

Risk Management and Pension Plan Choice in Japan

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Abstract

In previous studies, financial characteristics of plan sponsors and defined benefit plans have been found to affect asset allocation decisions in investment management. We examine the influence of these factors on plan design and choices of plan types in Japan. Our findings confirm that profit volatility, funding ratio, and pension plan size relative to a plan sponsor's total assets, exert some influence on decisions regarding plan termination and put-back of the contracted-out portion of Employee Pension Funds in Japan.

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Pension plan sponsors and managers of defined benefit (DB) plans in Japan have faced many hardships over the last 14 years. Above all, the depressed stock market and declining interest rates have contributed to the rapid spread of DB plan underfunding. In addition, new accounting standards introduced in fiscal 2000 made unfunded pension liabilities a greater concern for plan sponsors. Further, plan sponsors have been disappointed with the ineffectiveness of measures taken in the field of asset management, because of the narrowing risk premium in capital markets since 2000. Increasingly they are turning their eyes to the field of liability management and benefit design, seeking to control the financial risks of the pension plans offered. Measures taken include plan termination, benefit reduction, put-back of the contracted-out portion, and adoption of cash balance or defined contribution (DC) plans.

In this chapter, we evaluate whether and to what extent these changes in benefit design were influenced by sponsors' desire to control financial risk. We select several plan financial characteristics that affect risk tolerance and asset allocation decisions, such as the funding ratio, and examine whether these variables influence decisions regarding plan termination and put-back of the contracted-out portion of Employee Pension Funds. In particular, we examine the hypothesis that plan sponsors have altered the plan type they offer, as a way to control risks in pension management. We find that the pension plan's funding ratio, volatility of the plan sponsor's return on equity, and the size of the pension plan relative to the plan sponsor's total assets do exert an influence on decisions to change pension plan types.

This research is of general interest for at least two reasons. First, pension plans in other

countries today face similar challenges that their Japanese counterparts have experienced in the last decade. These challenges consist of a depressed stock market, declining interest rates, increasing longevity risk, and unfavorable regulatory changes (especially in the accounting arena). Japanese plan sponsor reactions, in terms of changing their benefit design, may offer valuable insights for others in similar circumstances. Second, how financial risk influences pension plan offerings is an important area of pension research that has yet to be thoroughly explored. We seek to shed light on these issues by analyzing what drives pension plan design in Japan.

Defined Benefit Plan Sponsor Risk Sensitivity

The Tokyo stock market began to plummet in 1990, and since then, Japanese investors have grown increasingly concerned about financial risks. Defined benefit pension plan sponsors were no exception. A key problem was that it became difficult for pension funds to earn higher returns by taking investment risks. The Nikkei stock average fell 80 percent, from the 1989 year-end peak of 38,916 yen to the April 2003 level of 7,831 yen. Assuming the average stock market risk premium of 5.44 percent from 1953 to 2002 is maintained, and adding this to the nominal risk free rate of 1.95 percent (from 1990-2002), the *ex-ante* probability of the historical rate of return on the Tokyo Stock Exchange Index (TOPIX) is below one percent (Usuki, 2003).¹ Such disappointing rates of return on pension fund investments were naturally of grave concern, since domestic stocks constitute 30 percent of DB plan assets in Japan.

Over the last 40 years, Japanese DB plans have been of two main types, namely the Employee Pension Funds (EPFs) and the Tax Qualified Pension Plans (TQPPs; see Clark and Mitchell, 2002). The EPFs have a contracted-out portion that is managed by the plan sponsor as a

partial substitute for a component of the public retirement benefit. As a consequence, the EPFs have some quasi-public characteristics not found in TQPPs, and accordingly, data on EPFs are more easily obtained than for TQPPs. Published data indicate that the average return on assets managed by EPFs was two percent in nominal terms and -0.4 percent in real terms in the 1989-2003 period (Pension Fund Association, 2003).

Especially from 2000, the premium per unit of risk or volatility declined, as compared to the preceding period. Yen-based premiums over the risk-free rate fell in asset classes such as domestic and foreign stocks, and also in domestic bonds although to a lesser degree. At the same time, volatility, as gauged by the standard deviation of return, increased notably in foreign bonds and stocks. As a result, the 60-month Sharpe Ratio decreased uniformly for all asset classes. This clearly hurt DB plans, since in addition to holding domestic as well as foreign bonds and stocks, DB plans also tend to invest around 15 of total assets in fixed-yield contracts sold by life insurers. But the guaranteed yield of these contracts was lowered from 2.5 percent to 1.5 percent in 1999.

A typical Japanese DB plan allocates, respectively, 25, 30, 10, 15, 15, and 5 percent of assets to yen-bonds, yen-stocks, foreign bonds, foreign stocks, insurance contracts and money market products, the Sharpe Ratio declined drastically after 2000 (see Figure 1). In other words, while investment risks increased, investment returns were associated with a declining risk premium.

Figure 1 here

Pension plan sponsors also had to take into account the impact of interest rate changes on the liability side of the DB balance sheet. The 20-year Japanese government bond yield which stood at 5.7 percent at the end of 1989, then fell to 2.2 percent in 1999, and 1.3 percent in 2002. These government bond rates are used to discount DB pension liabilities, so this decline

augmented the economic value of pension liabilities and increased plan sponsor burdens.

The stagnant rate of return on assets, combined with growing liabilities caused by the lower discount rate, have contributed to the increasing pension funding shortfall or decreasing surplus, which is a major down-side risk for Japanese pension plan sponsors. Figure 2 shows that the share of underfunded EPF plans has continued to rise over time, and it has exceeded 90 percent in 2001. Plan sponsors have voiced the concern that these funding shortages will worsen corporate financial ratios under the new accounting standard explained below, and that they could damage firm market valuation.

Figure 2 here

Impact of New Accounting Standards. Another factor causing Japanese pension plan sponsors to become more vividly aware of DB plan financial risks was the new accounting standard adopted in 2000. Prior to that, DB plans recorded only what was contributed to a plan as an expense on the income statement, without recognizing any liabilities on the balance sheet. As a consequence, it was unusual for top executives to devote any attention to DB fund management, unless a large increase in the contribution was requested.

In 2001, however, an accounting standard became effective, similar to Financial Accounting Standard 87 in the United States and International Accounting Standard 19 (Fore, this volume). This new standard stipulated that the difference between the market-based value of pension assets and liabilities (the PBO, or Projected Benefit Obligation) had to be recognized and disclosed as an item called “accrued pension benefits” on the liability side of the plan sponsor’s balance sheet.

When the new accounting standard was first applied, the average reported ratio of DB plan assets to liabilities was 54 percent for companies listed on the First Section of the Tokyo

Stock Exchange (year-end fiscal 2000).³ However, this ratio fell to 46 percent at year-end fiscal 2001 and 42 percent at 2002, because of the above-mentioned poor return and ballooning value of liabilities. Plan sponsors were then forced to recognize these deteriorating funding conditions every six months when financial statements were published. According to Benartzi and Thaler (1995), the more often people watch the result of their financial activities, the more risk-averse they become. If this hypothesis holds true for plan sponsors, disclosure of bad results under the new accounting standard would be predicted to make them more sensitive to risks in pension fund management and think about adopting measures to control risks in pension finance.

Shift of Focus from Assets to Liabilities. From the plan sponsor viewpoint, DB plan management is similar to that of other financial institutions (Davis, 1995; Peskin, 1997). That is, plan sponsors owe a long-term debt to employees (the promised pension) in which is backed by invested funds. In these circumstances, changes in investment strategy and benefit design can both be effective in financial risk management. As a primary measure to control risk, however, the traditional and universal response in developed countries has been for DB plan sponsors to change investment strategies and tactics, especially their asset allocation policies.

As a result, many pension plans in Japan have reduced their allocation to riskier asset classes since 2000, especially with regard to domestic and foreign stocks. Some have boosted the share of fixed-yield insurance products, while others moved to long-term domestic and foreign bonds seeking to bring the duration of assets closer to that of liabilities. Yet such measures on the asset management side have not served as a panacea. That is, even if a DB plan successfully engaged in duration-matching or immunization by investing in fixed income products such as bonds and insurance products, this would mean that the plan would forego the potential for higher returns. In the Japanese case, expected rates of return would fall far below the discount

rate used in actuarial calculations. Consequently, no matter how hard pension funds have tried to reduce risks on the asset side, they have not succeeded in keeping unfunded liabilities from growing.⁴

Changes in Pension Plan Types and Benefit Design

Finding it difficult to contain DB plan risk using asset management measures, Japanese plan sponsors have begun to alter the way they design the pension plan itself. If we consider benefit obligations to be akin to financial institution debt, there are two ways to control risks on the corporation's balance sheet. One is to eliminate or reduce the debt (or at least stop its growth), and the other is to reduce the interest rate risk due on debt by shortening the debt duration. Next we identify five tools that can serve that the purpose. The first, introducing a cash-balance plan, has the effect of shortening duration, while the other four (plan termination, benefit reduction, put-back of contracted-out portion, and introducing a defined contribution plan) help reduce, contain, or eliminate pension liabilities and the shortfall of assets relative to liabilities.

Plan Termination. The two major types of defined benefit plans, EPFs and TQPPs, declined in number by 12 percent and 28 percent respectively from their peaks (see Table 1). Termination eliminates the risk of growth in pension liabilities due to falling discount rates. As a rule, when a Japanese pension plan is terminated, accumulated assets must be distributed first to beneficiaries in the form of annuities, and then to active members either in the form of on-the-spot lump-sum payments or annuities after retirement. Also employers can establish DC plans and use the accumulated assets that otherwise would be distributed in cash to contribute to employees' accounts in defined contribution plans.

Table 1 here

Benefit Reduction. Another way to manage pension risk is to reduce DB plan benefits. The reduction of benefits accrued from past service was legalized in 1997, provided that certain conditions are met, including agreement between labor and management, and the existence of business difficulties. From fiscal 1997 through 2001, the number of EPFs whose benefits have been reduced each year was 7, 16, 52, 177, and 114 respectively. The most common pattern has been where pension plans reduced the annuity amount, by lowering the assumed rate of interest for the conversion of original lump-sum value into annuities.⁵ Of late, this reduction has not been limited to monthly annuity amounts, but rather it has also affected the value of the lump-sum amount. Another notable development has occurred in a few cases where pensioners' benefits have been pared down.⁶

Put-back of Contracted-out Portion. Another way to adjust DB pension risks applies only to EPFs. This involves the put-back or return of the assets and liabilities of the contracted-out portion to the public retirement system. This has become attractive because the decline in interest rates and increase in longevity have boosted the liability due to the contracted-out portion. Until recently, however, the rebate rate offered by the government was too low to compensate for that increase. As a result, plan sponsors faced the risk of a growing funding shortage in the contracted-out portion of the benefit.

Very recently, in 2002, the new Defined Benefit Corporate Pension Plan Law has permitted the return of the contracted-out portion by EPFs on more attractive terms. This put-back not only relieves DB plan sponsors of the risks associated with a potential increase in benefit obligations and shortfalls, but it also enables a plan sponsor to record one-time profits on its income statement. This is because the value of obligations recognized on the balance sheet is larger than the value of assets the sponsor must pay back to the government.⁷ Plan sponsors have

devoted much attention to this new rule, and by year-end 2003, the government had approved put-backs by 702 EPFs out of a total of 1,700 plans, including those of blue chip firms such as Toyota, Hitachi, and NEC.

Cash Balance Plans. Another approach to pension risk management involves the introduction of cash balance plans. In this new format, each participant's account balance increases periodically by the sum of service credits and interest credits, the latter of which equals the account balance at the end of the previous year multiplied by the base interest rate. Plan participants receive the balance of that cash value at the time of job termination or as an annuity at retirement.

An appeal of this scheme is that falling interest rates boost benefit liabilities via a declining discount rate, but this increase is offset by smaller interest rate credits. A lower interest rate, therefore, increases liabilities in a cash balance plan by much less than in a traditional DB plan. For this reason, benefit obligations in cash balance plans have a much shorter duration and their sensitivity to interest rate movements is smaller, than in traditional DB plans. Hence cash balance plans help plan sponsors to shift a portion of interest rate risks to plan participants.

This adjustment mechanism can be applied even to the post-retirement period when annuities are paid. Pension plans can adjust the interest rate by which the value of the lump-sum payment is converted into annuities, in synchrony with changes in market interest rates. This adjustment mechanism applied to annuitants is similar to the one for variable annuity products of life insurance companies.

Defined Contribution Plans. A final way to adapt benefit design for risk management purposes is to introduce a defined contribution plan. In 2001, the law permitted a modest level of employer contributions to this type of pension under tax-exempt status, and by September 2003,

some 538 employers with 529,000 employees had adopted this plan type.⁸ Some firms established their new plans from scratch, while others did so as a complete or partial substitute for existing DB pensions or book-reserve severance-pay schemes. Plans established as a full or partial replacement for DB plans have the effect of shifting investment risks from employers to employees.

Managing Pension Portfolios of Liabilities. While the portfolio risk management process of financial institutions always integrates assets and liabilities, DB pension management has traditionally focused only on the asset side. One reason may be that pension benefits have typically been construed as an exogenous factor to fund managers. Yet the reality now is that pension plan liabilities have become a more or less controllable variable in Japan. Pension plan sponsors are seeking ways to control risks by re-designing benefits, selecting appropriate plan types, reducing the amount of pension liabilities, and adjusting their duration.

As the concept of “portfolio” management extends beyond investment vehicles, plan sponsors are beginning to realize that they must also manage their plan’s liability portfolio. They then begin to question what the trade-off might be for lower risk in liabilities: that is, should they accept a lower expected return in exchange for lowering risk, as in the case of an investment portfolio? To answer this question, we use the analogy of financial institutions trying to change the composition of liabilities where the composition of assets is constant. Here the DB plan may be conceptualized as a financial operation which borrows money from plan participants and invests the funds thus gained. Plan termination or put-back of the contracted-out portion has the effect of suspending this operation completely or partially. The cost of this suspension is the lost opportunity of earning a higher rate of return than the interest rate on borrowed money and enjoying resulting profits. Changing a DB into a DC plan has the same effect. Adopting a

cash-balance plan has the effect of converting long-term fixed interest rate liabilities into floating rate notes. The opportunity costs are profits potentially achieved by the rise in discount rate when the duration of liabilities is longer than that of assets.

Whether this perspective is generally applicable in the Japanese context can be evaluated by examining whether plan sponsors' financial characteristics are related in sensible ways to the pension plans they offer. In the next section, we therefore examine what factors actually affected plan sponsor decisions regarding the termination of DB plans and the put-back of the contracted-out portion to the government.

Empirical Analysis

We hypothesize that plan sponsors in Japan have sought to reduce risk by terminating their DB plans or returning the contracted-out portion to the government, instead of by reducing investment in riskier assets. In our empirical analysis we build on related studies from other countries, which relate plan sponsor financial characteristics to the decision to change pension plan type. In the United States, for instance, Friedman (1983), Bodie *et al.* (1985) and Petersen (1996) relate asset allocation decisions in DB plans to the risk tolerance of the pension plan sponsors. They find that the plan sponsor's profitability tend to increase risk tolerance; this may be represented by return on total assets (Petersen, 1996) or return on net assets. Another important factor is the plan sponsor's financial stability, for which proxies include the standard deviation of profits (Friedman 1983; Petersen, 1996) or the firm's bond rating (Bodie et al. 1985). In general, they find that financial instability narrows risk tolerance as well as flexibility to invest in riskier assets.

In the case of pensions, another important factor affecting risk tolerance is the plan's

funding status, represented by the ratio of pension assets to liabilities. A higher funding ratio leads to a higher risk tolerance and allocation to riskier assets. Other controls include the maturity of the plan, usually represented by the ratio of beneficiaries to active participants (or active to total participants; Friedman, 1983), and benefit payments divided by assets and the year the plan started (Petersen, 1996). A more mature pension plan would be said to have less flexibility to invest in riskier assets.

Hypotheses. Drawing on these prior studies, we therefore hypothesize that plan sponsors with lower risk tolerance would be more likely to terminate their DB plans and return the contracted-out portion to the government. Specifically:

- Hypothesis 1 *Regarding Termination*: Financial characteristics of plan sponsors and pension plans that reduce risk tolerance expedite the termination of EPFs;
- Hypothesis 2 *Regarding Put-Back*. Financial characteristics of plan sponsors and pension plans that reduce risk tolerance expedite the put-back of the contracted-out portion of EPFs.

To evaluate these we use Probit multivariate regression models to explore the empirical relationships, controlling on several explanatory variables.⁹

Determinants of Termination. To Hypothesis 1, the dependent variable takes a value of 1 for EPFs terminated from April 2001 through June 2003, and 0 for those which did not terminate in this period. This variable y_t is estimated by the following probability function used in the Probit regression model:

$$y_t^* = \mathbf{a}_t + \mathbf{b}_t \mathbf{x}_r + \mathbf{h}_t \mathbf{x}_h + \mathbf{e}_t, \quad \text{where} \quad \begin{cases} y_t = 1, \text{if } y_t^* > 0 \\ y_t = 0, \text{if } y_t^* \leq 0. \end{cases}$$

The vector \mathbf{X}_r consists of factors that may cause plan termination due to risk tolerance,

while \mathbf{X}_h is a vector consisting of controlling factors that may affect the decision to terminate. More specifically, we select four variables to compose vector \mathbf{X}_r : the 5-year average return on shareholders' equity (ROE), the volatility of ROE (VROE), the funding ratio in the DB pension plan (pension assets divided by pension liabilities; FNDGRAT), and the ratio of pension liabilities or pension assets to the plan sponsor's total assets on the balance sheet (PAVSAST or PLVSAST). We hypothesize that risk tolerance would be reduced by lower profitability, higher volatility in profits, a lower funding ratio, and a larger ratio of pension plan assets or liabilities to business size of plan sponsor. Therefore, we expect the regression model to generate coefficients that are negative for ROE, positive for VROE, negative for FNDGRAT, and positive for PLVSAST and PAVSAST.

As control variables in vector \mathbf{X}_h , we include three elements: an industry dummy (INDUSTRY) indicating the plan sponsors' main line of business (where 0 means manufacturing and 1 means non-manufacturing); the ratio of taxes paid in the last five years to shareholder equity (TOE); and a variable representing size which is the natural logarithm of plan assets (LNPA) or natural logarithm of the number of employees (LNEMP). The expected sign of the regression coefficient for INDUSTRY is positive, since it is said that manufacturing companies pay more attention to the maintenance of long-term employment which employers try to nurture by defined benefit pension plans. Manufacturing companies are said to be more willing to take on the financial risks associated with DB pensions for the purpose of maintaining their employment practices. We expect a negative regression coefficient for TOE, since the termination of EPFs deprives plan sponsors having large taxable income of valuable tax deferrals. With regard to size (LNPA or LNEMP), we expect a negative regression coefficient, since there is a rule that requires a minimum number of plan participants.¹¹ (More precise variable

definitions appear in Appendix Table A1).

Determinants of Put-back. To test Hypothesis 2, we assign the value of 1 to EPFs that returned the contracted-out portion back to the government between April 2001 and June 2003, and 0 to the rest. The probability function used to estimate this variable y_p is as follows:

$$y_p^* = \mathbf{a}_p + \mathbf{b}_p \mathbf{x}_r + \mathbf{h}_p \mathbf{x}_h + \mathbf{e}_p, \quad \text{where} \quad \begin{cases} y_p = 1, \text{if } y_p^* > 0 \\ y_p = 0, \text{if } y_p^* \leq 0. \end{cases}$$

In this estimate, we exclude EPFs that terminated because it is impossible to return the contracted-out portion to the government once the EPF is terminated.

Vectors \mathbf{X}_r and \mathbf{X}_h consist of the same variables as above; we expect regression coefficients for each variable to have the same sign as indicated above, except for the size variables (LNPA or LNEMP). For those, we expect a positive regression coefficient, since we believe that from the perspective of cost efficiency, there are scale economies in DB plan operation. Putting back the contracted-out portion may decrease the size of EPFs below critical volume and heighten the chances of scale diseconomies. This means that the larger the size of the EPF, the easier it is to return the contracted-out portion.

Data Sources. All accounting data and industry codes are taken from the Nikkei Needs electronic database (2004). Data on EPF decisions as to termination and put-back of the contracted-out portion were obtained from the Ministry of Health Labor and Welfare (2003).¹² Because of data constraints, samples are limited to EPFs in existence as of March 2001, when the new accounting standard was introduced. Further, we exclude multi-employer EPFs unless they were managed by companies that are consolidated for the purpose of financial reporting.

Results. Multivariate Probit regression estimates for termination models appear in Table 2 where we use PAVS AST and PLVSAST as alternative relative size controls, and LNPA and

LNEMP as alternative absolute size controls.

Among variables reflective of risk tolerance, the funding ratio of pension plans (FNDGRAT) always generated coefficients with the expected signs and were significant at conventional levels in half the regressions. Among other variables, the coefficients for the ratio of pension plan assets or liabilities to sponsor's total assets (PAVSAST or PLVSAST), though significant only at 10 percent level, were consistently positive as expected. The coefficient for return on shareholders' equity (ROE) was positive, contrary to expectations. Of the control variables, coefficients for tax on shareholders' equity (TOE), the industry dummies (INDUSTRY), and logarithm of plan assets (LNPA) were insignificant. Notable are the coefficients for the logarithm of the number of employees (LNEMP), which were negative at statistically significant levels. This means that smaller EPFs are more likely to terminate, probably because of the legal requirement regarding minimum number of participants.

Table 2 here

These results suggest that plan sponsors with less risk tolerance, which we attribute to larger volatility in return on equity, a lower funding ratio, and larger pension plans relative to plan sponsor total assets, were more likely to terminate their EPFs. In addition, the number of employees or participants seems to affect decisions to terminate EPFs.

To explore the second hypothesis, we evaluate similar models with a different dependent variable; results appear in Table 3. Coefficients on risk tolerance for PAVSAST and PLVSAST (the relative size of pension plan to sponsor total assets) were positive and highly significant. Coefficient estimates for return on equity (ROE), volatility of return on equity (VROE), and funding ratio (FNDGRAT) were all insignificant. Among control variables, the (log) of the number of employees (LNEMP) had a positive and statistically significant effect; this

means that small plan sponsors found it difficult to return the contracted-out portion due to scale diseconomies after the put-back. We also found that coefficients for industry (INDUSTRY) were always positive, implying that plan sponsors in non-manufacturing industries were more likely to return the contracted-out portion. This is possibly because of less risk in labor management as explained in more detail below. Tax on shareholders' equity (TOE) was not significant.

Table 3 here

From these findings, we conclude that plan sponsors with less risk tolerance, which we attribute to larger pension plans relative to plan sponsor total assets, were more likely to return the contracted-out portion. In addition, plans sponsors with larger EPFs and in non-manufacturing sector were more active in returning the contracted-out portion.

Risks in Labor Management

In addition to financial risks explored here, we also note two risks in the area of labor management that could influence employers' views of changing plan type and benefit design. One is the risk of demoralizing employees. Pension plan termination and/or the introduction of defined contribution or cash balance plans appears to shift investment and longevity risks to employees. The put-back of the contracted-out portion often means a reduction in the amount of life annuity.¹³ As a result, employees lose old age income that might be seen as more secure in a traditional DB plan. This is particularly important in an environment such as Japan, where the public old age pension is diminishing its role; that is, employees would be more likely to appreciate receiving a stable benefit from their company pensions. Indeed, unstable benefits might degrade employee morale, which in turn could lower productivity or increase employee turnover.¹⁴ Employee demoralization could be a major deterrent to choosing a benefit design

which lowered plan sponsor financial risks.

The other risk to note is the problems that arise if employee tenure cannot be well-controlled, and DB plan formulas have long been associated with control over employee tenure. Figure 3 depicts the present value of benefits on the vertical axis and employee age on the horizontal axis; it shows that this hypothetical plan sponsors wants employees to stay on the job at least 15 to 20 years, but employee severance is preferred after 30 years of service or after age 50. In this way, the DB formula is an important tool to maintain long-term employment practices and to terminate them at some pre-arranged point. This use of a DB plan to effect labor management has been popular in automobile and other manufacturing industries where plan sponsors have sought to accumulate enterprise-specific employee expertise. If employers in these industries were to change DB into cash balance or DC plans, they might risk losing their ability to influence tenure.

Figure 3 here

Nevertheless, an increasing portion of plan sponsors in Japan is no longer focused on the maintenance of long-term employment practices. Instead, many firms have adopted merit-based compensation systems, even including retirement benefits. For example, several large companies have introduced cash balance plans because benefits there are based on average salary, and the benefit amount can easily reflect employees' performance over their careers.

Conclusions

This chapter suggests that that pension plan sponsors in Japan have sought to manage pension financial risks when choosing and changing pension plan types. This is a new development in Japan, especially regarding the termination of DB plans, though it confirms

studies from other countries. Important determinants of DB plan termination include the volatility of return on shareholder equity, the pension plan funding ratio, and the size of pension assets and liabilities relative to the size of the plan sponsor. In addition, we found that plan size also influenced decisions to terminate many Japanese EPFs. Regarding the decision to put-back the contracted-out portion of the EPF, we also identified several significant factors. These include the size of pension assets and liabilities relative to plan sponsors businesses, and the total number of employees. In other words, plan type choice is an important part of corporate risk management when the portfolio includes pension liabilities.

Data constraints preclude a direct analysis of firms' decisions to introduce DC or cash balance plans. Nevertheless, a research institute affiliated with the Ministry of Health, Labor and Welfare (Research Institute for Policies on Aging, 2003) showed that plan sponsors most focused on pension financial risks (especially the volatility of liabilities caused by changes in the discount rate) had the strongest interest in adopting a cash balance plan. Future research could extend our analysis to an examination of the introduction of defined contribution plans and cash balance plans as well.

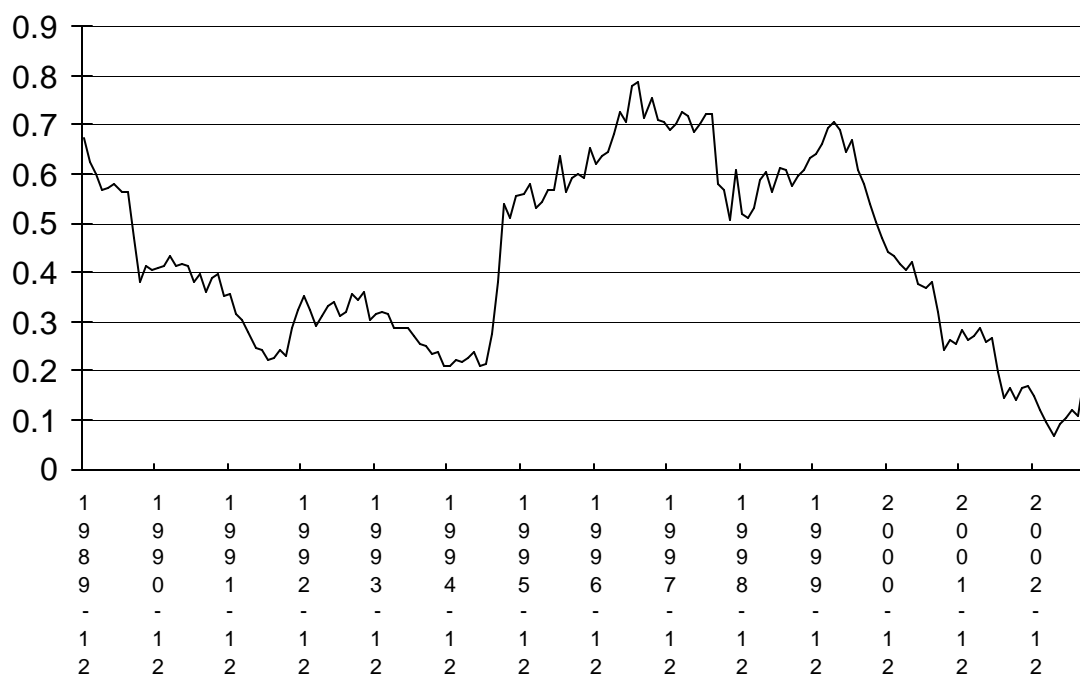
Our findings imply that financial risks will remain a main concern for pension plan sponsors in Japan. The future will likely witness an increase in plan terminations and put-backs of the contracted-out portion of EPFs, as well as additional conversions from traditional DB to cash balance and DC plans. Our analysis of Japan's experience in pension plan management also holds some implications for other developed countries. Since 2000, financial market conditions in Europe and North America have begun to resemble to conditions experienced in Japan over the past decade. Stagnant rates of return due to the sluggish stock market, ballooning pension obligations, and changes in accounting standards, are forcing plan sponsors to pay far more

attention to benefit design than ever before. Many of these factors are particularly familiar in the United Kingdom, where DB final salary based pension schemes have increasingly closed out new entrants and suspended benefit accruals (Veysey 2003). And in the US, more than 50 percent of corporate executives with DB plans are seriously considering changes in retirement programs (Feinberg, 2004). Our analysis of the relationship between pension plan design and financial risk management is therefore relevant and troubling for defined benefit stakeholders everywhere.

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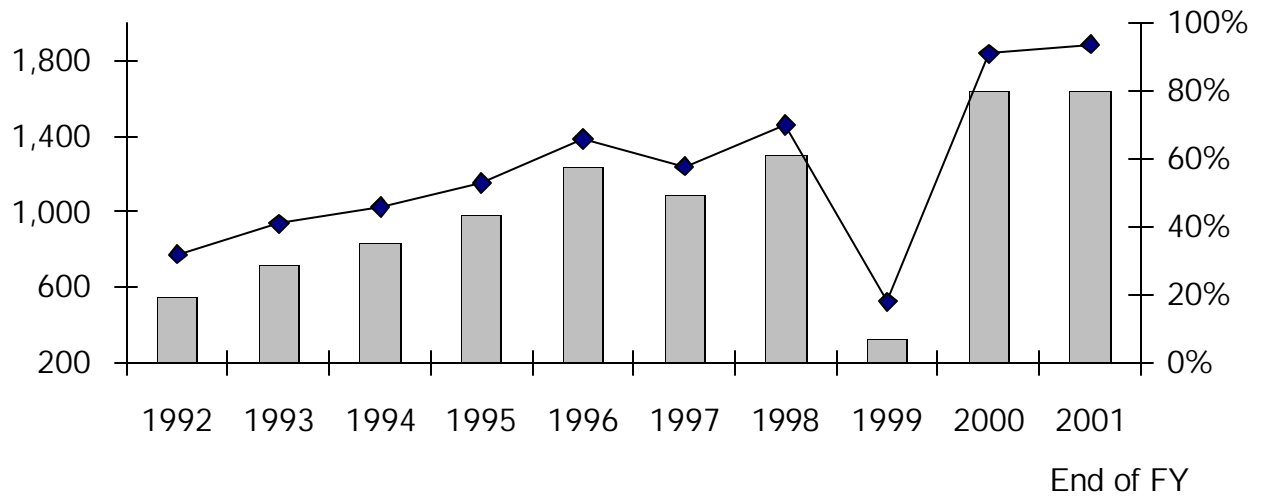
Figure 1: Monthly Sharpe Ratio of Model Portfolio Returns

Source: Author's calculations using data provided by Ibbotson Associates Japan, except for insurance contracts.

Note: Asset allocation in model portfolio and return indexes of each asset class are as follows:

Asset class	Allocation	Index
Yen bonds	25%	Nomura-BPI
Yen stocks	30%	TOPIX Total Return
Foreign bonds	10%	Citigroup World ex Japan Government Total Return
Foreign stocks	15%	MSCI World ex Japan Total Return
Insurance contracts	15%	Nippon Life Insurance General Account Contract
Cash (Risk free asset)	5%	Treasury Bills

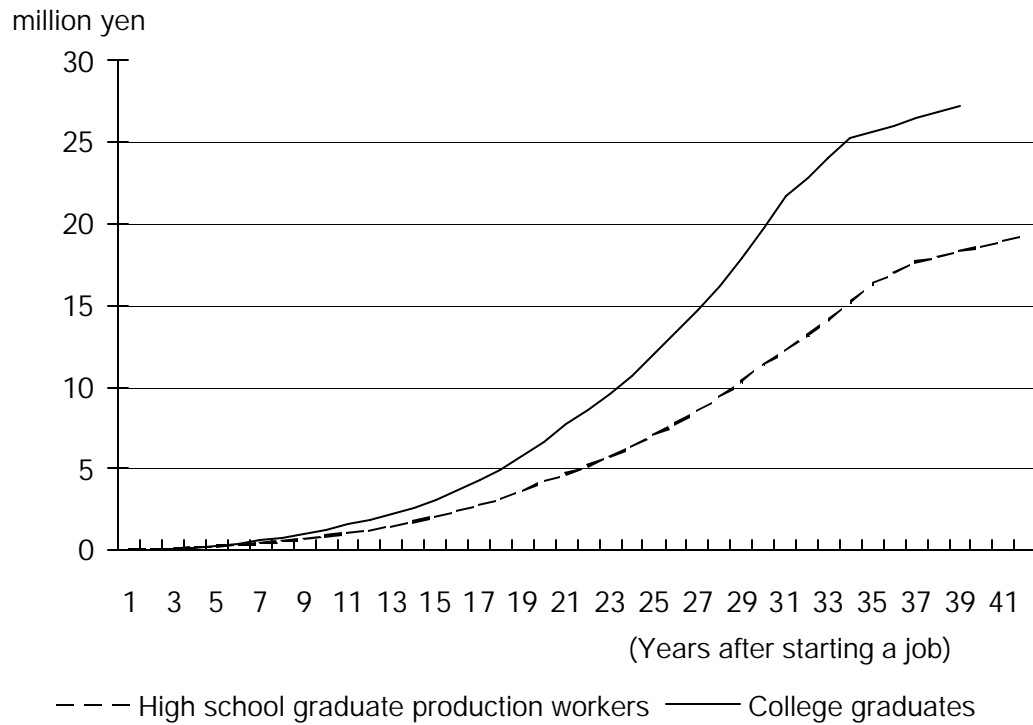
Figure 2: Number of Underfunded EPFs



Source: Ministry of Health, Labor and Welfare (2003)

Note: Bar chart shows number of underfunded EPFs, and line chart shows the percentage to total number of EPFs.

Figure 3: Amount of Retirement Benefits by Tenure



Source: Author's calculations using the data from Staff of Central Labor Relations Commission (2002).

Note: Shows combined amount of lump sum benefits and present value of annuities.

Table 1. Number of EPFs and TQPPs

	EPFs Termination (dissolution)	EPFs Put-back of Contracted-out Portion	EPFs Existing Fiscal Year End	TQPPs Existing Fiscal Year End
Fiscal year				
1991	0	N.A.	1,593	90,434
1992	0	N.A.	1,735	92,082
1993	0	N.A.	1,804	92,467
1994	1	N.A.	1,842	92,355
1995	1	N.A.	1,878	91,465
1996	7	N.A.	1,883	90,239
1997	14	N.A.	1,874	88,312
1998	18	N.A.	1,858	85,047
1999	16	N.A.	1,835	81,605
2000	29	N.A.	1,814	77,555
2001	59	N.A.	1,737	73,582
2002	73	481	1,656	66,741

Source: Pension Fund Association (2003)

Table 2. Probit Results For Plan Termination

	1	2	3	4
ROE	0.548 (0.427)	0.548 (0.427)	0.483 (0.373)	0.488 (0.377)
VROE	1.586 * (1.942)	1.579 * (1.932)	1.446 * (1.726)	1.440 * (1.719)
FNDGRAT	-1.543 ** (-1.976)	-1.126 (-1.509)	-1.634 ** (-2.138)	-1.245 * (-1.722)
PAVSAST	1.849 * (1.656)		1.732 (1.559)	
PLVSAST		1.161 * (1.787)		1.084 * (1.673)
TOE	0.200 (0.057)	0.264 (0.075)	0.643 (0.183)	0.690 (0.197)
INDUSTRY	-0.066 (-0.302)	-0.058 (-0.265)	-0.031 (-0.141)	-0.022 (-0.101)
LNPA	-0.092 (-1.215)	-0.093 (-1.227)		
LNEMP			-0.193 ** (-1.959)	-0.192 * (-1.948)

Source: Author's calculations from 416 observations.

** significant at 5% level; *significant at 10% level

Table 3. Probit Results for Put-Back

	5	6	7	8
ROE	0.334 (0.252)	0.352 (0.266)	0.333 (0.253)	0.353 (0.268)
VROE	-0.497 (-0.542)	-0.663 (-0.710)	-0.490 (-0.537)	-0.501 (-0.549)
FNDGRAT	0.005 (0.009)	0.602 (1.067)	0.044 (0.080)	0.693 (1.299)
PAVSAST	3.20085 *** (3.490)		3.35118 *** (3.672)	
PLVSAST		1.82294 *** (3.287)		1.92308 *** (3.484)
TOE	-2.659 (-0.930)	-2.625 (-0.917)	-3.329 (-1.154)	-3.301 (-1.142)
INDUSTRY	0.273 (1.624)	0.250 (1.498)	0.2777 * (1.652)	0.255 (1.526)
LNPA	0.079 (1.544)	0.081 (1.574)		
LNEMP			0.185 *** (2.660)	0.186 *** (2.679)

Source: Author's calculations from 379 observations.

*** significant at 1%; ** significant at 5%; * significant at 10%

Appendix Table A1. Variable Definitions

Explanatory Variables

ROE	5-year average of net profits fiscal 1996-2000 divided by average of shareholders' equity in the same 5-year period.
VROE	Standard deviation of net profits from fiscal 1996-2000 divided by average of shareholders' equity in the same 5-year period.
FNDGRAT	Value of pension asset divided by projected benefit obligations disclosed in financial statements at March 2001.
PLVSAST	Value of projected benefit obligations divided by total assets of plan sponsors disclosed in financial statements at March 2001
PAVSAST	Value of pension assets divided by total assets of plan sponsors disclosed in financial statements at March 2001.
INDUSTRY	Non-manufacturing = 1, manufacturing = 0.
TOE	5-year average of taxes paid from fiscal 1996-2000 divided by average of shareholders equity in the same 5 year period.
LNPA	Natural logarithm of pension assets.
LNEMP	Natural logarithm of number of employees.

Dependent Variables

PUT BACK	EPFs putting back contracted-out portion since April 2001 through June 2003 = 1, no put-back = 0.
TERMINATE	EPFs terminated since April 2001 through June 2003 = 1, no termination = 0.

Appendix Table A2. Descriptive Statistics

Test 1.	Min	Max	Mean	Std. dev.
ROE	-0.7271	0.5428	0.0057	0.0972
VROE	0.0038	1.3282	0.0884	0.1306
FNDGRAT	0.0608	0.9854	0.5954	0.1289
PLVSAST	0.0071	0.7281	0.2392	0.1396
PAVSAST	0.0014	0.4486	0.1412	0.0880
TOE	0.0018	0.1988	0.0492	0.0311
LNPA	4.3041	14.4228	10.0682	1.3476
LNEMP	5.2204	11.4189	7.6916	1.0153

Test 2.	Min	Max	Mean	Std. dev.
ROE	-0.7271	0.1923	0.0075	0.0898
VROE	0.0038	1.3282	0.0819	0.1179
FNDGRAT	0.2000	0.9854	0.6001	0.1270
PLVSAST	0.0071	0.7281	0.2353	0.1387
PAVSAST	0.0000	0.4500	0.1401	0.0885
TOE	0.0018	0.1930	0.0489	0.0290
LNPA	4.3000	14.4200	10.0996	1.3645
LNEMP	5.2204	11.4189	7.7286	1.0179

Endnotes

¹ The probability is 0.88 percent in a log-normal distribution and 0.63 percent in a normal distribution.

² The probability of a -4.86 percent return over those 13 years is 0.88 percent in a log-normal distribution and 0.63 percent in a normal distribution.

³ These numbers are averages for 1,006 companies whose accounting data on pension assets/liabilities are available for three continuous accounting periods ending March 2003.

⁴ Those who advocate that pension fund management needs a paradigm shift (such as Ambachtsheer, this volume) might suggest that plan sponsors could have improved funding by changing their asset allocation mix.

⁵ The original form of most of Japanese retirement benefits is a lump-sum payment. After the establishment of DB plans, this lump sum value has increasingly been converted to an annuity using a specified interest rate.

⁶ This reduction is possible provided that two-thirds of pensioners agree, and that pension plans reimburse the present value of benefits in lump sum if any of pensioners so request.

⁷ In the case of a put-back, an asset amount equal to the liability for the contracted-out portion must be returned to the government, specifically to the Government Pension Investment Corporation, instead of to the Employee Pension Fund Association.

⁸ The maximum amount is 216,000 yen per annum if an employer has a DB plan, and 432,000 yen per annum if there is no other pension plan at the same employer. These ceilings will be raised by 60,000 yen and 120,000 yen respectively from 2005.

⁹ Unfortunately, data for defined contribution plans, cash balance plans, and benefit reduction, and data for TQPPs are not publicly available, nor are variables to represent DB

plan maturity in Japan.

¹⁰ Unfortunately, it was impossible to find data for defined contribution plans, cash balance plans and benefit reduction, and data for TQPPs are not publicly available.

¹¹ The minimum number of participants is 500 for single-employer EPFs and 800 for multi-employer EPFs.

¹² Descriptive statistics for variables appear in Appendix Table A2.

¹³ There is a rule that requires EPFs to pay at least 50 percent of their retirement benefits in life annuity combined with the contracted-out portion. This rule does not apply to EPFs after they return the contracted-out portion.

¹⁴ Although agreement with labor is required to alter the benefit design, it is difficult for the employees' side to refuse an employer's proposal, given loose labor market conditions in Japan at present.

¹⁵ This research is subsidized by the Ministry of Health Labor and Welfare and published as the Research Institute for Policies on Aging (2003).

¹⁶ The survey was conducted by the Research Institute for Policies on Aging in 2002.

¹⁷ It might be evident that the primary motive for the benefit reduction is to alleviate risks caused by the large amount of pension obligation.

¹⁵ Veysey (2003).

¹⁶ See Feinberg (2004), for example.

²¹ There is a rule that requires EPFs to pay at least 50 percent of their retirement benefits in life annuity combined with the contracted-out portion. This rule does not apply to EPFs after they return the contracted-out portion.

²² Although agreement with labor is required to alter the benefit design, it is difficult for the workers' side to refuse management's proposal given the present labor market conditions.