DB Plan Management
—Lessons from Market Turmoil

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Asset allocation

GPIF Strategic Asset Allocation

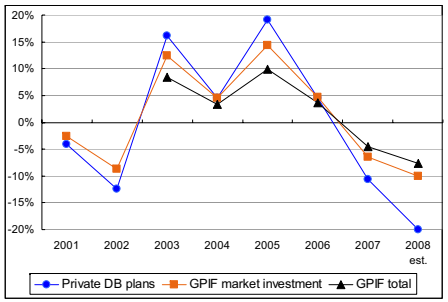
	SAA	Permissible deviation
Domestic fixed income	67%	± 8 %
Domestic equity	11%	± 6 %
Foreign fixed income	8%	± 5 %
Foreign Equity	9%	± 5 %
Cash	5%	± 0 %

Asset Allocation of Occupational (Private) DB Plans (%)

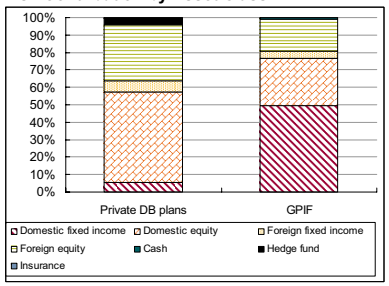
	1990	1994	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Equity	18.4	16.5	37.1	44.8	54.6	52.2	51.6	41.9	43.3	47.0	49.1	46.8	39.7
Domestic	13.0	11.1	21.5	28.3	36.5	34.0	32.0	25.9	28.2	29.4	30.8	28.0	23.5
Foreign	5.4	5.4	15.6	16.6	18.0	18.1	19.6	16.0	15.1	17.6	18.3	18.8	16.2
Domestic fixed income	21.7	21.2	24.1	22.2	21.5	21.3	21.3	23.2	20.1	21.4	20.9	21.8	24.9
Convertible bonds	3.3	4.7	3.5	2.0	1.6	1.3	0.7	0.4	0.1	0.02			
Foreign bonds	5.2	3.8	6.1	8.5	7.4	10.3	10.2	11.9	10.3	12.0	11.7	12.5	13.1
Insurance (gen. acct.)	36.9	42.2	24.4	17.7	11.1	11.3	12.1	14.0	10.5	7.9	7.5	8.2	10.1
Real estate	0.6	0.3	0.1	0.1	0	0	0	0	0	0	0	0	0
Cash	3.2	2.8	2.2	2.5	2.5	2.2	2.7	4.4	10.4	6.1	3.5	2.9	3.5
Other	10.8	8.4	2.5	2.2	1.3	1.4	1.5	4.3	5.3	5.7	7.4	7.7	8.7
Hedge funds											4.8	4.8	5.6

Risk contribution and investment performance

Return Record of Pension Funds (fiscal year)



Risk Contribution by Asset Class



Risk = 7.8% Risk = 5.5%

Lessons from market turmoil

- Rebalance rule and periodic revision of SSA
- Risk management
  - -- Risk diversification
  - -- Liquidity management
- Limitations of Quantitative Portfolio Construction
  - -- Assumption of normal distribution vs. tail risk
- Communication with stakeholders
  - -- Shared investment beliefs
  - -- Timely disclosure
- With equity investment, what is the true economic cost of future benefits?

Rebalance rule and revision of SAA

- Should we rebalance?
  - -- Rebalance rule is an integral part of SAA.
  - -- As long as estimated parameters (return and covariance matrix) are constant, portfolio should be rebalanced to abide by risk budget limit.
  - -- In practice, constant rebalancing is too expensive, and a certain amount of portfolio deviation from SAA is permissible.
- Should we revise SAA (strategic asset allocation)?
  - -- YES, if we judge that parameters have changed.

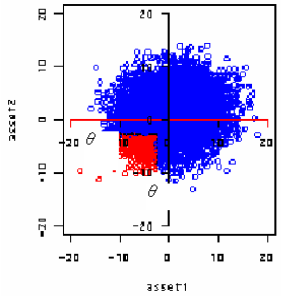
  BUT THAT JUDGEMENT IS NOT AN EASY TASK.

Pros and cons of two methodologies of SAA revision

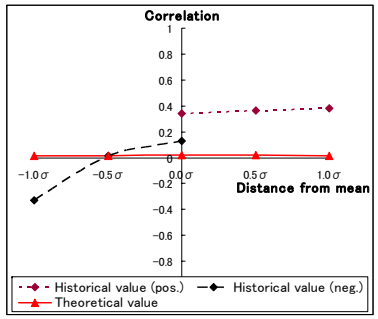
	Revise every 5 (or 3) years	Revise at any time
Pros	・Prudent and careful judgment ・Lower transaction costs ・Cosistency with periodic actuarial valuation	・Easy to adjust to changes in economy and market
Cons	・Slow adjustment to changes in economy and market	・Excessive influence of market volatility ・Inconsistency with periodic actuarial valuation ・Increase in transaction costs

Is diversification effective against downside risk?

- Conditional Correlation
  - -- Correlation among risk assets increase in “crisis regime ”
  - -- Test of exceedance correlation (calculated from monthly return data)

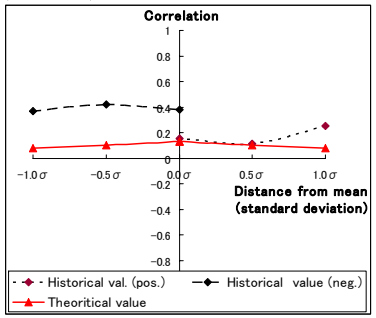


Domestic Equity vs Domestic Fixed Income (1980-2007)



Unconditional correlation = 0.063418

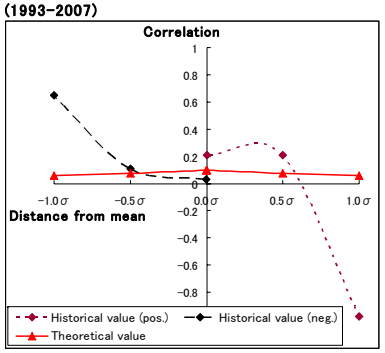
Domestic Equity vs Foreign Equity (1985-2007)



Unconditional correlation = 0.289074

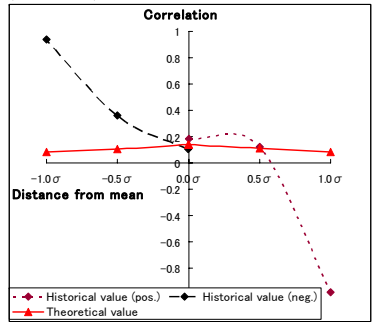
Source: Ibbotson Associates

Domestic Equity vs Hedge Fund (1993-2007)



Unconditional correlation = 0.229629

Domestic Equity vs Equity LongShort (1993-2007)



Unconditional correlation = 0.30356

Source: Ibbotson Associates

Liquidity management

- Illiquid asset classes (e.g., real assets)

-- Price uncertainty increases in times of market turmoil

-- Leveraging makes illiquid assets even more illiquid

-- Impediment to rebalancing

- Cash-out for benefit payment

-- If funding ratio falls below 100%, it is raised by cash-in but lowered by cash-out

-- Listed equity is the most liquid but also the most volatile asset class

Limitations of quantitative analysis --

Assumption of Normal Distribution vs. Tail Risk

- Return distribution

-- (Un)Reliability of historical return data

-- (Un)Reliability of the assumption of normal distribution

" Black Swan" - Popper, Carl and Taleb, Nicholas

-- Does what we have experienced occur only in once in 100 or 1,000 years?

Pension fund return from 7/2007 through 11/2008 was -36.4% (-30% annual basis). Assuming expected return of 4.5% annum, and standard deviation of 8%, this loss is deviated between three sigma (0.135% probability) and four sigma (0.00317%) from the mean.

- Countermeasures for Tail Risk

-- Non-parametric optimization such as bootstrap

-- Optimization with lower partial moment (LPM)

-- (Dynamic) hedge

-- Stress test

-- Deliberate neglect, because we are long-term investors

- All quantitative analyses have limitations

"Not everything that counts can be counted, and not everything that can be counted counts." – Albert Einstein

Communication with stakeholders

- Sharing investment beliefs and knowledge about the market
- Timely disclosure of information

	Examples of Investment Beliefs	Misunderstanding of Investment Beliefs
1	Risk premium (compensation for risk) does exist.	• Risk premium is positive in every investment period. • Historical level of risk premium is a good indicator of future level. • Standard deviation or VAR assuming the normal distribution of risk premium is the sole risk measure.
2	Diversification is free lunch to improve efficiency.	• Diversification means investment in different asset class labels. • Correlation among asset classes is stable.
3	Short-term market timing requires special skills, while a long-term investment horizon has more chances of success.	• Strategic Asset Allocation can be revised only at set intervals, even if market conditions change significantly.
4	Illiquidity bears a risk premium.	• Premium for liquidity is positive and stable in any period.

With equity investment, what is the true economic cost of future pension benefits ?

- Can equity investment reduce plan costs ?

-- In actuarial practice, equity investment entails a lower discount rate, and thus requires a lower contribution.

-- But as the equity risk premium implies, the lower cost is not "certainty equivalent" to the cost incurred in a fixed income portfolio.

-- Even assuming mean reversion in equity return, the lower cost (lower required contribution) of benefits cannot be fully verified.

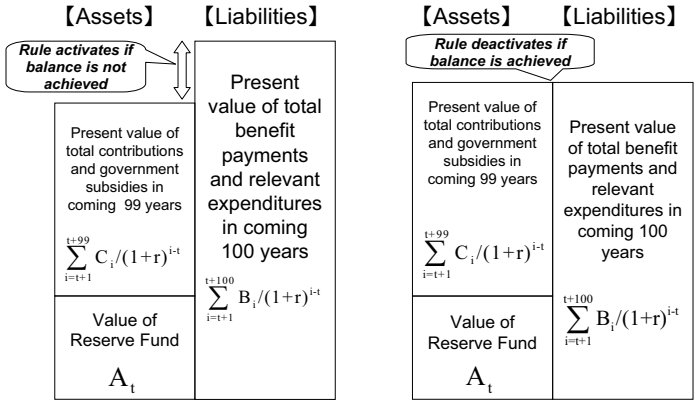
- The true economic cost of benefits is calculated as the contribution required assuming you invest in a fixed income portfolio that is completely immunized against changes in plan liabilities. If that cost is too expensive, you may well consider changes to the plan design:

--introduction of a different benefit formula such as a "hybrid plan," where plan participants share risks of economic and actuarial changes to some extent; or

-- renegotiation and reduction of benefits.

Benefit Adjustment Rule in Public Pension

Real benefit adjusts (decreases) to reflect the decrease in number of active insured (workers) and greater longevity of beneficiaries



Note:
1.Nominal value of benefit amount never decreases.
2. Schedule of contribution rate is fixed.

Notes: A= Value of reserve fund, C= Revenue (pension insurance tax and government subsidies), B= Expenditures (benefits and relevant expenditures), r= Discount rate.

Summary

- Stick to the investment belief that risk-taking rewards in long-term.
- At the same time short-term risk management making use of various methods both quantitative and qualitative and not limited to the one depending on variance-covariance matrix is important.
- Because of the decline in risk taking capacity of investors such as investment banks and hedge funds, risk premium will rise in the long run.
- Until the higher risk premium is factored in, instability and uncertainty of securities price will continue. But after the market adaptation to the lower risk tolerance of investors is completed, we will be able to enjoy higher reward for the same amount of risk.

Reminder:

Views and opinions in these slides are Usuki's personal ones and do not necessarily reflect those of GPIF, NLI Research or any organization he is affiliated with.