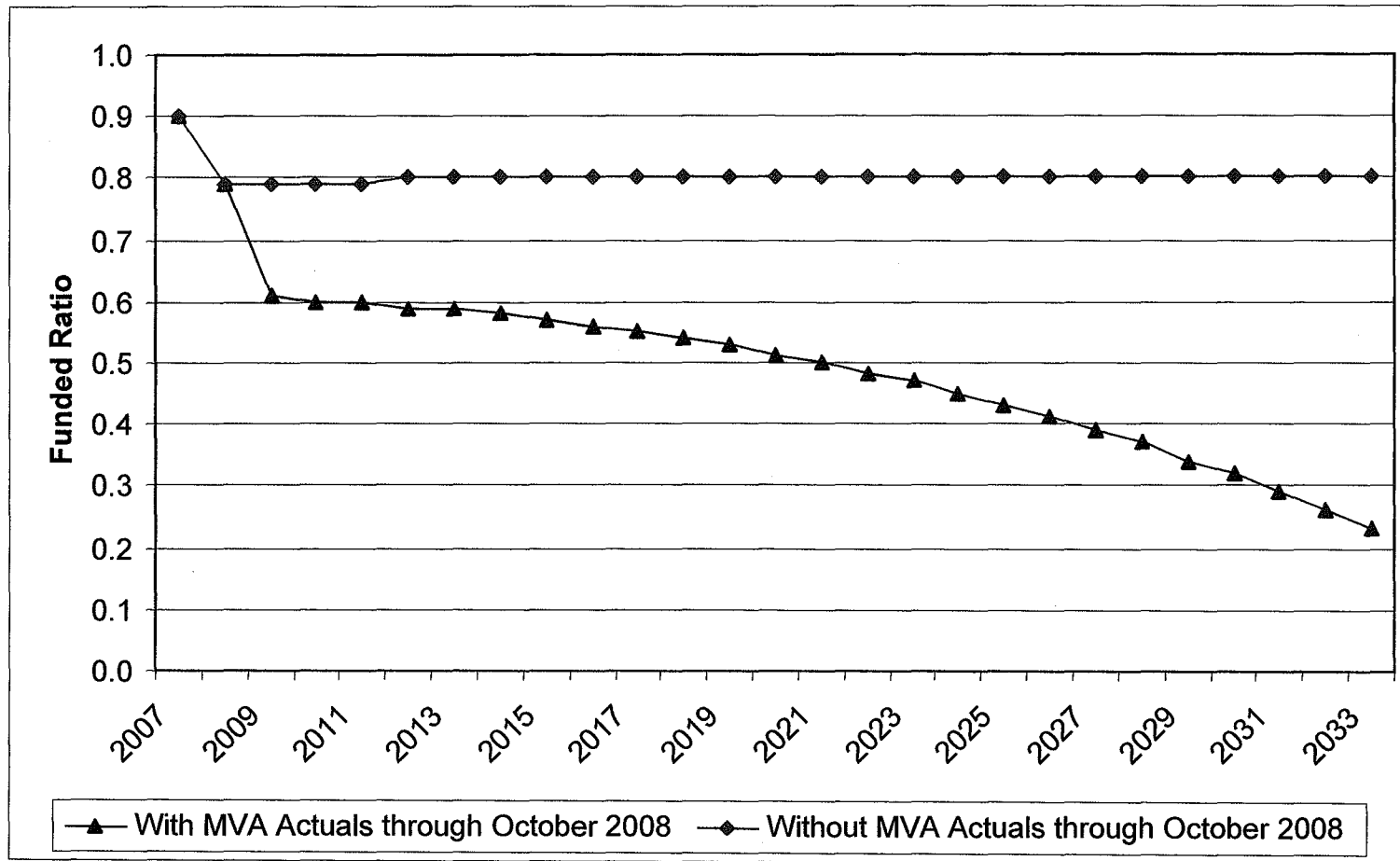
## 8.5% Investment Return Adjusted for experience thru Oct 2008

Year	Actuarial Value of Assets (AVA)	Market Value of Assets (MVA)	Actuarial Liability	BOY Funded Ratio	Employer Contributions (% of payroll)	Expected Employee Contributions (% of payroll)	Funding Expected Bft Pymts
2007	46,113,586,941	48,694,008,834	53,810,046,281	0.90	6.30	4.55	2,867,447,173
2008	48,389,334,858	44,778,736,618	56,806,475,924	0.79	6.35	4.44	3,043,635,083
2009	43,489,442,164	*36,241,201,803	59,412,133,897	0.61	6.45	4.46	3,229,549,232
2010	45,039,680,185	37,533,066,821	62,061,532,369	0.60	6.55	4.50	3,423,867,842
2011	44,366,937,440	38,797,069,564	64,752,561,165	0.60	6.55	4.54	3,623,351,786
2012	42,145,339,340	40,008,628,223	67,487,005,452	0.59	6.55	4.57	3,832,657,349
2013	41,155,717,431	41,155,717,431	70,259,815,347	0.59	6.55	4.61	4,050,353,022
2014	42,226,118,557	42,226,118,557	73,067,676,716	0.58	6.55	4.64	4,274,917,162
2015	43,208,264,006	43,208,264,006	75,907,648,238	0.57	6.55	4.67	4,505,476,814
2016	44,091,164,526	44,091,164,526	78,778,200,211	0.56	6.55	4.69	4,747,863,077
2017	44,855,896,253	44,855,896,253	81,666,445,605	0.55	6.55	4.72	4,980,771,415
2018	45,503,907,972	45,503,907,972	84,597,180,954	0.54	6.55	4.74	5,222,609,853
2019	46,018,281,798	46,018,281,798	87,566,773,464	0.53	6.55	4.75	5,479,380,684
2020	46,374,118,050	46,374,118,050	90,556,630,690	0.51	6.55	4.77	5,719,934,929
2028	42,474,906,097	42,474,906,097	116,210,133,051	0.37	6.55	4.86	7,721,618,708
2033	31,474,254,198	31,474,254,198	134,688,791,665	0.23	6.55	4.88	8,915,311,886

\*Market Value of Assets at 7/1/09 based on actual returns for 6/30/08-9/30/08 and expected returns for 10/08-7/1/09

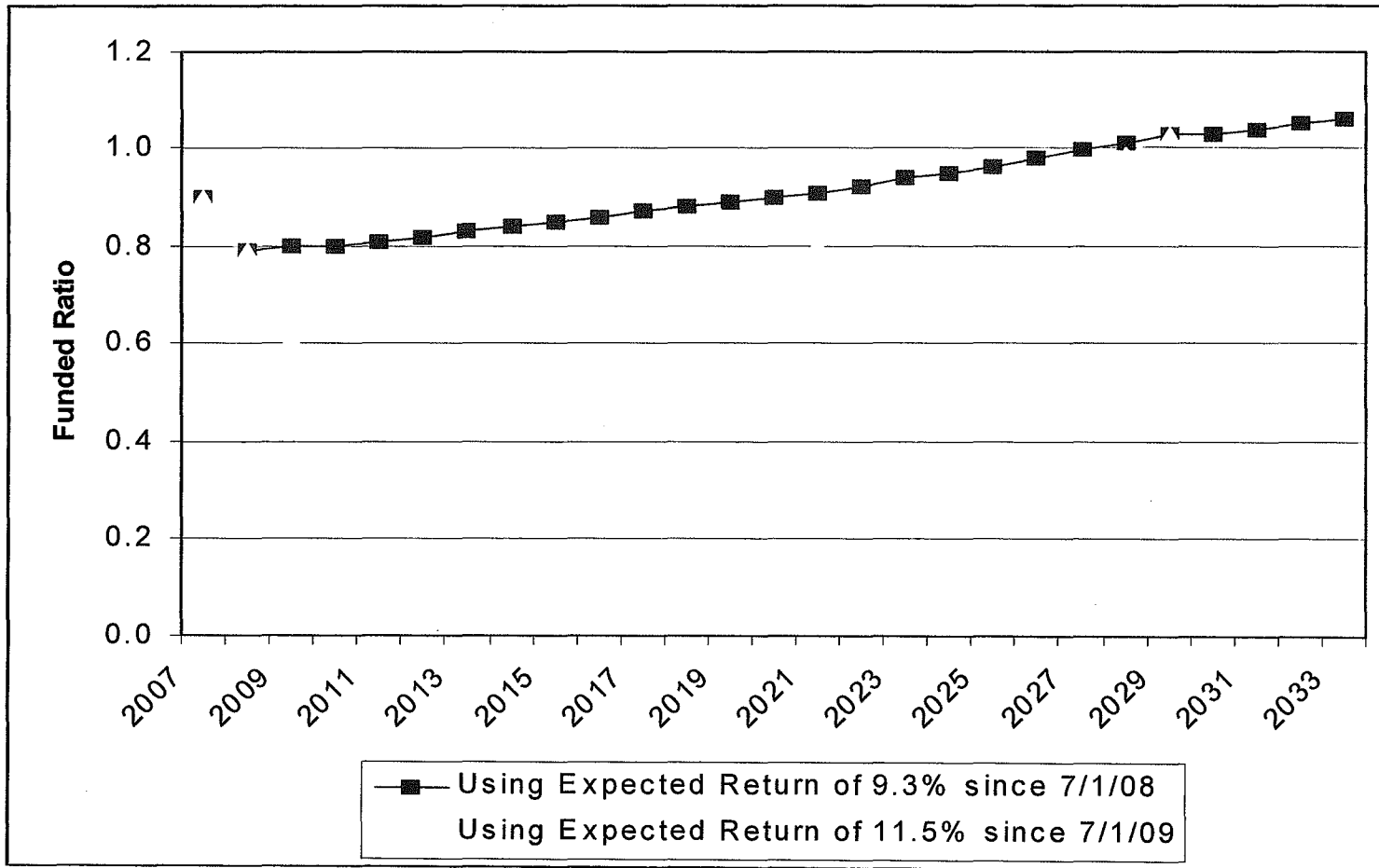
\*\*Policy Full Funding Test is determined at end of each plan year

# Deterministic Forecasts – Funded Status



# Deterministic Forecasts – Funded Status

## Investment Return needed for Full Funded Status at 2028/2033



# MNSBI Asset Liability Study

## Capital Market Assumptions

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<b>Asset Classes</b>	<b>Real Return (%)</b>	<b>Nominal Return (%)</b>	<b>Risk (Std Dev)</b>
Domestic Equity	6.0	9.0	17.0
International Equity	6.0	9.0	18.0
Emerging Markets	8.0	11.0	25.0
Alternative Assets	8.5	11.5	20.0
Domestic Bonds	3.0	6.0	7.0
Cash Equivalents	1.0	4.0	2.0
Inflation	3.0		1.0

# MNSBI Asset Liability Study

## Capital Market Assumptions

---

### Correlation Matrix

	1	2	3	4	5	6	7
Domestic Equity	1.00						
International Equity	.70	1.00					
Emerging Markets	.65	.65	1.00				
Alternative Assets	.55	.45	.40	1.00			
Domestic Bonds	.20	.10	-.05	.20	1.00		
Cash Equivalents	.00	-.05	-.05	.00	.00	1.00	
Surprise Inflation	-.28	-.09	.25	.19	-.48	.02	1.00

# MNSBI Asset Liability Study

## Investment Options

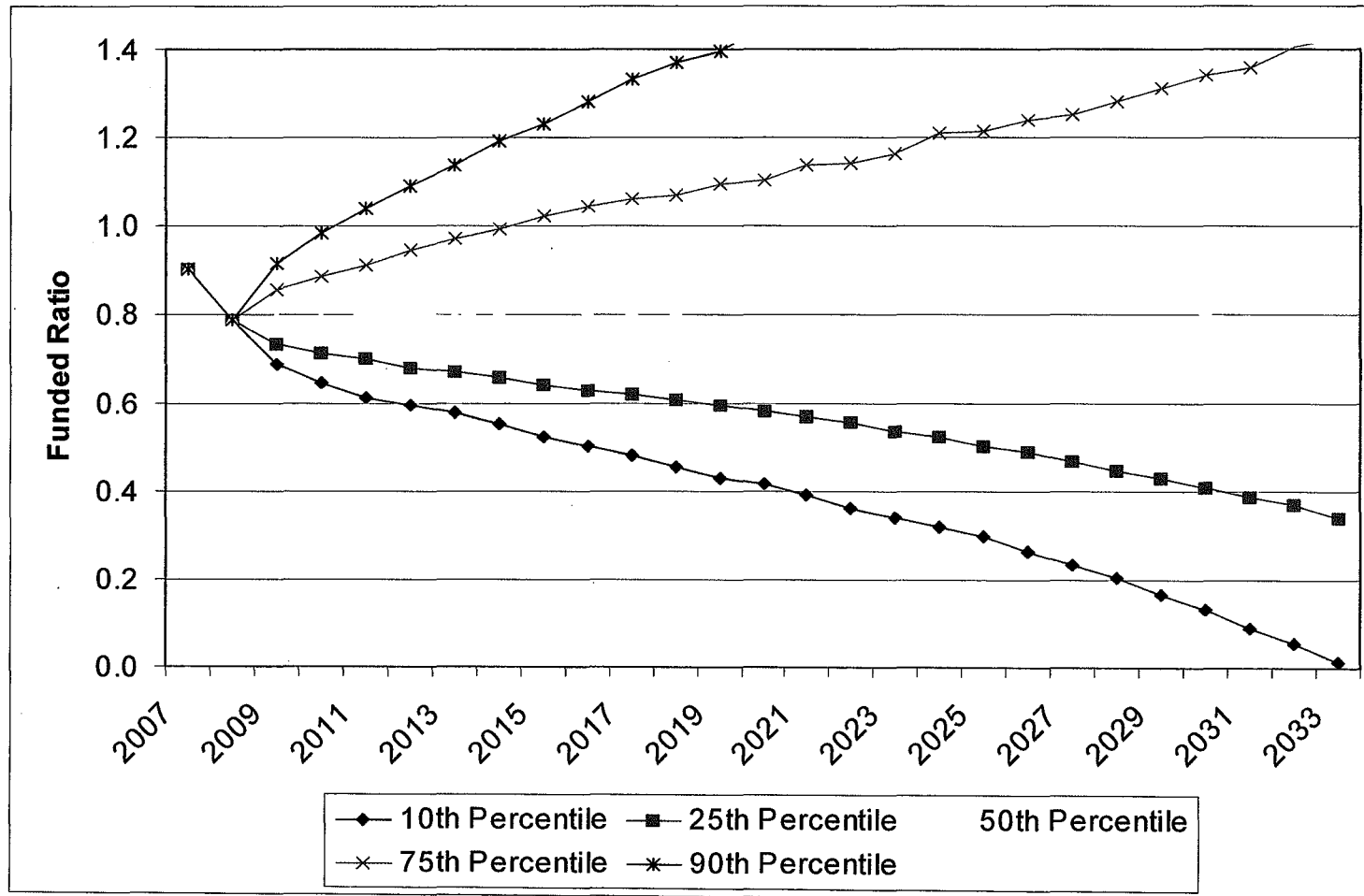
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Asset Class	Current Policy	Option 1	Option 2	Option 3	100% Equity
US Stocks	45.0%	45.0%	40.0%	40.0%	58.0%
International	12.0	12.0	16.0	16.0	16.0
Emerging Markets	3.0	3.0	4.0	4.0	4.0
Alternatives	16.0	20.0	18.0	20.0	20.0
US Bonds	22.0	18.0	20.0	18.0	0.0
Cash	2.0	2.0	2.0	2.0	2.0
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Annual Exp Return (%)	8.70	8.92	8.91	8.94	9.48
Annual Exp Risk (Std Dev)	12.30	12.81	12.79	12.75	15.35

# Stochastic Forecast – Funded Ratio

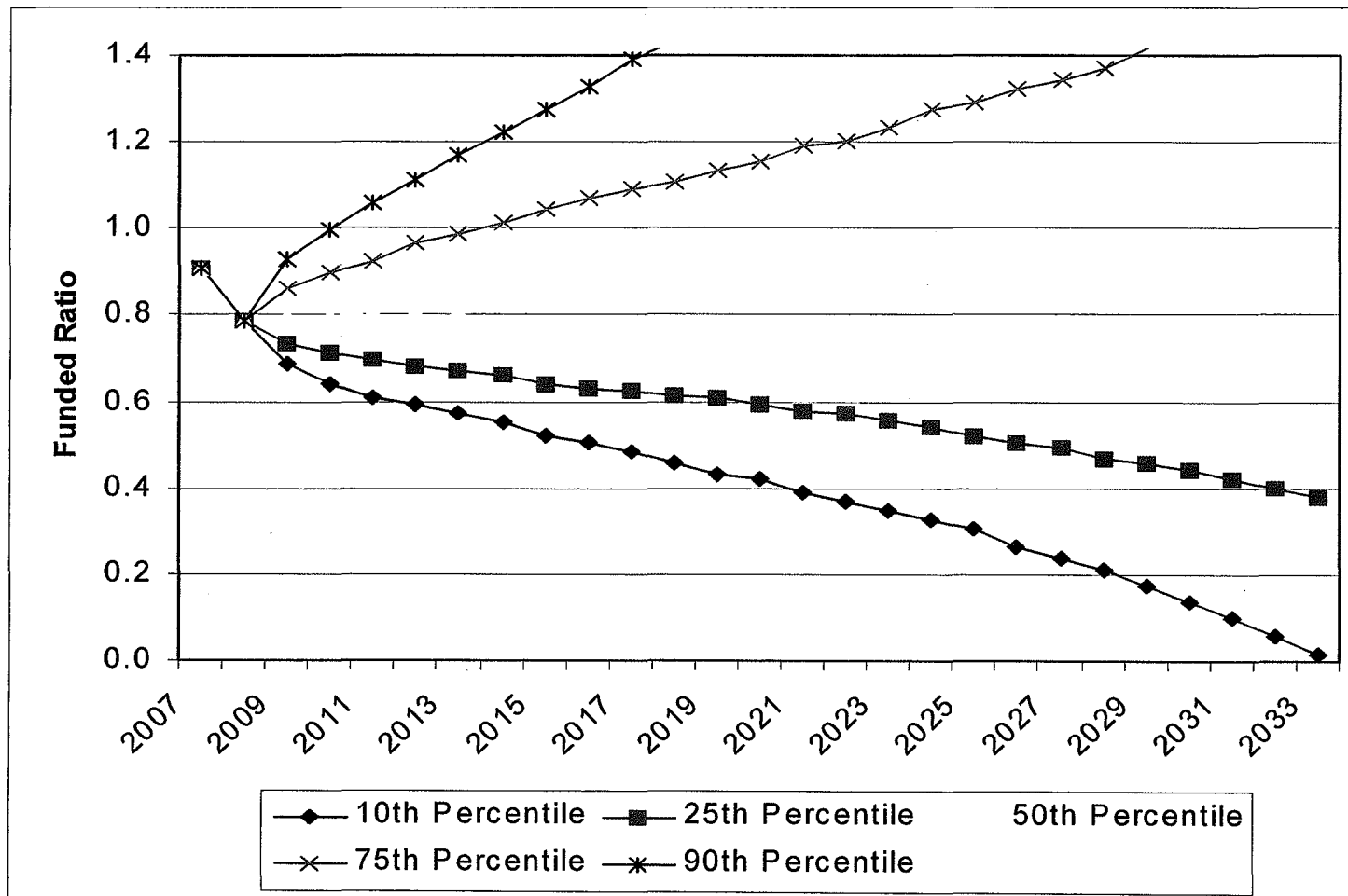
Current Investment Policy, Expected Returns since 7/1/08





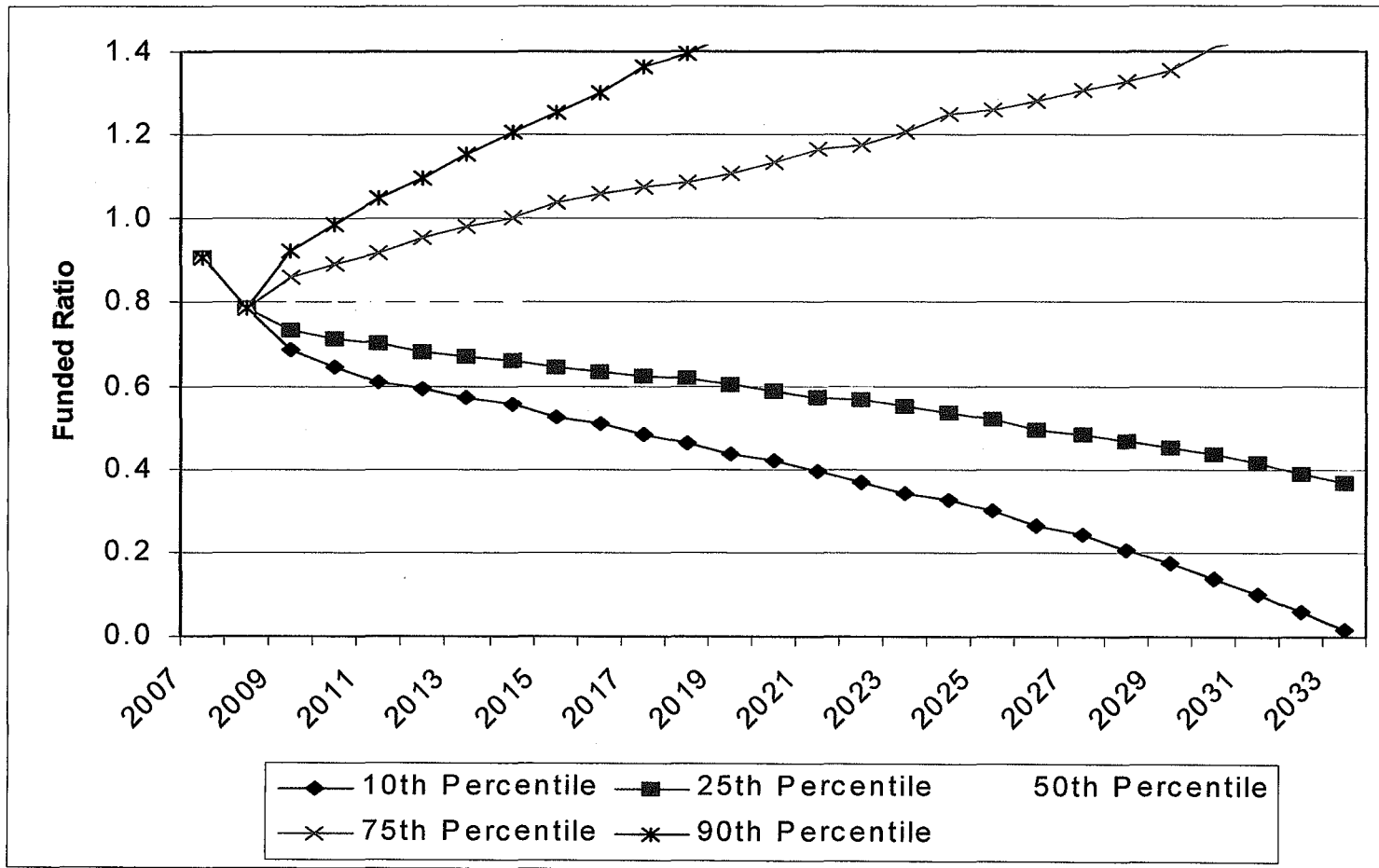
# Stochastic Forecast – Funded Ratio

## Investment Option 1, Expected Returns since 7/1/08



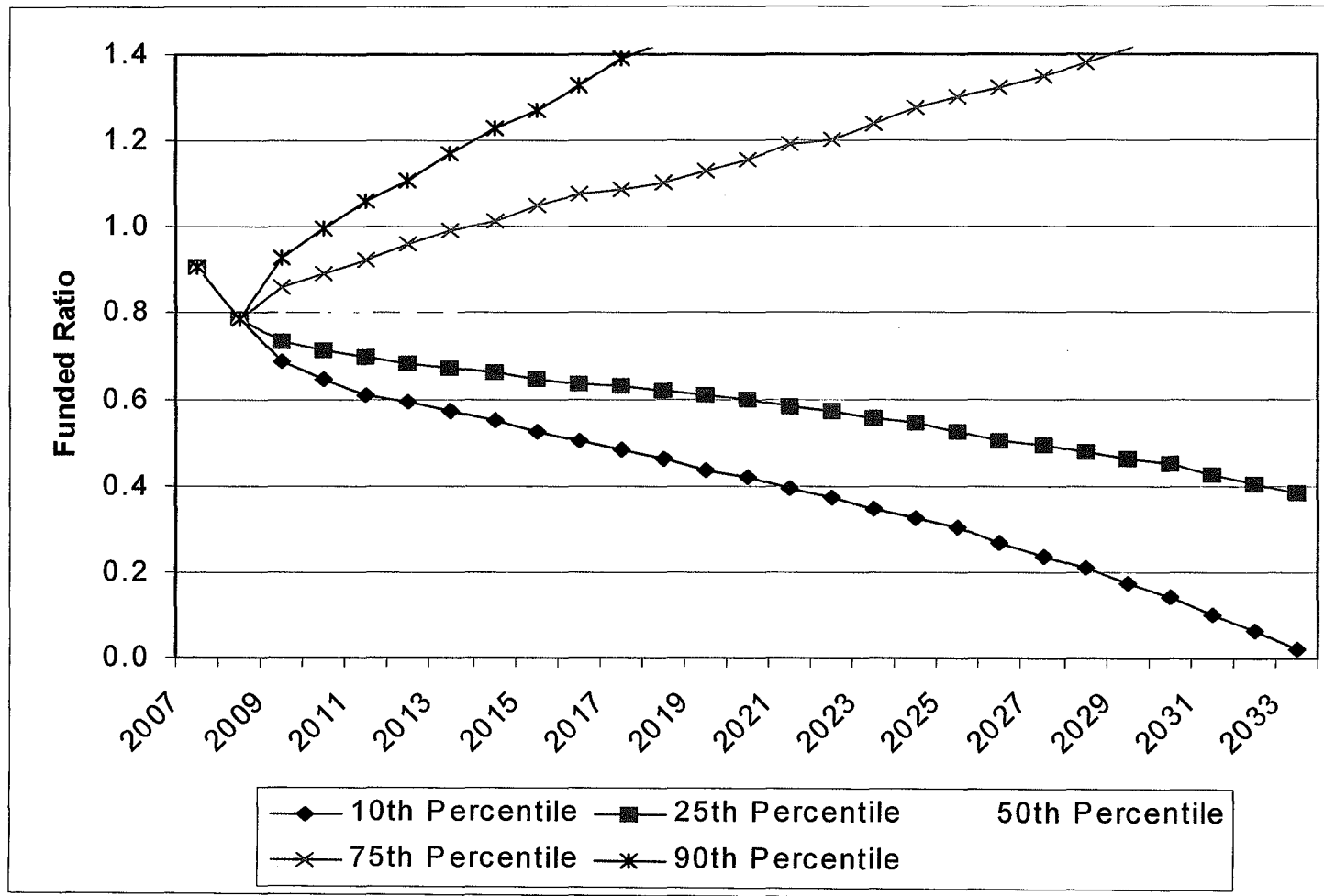
# Stochastic Forecast – Funded Ratio

## Investment Option 2, Expected Returns since 7/1/08



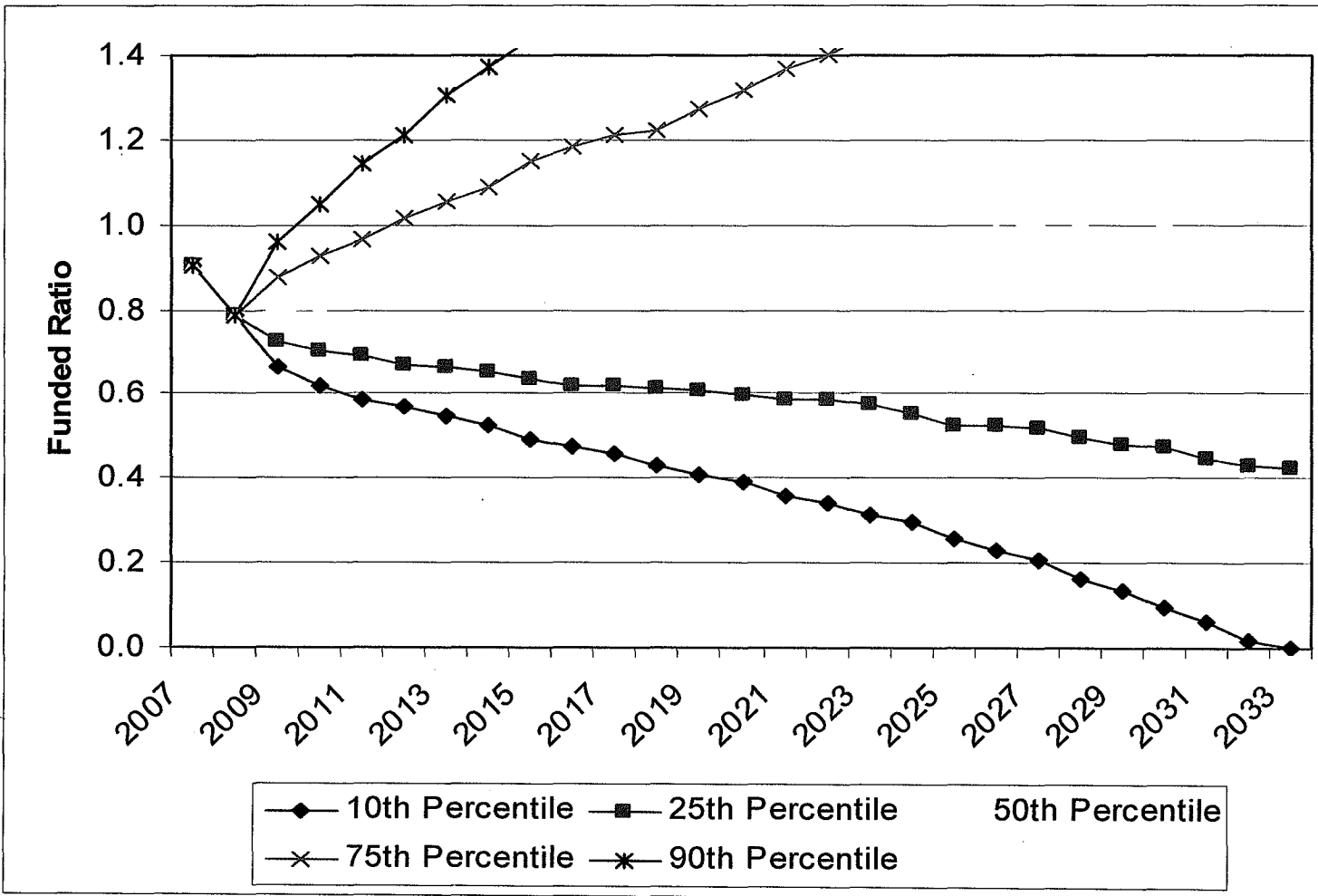
# Stochastic Forecast – Funded Ratio

## Investment Option 3, Expected Returns since 7/1/08



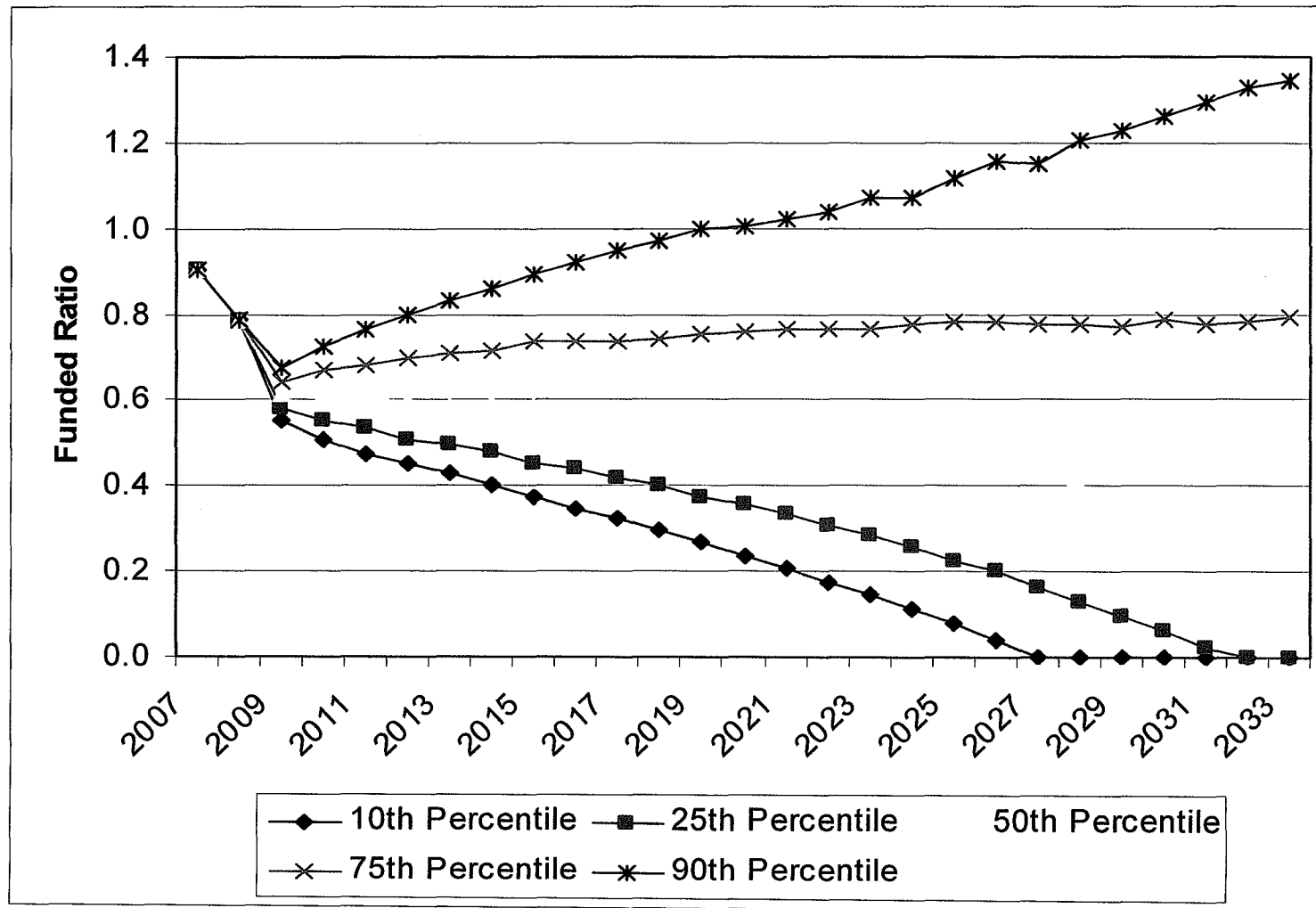
# Stochastic Forecast – Funded Ratio

## 100% Equity, Expected Returns since 7/1/08



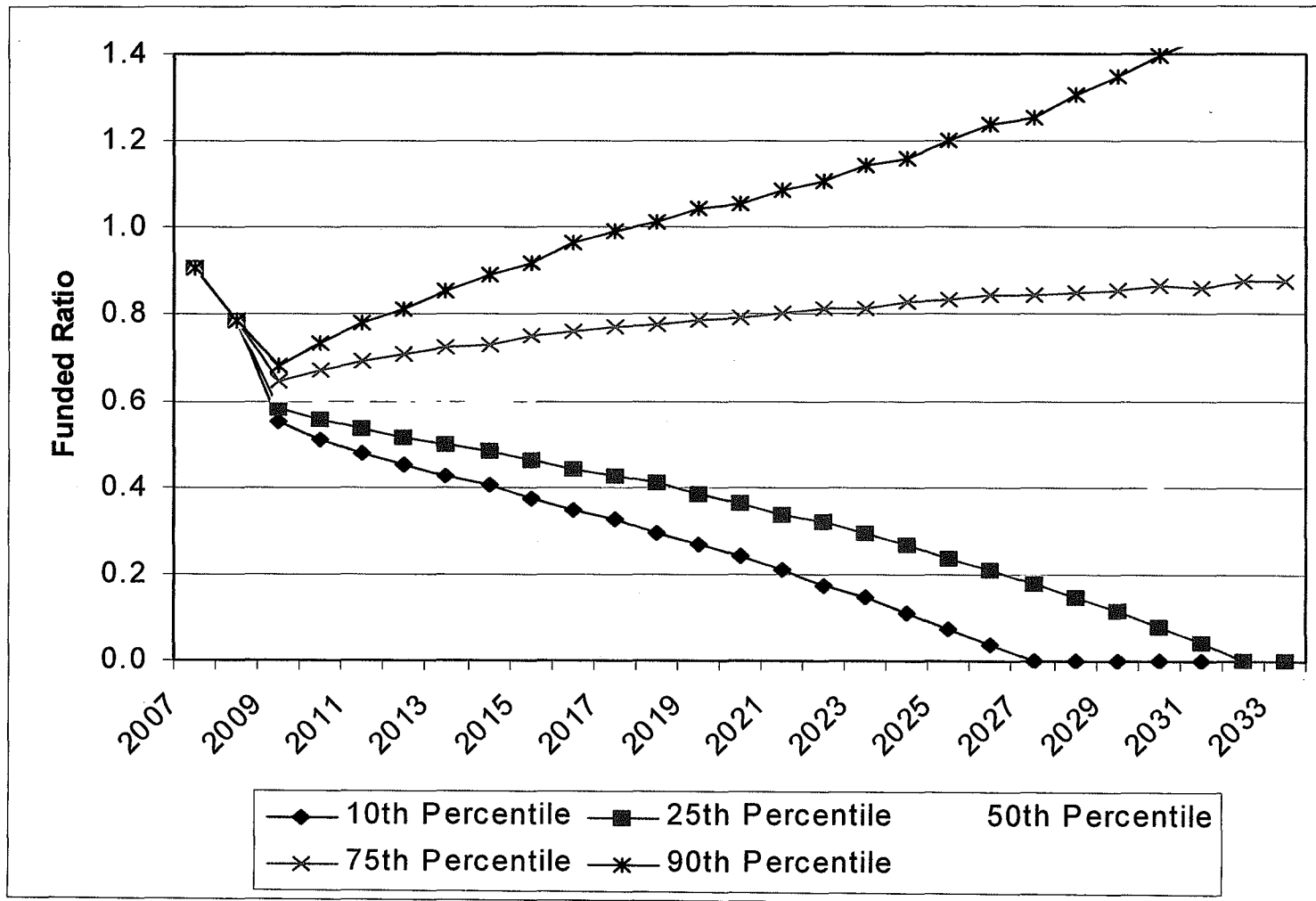
# Stochastic Forecast – Funded Ratio

## Current Investment Policy, With Effect of 2008 Actual Returns



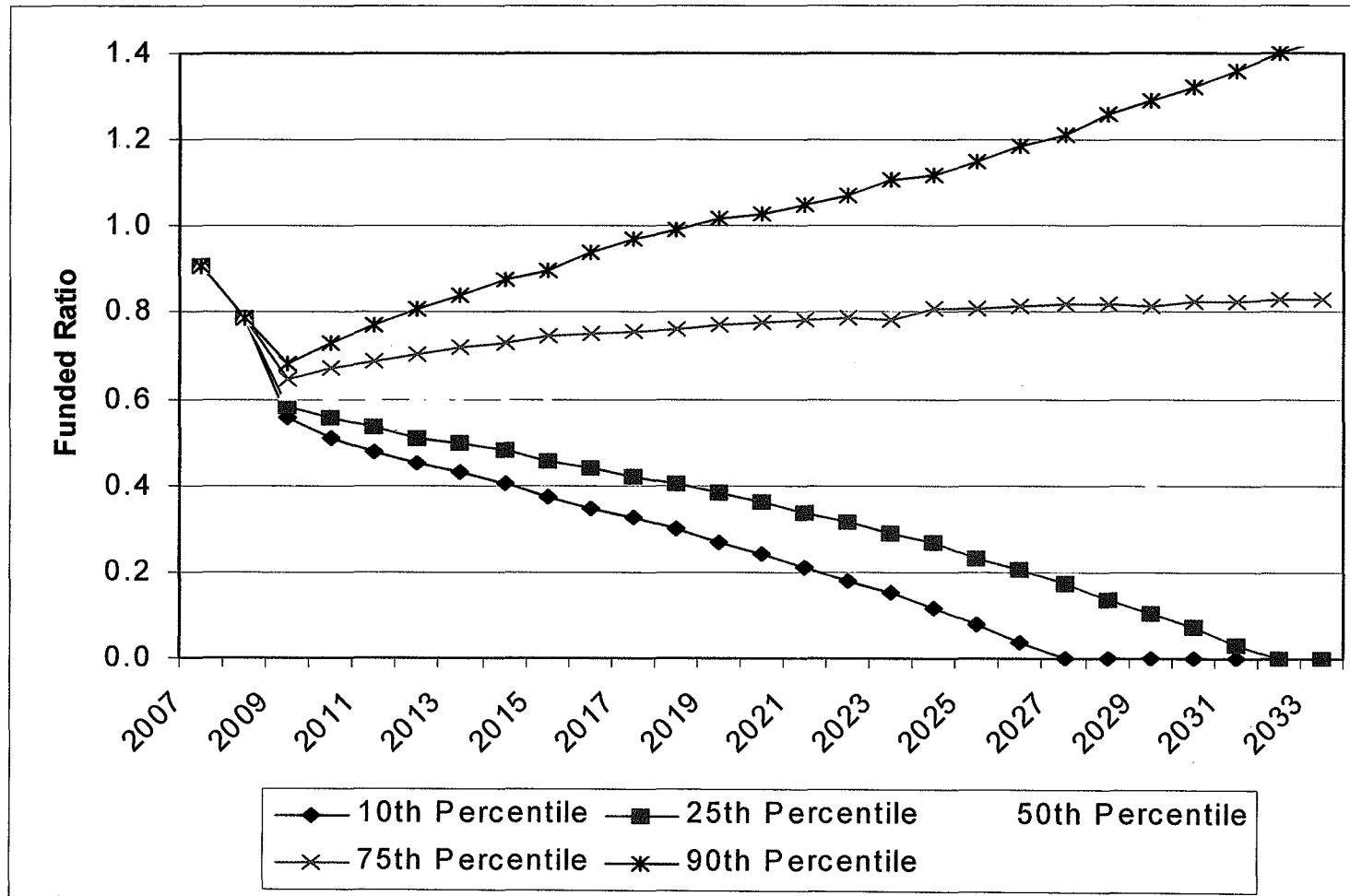
# Stochastic Forecast – Funded Ratio

## Investment Option 1, With Effect of 2008 Actual Returns



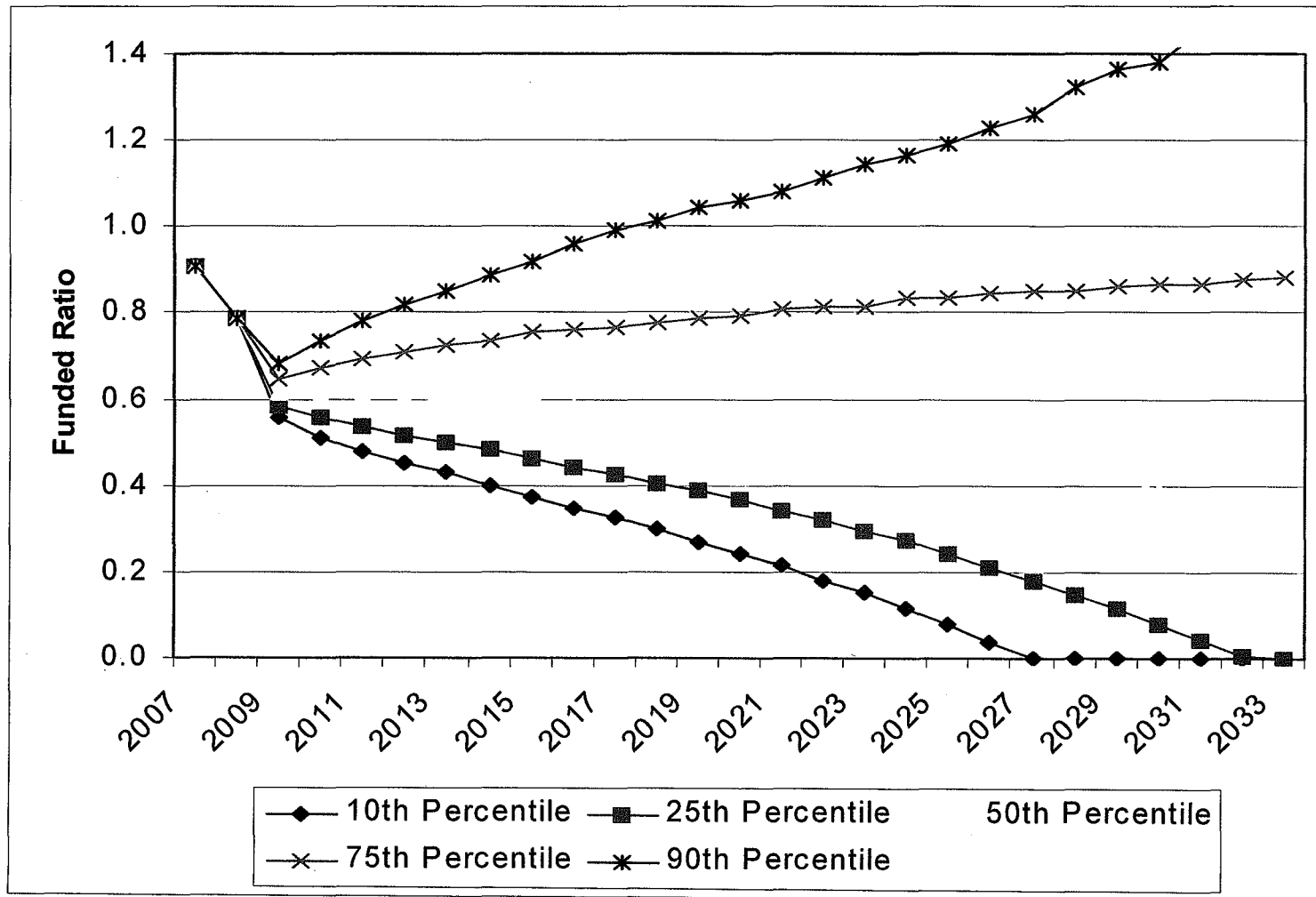
# Stochastic Forecast – Funded Ratio

## Investment Option 2, With Effect of 2008 Actual Returns



# Stochastic Forecast – Funded Ratio

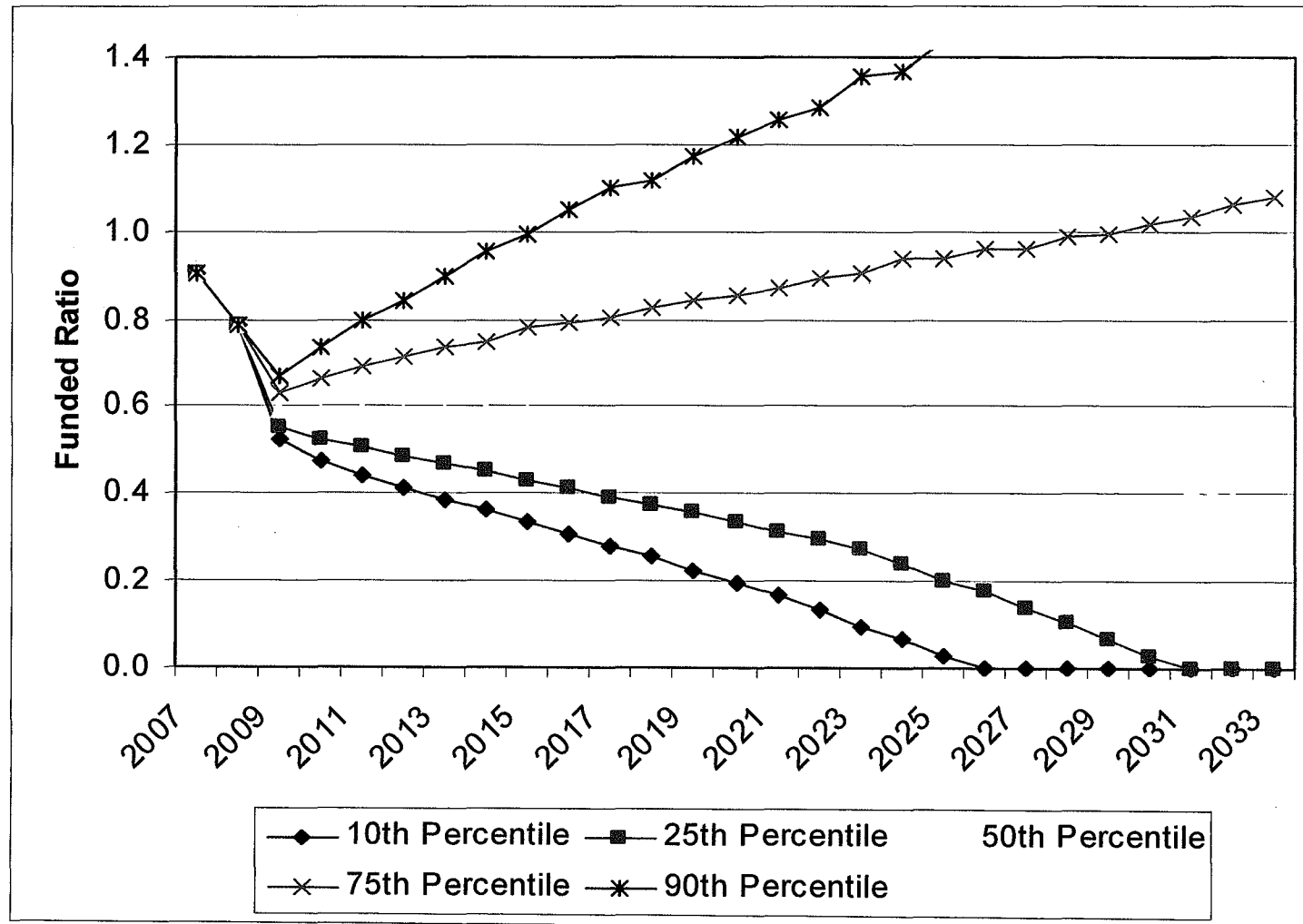
## Investment Option 3, With Effect of 2008 Actual Returns





# Stochastic Forecast – Funded Ratio

## 100% Equity, With Effect of 2008 Actual Returns



# Sample Table

Forecast Year: 2028

	PV Contributions		Funded Ratio (MVA/AAL)	
	Mean	Std Dev	Mean	Std Dev
<b>Expected Returns since 7/1/08</b>				
Current Portfolio	8,767,659,669	2,531,093,286	0.974	0.766
Option 1	8,571,418,346	2,629,430,318	1.050	0.854
Option 2	8,650,651,743	2,573,356,705	1.014	0.805
Option 3	8,557,180,165	2,617,640,410	1.053	0.850
100% Equity	8,131,909,113	2,989,825,786	1.327	1.291
<b>With Effect of Actual 2008 Returns</b>				
Current Portfolio	10,578,227,421	1,975,971,675	0.531	0.532
Option 1	10,462,645,189	2,085,014,597	0.586	0.591
Option 2	10,504,487,823	2,004,300,182	0.560	0.559
Option 3	10,445,515,340	2,062,030,064	0.588	0.589
100% Equity	10,458,807,261	2,737,726,785	0.703	0.830

# Sample Table

**Forecast Year: 2033**

	<b>PV Contributions</b>		<b>Funded Ratio (MVA/AAL)</b>	
	<b>Mean</b>	<b>Std Dev</b>	<b>Mean</b>	<b>Std Dev</b>
<b>Expected Returns since 7/1/08</b>				
Current Portfolio	9,843,454,516	3,437,961,007	1.068	1.121
Option 1	9,596,690,351	3,554,688,616	1.186	1.281
Option 2	9,688,260,880	3,478,804,836	1.129	1.199
Option 3	9,570,246,607	3,531,024,067	1.190	1.283
100% Equity	9,124,415,721	4,044,685,828	1.641	2.122
<b>With Effect of Actual 2008 Returns</b>				
Current Portfolio	12,664,119,661	3,478,820,329	0.522	0.726
Option 1	12,443,043,024	3,589,050,335	0.560	0.833
Option 2	12,528,872,249	3,500,412,830	0.562	0.780
Option 3	12,417,537,358	3,557,838,245	0.603	0.836
100% Equity	12,481,107,386	4,386,189,331	0.803	1.299

# **MNSBI Asset Liability Study**

## **Discussion and Recommendations**

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