

Application of Enterprise Risk Management to Private Pension

Katsuhiro Yagura

Certified Pension Actuary, Fellow of the Institute of Actuaries of Japan

Pension Consulting Division

Mitsubishi UFJ Trust and Banking Corporation

1-4-5, Marunouchi, Chiyodaku, Tokyo 100-8212, Japan

Tel: +81-3-6250-3365, Fax:+81-3-6250-3357

E-mail: katsuhiro_yagura@tr.mufg.jp

Contents

1. Introduction	2
2. About Private Pension	3
2-1. Significance of Private Pension	3
2-2. Advantages of Private Pension	4
3. Recent Tendency of Private Pensions (in US & Japan)	5
4. Reasons for DB pension Difficulties	6
5. Application of ERM to Private Pensions	7
6. Methods of ERM	9
6-1. Risk Control with Economic Capital	10
6-2. Risk Assessment with Risk Maps	12
7. Case Studies	14
8. Conclusion	17
Reference	17

Abstract

Private pensions are popular in a lot of countries (the US, Japan, the UK, etc), play an important role in supplementing public pension benefits which are not necessarily sufficient. And they give their sponsor company the advantages of tax preferences and smoothing out cash flow, etc.

But the administration of a private pension, particularly a defined benefit (DB) pension, becomes a heavy burden for the sponsor company. I think there are three main reasons for this:

- (1) Pension plans become mature over time.
- (2) Since accounting standards worldwide are converging to International Financial

Reporting Standards (IFRS), private pensions have a larger influence on business administration for the sponsor company.

- (3) Economic stagnation of developed countries, low interest rates and increased market volatility enlarge private pension risks.

In order to adjust to the environmental changes mentioned above, there are a lot of cases where DB pension plans have been terminated, frozen or shifted to a defined contribution (DC) pension plan. But avoiding DB pension risks is not necessarily the best solution.

On the contrary, we should consider risk management for private pension from a more comprehensive view. In other words, it will be effective to view private pension risk management within the framework of Enterprise Risk Management (ERM), including other business risks of the sponsor company.

In this paper, I will explain two typical risk management tools of ERM as follows:

- (1) Risk Control with Economic Capital
- (2) Risk Assessment with Risk Maps

Then I will illustrate private pension risk management using these tools with some case studies.

As we actuaries are experts on quantitative risk analysis and pension liability valuation, we should aggressively participate in ERM application to private pensions. By doing so, we can facilitate better business administration of employers and increase working motivation of employees, and consequently we can contribute to social and economic development.

Keywords

DB pension, DC pension, ERM, Economic Capital, Risk Map

(The opinions in this paper are all individual ones. They do not represent the official views of the association the author belongs to.)

1. Introduction

I would like to discuss private pension risk management within the framework of Enterprise Risk Management (ERM). It can be very effective because private pensions are one part of their sponsor company's business and so their risks should be synthesized with other risks of the sponsor company's businesses. As a result of the application of ERM to the private pensions, their sponsor company can find the best solution for its private pension administration.

Section 2 explains the significance and advantages of private pensions. Section 3 shows the recent tendency of private pensions by examining the statistics in the US and Japan. Then we can see the trend that a lot of defined benefit (DB) pension sponsor companies have gotten their DB plan terminated, frozen, or shifted to a defined contribution (DC) pension plan. Section 4 considers reasons for DB pension difficulties. Section 5 deals with the effectiveness of ERM application to private pensions. Section 6 gives detailed methods of ERM. Section 7 illustrates private pension risk management using ERM tools with some case studies. Section 8 provides the conclusion of this study.

2. About Private Pension

2-1. Significance of Private Pension

These days, pensions have had a great influence on the economy. For some countries, the amount of pension assets is larger than their GDP (See Table 1).

Table 1

Total Pension Assets & Assets/GDP ratio

	Total Assets 2011 (USD billion)	Assets/GDP (local currency)
US	16,080	107%
Japan	3,363	55%
UK	2,394	101%
Canada	1,303	78%
Australia	1,301	96%
Netherlands	1,046	133%

Source: Global Pension Asset Study 2012 (Towers Watson)

Pensions have both public and private sectors. Private pensions are popular in a lot of countries and play an important role in supplementing public pension benefits which are not necessarily sufficient. In some countries, the private pension sector is larger than the public pension sector (See Table 2).

Table 2

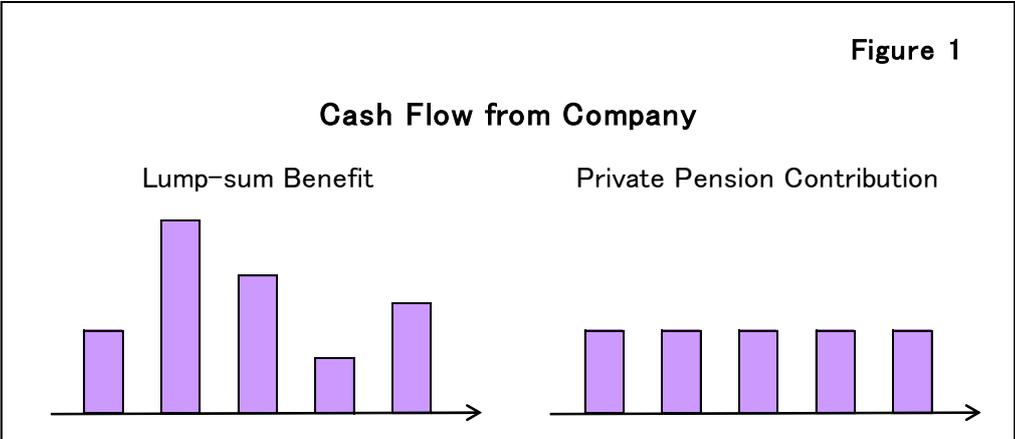
Public vs. Private Sector (Pension Assets)

	Public	Private
US	29%	71%
Japan	71%	29%
UK	12%	88%
Canada	61%	39%
Australia	85%	15%
Netherlands	31%	69%

Source: Global Pension Asset Study 2012 (Towers Watson)

2-2. Advantages of Private Pension

Private pensions also give their sponsor company some advantages. In many countries, the government gives the sponsor companies tax preferences. For example, contributions to private pensions are included in tax deductible expenses. Private pensions can smooth out cash flow from their sponsor company. If a company has in-house retirement benefits and severance payments only, their cash flow is quite different every year, because the number of employees who retire or leave their job is different every year. But in the case of private pensions, their sponsor company only has to pay level contributions to the private pension fund. (The pension benefits are paid from the fund.) Therefore their cash flow is stable every year (See Figure 1).



With private pensions, the employees feel safe in their future retirement, they are motivated to work for their company, and they can be retained for a long time.

3. Recent Tendency of Private Pensions (in US & Japan)

In order to consider the recent tendency of private pensions, I have examined the statistics in the US and Japan, which have the largest amount of pension assets in the world.

From Table 3, we can see some facts as follows:

(In both the US and Japan) Private pensions have developed remarkably over the last 30 years. DB pensions have, however, stagnated for the last 10 years, whereas DC pensions have developed steadily for the last 30 years.

(Only in the US) The amount of DC pension assets has been larger than that of DB.

(Only in Japan) The amount of DC pension assets is still small because only about 10 years have passed since the Japanese government authorized DC pension plans.

Table 3

Private DB & DC Pension Assets

(USD billion)

	US		Japan*	
	DB	DC	DB	DC
1978	273	105	52	–
1988	912	592	332	–
1998	1,937	2,085	848	–
2003	1,941	2,307	888	2
2009	2,194	3,317	788	61

Sources: Pension and Health Plan Bulletins and Form 5500 Data
 (US/Employee Benefits Security Administration)
 Kigyounenkin no jutakugaikyou
 (Japan/Trust Association, Life Insurance Association, JA kyousairen)
 Newsletter on Pensions & Investment
 (Japan/Rating and Investment Information Inc.)
 * Japan's figures are converted as 1USD=80JPY.

DB stagnation and DC development indicate that a lot of DB sponsor companies have gotten their DB plan terminated, frozen, or shifted to a DC plan. It is mainly because they think DB has many kinds of risks (described in detail later) and DB administration becomes a heavy burden for them. That is why they reduce DB plans, to avoid or decrease those risks. This trend is seen not only in the US and Japan but also in other countries.

4. Reasons for DB pension Difficulties

DB plans have a lot of risks and their sponsor companies want to reduce their DB plans considering the following facts.

First, pension plans are becoming mature over time. Life expectancy at birth has lengthened worldwide (As shown in Table4, life expectancy has increased several years compared to 30 years ago in the 5 countries). Besides, total fertility has declined worldwide (As shown in Table5, total fertility has generally fallen compared to 30 years ago, although a little improvement is seen in some countries). Therefore, in many DB plans, the fund is already huge and the benefit exceeds the contribution. In such a state, the DB pension fund needs safer management. (Once it suffers large investment loss, it is difficult to recover it.)

Table 4

Life Expectancy at birth

(years)

	US	China	UK	Germany	Japan
1979	73	67	73	73	76
2009	78	73	80	80	83

Source: World Development Indicators (The World Bank)

Table 5

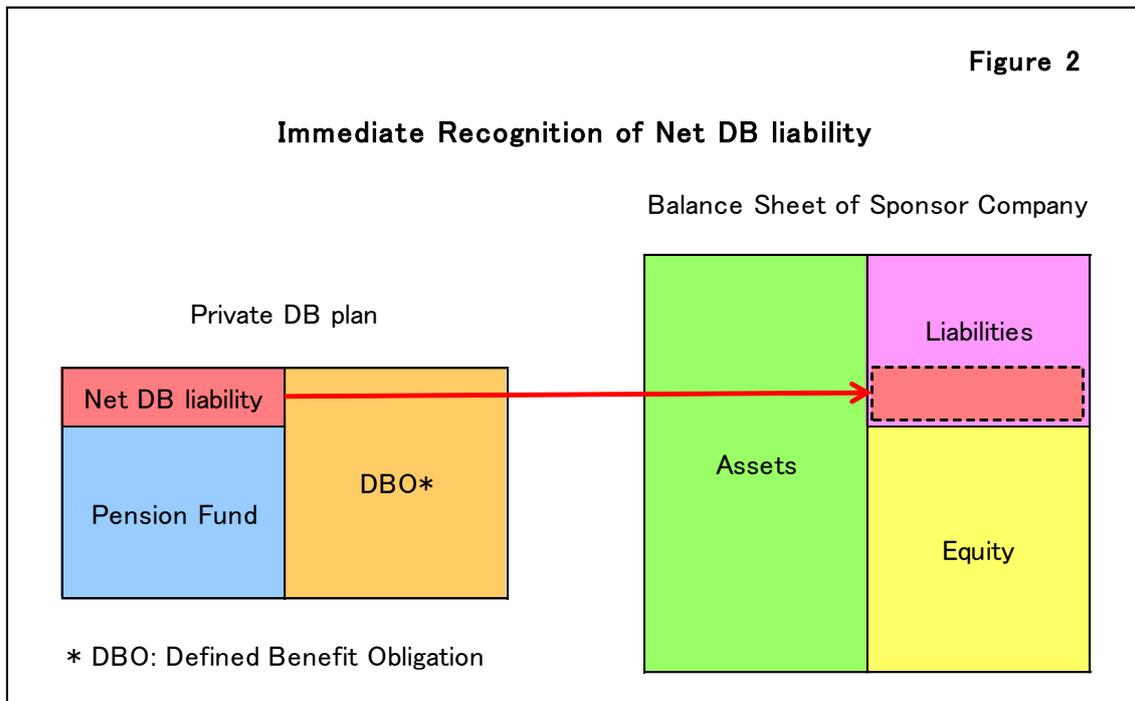
Total Fertility (children per woman)

	US	China	UK	Germany	Japan
1975-1980	1.79	2.93	1.73	1.52	1.83
2005-2010	2.07	1.64	1.83	1.36	1.32

Source: World Population Prospects, the 2010 Revision (United Nations)

Second, accounting standards worldwide are converging to International Financial Reporting Standards (IFRS), as a result, private pensions have a larger influence on business administration for the sponsor company. According to IFRS, the DB sponsor company must recognize its net DB liability immediately (See Figure 2). Originally DB pension's liability was considered in the long term because its benefits and

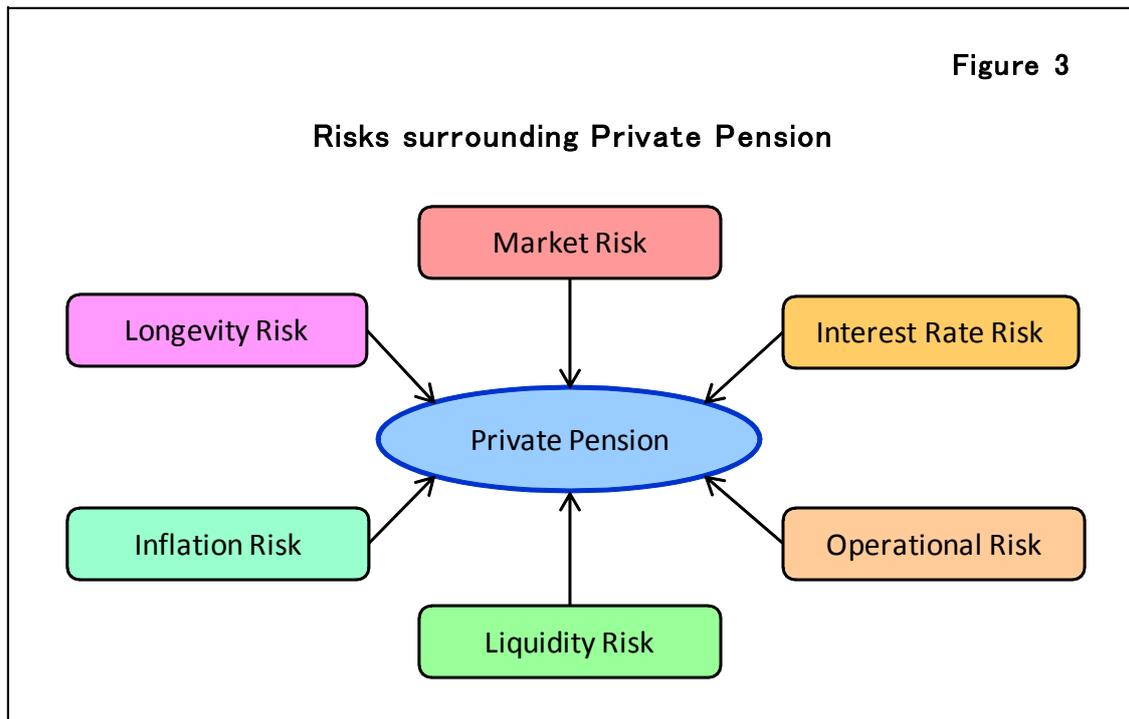
contributions continued to be paid for a long period. Even if the DB plan incurred losses in its fund, it had the opportunity to recover later. But IFRS forces short-term consideration about DB liability. Thus DB sponsors must be careful of transient losses and want to avoid uncertainty concerning their DB plan.



Finally, DB plans have more and more market risk these days. It is because a lot of developed countries are in economic stagnation, interest rates are getting lower and stock market volatility is getting larger (One of the main reasons is that hedge funds have recently prevailed worldwide in pension investment.). Therefore it is very difficult to obtain steady gains in the market.

5. Application of ERM to Private Pensions

Private Pensions are exposed to many kinds of risks (See Figure 3). As mentioned above, DB plans have longevity risk and market risk. Besides that, they are also exposed to interest rate risk (If the interest rate becomes lower, DBO increases.) or inflation risk, etc.



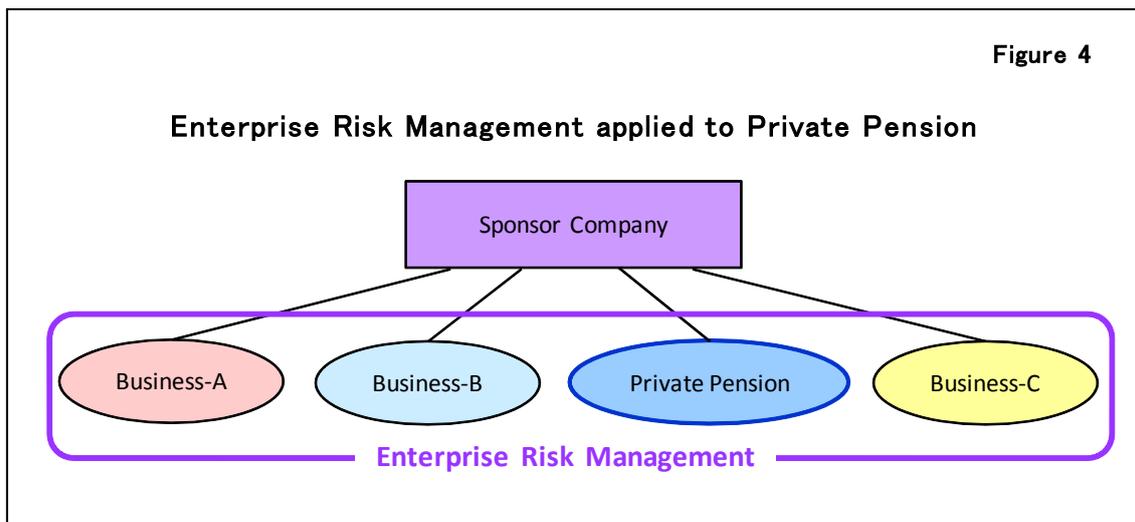
On the other hand, DC plans are said to be risk-free pension plans. But the fact is that DC plans also have some risk factors as follows:

- The employees have risks (market risk, longevity risk, inflation risk, etc) instead of the sponsor company.
- It seems difficult for amateur employees to get good investment performance.
- Although the sponsor company does not have to recognize DC liability, it has to recognize DC cost.

Furthermore, one should be careful about the termination or freeze of DB plan, because these actions might lower the employees' morale.

It is not necessarily the best solution to only avoid private pension risks. On the contrary, we should consider risk management for private pensions from a more comprehensive view. Private pensions are just one part of their sponsor company's business. The sponsor has many other businesses which have their own risks. It is very important for the sponsor to manage synthetic risks concerning all its businesses. In other words, it will be effective to view private pension risk management within the framework of ERM, including other business risks of the sponsor company (See Figure 4).

Figure 4

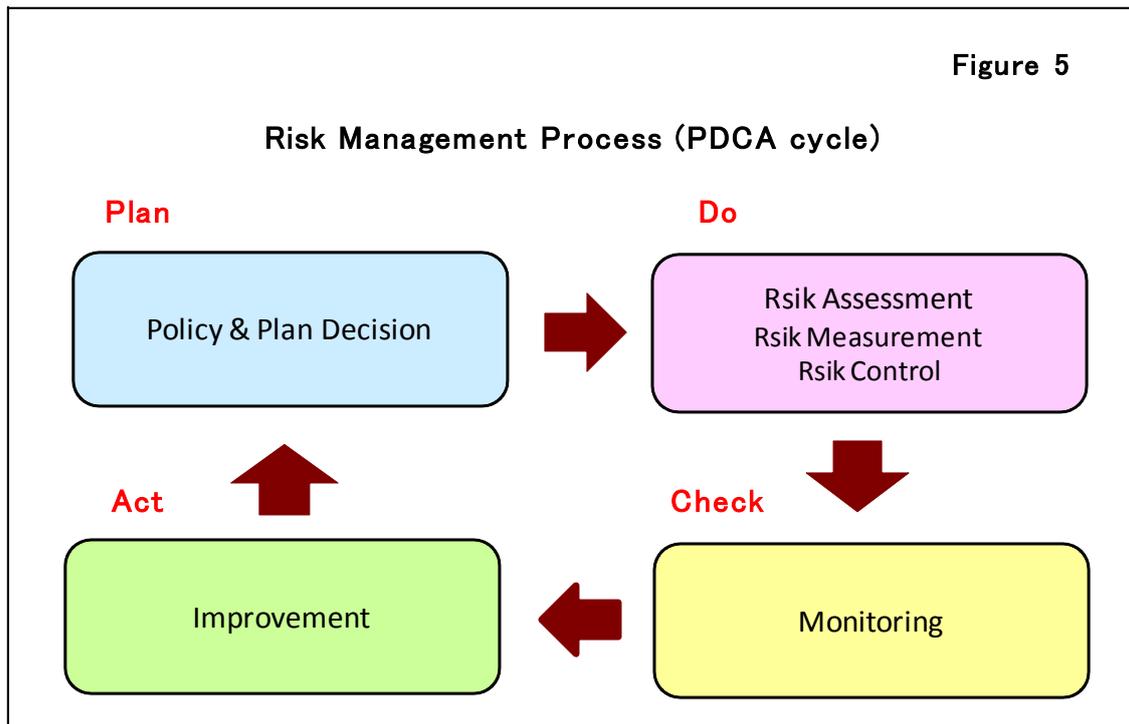


6. Methods of ERM

The goal of ERM is not to avoid or decrease risk. Without risk, there is no return. Rather, it is to maximize return and corporate value on the condition to keep the risk within the tolerance level, considering all enterprise activities.

ERM has some features. First, ERM is integrated into the business process and so it can contribute to improvement of business performance. Second, ERM helps allocate the management resources to each of the business sections by utilizing the risk information. Third, ERM integrate all optimized results of each risk management, considering the correlation of one another, and optimize them overall.

Generally risk management process forms a PDCA cycle. That is to say, first decide policy and plan for risk management (Plan). Second assess risk, measure it and control it (Do). Third monitor how risk management is going (Check). Finally review the management performance and improve its management policy and plan (Act) (See Figure 5).



In order to integrate risk management for all businesses, you must utilize common risk management methods. ERM has a lot of effective tools and I introduce two typical ones as follows:

- (1) Risk Control with Economic Capital
- (2) Risk Assessment with Risk Maps

6-1. Risk Control with Economic Capital

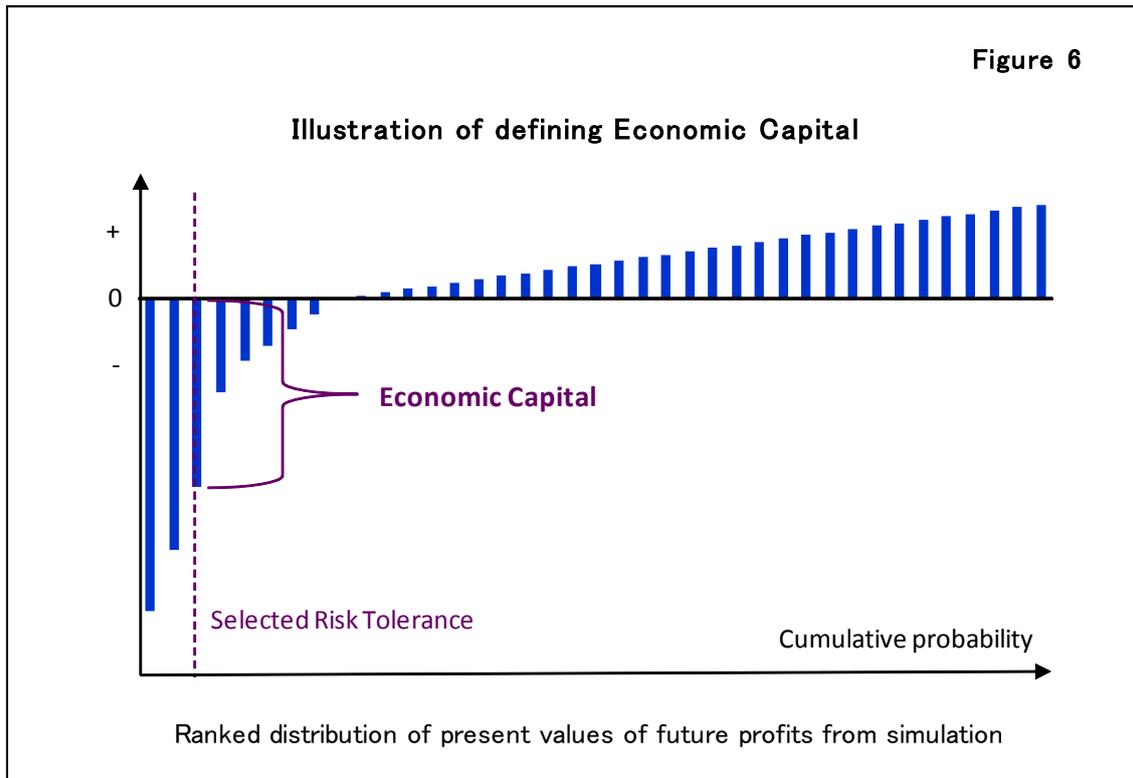
Economic Capital (EC) is defined as the level of capital that management should set aside for risk. Figure 6 shows an example of EC calculation. Present values of future profits from simulation (e.g. Monte Carlo simulation) are ranked in ascending order. The value at the selected risk tolerance (e.g. 1st percentile) becomes EC.

Defined with the mathematical formula, EC at time zero, K_0 , must be set at a level large enough to ensure at any point in the future, $t \geq 0$

$$\Pr (K_t \geq kL_t) \geq 1 - \alpha$$

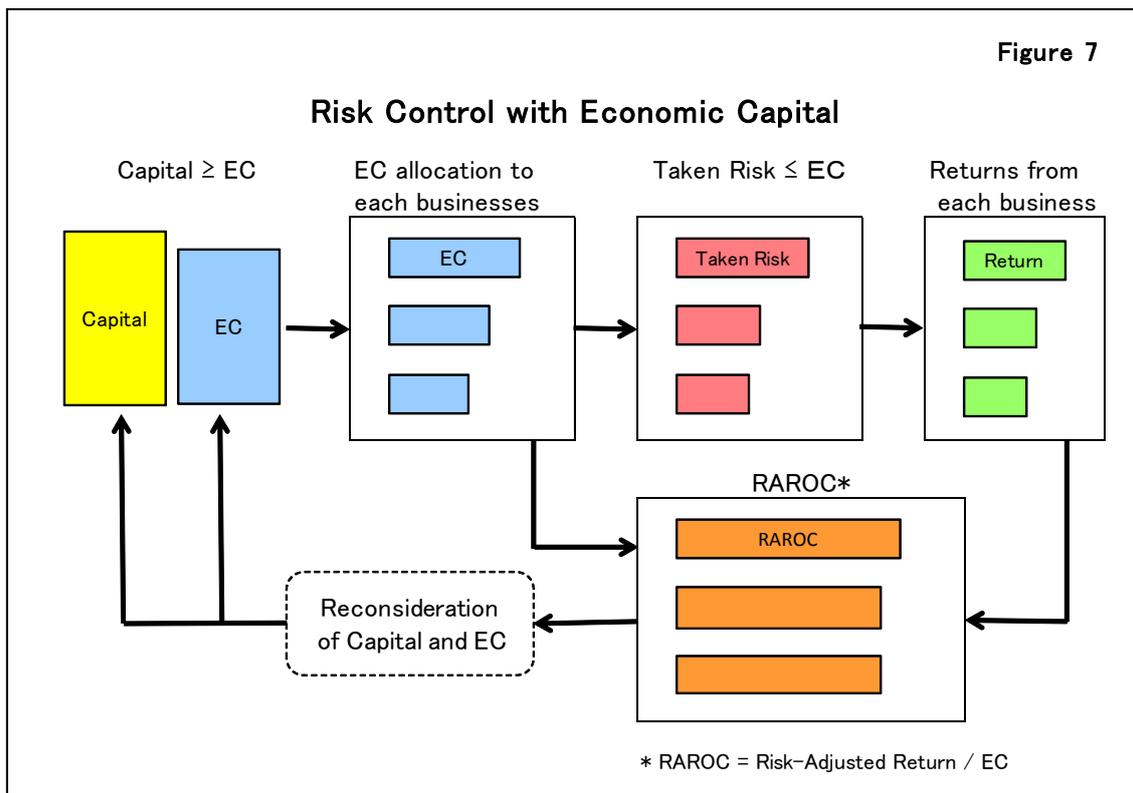
(K_t is the value of the capital (=the value of the assets—the value of the liability), L_t is the value of the liability, $k \geq 0$, α is a particular level of risk tolerance (e.g. 1%.)

If a company keeps more capital than EC, you can consider it well prepared for the risk.



EC plays an important role within the framework of ERM. By measuring EC, employers can control the entire risk of their company and assess the risk-adjusted returns on capital.

In other words, first they must make sure that their company's capital is larger than the total of EC. Second they allocate EC to their businesses. Third each business must take risk under the allocated EC. (By doing so, the employers can control their risk.) Fourth they assess their risk-adjusted returns on capital (RAROC) by using EC. Based on the assessment, they reconsider the level of capital and EC. Then they repeat this cycle (See Figure 7).



6-2. Risk Assessment with Risk Maps

Risk Map is a useful tool for overlooking all risks surrounding the company. Figure 8 shows a sample of a Risk Map. It ranks business risks by impact on the horizontal axis and by probability on the vertical axis. It draws risk tolerance and risk appetite. (Your risk level can exceed your risk appetite but it must not exceed your risk tolerance.) Then it divides the area according to risk level, severe-high-medium-low. In Figure 8, two business risks are ranked: business-A's risk level is "medium" and business-B's risk level is "severe".

Risk Map can also show the effect of risk control. Figure 9 shows the effect of two actions for business risks. Action-A reduces business-A's risk level from "medium" to "low". Action-B reduces business-B's risk level from "severe" to "medium". If the employer must choose only one action for risk control because of budget constraints, he should choose action-B. It is because business-B's risk level exceeds the risk tolerance and business-A's does not.

Figure 8

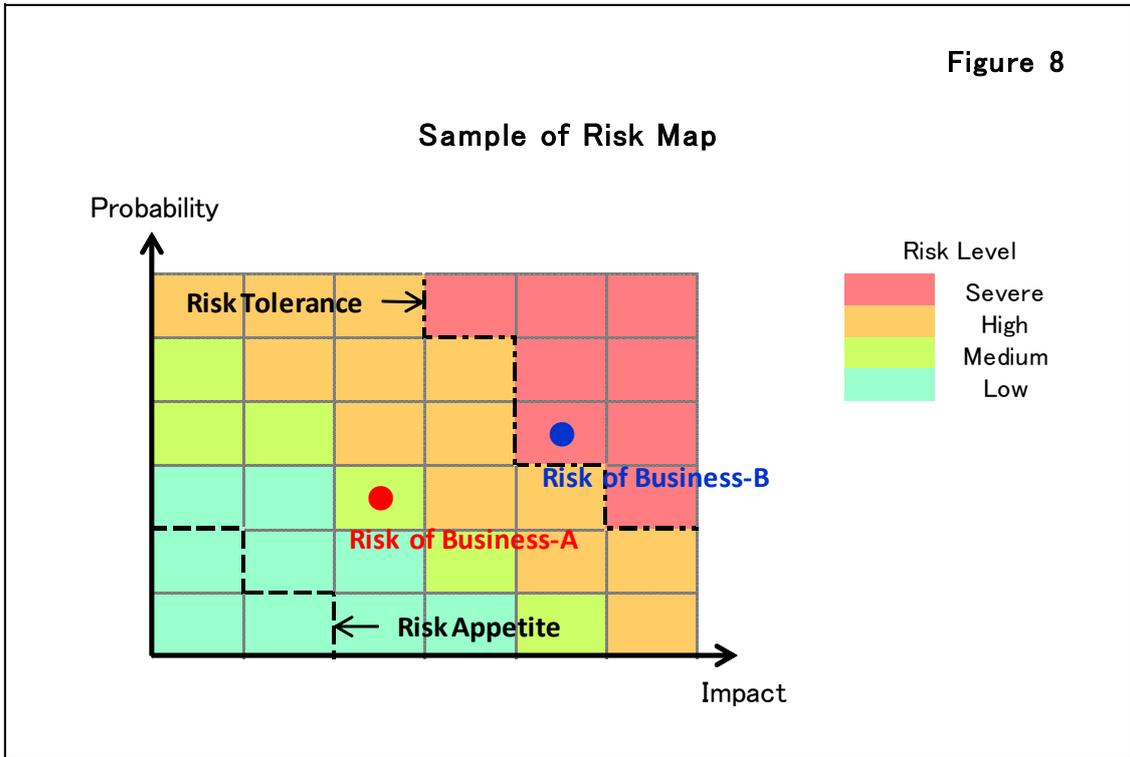
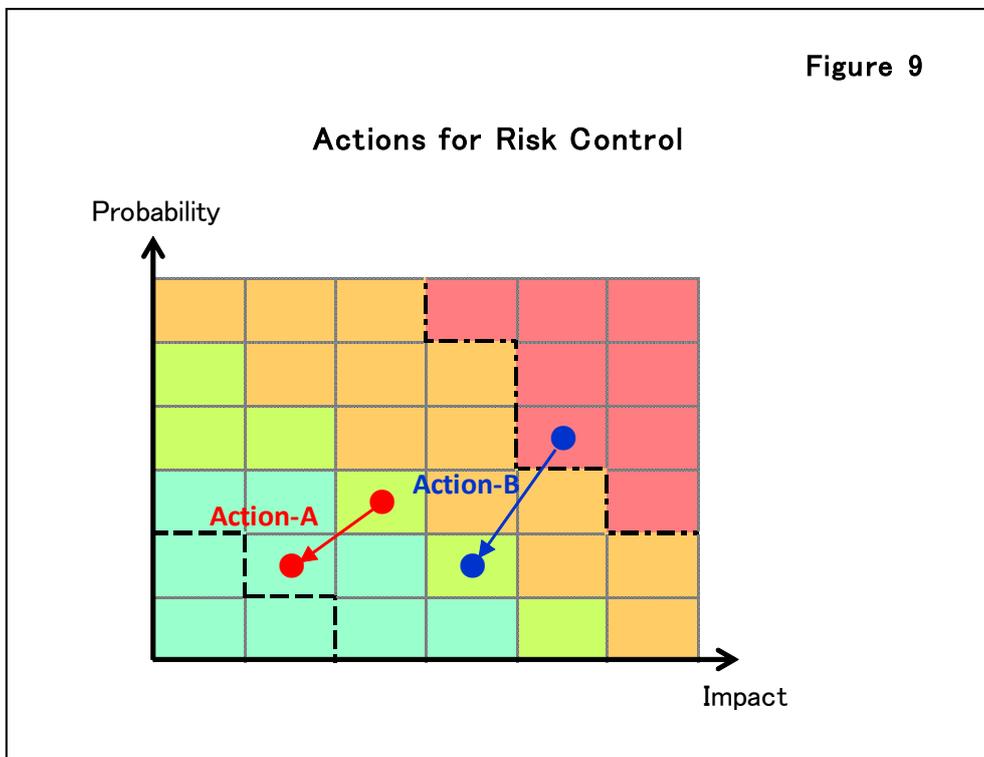


Figure 9



7. Case Studies

I will illustrate private pension risk management using EC and Risk Map with some case studies. I define the risk as “The sponsor must make extra contributions to its private pension plan”. Probability on the vertical axis represents probability that the risk will occur. And impact on the horizontal axis represents the average amount of extra contributions.

(The results mentioned below are samples and not based on exact calculations.)

Company-A is a DB plan sponsor. Its DB pension financial status is as follows:

Assets=110, Liability=100 (therefore Surplus=10)

The asset allocation is “Stocks: Bonds = 70:30”

The allocated EC is 25. The measured value at risk* (VaR) is 20.

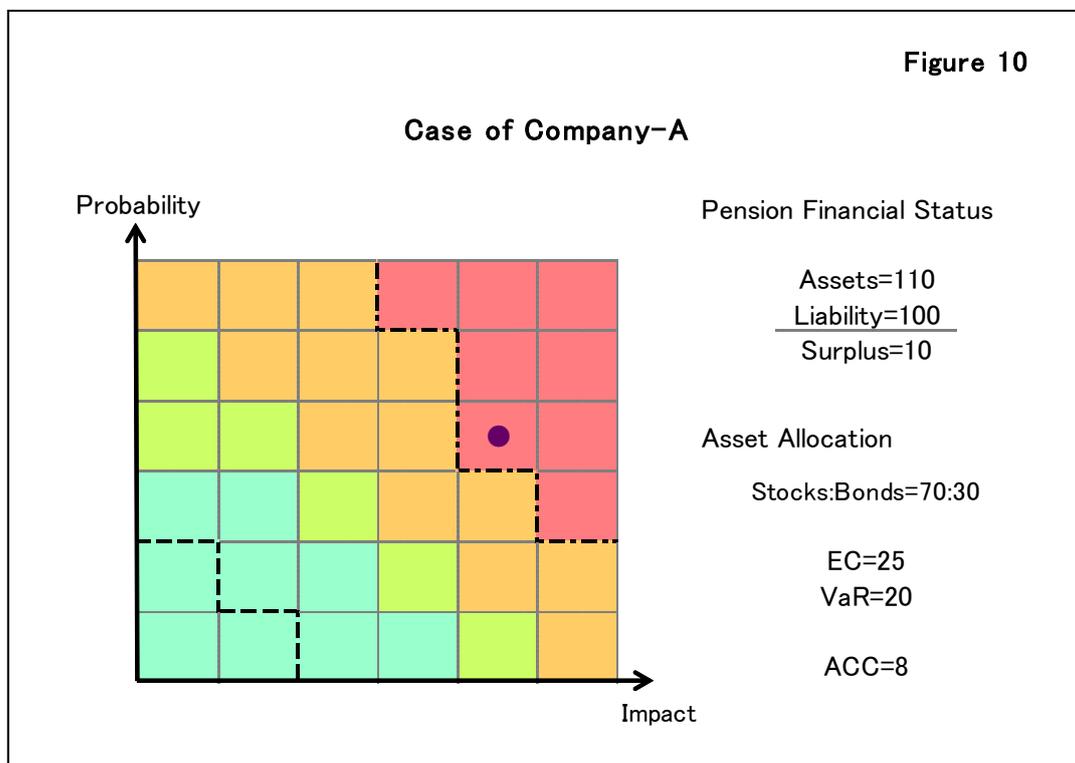
(* Value at risk is defined as the maximum market loss within a particular possibility (e.g. 99%.))

The additional contributions capacity (ACC) is 8.

Suppose EC must meet the conditions as follows:

- (1) $VaR < EC$
- (2) $EC \leq Surplus + ACC$

In this case, EC (25) does not meet the second condition because $Surplus + ACC = 10 + 8 = 18$. And its risk level is ranked “severe” (See Figure 10).



Company-A must take action for risk control. It can take action- I and action- II .

Action- I : Asset Allocation Shift from Stocks to Bonds <Stocks:Bonds=70:30→40:60>

Action- II : Partly Shift to DC (for the future service) and Pension Buyout

(for the past service) <30% of the DB plan is converted>

Although action- I reduces expected return from the pension assets and increases probability that investment loss will occur, it decreases the average amount of investment loss.(*)

(*) The assumption is as follows:

	Expected Return	Standard Deviation	Correlation Coefficient
Stock	7%	15%	-0.3
Bond	3%	3%	

*The assumed interest rate for calculating pension liability: 4.0%

In this case, the asset allocations' expected return and risk (standard deviation) are as follows:

	Expected Return	Standard Deviation
Old	5.8%	10.8%
New	4.6%	6.5%

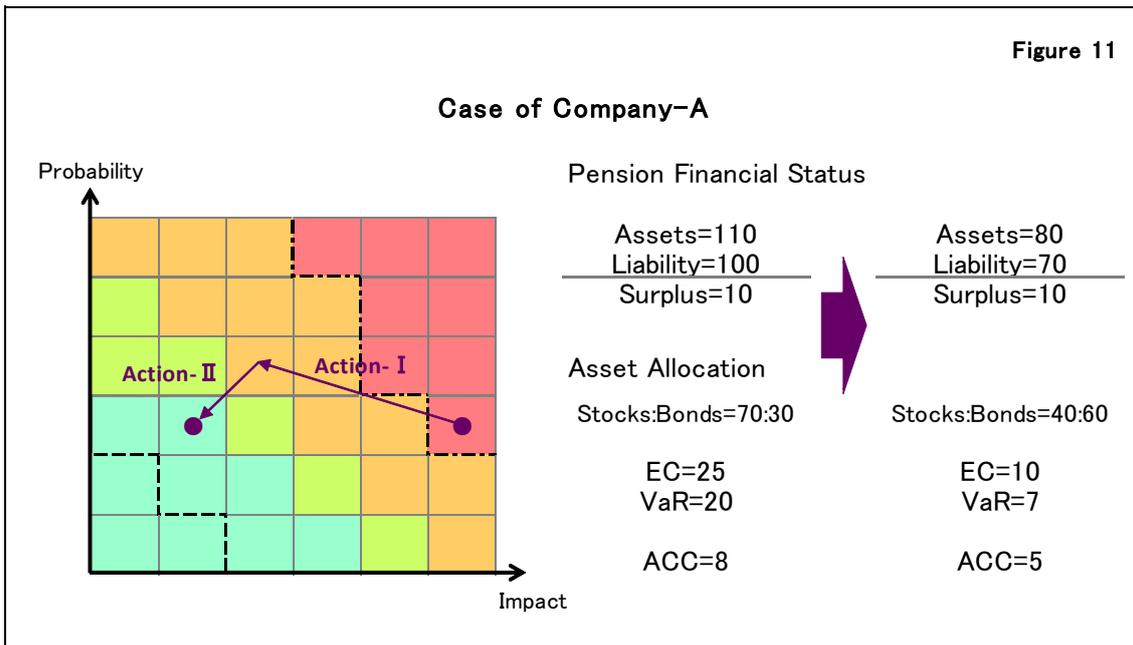
The expected return decreases from 5.8% to 4.6% but it is still higher than the assumed interest rate for calculating pension liability. And the standard deviation decreases from 10.8% to 6.5%.

Action- II reduces both the risk probability and the risk impact. (It is because the net pension liability disappears and the potential investment loss decreases.)

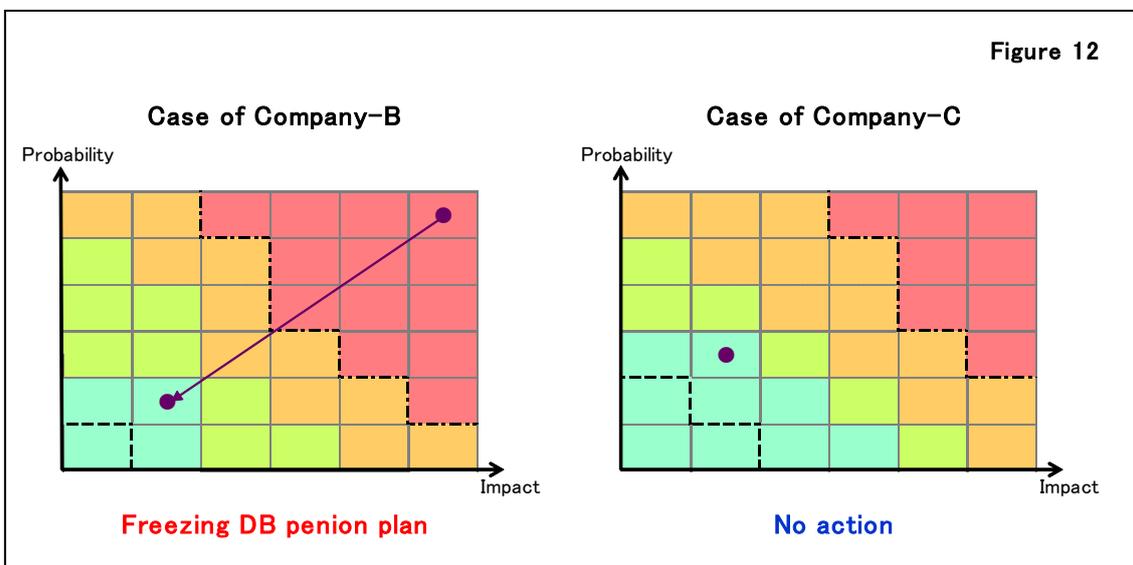
By taking action- I and action- II , VaR decreases from 20 to 7.

By taking Action- II , ACC decreases from 8 to 5, because Company-A must pay the cost for the pension buyout.

Following VaR's decrease, EC is reallocated and decreases from 25 to 10. Therefore EC meets both of the conditions. Besides, the risk level moves from "severe" to "low" (See Figure 11).



Actions for risk control depend on the sponsor's risk tolerance, risk appetite, and pension financial status. Figure 12 shows as follows: company-B's DB plan state is so bad that the plan should be frozen. And company-C's DB plan state is so good that the sponsor needs no action.



Besides they depend on the effect and the correlation compared with other business risk controls.

8. Conclusion

As I mentioned above, private pensions give a lot of advantages to both employers and employees. But they are exposed to many risks and it seems difficult to control them. ERM is a useful scheme for managing comprehensively all business risks of the company, and so it can be effective for private pension risk management. Although I introduced only a few methods and examples of ERM in this paper, ERM has plenty of other useful tools.

The best solution for private pension risk management differs from company to company. We should find it within the framework of ERM.

Some people believe that theoretical risk management is not helpful because we cannot predict the future. I do not agree with this opinion. As uncertainty increases, risk management based on rational analysis will be more important.

In this paper, I have explained only quantitative risk management. In fact, there are qualitative risks which cannot be quantified. Therefore you should consider both kinds of risks for practicing risk management.

ERM is such a new field that its practical methods have not been completed yet. As we actuaries are experts on quantitative risk analysis and pension liability valuation, we should aggressively participate in ERM application to private pensions. By doing so, we can facilitate better business administration of employers and increase working motivation of employees, and consequently we can contribute to social and economic development.

Reference

- [1] James Lam (2003), "Enterprise Risk Management"
- [2] Paul Sweeting (2011), "Financial Enterprise Risk Management"
- [3] Michel Crouhy, Dan Galai, Robert Mark (2006),
"The Essentials of Risk Management"
- [4] The Society of Actuaries (2004), "Specialty Guide on Economic Capital"
- [5] KPMG AZSA LLC (2009), "ERM changes business administration" (in Japanese)