

**Actuarial Liability Pricing Does Not Reflect Risk:
Risky Assets are Still Risky in the Long Run and
There is No "Free Lunch"**

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The Magic of Value Creation from Nothing

Borrowing at 3% and Lending at 8% as a Function of Time Horizon

Length of Time Horizon (Years)	Value of \$1 billion Investment at 8%	Value of \$1 billion Loan at 3%	Excess Value Created for the Borrower
0	\$ 1.00	\$ 1.00	\$ 0.00
1	1.08	\$ 1.03	0.05
5	1.47	\$ 1.16	0.31
10	2.16	\$ 1.34	0.82
20	4.66	\$ 1.81	2.85
30	10.06	\$ 2.43	7.63
50	46.90	\$ 4.38	42.52
75	321.20	\$ 9.18	301.98
100	2,200.00	\$ 19.22	2,180.78
200	4,838,950.00	\$ 369.36	48,385,806 (\$4.8 Quadrillion)

Actuarial Valuation of Pension Liabilities Do Not Reflect Risk

Valuation of Promised Benefit of \$1000 in 30 Years

Fraction of Portfolio in Equities	Expected Return on Asset Portfolio	Actuarial Present Value of Liabilities	Benefit-Shortfall Guarantee Pmt Premium	Cost of Actuarial Value & Guarantee
0.0	3.0%	\$407	\$ 0	\$407
0.1	3.5%	350	63	413
0.2	4.0%	301	113	415
0.3	4.5%	259	156	416
0.7	6.5%	142	276	418
0.8	7.0%	122	296	419
0.9	7.5%	105	314	419
1.0	8.0%	91	328	419

Expected return on equities = 8%

Standard deviation of return = 20%

30-Year UST Bond = 3%

(Rates used are continuously compounded)

Future Contribution Risk to State from Underperformance Promised Benefit of \$1,000 in 30 Years

Realized Rate of Return on Fund Assets	Value of the Fund in 30 Years	Shortfall of Pension Asset Minus Liability Value	Realized Percentage Funding of Pension Plan	Benefits Paid from Future State Revenues
8.0%	\$1,000	\$ 0	100%	0%
7.5%	\$ 870	\$ 130	87%	13%
7.0%	\$ 757	\$ 243	76%	24%
6.5%	\$ 657	\$ 343	66%	34%
6.0%	\$ 571	\$ 429	57%	43%
5.0%	\$ 430	\$ 570	43%	57%
4.0%	\$ 322	\$ 678	32%	68%
3.0%	\$ 241	\$ 759	24%	76%

Present Value of \$1,000 in 30 Years at 8% = \$ 99.38 = Actuarially Fully-Funded Plan Assets Today

Can the Stock Market Greatly Underperform over 30 Years?
Japan Third Largest Economy in the World:

Nikkei 225 Stock Market 1984-2013

1984	10,071
1989	31,577
1990	37,242 [high 38,951]
1991	23,271
1992	22,076
1993	17,038
1994	20,256
1995	18,647
1996	20,806
1997	18,308
1999	14,544
2000	19,537
2001	13,741
2002	10,027
2003	8,286
2004	10,785
2005	11,422
2006	16,929
2007	17,377
2008	13,518
2009	7,909
2010	10,212
2011	10,282
2012	8,789
2013	11,153