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Application of ERM to Private Pension

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

1. Private Pension

Significance of Private Pension

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)

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)

In the countries above,

- The total pension assets is almost as enormous as their GDP.
⇒ Pensions have a great influence on the economy.
- The private pension sector's share is large compared to the public sectors.
⇒ Private pensions play an important role in supplementing public pension benefits which are not necessarily sufficient.

Advantages of Private Pension

- Tax preferences
(e.g. Contributions are included in tax deductible expenses.)
- Smoothing out cash flow from the sponsor company
In-house retirement benefits and severance payments
⇒ Cash flow depends on the number of retirees.
Private pensions
⇒ Cash flow is level contributions.
- The employees feeling safe in the future retirement
⇒ They are motivated to work for their company.

Recent Tendency of Private Pensions

Change of Total Pension Assets over the last decade

(USD billion)

	2001	2006	2011
US	9,723	13,693	16,080
Japan	2,116	3,084	3,363
UK	1,054	2,338	2,394
Canada	481	1,027	1,303
Australia	270	743	1,301
Netherlands	433	873	1,046

Sources: Global Pension Asset Study 2012 (Towers Watson)
Global Pension Asset Study 2007 (Watson Wyatt)

Change of DB/DC* Asset Split over the last decade

	2001	2006	2011
US	48/52	46/54	43/57
Japan	100/0	99/1	98/2
UK	92/8	67/33	61/39
Canada	97/3	97/3	96/4
Australia	17/83	15/85	19/81
Netherlands	98/2	99/1	93/7

Source: Global Pension Asset Study 2012 (Towers Watson)
* DB: Defined Benefit, DC: Defined Contribution

We can see some facts as follows:

- The total pension assets has increased for the last decade but the rate of increase has gotten lower for the last 5 years.
- The ratio of DC pension has been larger than 10 years ago.

⇒ **A lot of DB plans have been terminated, frozen, or shifted to a DC plan.**

DB Pension Difficulties

< Main Reasons for DB Pension Reduction >

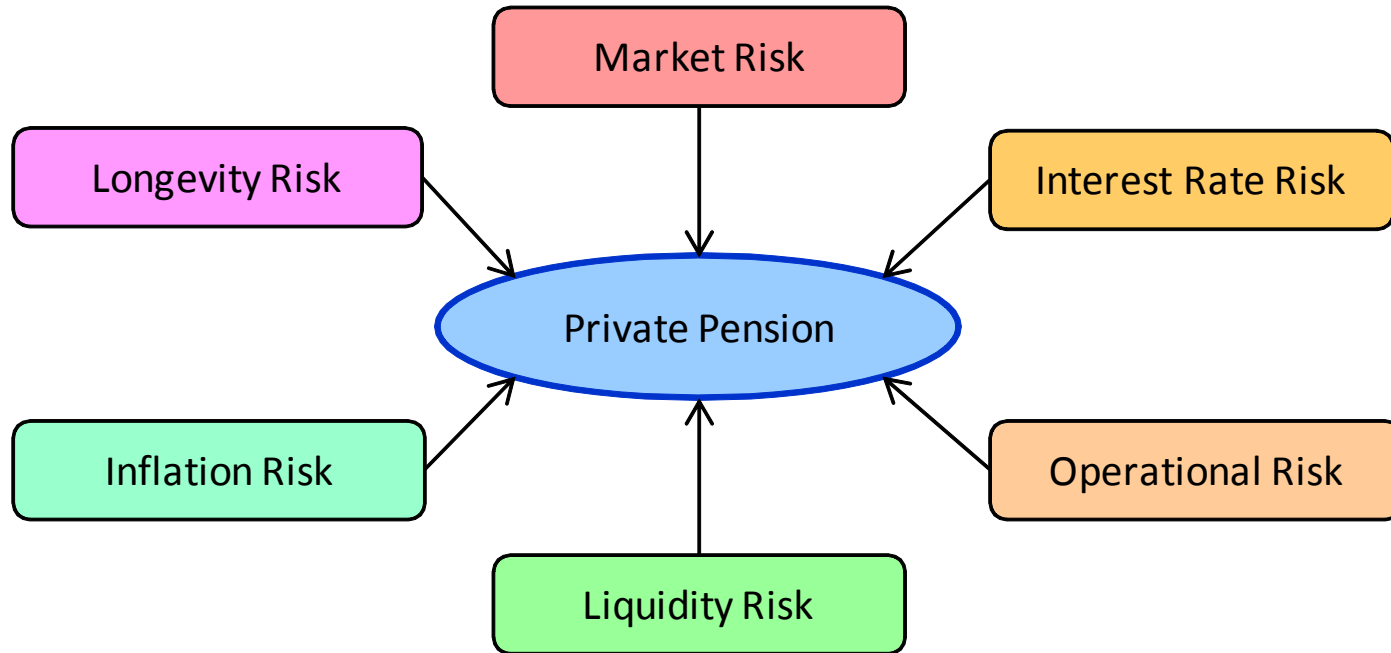
DB pensions have a lot of risks and the administration seems difficult.

- Lengthened life expectancy at birth and declining total fertility
As DB plans are becoming mature, the fund is becoming huge and the benefit exceeds the contribution.
⇒ The impact of investment loss becomes larger.
- Accounting standards worldwide converging to IFRS
The DB sponsor companies must recognize their net DB liability immediately and the influence on their business administration becomes larger.
⇒ they tend to avoid risks concerning DB pension.
- More market risk for DB plans
Interest rates are getting lower and stock market volatility is getting larger.
⇒ It is difficult to obtain steady gains in the market.

Problems about DC Pension

- Risks are transferred from the sponsor company to the employees.
(market risk, longevity risk, inflation risk, etc)
 - It seems difficult for amateur employees to get good investment performance.
 - Although the sponsor does not have to recognize DC liability, it has to recognize DC cost.
- ⇒ **The shift to DC plan for avoiding DB pension risks is not necessarily the best solution.**

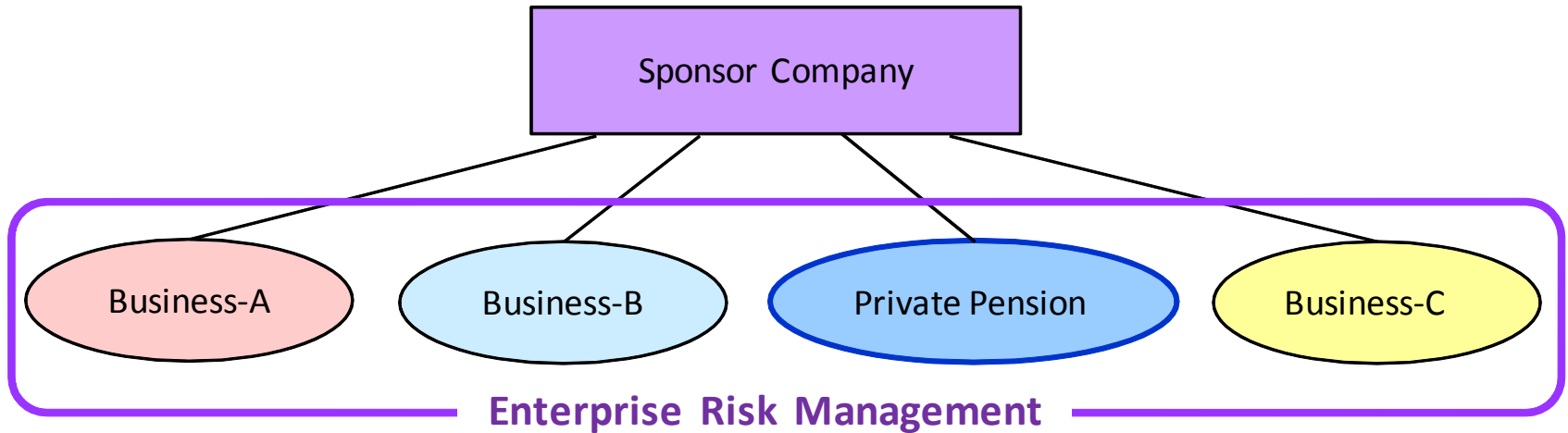
Risks surrounding Private Pension



Private pensions are exposed to many kinds of risks.
But it is not necessarily the best solution to only avoid private pension risks.

⇒ **Comprehensive management of all kinds of risks will be effective.**

ERM Effectiveness



The sponsor company has many businesses which have their own risks. And its private pension can be considered as one of its businesses.

⇒ **We should view risk management for private pensions within the framework of ERM, including all the business risks of the sponsor company.**

2. ERM

ERM Outline

< ERM Goal >

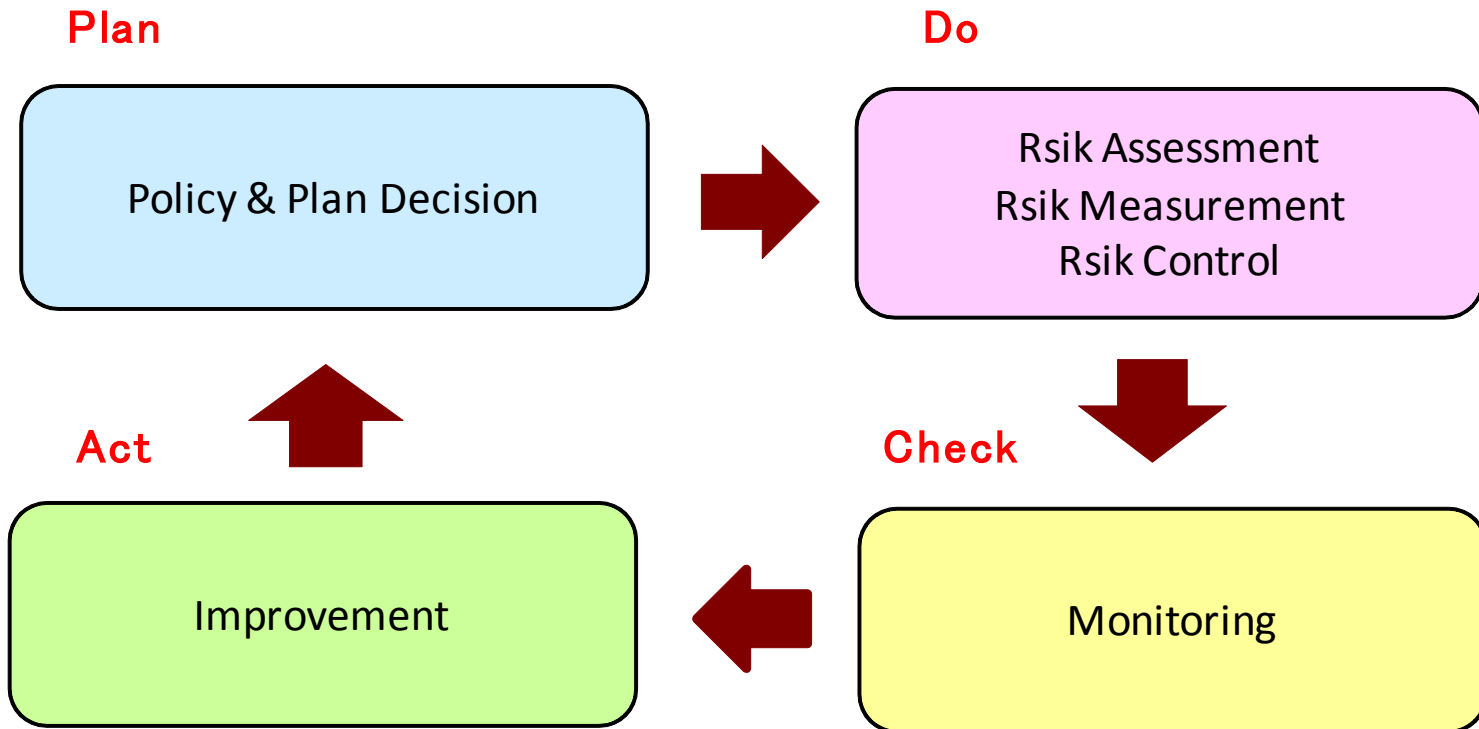
The goal of ERM is not to avoid or decrease risk. It is to maximize return and corporate value on the condition to keep the risk within the tolerance level, considering all enterprise activities.

< ERM Features >

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

Risk Management Process

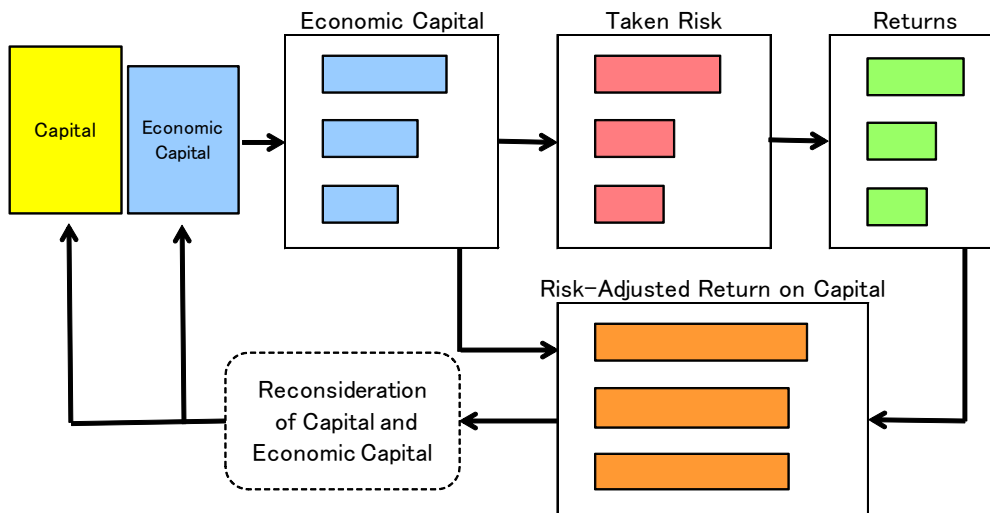
Risk management process forms a PDCA cycle.



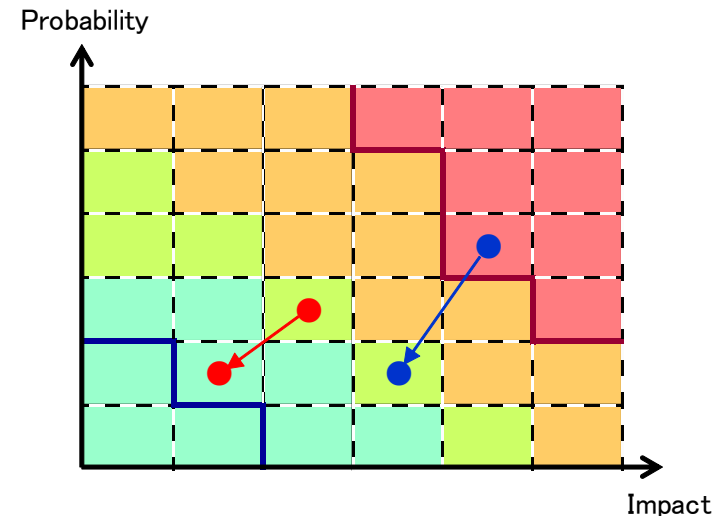
Typical ERM Tools

For implementing ERM, common risk management tools are necessary.

(1) Risk Control with Economic Capital



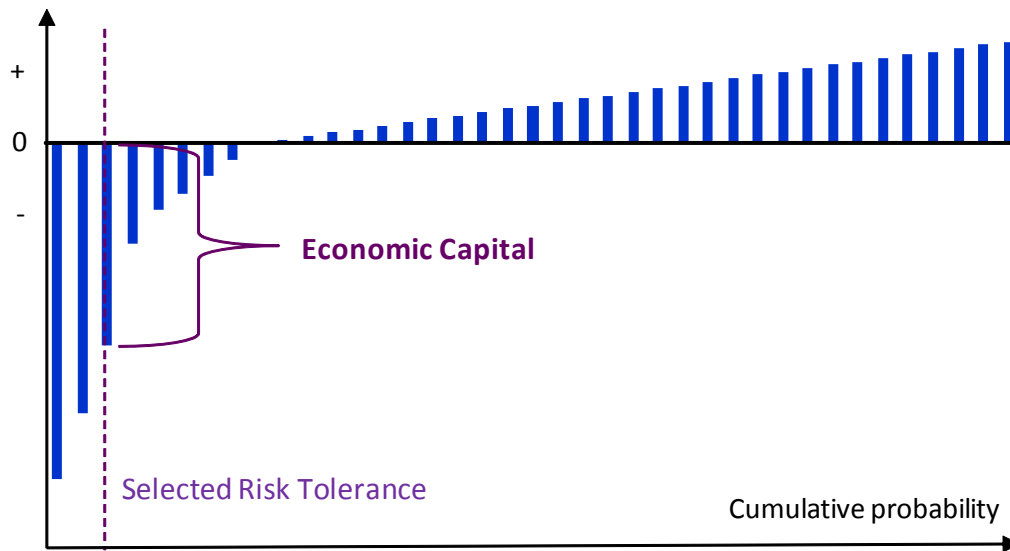
(2) Risk Assessment with Risk Maps



Economic Capital (1)

Economic Capital is the level of capital that the company should set aside for risk.

Illustration of defining Economic Capital



Ranked distribution of present values of future profits from simulation

Economic Capital at time 0, 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 : value of capital
(= value of assets - value of liability)

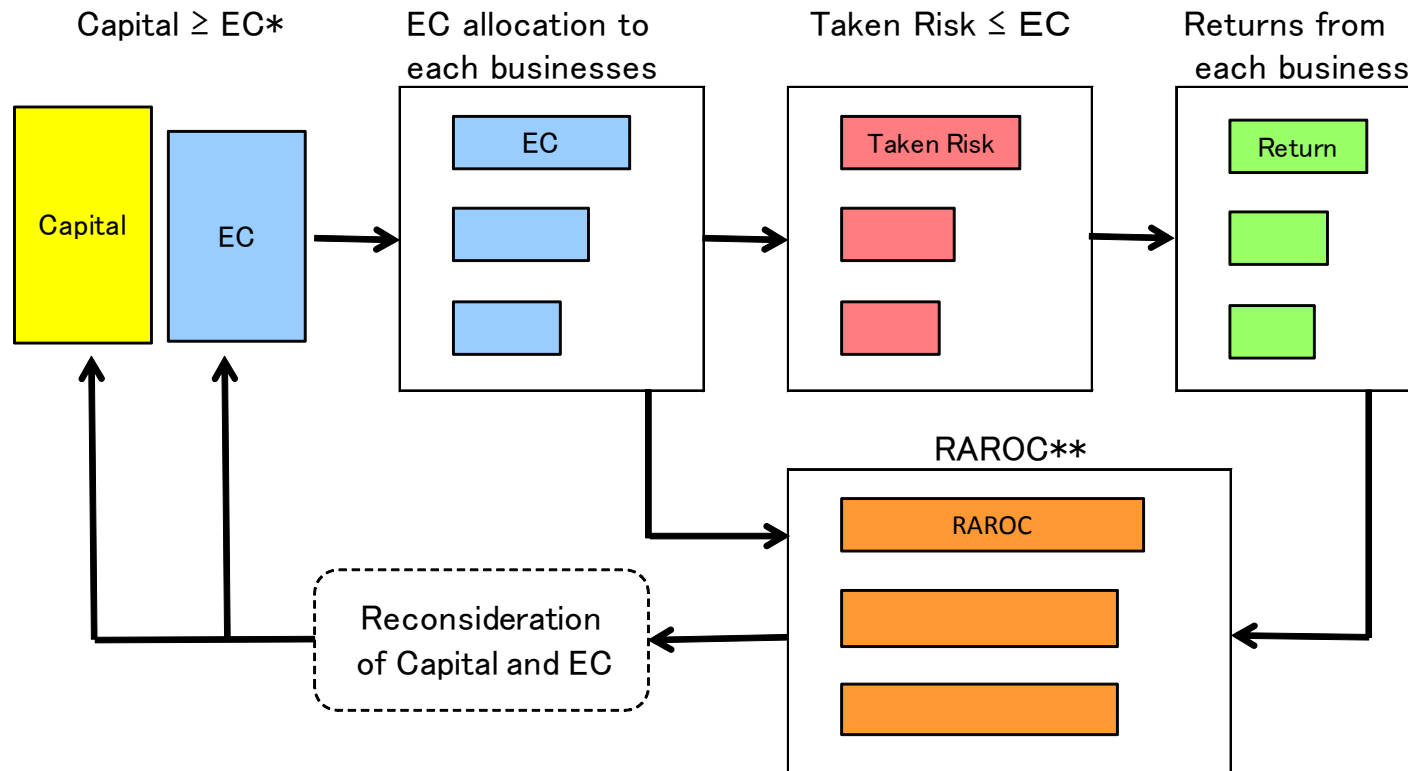
L_t : value of liability

$k \geq 0$

α : risk tolerance (e.g.1%)

Economic Capital (2)

Economic Capital can be utilized within the Framework of ERM. By measuring it, employers can control the entire risk of the company and assess the risk-adjusted returns on capital.



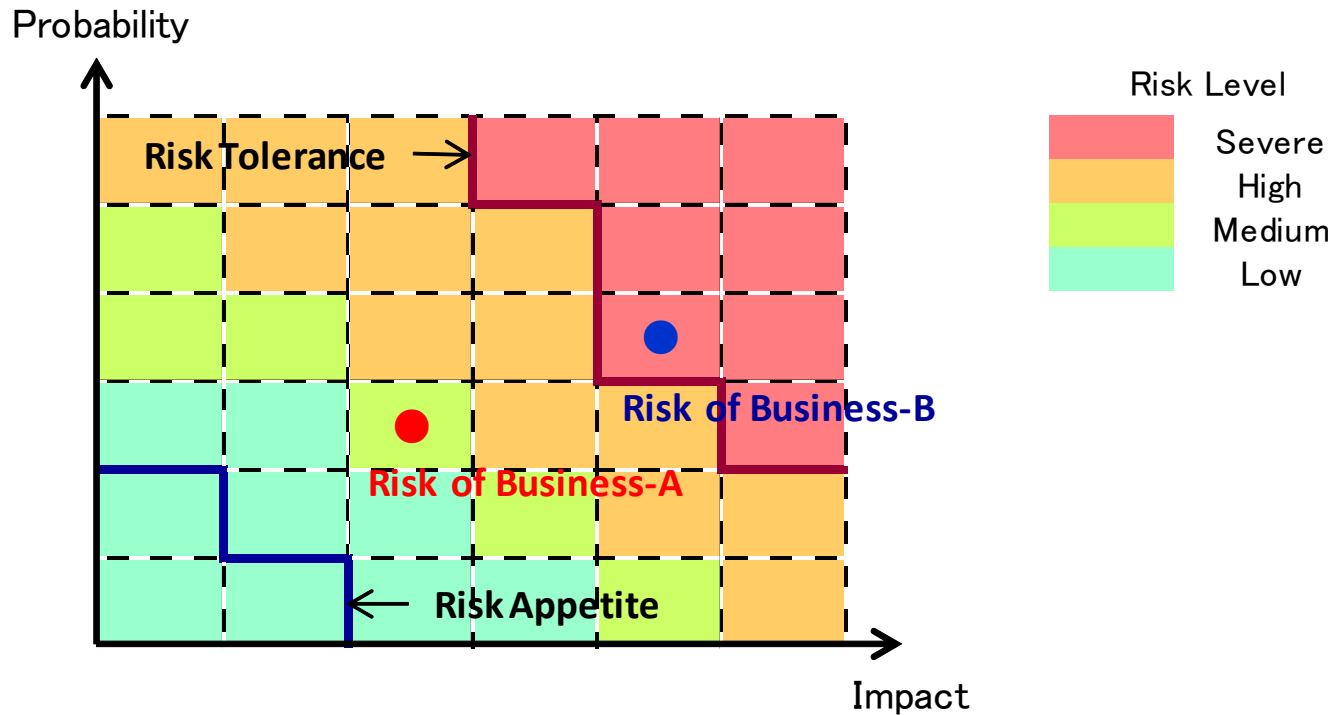
* EC : Economic Capital

** RAROC (Risk-Adjusted Return on Capital) = Risk-Adjusted Return / EC

Risk Map (1)

Risk Map is a useful tool for overlooking all risks surrounding the company.

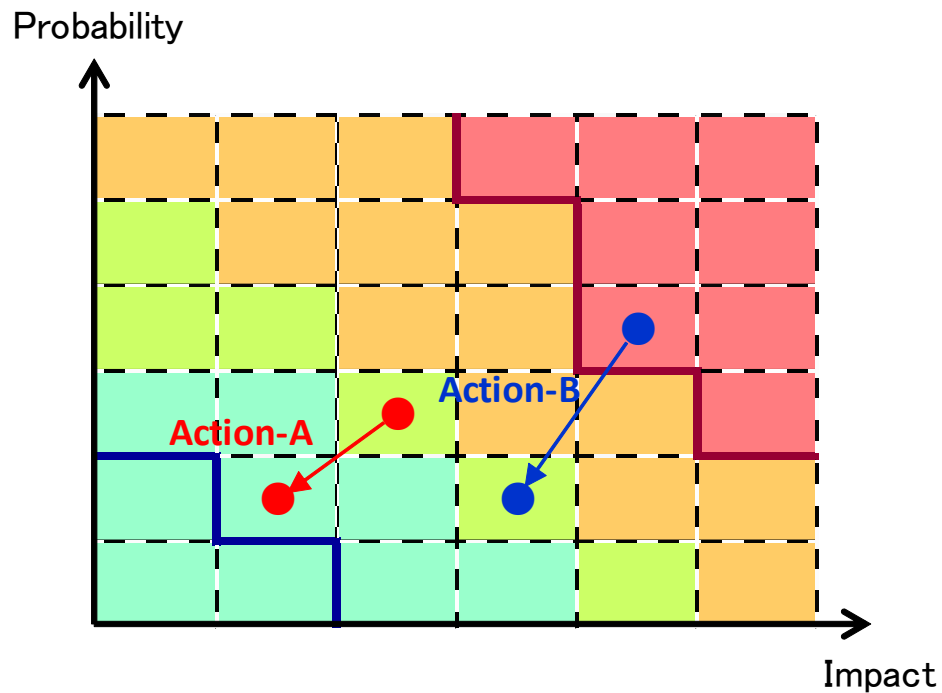
Sample of Risk Map



Risk Map (2)

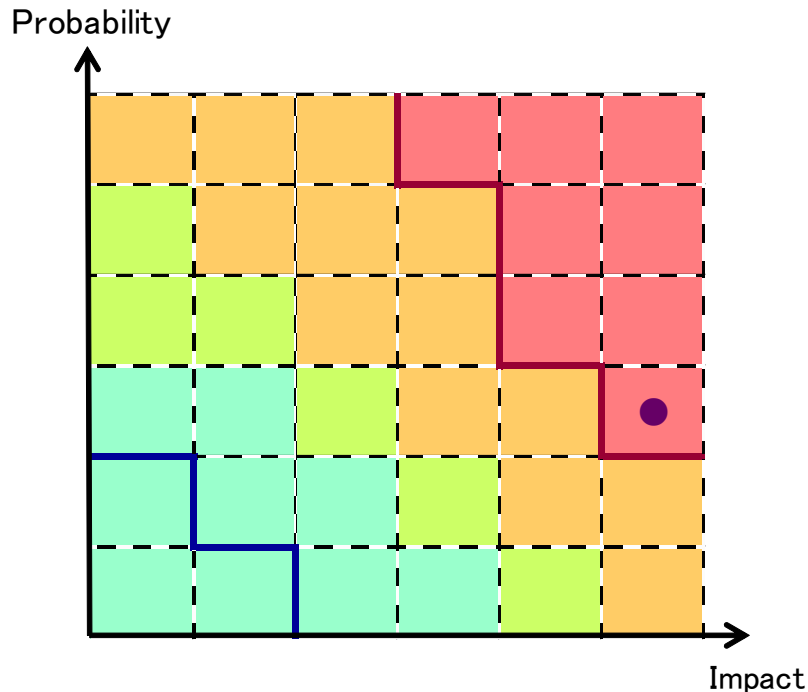
Risk Map can also show the effect of risk control.

Actions for Risk Control



3. Case Studies

Case Study about DB plan sponsor Company-A (1)



Pension Financial Status

Assets=110

Liability=100

Surplus=10

Asset Allocation

Stocks:Bonds=70:30

EC=25

VaR=20

ACC=8

Definition of the risk:

“The sponsor must make extra contributions to its private pension plan”

Probability:

The probability that the risk will occur

Impact:

The average amount of extra contributions

The conditions EC must meet:

(1) $VaR^* < EC$

(2) $EC \leq Surplus + ACC^{**}$

※ The results are samples and not based on exact calculations.

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

** ACC: additional contribution capacity

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

Case Study about DB plan sponsor Company-A (2)

Action- I :

Asset Allocation Shift from Stocks to Bonds

<Stocks:Bonds=70:30→40:60>

Assumption

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



The asset allocations' return and risk

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

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

Action- II :

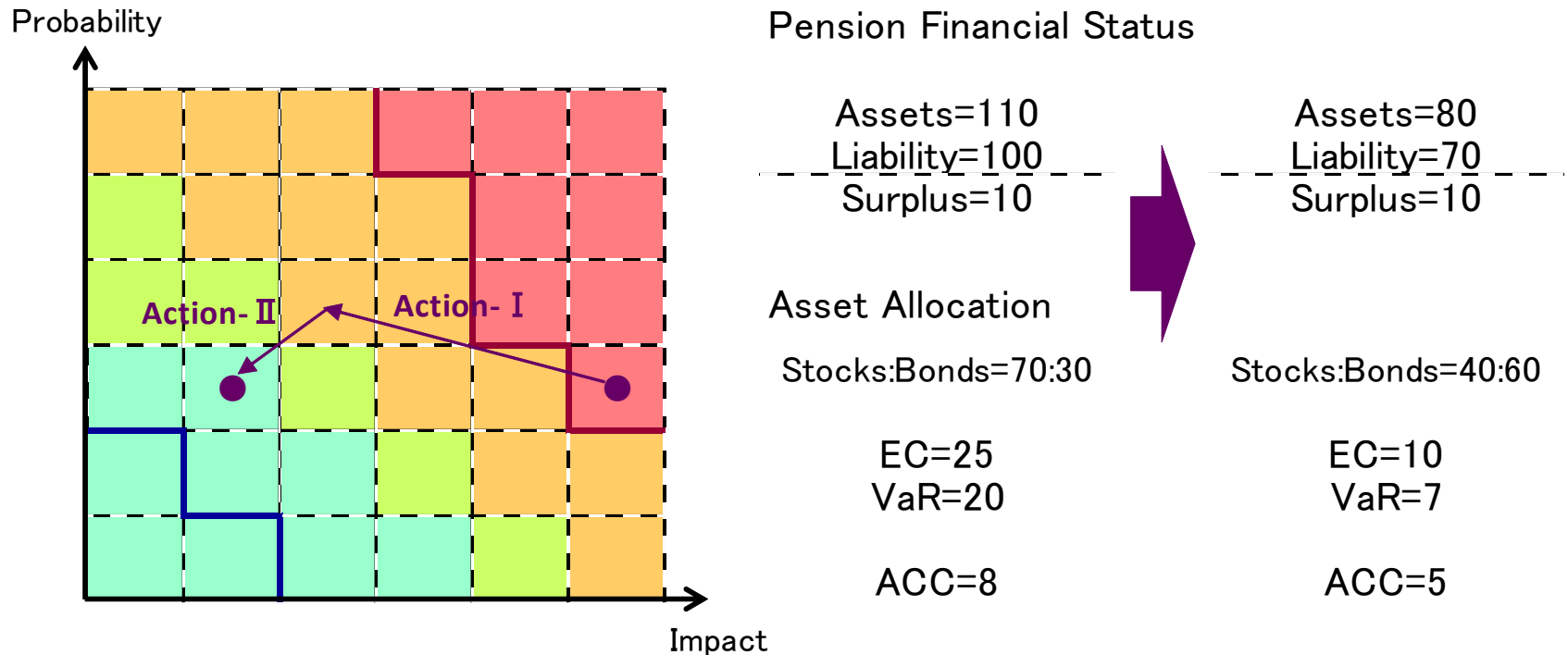
Partly Shift to DC (for the future service) and Pension Buyout (for the past service)

<30% of the DB plan is converted>

⇒ VaR decreases from 20 to 7.

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

Case Study about DB plan sponsor Company-A (3)



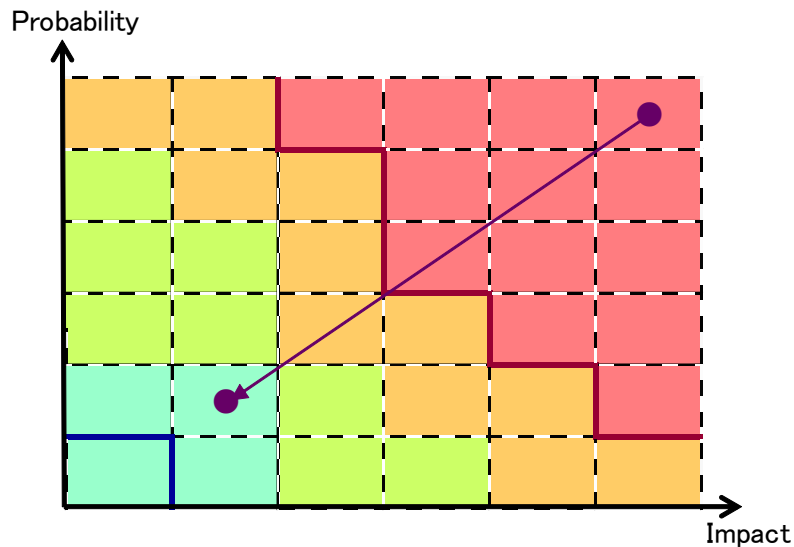
※ The results are samples and not based on exact calculations.

Following VaR's decrease, EC is reallocated and decreases from 25 to 10. Therefore EC meets both of the conditions. ($7 < 10$, $10 \leq 10+5$) Besides, the risk level changes from "severe" to "low".

Important Points (1)

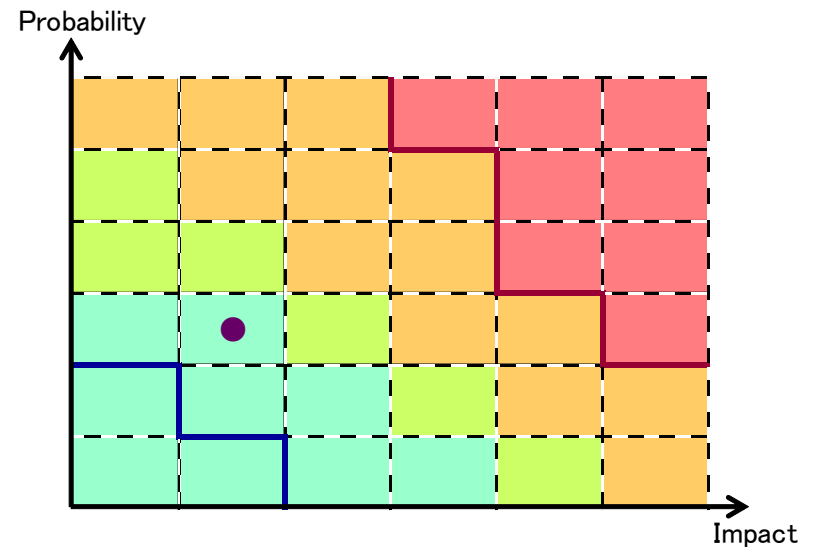
- The best solution depends on companies.

Case of Company-B



Freezing DB penion plan

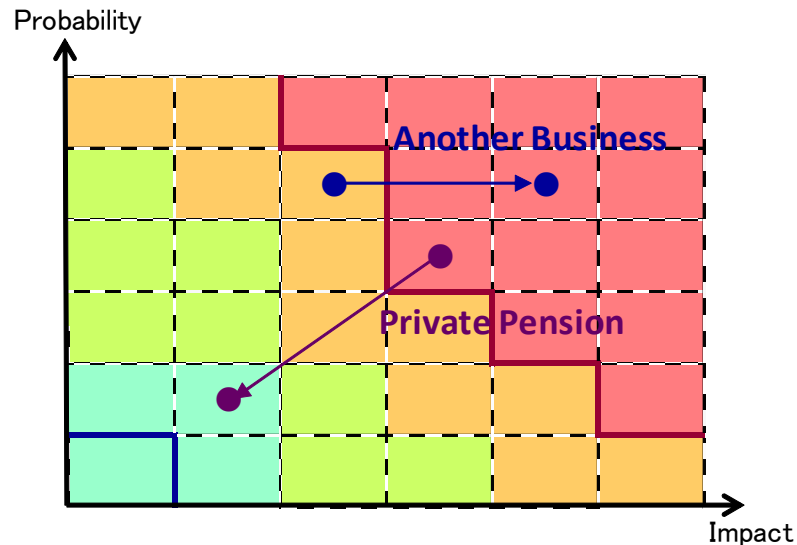
Case of Company-C



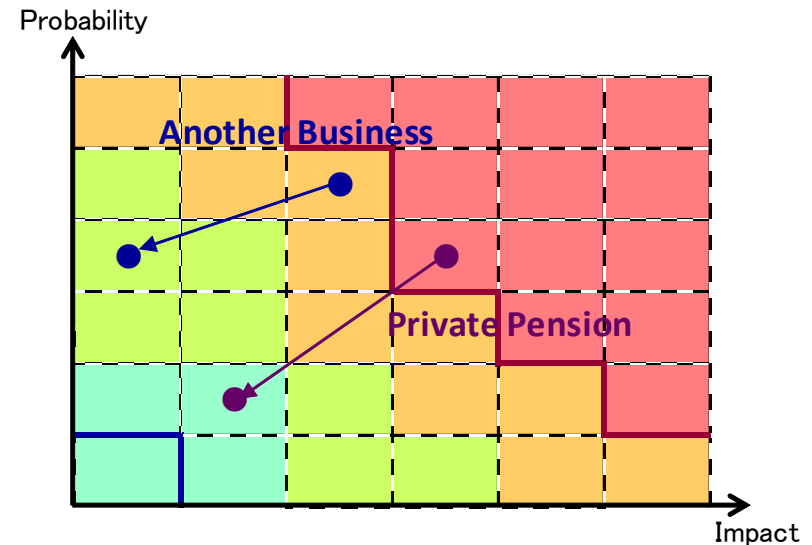
No action

Important Points (2)

- The correlation with another business risk control should be considered.



Negative Correlation



Positive Correlation

- Some risks (disaster risk, reputational risk, etc) cannot be quantified. Therefore we should also consider qualitative risk management.

4. Conclusion

Conclusion

- ERM is the risk management approach which helps companies recognize and assess their business risks synthetically, and it can be effective for private pension risk management.
- ERM has a lot of useful tools (Economic Capital, Risk Map, Scenario Analysis, Risk Indicators, Alternative Risk Transfer(ART),etc). By using them efficiently, we should find the best solution for the company.
- **As we actuaries are experts on quantitative risk analysis and pension liability valuation, we should aggressively participate in ERM application to private pensions. As a result, we can contribute to social and economic development.**

Thank you for your attention & patience.