2nd PBSS COLLOQUIUM
Helsinki, Finland 21-23 May 2007

Moderator: Ole Haugaard

H. Iizuka: *The consideration of the characteristics of the pension liabilities and measurement methods*

R. Matsubara: *Funding Standards and Protection of Benefit Rights*

J. Sakamoto: *Role of the Actuary in the process of unifying the social security pension schemes*
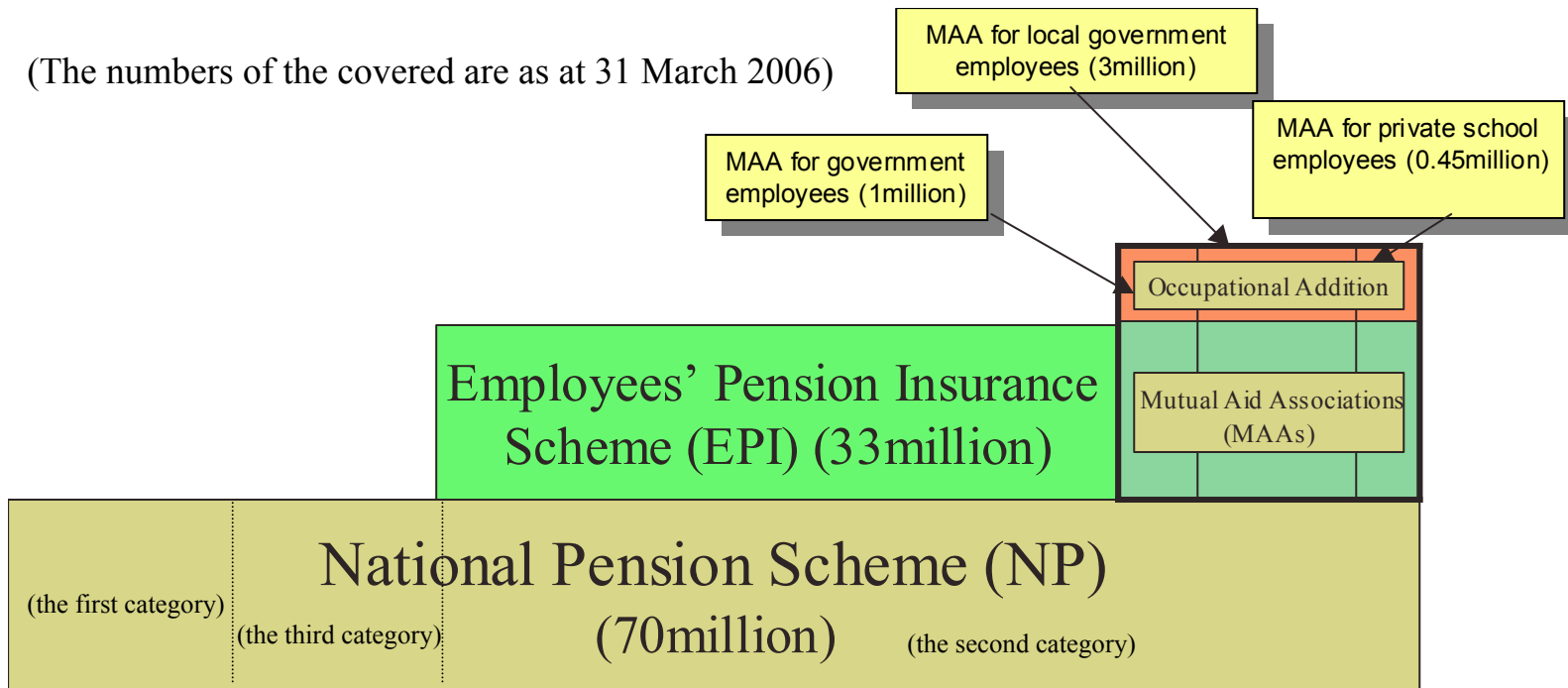
Pension Schemes in Japan

*Brief description of the schemes
to give a proper framework for discussion*

Nomura Research Institute

Junichi Sakamoto

Social Security Pension Schemes in Japan

(The numbers of the covered are as at 31 March 2006)

MAA for local government employees (3million)

MAA for private school employees (0.45million)

MAA for government employees (1million)

Occupational Addition

Employees' Pension Insurance Scheme (EPI) (33million)

Mutual Aid Associations (MAAs)

(the first category)

(the third category)

National Pension Scheme (NP) (70million)

(the second category)

Classification of NP active participants:

- the first category: farmers, the self-employed, etc. aged 20-59 (22 million)

- the second category: people covered by the schemes for employees (37million)

- the third category: the dependent spouses aged 20-59 of employees in the second category (11million)

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Complementary Pensions in Japan
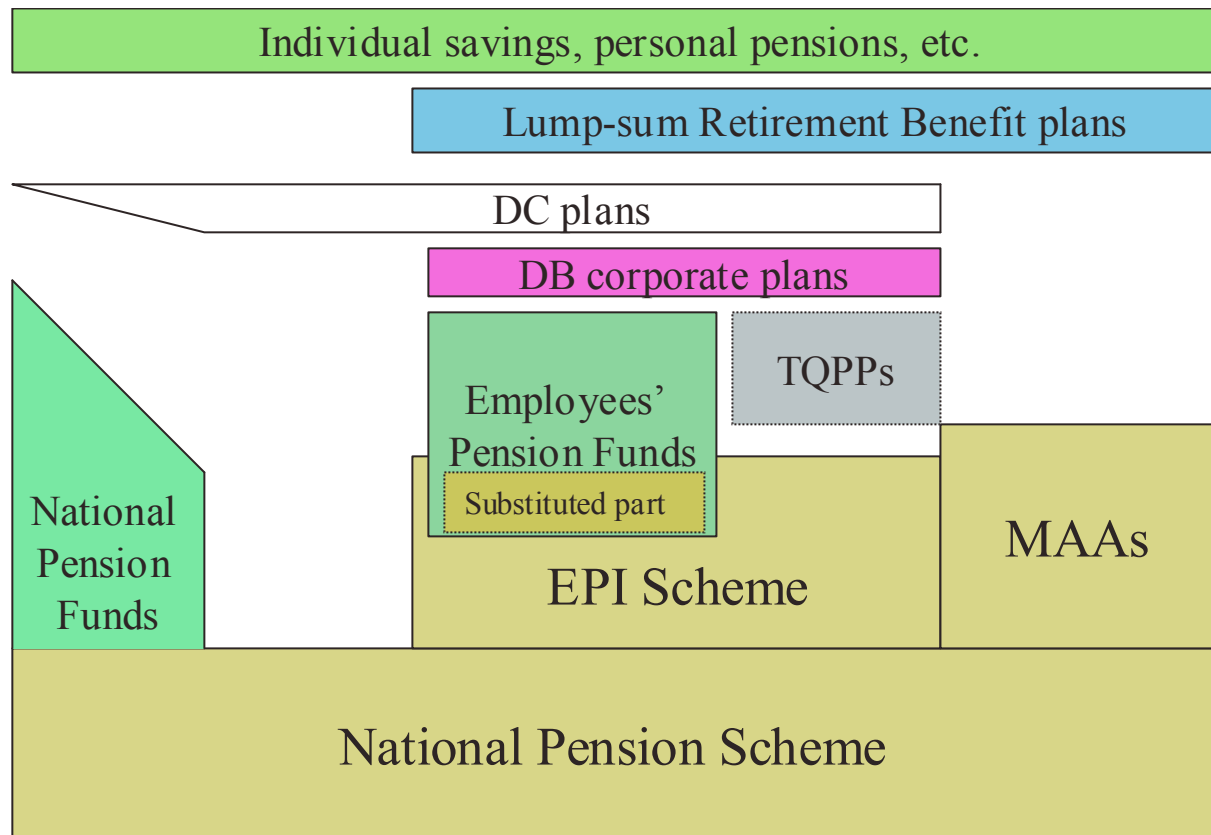
2nd PBSS COLLOQUIUM
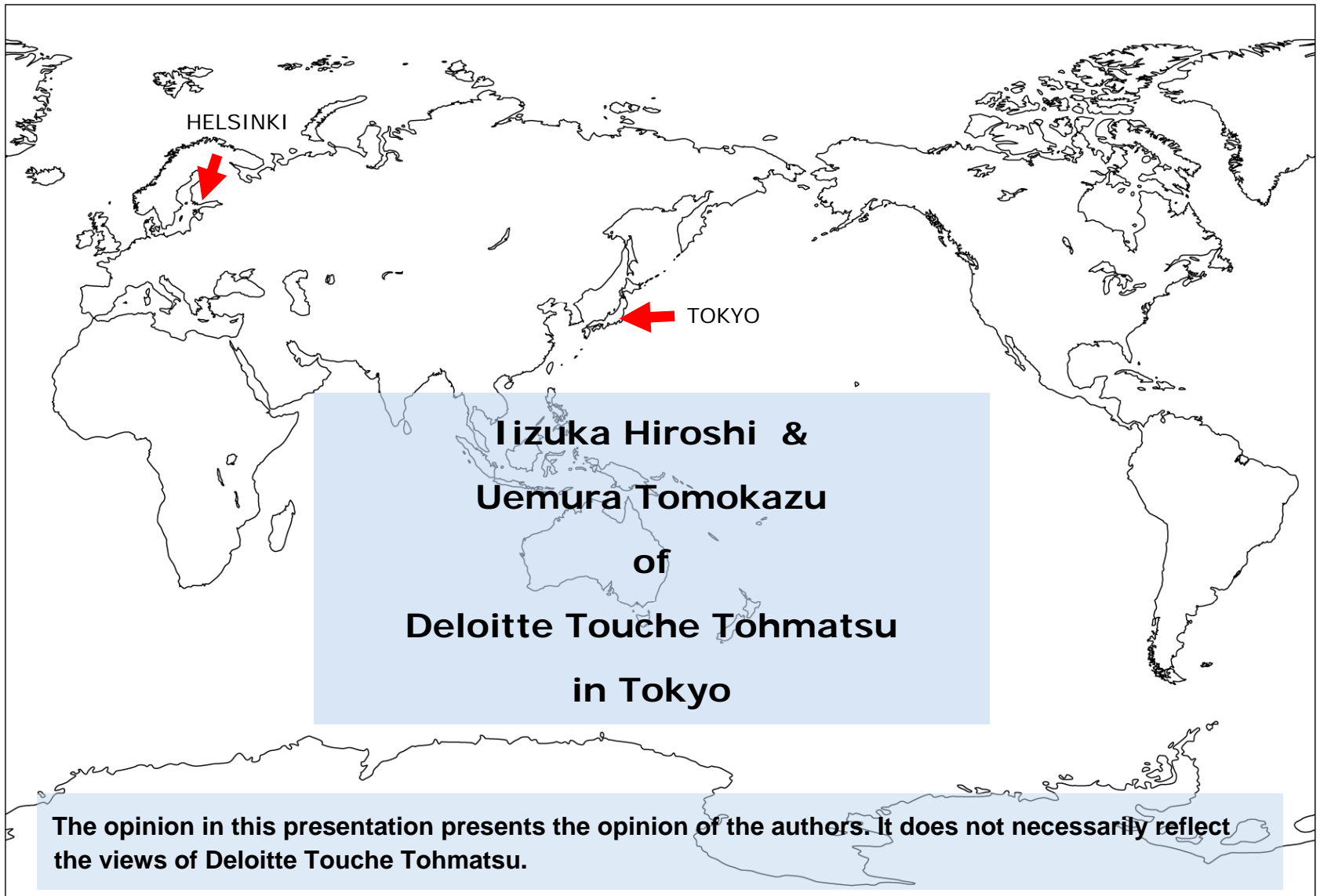Helsinki, Finland 21-23 May 2007

Consideration of the characteristics of pension liabilities and measurement methods

Authors

Hiroshi Iizuka and Tomokazu Uemura

Deloitte Touche Tohmatsu

HELSINKI

TOKYO

Iizuka Hiroshi &

Uemura Tomokazu

of

Deloitte Touche Tohmatsu

in Tokyo

The opinion in this presentation presents the opinion of the authors. It does not necessarily reflect the views of Deloitte Touche Tohmatsu.

Consideration about pension liabilities and measurement methods

Currently, three methods (based on **present value = "discounted"**) are used to evaluate post-retirement plans' liabilities in Japan

Uniqueness of Japanese plans is that the benefits are **based on lump-sum**

Due to such uniqueness, the liabilities were once measured by **"non-discount"** method

However, the **"non-discount"** method may offer some solutions to the problems in evaluating **cash-balance** plans

There are problems in **"non-discounted liability"**, and that method has been disused

Which the post-retirement plan's benefit is based on?
Pension or **Lump-sum**

Table of Contents

Summary of this presentation

- There are several liability types of post retirement benefits.
  - The liability for funding purposes
    - A debt for the accrued portion of the certain future expenses
  - The liability for accounting purposes
    - A reserve for the future payments
- These liabilities have different characteristics
  - The measurement methods must be different to match each characteristics
  - Especially the discount rate used to measure liabilities should have different meanings of basis
- **The discussion in this presentation is based on Japanese regulations, accounting standards and customs**
- Introduction of some features of Japanese post-retirement plans
  - The unique characteristics of Japanese plans
  - The concept of "non-discounted liability"
    - The problems of "non-discounted liability" and it's potentials of application.

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Liability for accounting purposes

- The characteristics of a post retirement plan from the accounting point of view.
    - A plan that will pay an expense in the certain
    - An expense from the plan is predictable on some level
- The rules for expenses to be booked as an allowance under Japanese GAAP
    - A future expense or loss is scheduled for certain
    - The amount of that expense or loss can be projected with certainty
    - That expense or loss is related to the income of the fiscal year in which that expense or loss will be recognized
- Post retirement payments meet the above conditions, and shall be booked in a financial statement as an allowance
- The measuring method for accounting
    - Liabilities should be present values of the future expenses from the plans
    - The future expenses should be discounted with a risk-free (or quasi risk-free) rate to reflect only the time-value
        - Under Japanese GAAP: Japanese Government bonds, Government Agency bonds or high rated Corporation bonds are the risk-free rate

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Liability for funding purposes

- The defined benefit pension plans are regulated by the government under two standards to secure sound management of the plans in Japan
  - The continuous standards
  - The discontinuous standards

- The continuous standards
  - Objective; to determine the level of contributions in order to meet the future payments and to see whether or not the reserves are sufficient
  - The "long-term" projection is important for the continuous standards
  - The discount rate for the continuous standards is determined based on long-term return on assets
    - There are lower bounds of the discount rate due to taxation

The lower bounds of the discount rate of the continuous standards

FY	The lower bounds		FY	The lower bounds
2002	1.20%		2005	1.30%
2003	1.20%		2006	1.20%
2004	0.90%		2007	1.30%

Liability for funding purposes

- The discontinuous standards
  - Objective; to see if the plan assets are sufficient to meet the accrued benefits of past service period of employees on plan termination
  - The discount rate for discontinuous standards is determined by the yield of risk-free assets
    - The reason is that the amount of distributed assets should be equal to the accrued benefits even when employees manage them by risk-free assets after the plan termination
  - The discount rate for discontinuous standards is regulated by the government in Japan

The regulated discount rate for the discontinuous standards

FY	Discount rate		FY	Discount rate
2002	2.50%		2005	2.20%
2003	2.23%		2006	2.17%
2004	2.29%		2007	2.20%

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Overview of Japanese post-retirement plans

- The uniqueness of Japanese post-retirement plans
  - Based on lump-sum payments
    - The relatively large amount of public pension could cover the living expenses for the aged
    - The delayed regulation of corporate pension systems
    - The needs of temporary money to refund mortgages
  - Many companies have made their retirement benefits be able to be paid as pension
    - Most plans still pay the retirement benefits only in lump-sum to short-term employees
    - To receive payments as pension, employees need to have long-term service or retire after a certain age

Pension payment of lump-sum based plan

Lump-sum = Pension resource

Pension conversion

By projected yield

Entry▲

▲Retirement

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"Non-discounted liability"

- The former plan liability for lump-sum only plans was measured by "non-discounted liability" (before 2000/4/1)

- The amount of the "non-discounted liability" equals to the total amount of the lump-sum benefits as of measurement date (i.e. the amount of liability = the total accrued benefits)

  - The measurement method used before the introduction of the Projected Credit Unit method same as FAS87 and IAS19

  - Currently, rather small companies (smaller than 300 employees) may be allowed to use this "non-discounted liability" for accounting purpose

    - Measuring liability with "Non-discount" method is allowed only when the reliability of assumptions (salary increase rates and withdrawal rates) is relatively lower.

"Non-discounted liability"

- The problems of "non-discounted liability"
  - 1. "Non-discounted liability" cannot reflect the future increase of the benefit
    - The "back-loaded" plans have much serious problems

A typical Japanese "back-loaded" plan's benefit curve

Benefit Curve

Benefit rise 50% at the age of 55
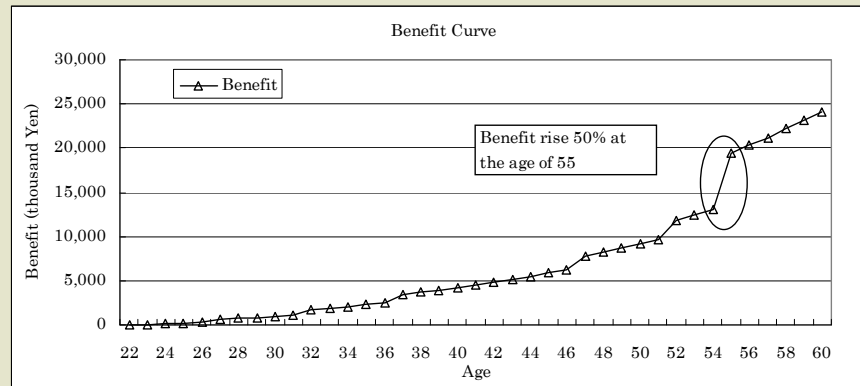
- The amount of the liability should rise rapidly as the employees service year increase
  - This is the case with projected credit unit method as well
  - In the case where the benefits are attributed by the benefit formula, the liability measured by the projected credit unit will be smaller than "non-discounted liability"
  - To measure those "back-loaded" plans the benefit attribution should be based on a straight-line service year basis (FAS87, IAS19)

"Non-discounted liability"

- The problems of "non-discounted liability"

    - 2. The difference between the projected yield for the pension resources and the discount rate at pension payable plans
        - Projected yield for the pension > Discount rate, then "non-discounted liability" will be smaller than the PV of the pension payments

Projected yield and discount rate

Pension conversion

By projected yield
(a)

Lump-sum
= Pension
resource (A)

Present value (B) as
of retirement by
discount rate (b)

When
projected yield (a) >
discount rate (b)

Then
pension resource (A) <
present value (B)

Liability is underestimated
by "non-discount" method

"Non-discounted liability"

- The conditions to regard the "non-discounted liability" as a reasonable liability for accounting
  – Benefits are not "back-loaded" excessively
  – When the plan can pay benefits as pension, the projected yield for the pension resource is related to the discount rate

Cash-balance plans might meet above requirements

  -Benefit accrual are generally mild (not so rapid)

  -Revaluation may be based on the same index as discount rate (such as government bonds or low-risk corporate bonds)

Note: Due to the diversity of cash-balance plans, many points should be considered before using "non-discounted" method to measure the liabilities.

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- The discount rates are determined by two main approaches
  - The liability approach which reflects the concept of accounting
  - The assets approach which reflects the concept of continuity of funding

- The issue of "non-discounted liability"
  - The similarity of lump-sum based plans and cash-balance plans suggests the "non-discounted" method to measure the liability for those types of plans
    - The concept of cash-balance plans are not much like other "pension based" plans prevailing in U.S. and EU
    - But it has some similarity with "lump-sum based" plans such as Japanese post-retirement plans
    - Also some conditions may be suitable for "non-discount" method to be applied

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Funding Standards and Protection of Benefit Rights in Japan

PBSS2007 in Helsinki

22 May 2007

Ryo Matsubara
Certified Pension Actuary (Japan)

Qualified Defined Benefit Corporate Pension Plans in Japan

Tax Qualified Pension Plan (TQPP) ← Corporate-Tax Code

Employees' Pension Fund (EPF) ← Employees' Pension Insurance Act

Corporate Pension Plan (CPP)

Corporate Pension Fund (CPF) ← Defined Benefit Corporate Pension Act (DBA)

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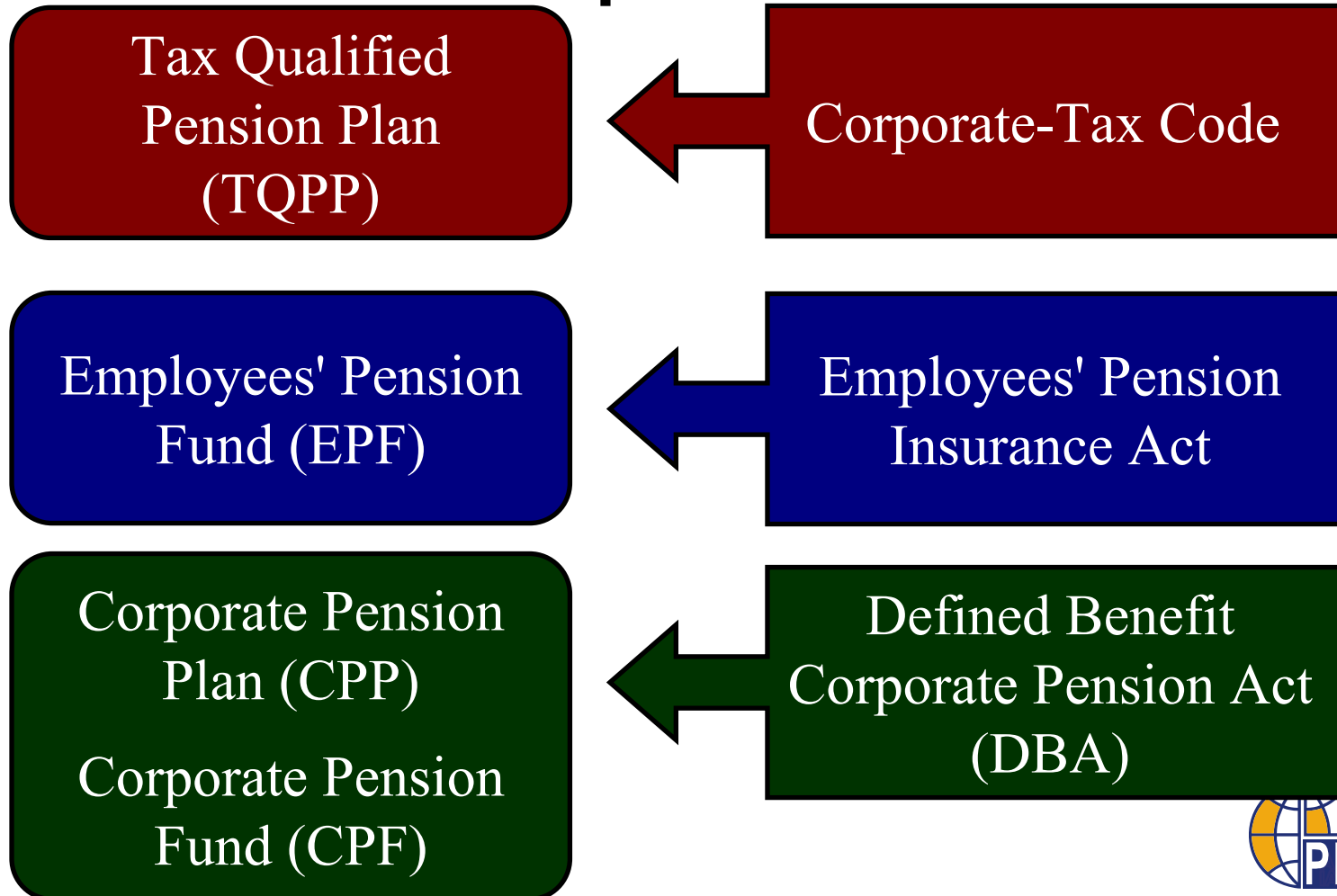
Funding Requirements of Qualified DB Corporate Pension Plans in Japan

Tax Qualified Pension Plan (TQPP)	Almost Nothing
Employees Pension Fund (EPF) Corporate Pension Plan (CPP) Corporate Pension Fund (CPF)	"On-Going": Actuarial Liabilities "At-Risk": Minimum Funding Standards ==> Additional Contributions are required.

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Structure of Protection of Benefit Rights under DBA

Protection of Benefit Rights

Minimum Funding Standards (MFS)

To keep Funding Level

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Typical Plan Design in Japan

Retirement Allowance Plan

(a Fundamental Promise, provides only Lump Sum)

Funding Vehicles

RAP is partly/fully funded through Qualified Corporate Pension Plans such as EPF, TQPP, CPP and CPF

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Typical Plan Design in Japan

Define Lump-sum Benefits at Resignation First
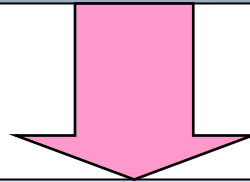
Then Define Annuity Benefits Option

You can easily define
the amounts of "Walk-away" Benefits.

Structure of Protection of Benefit Rights under DBA works well?

Answer is **NO!**

Minimum Funding Standards (MFS)

<

Walk-Away Benefit Obligation (WABO)

The Fundamental Promise the employer made.

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Structure of Protection of Benefit Rights
~ My Thought ~

Protection of Benefit Rights

Demand the plan sponsor to take necessary actions

Plan Sponsor (Employer)

Pension Committee
Funding Policy
Investment Policy

Participants

Both Parties are well informed. Each Party should have a budget to employ their own advisers.

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Thank you!
Any Questions?

Minimum Funding Standard (MFS) under DBA

MFS =
Present Value of Minimum Benefits

Minimum Benefits
Type A;
Current Benefit (including lump-sum benefit), but only payable at Normal Retirement Age

Minimum Benefits
Type B;
Current Benefit x f(X) where f(X) is a ratio determined by current age.

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Example of Type A

- Plan A:
  - A Final Pay Plan, Annuity is eligible with 15 years of service.
  - Lump Sum Benefit = Monthly Salary x A(T), where T is Years of Service
  - Annuity Benefit = Monthly Salary x B(T) x C(X), where X is Age at Resignation
  - Normal Retirement Age: 60

Example of Type A
~ Lump Sum Benefit ~

– Participant X: Age 35, 10 years of service and monthly salary of 350,000 Yen
A(10) = 6.5, A(35) = 44.6

• Minimum Benefit of X

= 350,000 x A(35) x {A(10)/A(35)}

= 350,000 x A(10) = 2,275,000 Yen

• This amount is equal to the amount of walk-away benefit. However it is only payable at age 60, while the walk-away benefit is payable now.

Example of Type A
~ Annuity Benefit ~

– Participant Y: Age 50, 25 years of service and monthly salary of 500,000 Yen
$B(25) = 2.442$, $B(35) = 3.9461$
$C(50) = 1.4802$, $C(60) = 1$

• Minimum Benefit of Y
$= 500{,}000 \times B(35) \times \{B(25)/B(35)\} \times C(60)$
$= 500{,}000 \times B(25) \times C(60) = 1{,}221{,}000$ Yen

• Walk-Away Benefit of Y
$= 500{,}000 \times B(25) \times C(50) = 1{,}807{,}324$ Yen

Comparison of Walk-Away Benefits and Minimum Benefits (Type A, Annuity)

Walk-Away Benefit VS Minimum Benefit
(Sample Plan ~ Annuity Benefit)

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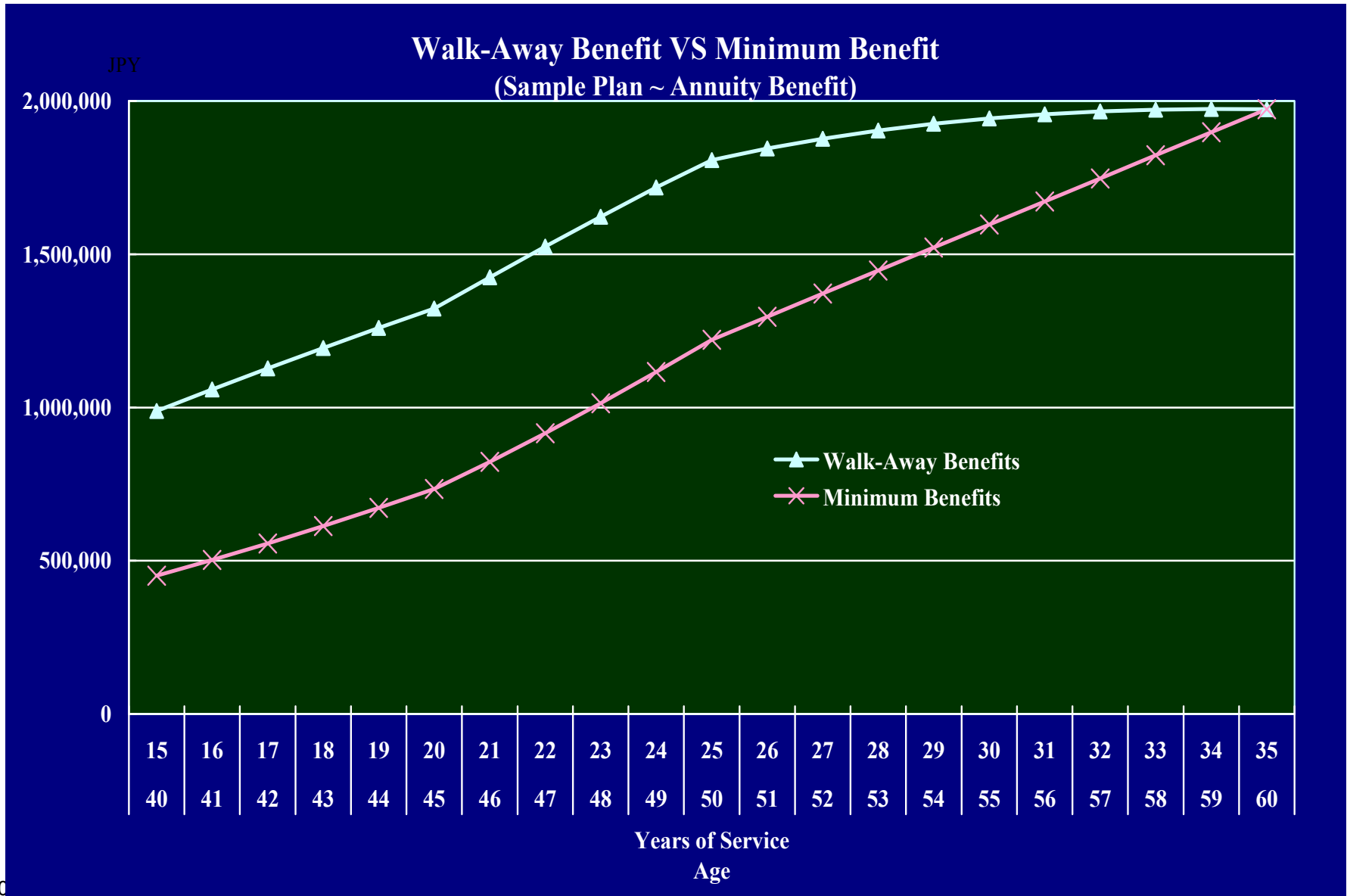
Comparison of Walk-Away Benefits and Minimum Funding Standards

Walk-Away Benefit VS Minimum Funding Standard
Sample Plan ~ Lump Sum Benefit
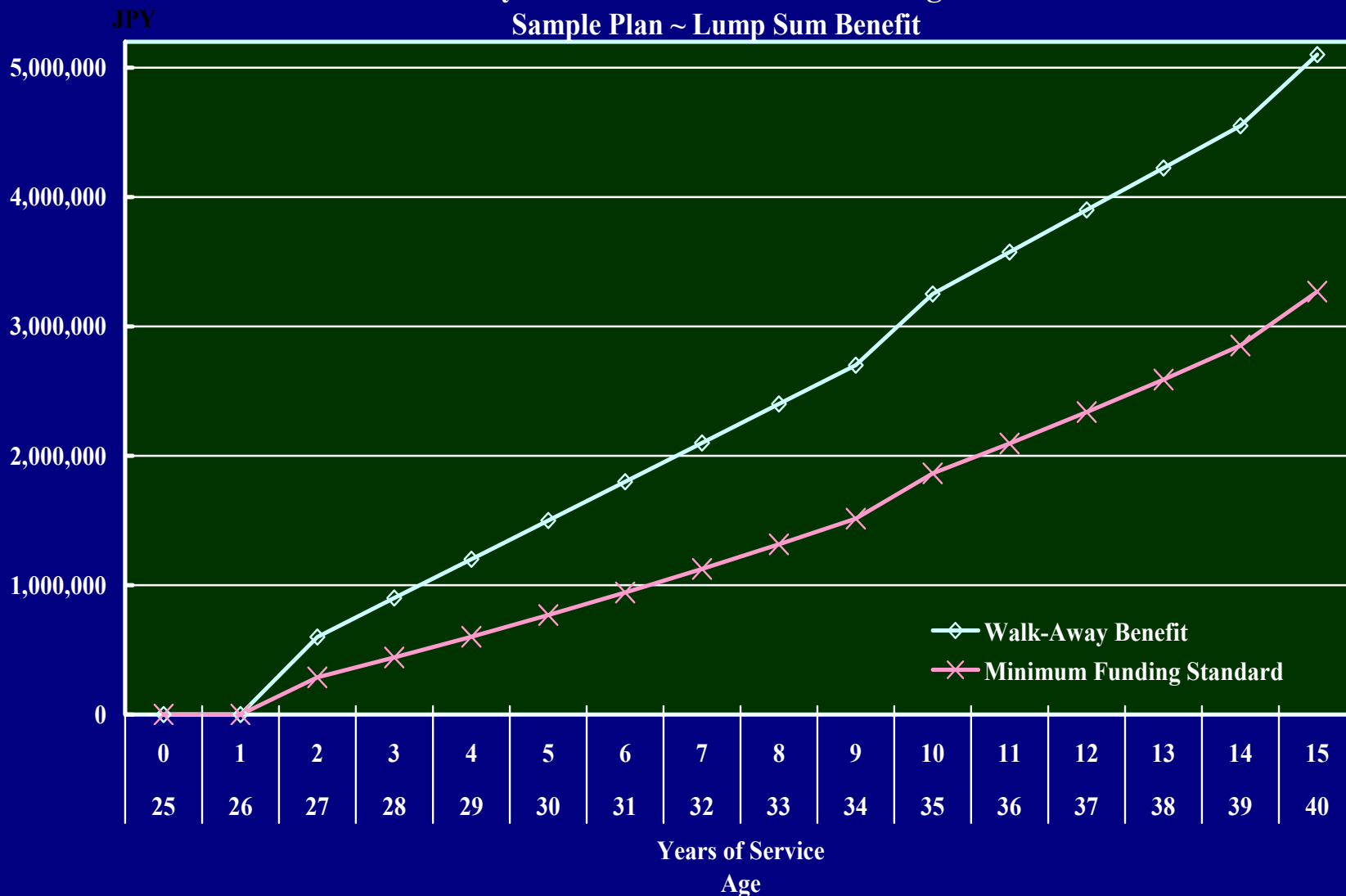
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Role of the Actuary in the Process of Unifying the Social Security Pension Schemes in Japan

Nomura Research Institute

Junichi Sakamoto

Evolution of Social Security Pension Schemes in Japan (1)

Until the end of 1930's
- Superannuation system for Civil servants (SSCS)
- Mutual aid associations for public employees (MAAs)

In the 1940's
- SSCS
- MAAs
- Seamen's Insurance
- Employees' Pension Insurance (EPI) scheme for private employees

In the 1950's
- SSCS was merged with the MAAs (government, local government, JR, JT, NTT)
- Seamen's Insurance
- EPI scheme
- New MAAs (private school employees, agricultural cooperative employees)

Evolution of Social Security Pension Schemes in Japan (2)

<u>In the 1960's</u>

the EPI scheme

the Seamen's Insurance

the NP scheme

MAA for Government Employees

MAA for JR Employees

MAA for JT Employees

MAA for NTT Employees

MAA for Local Government Employees

MAA for Private School Employees

MAA for Agricultural, Fishery and Forestry Coperative Employees

JR=Japan Railway Company
JT=Japan Tobacco Company
NTT=Nippon Telegraph and
Telecommunication Company

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Problems

- Pension jealousy discussion

  - final salary scheme (MAAs) vs career average scheme

  - pensionable age (MAAs=55, EPI=60)

- Financial problems caused by changes in industrial structure or employment structure

  - NP scheme

  - Seamen's Insurance

  - MAA for JR employees

Unification Process (1)

- 1979 reform

  - pensionable age of MAAs: 55 → 60

- 1985 reform

  - coverage of the NP scheme: extended to the whole nation

  - Seamen's Insurance was merged with the EPI scheme.

  - benefit formula of MAAs: final salary → career average

    (MAAs earnings-related formula)

    = (EPI earnings-related formula) + (occupational addition)

    ((occupational addition) = 0.2 x (EPI earnings-related formula))

Unification Process (2)

- 1985 reform unified the flat-rate part.

Contributions & subsidy

Employees	
Employers	→ the EPI scheme
Government	

Transfer of designated amount of money

NP Special Account

Employees	
Employer	→ the MAA for Government Employees
Government	

NP Sub-account ← *Contributions* ← the self-employed, etc.

← *Subsidy* ← Government

Employees	
Employer	→ the MAA for Local Government Employees
Local Governments	

Transfer of designated amount of money

Basic Pension Sub-account

Employees	
Employer	→ the MAA for Private School Employees
Government	

Basic pension benefits

Basic Pension Beneficiaries

The designated amount of money is the share of each scheme of the total amount of basic pension benefits in proportion to the number of employees aged 20-59 in the 2nd category plus their dependent spouses in the 3rd category or to the number of people paying contributions in the 1st category.

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Unification Process (3)

- 1997: MAAs for JR, JT, NTT employees were merged with the EPI scheme.

- 2002: MAA for Agricultural, Fishery and Forestry Cooperative Employees was merged with the EPI scheme.

The Bill

Going to be simplified!

Employees' Pension Insurance Scheme

National Pension Scheme
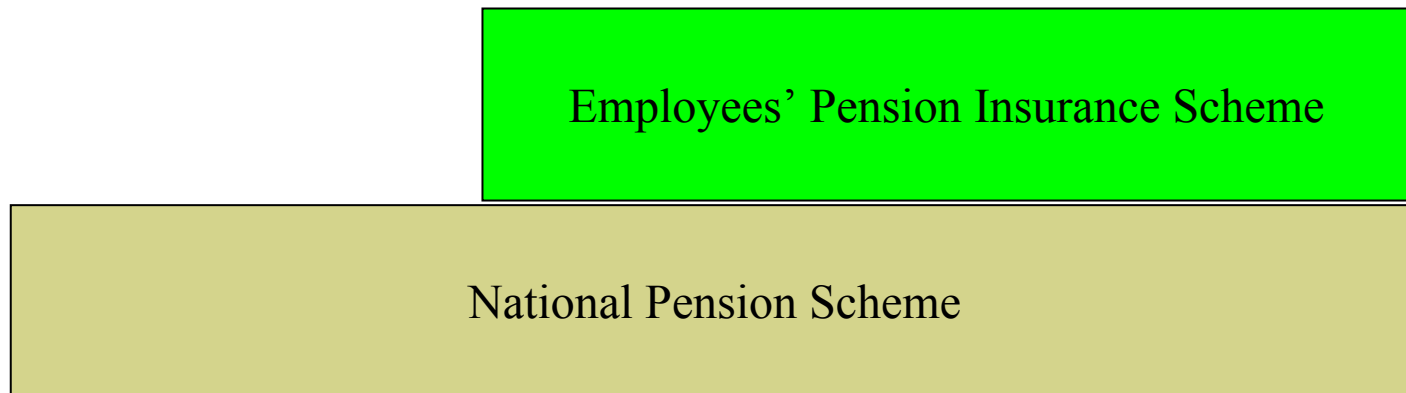
Unification---objectives

- Equity
- Financial stability

Unification---issues

- Benefit design

- Financial framework

   - way of pooling contributions

   - financial interchange

   - reserve fund to be shared

   - investment rule when the reserve fund to be shared is

     separately managed by the former insurers

- Administration

Issues---benefit design

- To be converged into a single design

  - with transitional provisions

- The 1985 reform greatly facilitates the convergence.

- No accruals for occupational addition after April 2010

  - to be replaced by an occupational pension scheme for civil servants

- Other small differences

- MAA Benefits corresponding to the period before the merger of SSCS with MAAs are to be reduced.

  - being financed by tax

  - 27% reduction with the floor of max{90%x(total benefit), JPY 2.5 million}

  - not applicable to private school employees

Issues---way of pooling contributions

- Options

  (1) perfect pooling

  (2) former insurers to function as EPI branch

    - to avoid steep increase of transitional cost

- The bill has chosen (2).

  - former insurers collect contributions, keep records, pay benefits

    and manage and invest the reserve funds.

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Issues---financial interchange (1)

- Options

  (1) Perfect interchange

  (2) Partial interchange

    - to avoid violent impact on former insurers

- The bill has chosen (2) as transitional measure.

  - 50% interchange

  - Changing it into (1) is to be deliberated, taking account of the experience during FY 2010 – FY 2027. FY 2027 is the year when the contribution rate becomes uniformly 18.3%.

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Issues---financial interchange (2)

- Partial interchange formula

50% ← (Not to be interchanged)

50% ← (to be interchanged) →

87% — According to the size of pensionable remunerations

13% — According to the size of reserve fund

Total amount of expenditures

(Note) 87% was determined on the basis of the financial projections for the next 100 years.
It is reviewed every five years.
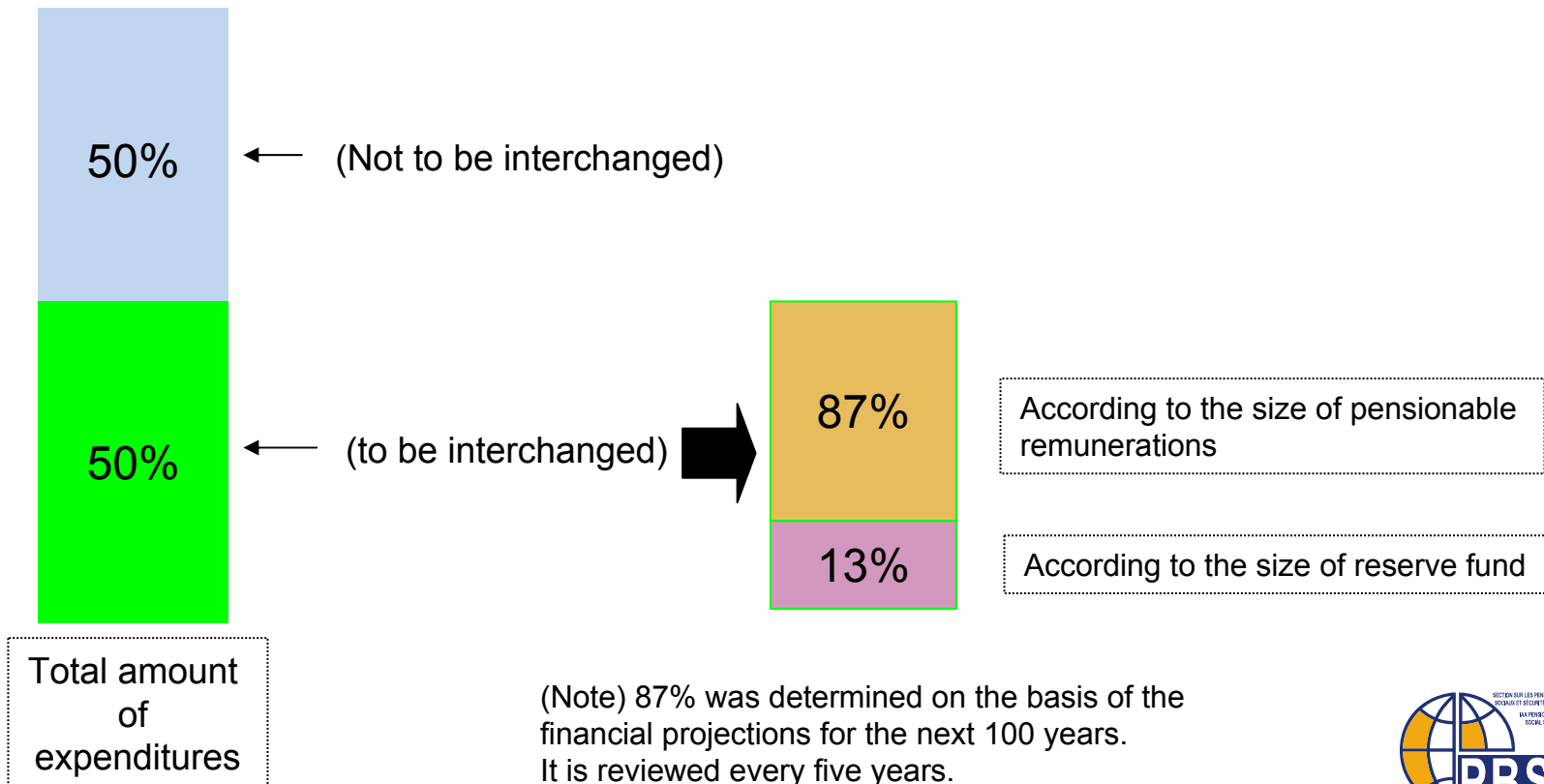
Issues---reserve fund to be shared

- Options
  (1) the amount of reserve fund that would have been accumulated if the scheme
     had been operated from the outset in the same provisions as the EPI scheme
  (2) the amount of accrued liabilities assuming there is no indexing provision
  (3) the amount of reserve fund that has the same fund ratio as the EPI scheme on
     the day of unification
  (4) the amount of reserve fund whose ratio to the present value of benefits
     corresponding to the past period is equal to that of the EPI scheme on the day
     of unification
  (5) the amount of reserve fund whose ratio to the difference between the present
     value of benefits and the present value of contributions is equal to that of the EPI scheme
     on the day of unification

- The bill has chosen (3).
  - political reason

Issues---
management and investment of the reserve fund

- Investment principles

  - the Minister of Health, Labour and Welfare drafts to consult

    other ministers concerned

- Disclosure

  - the MHLW drafts the annual report to consult other ministers

  - the MHLW drafts measures to be taken to improve the situation

    of former insurers to consult other ministers concerned

  - each former insurer has to publish annual report

Role of the Actuary in the Process of Unification

- Supervisory role
- Advisory role

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Role of the Actuary---supervisory role

- Actuarial Subcommittee of the Social Security Council was set up in 1980.

- It had the power to demand data from the ministries that supervised social security pension schemes.

- It published several reports that helped people understand the financial conditions of each of the social security pension schemes.

- It has contributed to forming people's credibility about the financial conditions of each scheme.

Role of the Actuary---advisory role

- In each stage in the process of unification, the Actuarial Affairs Division, Pension Bureau, Ministry of Health, Labour and Welfare gave actuarial advice for financial framework necessary for unification.

Example
(merger case of MAA for JR employees)
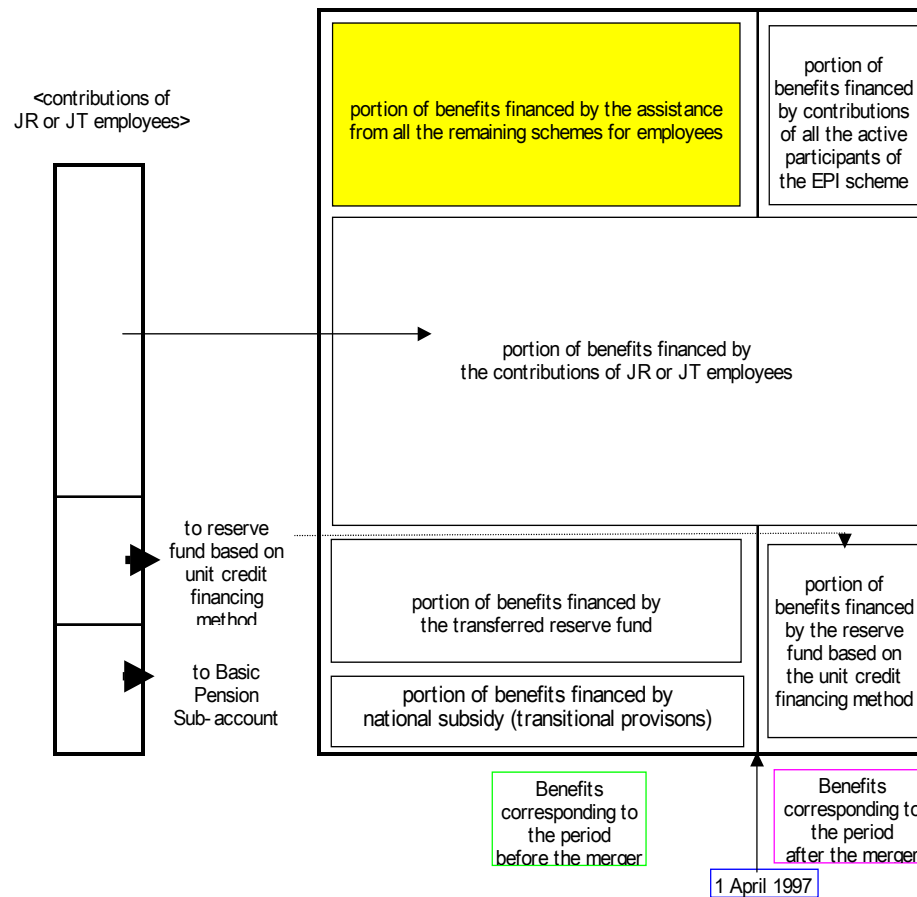
Thank you very much for your attention!

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Moderator: Eduard Ponds

A. Castro-Gutierrez: *Actuarial Valuation Methods*

and Assumptions: Experience from

Developing Countries

C. Patel: *Security on pension provision*

The historical development of social security in developing countries (DC)

- A Century ago: The first public pension schemes in Latin America

    – Fully funded (collective funding)

    – General Average Premium (GAP) financed

    – Non indexed benefits

    – No periodical actuarial valuations (even if provisions were indicated in the law)

The historical development of social security in DC

- After the Second World War: Social security pension schemes as an instrument of social policy, but for the salaried workers and civil service only (Latin America)
  - Fully funded schemes, but in practice PAYG schemes with significant accumulation of reserves (used for other purposes)
  - The fiction of the Scaled Premium financial system

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The historical development of social security in DC

- The social security reform in the 90 's: The Latin American experience
  - Private pension schemes as the main pillar for old-age income security: Another fiction?
  - The good experiences: Costa Rica and Uruguay
  - How about the other countries?

Actuarial valuations in DC

- Social security in other developing regions: Africa, Asia and the Pacific, the Caribbean
  - Provident Funds (PF), a good income replacement provider?
  - From PF to pension schemes: Modern approach with not so good practical experience
  - Pension reform: from   PF to GAP, from partialy funded to fully funded (individual accounts). What next? NDC seems to be a good way ahead.

Actuarial valuations in DC

- First experiencies in Latin America (1940 's, 1950 's and 1960 's): fully funded, GAP pension schemes
  - National economies in strong and continued development
  - Demographic growth, in particular fertility
  - Inflation under control

  Therefore, « no need » for actuarial valuations (?) since there were no financial problems in view ...

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Actuarial valuations in DC

- First experiencies in Latin America; Technical bases:

    – Mortality: Hunter Tropicalized mortality table

    – Invalidity: Italian 1937 table

    – Interest: 3% - 3.5% (inflation was not a problem)

Actuarial valuations in DC

- But in the 1970 's and even more in the 1980 's, when pension systems started becoming mature and reserve funds were needed to pay benefits, but no funds were available, pension schemes switched to a sort of scaled premium system. And the same type of problems came back again …

- Same old story … (evasion, corruption, etc.)

- But how about actuarial valuations?

Actuarial valuations in DC

- Actuarial valuations were conducted more or less periodically, to comply with the law.

- But measures to restore financial equilibrium were seldom adopted (also because current income > benefit expenditure)

- Technical bases, both demographic and financial, were and are sound and available, since statistics are permanently produced and optional financial systems (scaled premium, PAYG, fully funded options) are considered by actuaries when carrying out valuations

Actuarial valuations in DC

- In other words, there were no major technical problems.

- Problems were of a different, political nature

- All Latin-American countries produce sound and reliable statistical data: demographic, financial and economic

- Not all pension schemes produce own ' experience data, but actuaries can rely on good estimates out of past or similar experiences from other countries

Actuarial valuations in DC

- In Asian countries the situation is a sort of a mix between sound technically supported actuarial work and a somewhat improvised actuarial work or rely from external aid

- Some DC countries, like India or the Philippines, have a formal, sound actuarial tradition, based on a strong actuarial training and institutional professional work

- Other countries, like some Pacific islands, rely on technical advice from international organisations, like the ILO or the WB

Actuarial valuations in DC

- In Africa the situation is different, depending upon the former colonial administrations

- In French-speaking Africa the actuarial work is not really relevant, pension schemes been a sort of a second priority for governments: family allowances and the « action sanitaire et sociale » being the focus of public authorities

- Pensions follow the French approach of « Répartition par points » schemes, a sort of NDC schemes

Actuarial valuations in DC

- In English-speaking Africa the trend is to a formal actuarial work. Former PF have converted into pension schemes (as in the English-speaking Caribbean)

- Statistical data are neither good nor reliable; the ILO is quite active in this field and they use their demographic and social budget models to perform their actuarial valuations

- There is room for improvement and the trend is good

Actuarial valuations in DC

- In the English-speaking Caribbean the situation is quite different and good

- Young small countries with young defined-benefit pension schemes

- Almost all countries produce reliable statistics and actuarial valuations are carried out regularly

- Like Latin-American, Asian and African countries, they will face an ageing population soon

- But their economies are more vulnerable

Actuarial valuations in DC

- In sum, DC have a range of different situations according to their social security development

- The actuarial function is also different among countries: Most Latin-American countries, like some Asian countries, have a formal actuarial tradition

- Other DC have still to develop actuarial skills and a professional tradition to establish

- All this is for the benefit of their pension schemes

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Security in pension provision

The role of the funding method and assumptions in providing pension security, now and in future.

Chinu Patel, F.I.A.
Watson Wyatt, UK
chinu.patel@watsonwyatt.com

Pension Security

=

Level and certainty of fund collateral + **Strength of sponsor support** + **Quality of governance**

- Funding level
- Funding volatility
- Ability to provide future financial support
- Obligation to support
- Willingness to continue voluntary support
- Management structure and processes for sound operation of Scheme

- Funding method
- Assumptions
- Solvency and other margins

Today's focus: variations in security through collateral in pension scheme?

Including:
- External policing
- Transparency

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Main purposes of a valuation

	Funding	**Accounting**	**Discontinuance**	**Statutory Compliance**
Purpose	Budgeting cash flows	Reporting liabilities in sponsor's accounts	Legal liability on plan termination	Tax / Supervision
Objectives	Smoothed contribution rates	Consistency and comparability between companies and transparent disclosure	What is the cost of 'walking away'?	Minimum/maximum funding; levies, etc
Practical application	• Flexibility and judgment in setting discount rates • How much risk is affordable and what is the expected return from actual asset portfolio? • Subject to minimum requirements in some countries	• Method and assumptions largely prescribed (in most countries) • Discount rate linked to bond or government yields • Volatile results if actual investment policy involves equity (and similar) assets	• What would it cost to buy-out accrued liabilities with a third party? • Usually an assessment at a yield below government bonds, and a conservative mortality assumption	• Methods and assumptions usually prescribed. • Influenced by local practices and culture.

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SECTION SUR LES PENSIONS, AVANTAGES SOCIAUX ET SÉCURITÉ SOCIALE DE L'AAI
IAA PENSIONS, BENEFITS AND SOCIAL SECURITY SECTION

**IAA & Groupe Consultatif reports
Actuarial methods and assumptions**

Commentary and overview of second pillar retirement benefits and funding vehicles, actuarial methods and assumptions

- Country by country description
- European countries   -   December 2001
- Non European countries   -   September 2005

Minimum technical provisions in European countries Dec 2003 +

Summary of conclusions
Sources of variation in pension security

- Different approaches to valuation of assets
- Different actuarial funding methods, each leading to its own definition of technical provisions
- Different approaches to setting actuarial assumptions; different financial and demographic assumptions
- Different approaches to valuing options and allowing for risks.
- Different ways of allowing for prudence.

Methods for valuing assets

- **Market value** - Austria, Belgium, Netherlands (some funds), Norway (accounting purposes), Portugal, Spain, UK, Australia, NZ, Japan, US, Mexico

- **Discounted income value** - Cyprus, Ireland

- **Average market value** - Cyprus, Ireland, UK (not common), Canada, US

- **Book value** - Denmark, Finland, Germany, Japan

Technical provisions

Amount of the technical provision depends on:

- Actuarial funding method:

  - ## Implicit liability definition
  - ## Member options and guarantees
  - ## Sponsor/trustee options

- Economic assumptions

- Demographic assumptions

- Implicit or explicit solvency margins for risk, expenses etc

Actuarial Funding methods: Two main families

Security driven - benefit allocation

Maintain a target level of funding based on pre-defined benefit obligation:

- Current Unit Method (CUM)

- Projected Unit Method (PUM)

Contribution driven – cost allocation

Define certain level of contribution based on pre-defined benefit obligation:

- Entry Age Method (EA)

- Attained Age Method (AA)

Principle: to fund for each employee's benefits whilst they are economically active.

Factors affecting choice of funding method

- Scheme's legal documents
- Minimum and maximum funding rules
- Disclosure requirements
- Nature of fund, eg 'open' or 'closed'
- Accounting standards (indirect)
- Funding vehicle, eg pension fund or life insurance
- Professional judgement – purpose, guidance, custom and practice

Who uses which method?

- **Projected Unit**

  Belgium, Cyprus, Germany (commercial accounting), Ireland, Netherlands (commercial accounting), Spain, UK, Australia, NZ, Japan, US, Canada, Turkey, Mexico, and for IAS/US GAAP

- **Current Unit**

  Finland, Netherlands, Norway, Switzerland, Canada, Japan

- **Attained Age**

  Austria, Germany (infrequent), Ireland (infrequent), Australia, Canada, NZ, US

- **Entry Age**

  Germany and Austria (Infrequent), Australia, Canada, Japan

  No country or geographical divide.

What's the difference?
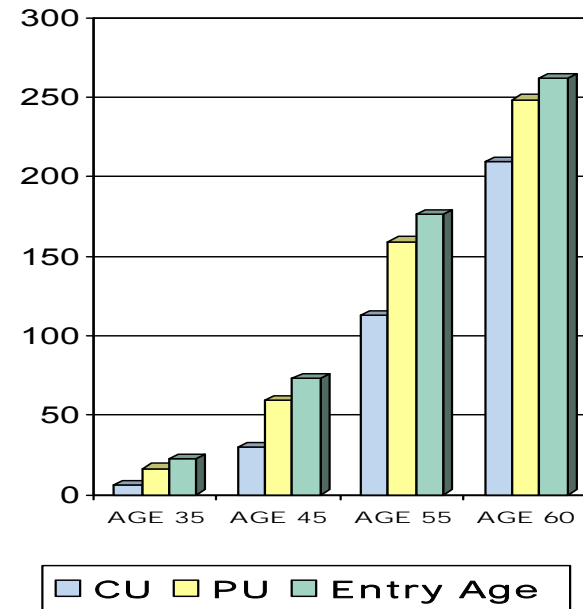
At age 35, strongest method has a technical provision approximately 4 times the weakest; smaller differential at higher ages

Main economic assumptions : how decided and how different?

Three distinct approaches:

- Full prescription : usually where insurance tariffs apply.

- Flexibility within minimum and maximum limits set by supervisory or tax authorities (eg, US, UK, Belgium, Spain, Netherlands).

- Freedom of choice but with specific aims, eg all assumptions together to represent a best estimate for future (UK, Ireland, Australia, Canada, New Zealand). Often supplemented by actuarial professional guidance.

Typical real (net of inflation) discount rates for funding %	
US	4 to 5
Canada	1.5 to 5.5
Japan	3 to 4
Australia	4 to 6
New Zealand	2 to 3
Mexico	3.5 to 5.5
Turkey	5 to 10
UK	2 to 4

Actual net discount rates used will depend on plan design (salary related, price related, fixed, cash/annuity, discretionary benefits, etc) and asset valuation method

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Demographic assumptions

- Practice ranges from:

  - complete set of demographic assumptions to use of mortality and retirement decrements only
  - using standard tables specified in regulations etc to complete freedom of choice for actuaries (eg, UK/Ireland)

- In most countries standard mortality tables developed either through population or other censuses are used; frequency of updates varies (10-15 years not uncommon)

- Future mortality improvements are allowed for in some countries but not in others; considerable uncertainty about what the level of future improvements should be

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Mortality assumptions – how different?

City University research on international mortality comparisons

Discount rate compared to 3% for the UK, equivalent to change in mortality table (male age 65, includes reversionary widow's pension)

Many reasons why they should be different. More work needed on:-
- whether such big differences are justified;
- what is appropriate for future mortality improvements?

Other factors affecting technical provisions

- Under many pension plans there are options available for the employee,
eg early retirement on enhanced terms.

- Under many pension plans there are options available for the employer/trustees
eg, discretionary pension increases

- Some pension plans have to meet expenses from the fund.

- Most pension plans take investment risks!

- The need for prudence

Funding: summary
Sources of variation in pension security

- Different approaches to valuation of assets
- Different actuarial funding methods, each leading to its own definition of technical provisions
- Different approaches to setting actuarial assumptions; different financial and demographic assumptions
- Different approaches to valuing options and allowing for risks.
- Different ways of allowing for prudence.

Will the IORP Directive affect funded pension security in Europe?

Main features of the of **minimum** solvency requirements:

- Sufficient technical reserves to protect members and beneficiaries
- Under funding permitted, subject to recovery plans
  (except for cross border arrangements)
- Member states have freedom to determine their own pension system structure

How prescriptive is the IORP Directive on funding methods and assumptions?

- Minimum Technical Provisions must cover:
  - Benefits in payment;
  - Members' accrued pension rights; and
  - Any other guarantees

No explicit definition of technical provisions or accrued rights

- Assumptions and Method
  - Prudent assumptions and method recognised by competent authorities

National governments to decide

- Assumptions:
  - *Economic*: Discount rates based on actual assets holdings and expected future returns OR the market yield on high-quality corporate or government bonds
  - *Demographic*: Based on the plan membership and risk characteristics

Some markers on what is expected

Monitoring convergence (Article 15(6)) '…*with a view to further harmonisation …in particular interest rates and other assumptions influencing the level of technical provisions …. The Commission shall propose any necessary measures to prevent possible distortions caused by different levels of interest rates …..*'

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Groupe Consultatif surveys: principal observations
Funding methods (for minimum technical provisions)
Pre IORP Directive

- For final salary schemes, only Spain required minimum reserves to be set using the PBO method.

- All others required minimum reserves to cover at least the accrued liabilities, with adaptations to reflect social choices on indexation and other elements of preservation law.

- Differing practices regarding margins for prudence through:
  - Disregarding future withdrawals
  - Specific reserves for self insured risk benefits
  - Specific reserves for significant member controlled options
  - Reserves for expenses of winding up where these have to be met from scheme resources
  - Explicit solvency cushions

Groupe Consultatif survey: principal observations
Financial assumptions (for minimum technical provisions)
Pre IORP Directive

- Two distinct families:

    – Most countries prescribed fixed maximum discount rates. Range 2.75% - 6%
    – A full set of assumptions applied in Ireland, Spain, UK (narrower range of net discount rates)

- Only UK and Ireland linked the assumptions to prevailing market conditions, plus an indirect link in one other country through regulatory oversight.

- No requirement or practice pre IORP to link assumptions to actual asset or liability profiles

Will we get more or less convergence as the IORP Directive takes effect?

Little or no change expected in some countries, but many countries have yet to decide or communicate their approach!

Three distinct approaches so far:

1. **Ireland**: Continue with the uniform minimum standard for all schemes, with a strengthened reserving basis as a consequence of financial market changes.

2. **Netherlands**: Fully prescriptive approach with market based technical reserves (based on prescribed term dependant discount rates), plus additional risk based solvency capital and strict deficit correction periods. Discretionary indexation.

3. **UK**: Each scheme to decide for itself. No rigid minimum or maximum but strong on principles, governance and disclosure, with Regulator intervening if trustees and sponsors cannot agree a funding strategy (or end up agreeing a weak strategy). Strong expectation for trustees to behave like major creditors, threat of intervention otherwise.

Illustrative range of technical provisions in the UK under new SSFP regime
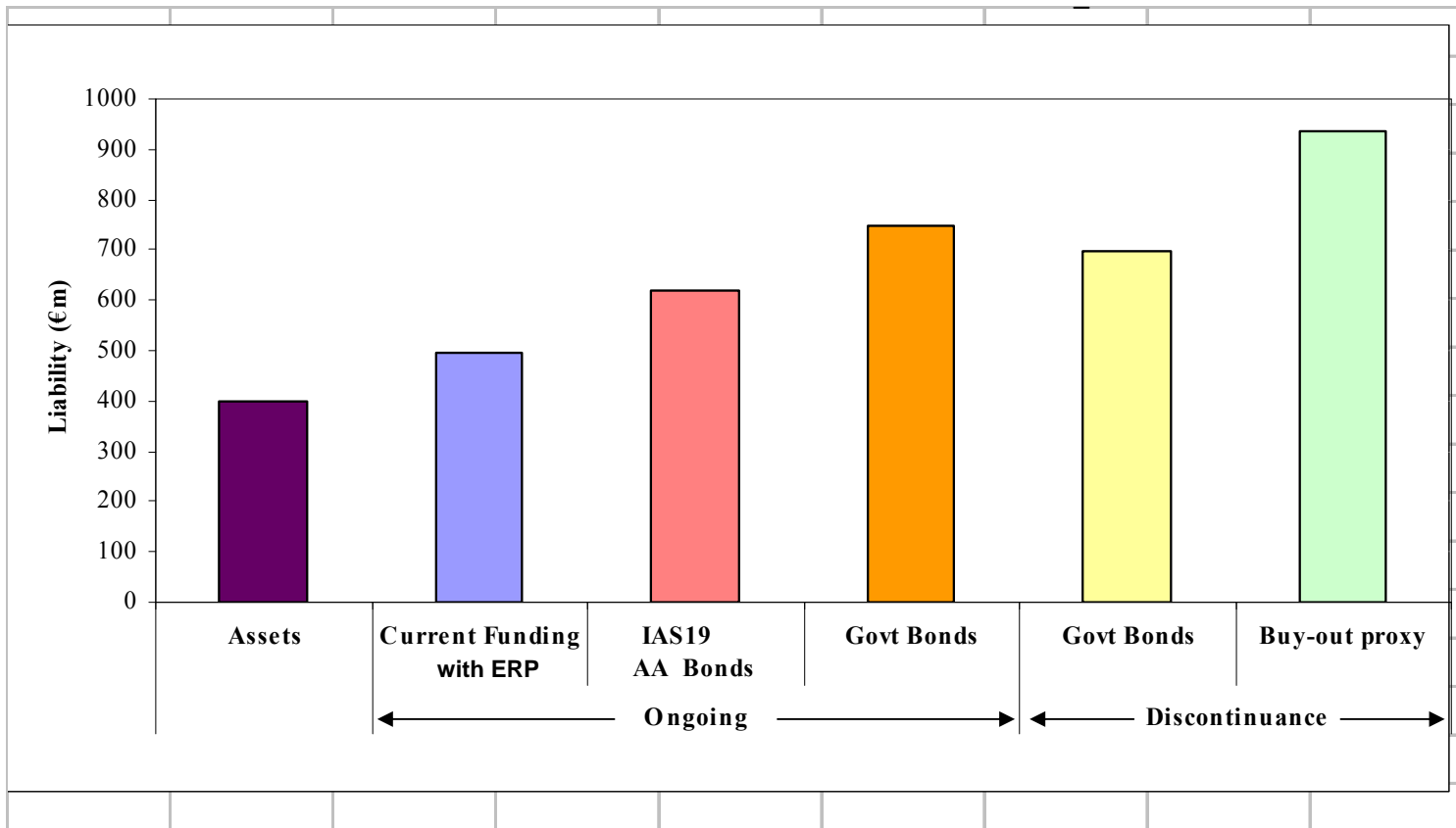
All together, in numbers

Minimum technical provision vs. IAS19 liability obligation
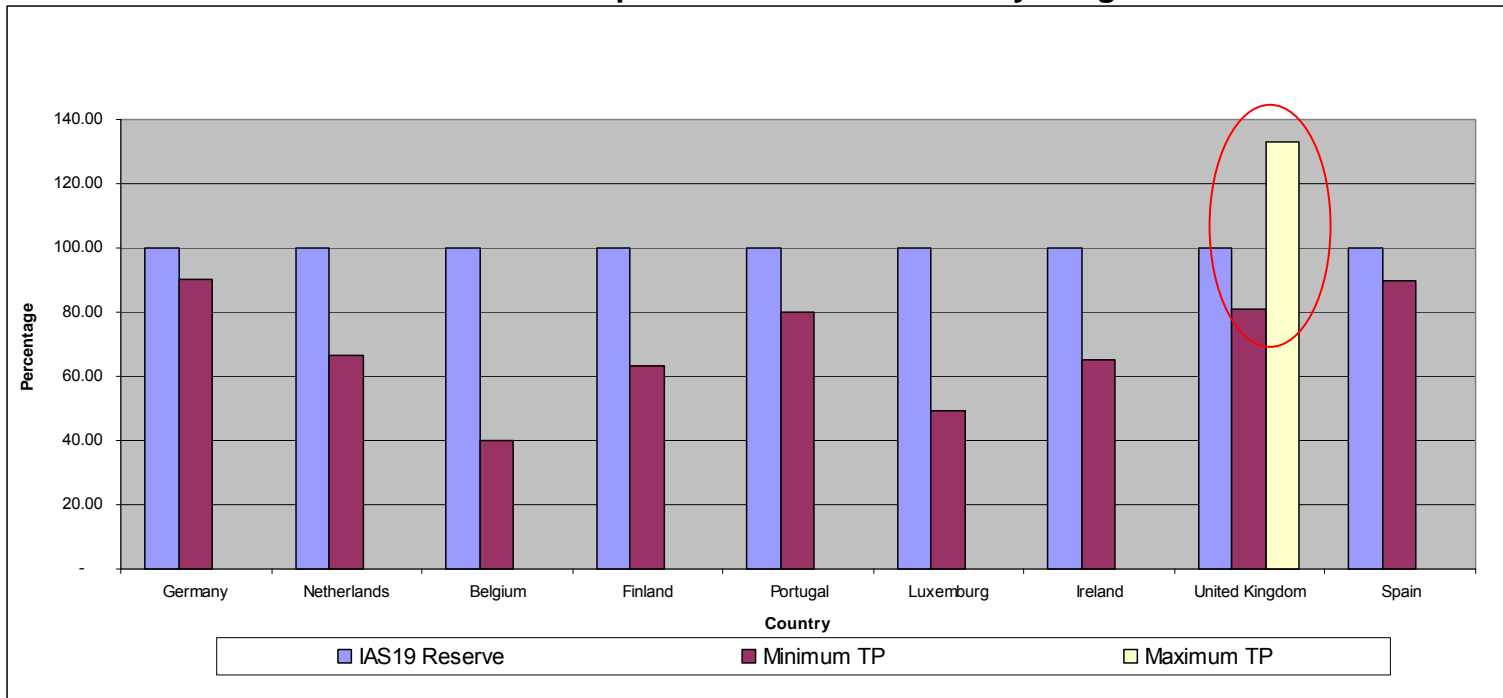
Illustration for an active member within 15 years of retirement, and full indexation in payment; differentials would be different for pensioners.

Funded pension security at the minimum level varied vastly between countries before the IORP Directive, and looks like continuing to do so.

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What next?
Current issues and developments

- Greater market consistency?
    - Assets at market value
    - Discount rates linked to actual asset portfolio or yields on matching investments

- Greater regard for liability profile? Term structure of interest rates, matching portfolios, etc?

- Greater focus on non financial risks?
    - More 'direction' on base mortality assumption?
    - Uncertainty about future longevity to become a major assumption?

- Greater focus on other risks to pension security?
    - Integrated investment and contribution strategies?
    - Funding targets and deficit plans linked to sponsor risk?
    - Explicit allowance for investment risks?

- Greater focus on funded collateral via tighter prescription (as in Netherlands) possibly with some relaxation elsewhere (eg discretionary indexation)?

- Greater focus on re-inventing a scheme specific solution within a principles based framework, with checks and balances (ie funded collateral seen as one pillar of a bigger security picture and trade-offs with other pillars possible at national or scheme level with full transparency)?

Questions for discussion

2nd PBSS COLLOQUIUM
Helsinki, Finland 21-23 May 2007

Moderator: Eduard Ponds

J-F. Gavanou*: Employee's participation (contributions) to the funding of pension benefits: how to best incorporate it in the actuarial valuation of pension obligations?*

L. Koskinen: *Modelling and predicting individual salaries*

M. Economou: *Implementing a pension plan along with the age increase of the plan participants*

Y. Fujisawa: *Legal funding rules on DB plans in Japan and in the US*

Employee's participation (contributions) to the funding of pension benefits : how to best incorporate it in the actuarial valuation of pension obligations ?

Presentation Jean-François Gavanou

Institut des Actuaires (France)

Group Vice President Pensions, Atos Origin

22 May 2007

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Context

- Pension actuarial fundamentals used for (employer's) accounting purposes are under comprehensive revision globally :
    - IASB employee benefit project (July 2006) :
        - long term : "*a <u>fundamental review</u> of all aspects of post-employment benefit accounting*"
    - FASB (November 2005) :
        - "*the objective of this project is to <u>comprehensively reconsider guidance</u> in FASB 87-88-106-112*"
    - ASB (UK standard setter) designated by other national standard setters and EFRAG to lead European research on pension accounting
    - part of the IASB – FABS convergence project

Context – Example of the FABS « menu »

- *Delayed Recognition*
  - *Expected long-term return on plan assets*
  - *Actuarial gain and losses amortized subject to 10 percent corridor*
  - *Calculated value of assets for expected ROA and 10 percent corridor*
  - *Prior service costs amortized over active service period*
- *Combining of service cost, asset returns, and financing costs*
- *Insufficient information about cash flows*
- *Measurement of the liability*
  - *PBO versus ABO versus termination liability*
  - *Cash balance plans and plans with lump-sum benefits*
  - *Discount rate(s) to use*
- *Assumptions provide too much latitude*
  - *Discount rate and expected rate of return on assets.*
- *Contributions-based accounting for an employer's participation in a multiemployer plan*
- *Insufficient and overly complex disclosures.*

Context – Example of the ASB « menu »

- *how is the relationship between an employer and a pension scheme best reflected in the employer's financial statements?*
- *how should the employer's liability in respect of pensions be quantified? In particular:*

  - *what is the most appropriate actuarial method?*

  - *should the employer's liability reflect future salary increases?*

  - *what discount rate should be used to translate future cash flows into a realistic present value?*

- *what is 'the expected return on assets', and how (if at all) should it be reflected in the employer's financial statements?*
- *what is the impact on financial reporting of pension fund regulation arrangements, such the introduction of the PPF levy?*
- *are the disclosures required by current standards appropriate? This will include consideration of whether liabilities that might arise in the event of a takeover of the employer are adequately disclosed under current requirements.*

Accounting for employee contributions – why a topic ?

- a particular aspect to the fundamental review of pension accounting / actuarial principles

- numerous pension schemes include minimal employees' contributions as a requisit

- internationally, employee participation vary from minimal (a couple of % of salary, subject to caps) to very significant (« share of costs » schemes under which employee pay 50% of plan costs)

- still, usually immaterial in North America

Accounting for employee contributions – why a topic ?

- Current « internationally recognized » accounting standards (IASB, FASB) :
  - do not future factor employee contributions
  - into the actuarial measurement of the employer's liability
- Employee contributions are taken into account when cashed out as an element of the fair of plan assets
- One major exception is FAS 106 (post retirement medical obligations) under which employer costs are valued as :
  - the probable present value of future health costs
  - less the probable present value of beneficiaries' future contributions (premiums)

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Accounting for employee contributions – research for alternative actuarial treatments

- Assumptions :

  – no change to current "projected unit credit method" (PUCM) required by current IAS 19 and FAS 87

  – no change to current practice references for main actuarial assumptions

  – illustration on one typical pension plan through

  – incorporation of future employee contributions as a reduction of future pension costs before discounting and prorating impacts of PUCM

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Preliminary results of research

- Impact on gross liability shown on balance sheet :

% Difference in gross benefit liability to be recorded on balance sheet between current and alternative actuarial method
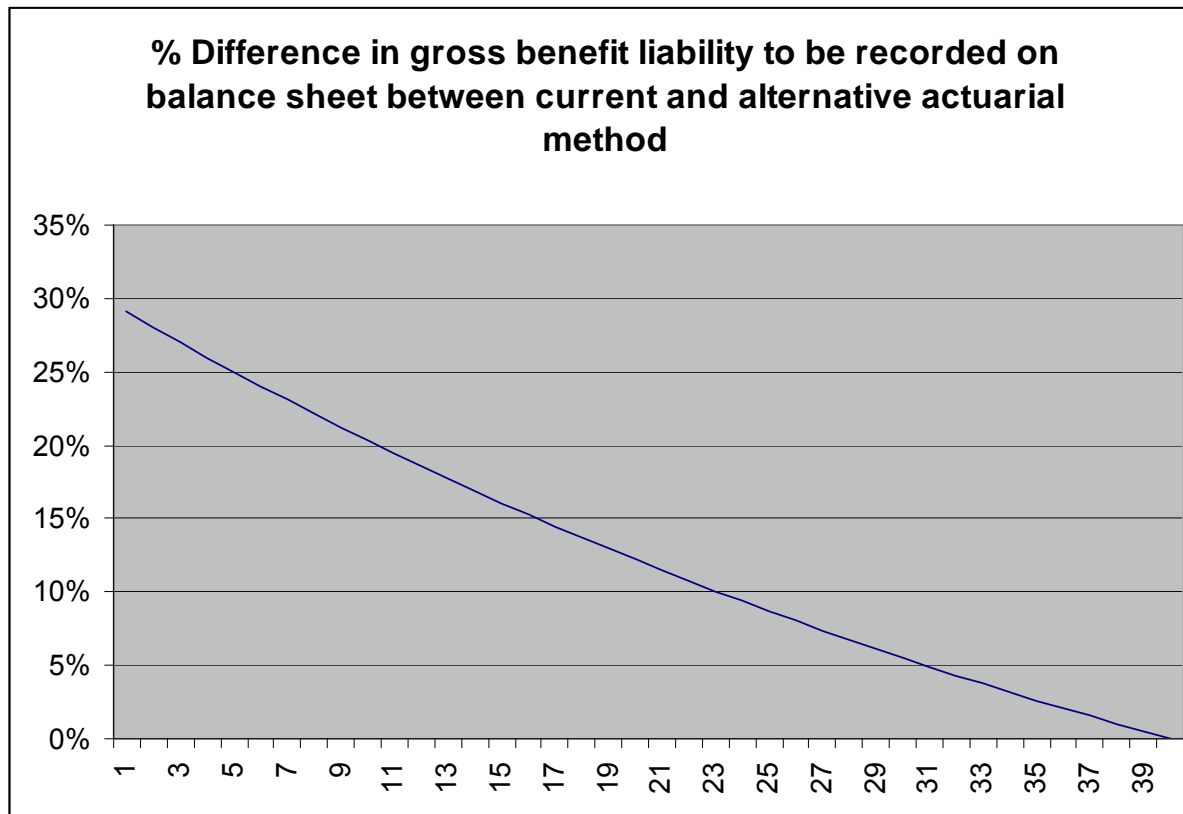
Preliminary results of research

- Impact on net liability shown on balance sheet :

Comparison of net liability shown on balance sheet

Net liability shown - current actuarial method
Net liability recorded - alternative actuarial method
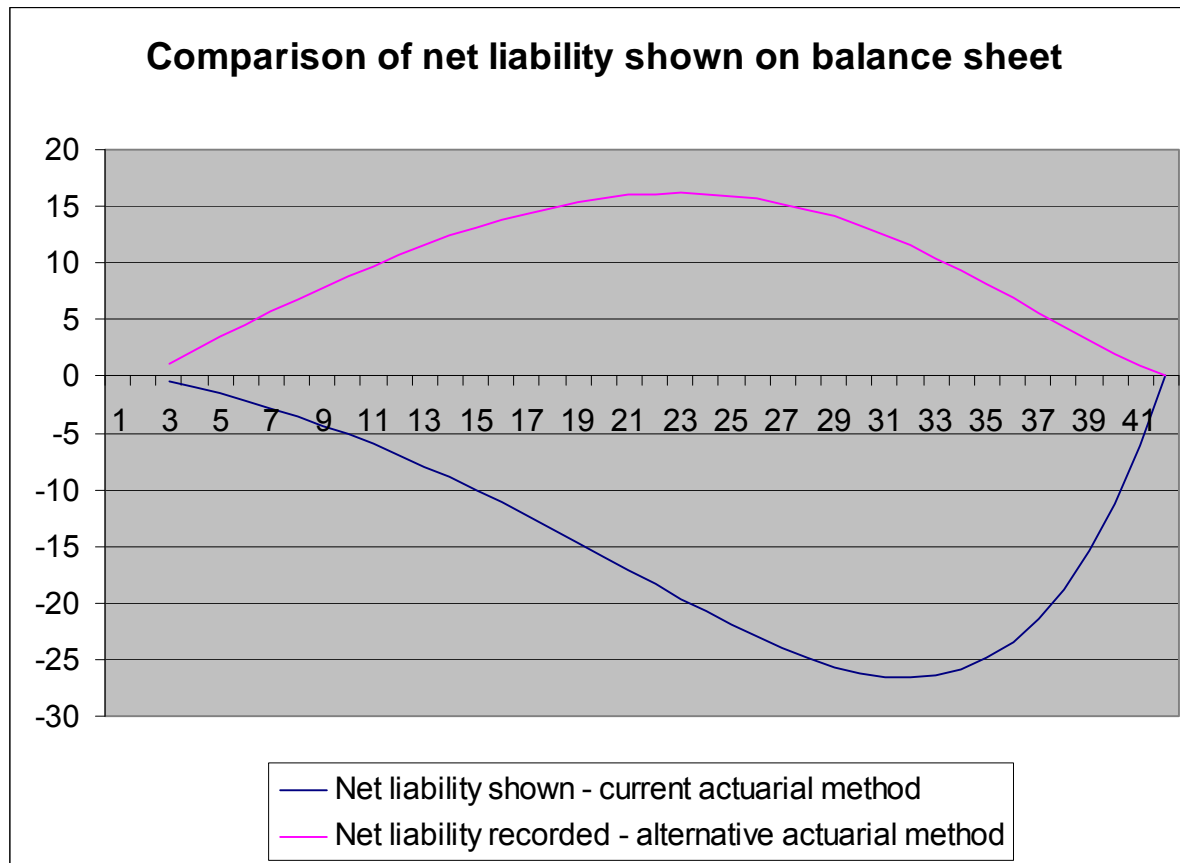
Preliminary results of research

- Impact on profit and loss expense :

Total P&L impact of proposed alternative treatment
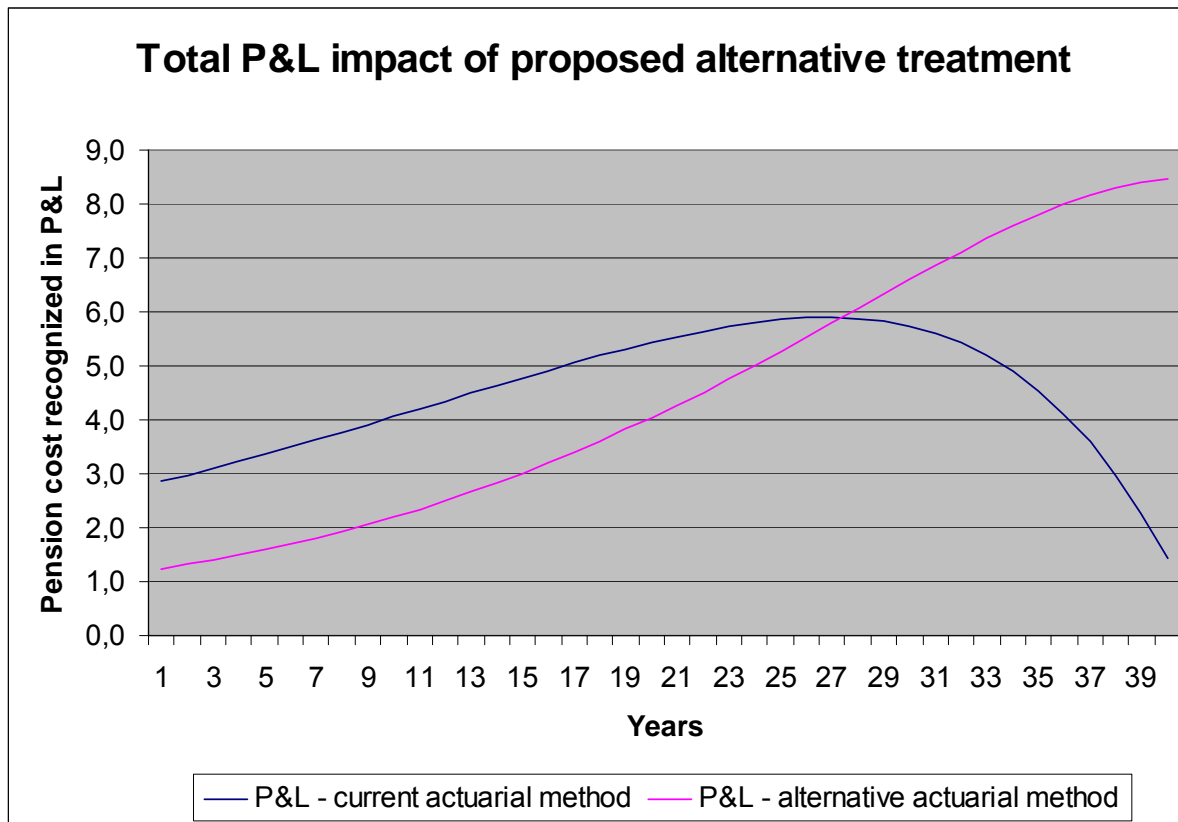
Conclusion

- For some schemes, employee funding (past and future) is a significant contributor to the total funding of plan costs
- Incorporation by current international accounting standards is "cash basis" and not prospective, which is not entirely consistent and thus satisfactory
- The fundamental revision of these standards is a good opportunity to revisit this topic
- Our preliminary research shows the potential significance of trying to better incorporate employee funding
- Complementary actuarial research will be needed to identify the best method

2nd PBSS COLLOQUIUM
Helsinki, Finland 21-23 May 2007

OUTLINE

- **Background**

- **Problem**: To model and predict **individual** wages.

- **Data:** A unique Finnish dataset.

- **Model**: A **panel data** models for **subpopulations.**

- **Predictions**: Genuine out-of-sample predictions.
    - Normal growth period and deep recession

- **Concluding remarks.**

1. Background (1)

- **Actuarial models** are constructed to aid in the assessment of the financial and economic consequences. This **requires**:

  – understanding the <u>conditions and processes</u> under which past observations were obtained;

  – anticipating <u>changes</u> in those conditions that will affect future

  – evaluating the <u>quality</u> of the available <u>data</u>;

  – bringing <u>judgment</u> to bear on the modeling process, <u>validating</u> the work as it progresses;

  – estimating the <u>uncertainty</u> inherent in the modeling process itself.

1. Background (2)

- Different types of models have been proposed for describing **average** salary profiles.

- Moderate average wage is not equivalent to a moderate pension for all individuals.

- **Individual** profiles are rarely modeled.

- Modeling is **often limited** by lack of adequate data; Here a unique Finnish dataset of individuals is exploited.

2. Problem

- The **general objective** of this study is to develop a model that describes 1) **individual features** of salary development and 2) can be used for **prediction** purposes.

- In this paper a **dataset** of individuals is exploited - all the participants of the Finnish private-sector statutory pension scheme who retired in 1998.

- It is very natural to assume that **genders** are treated as different subpopulations.

- Our approach is to further divide the data according to **income quartiles** in the year 1975. This reflects the effect of certain **socio-economic factors**.

3. Data

- The data was collected as a part of the Finnish pension reform package in 2001-2002.

- All people who retired in 1998.

- We focused on the cohorts born between 1933 and 1938 and the years from 1975 to 1994.

- These limitations mean that we have 2986 individuals in the analysis.

Annual change (%) of mean wage in each quartile (men).
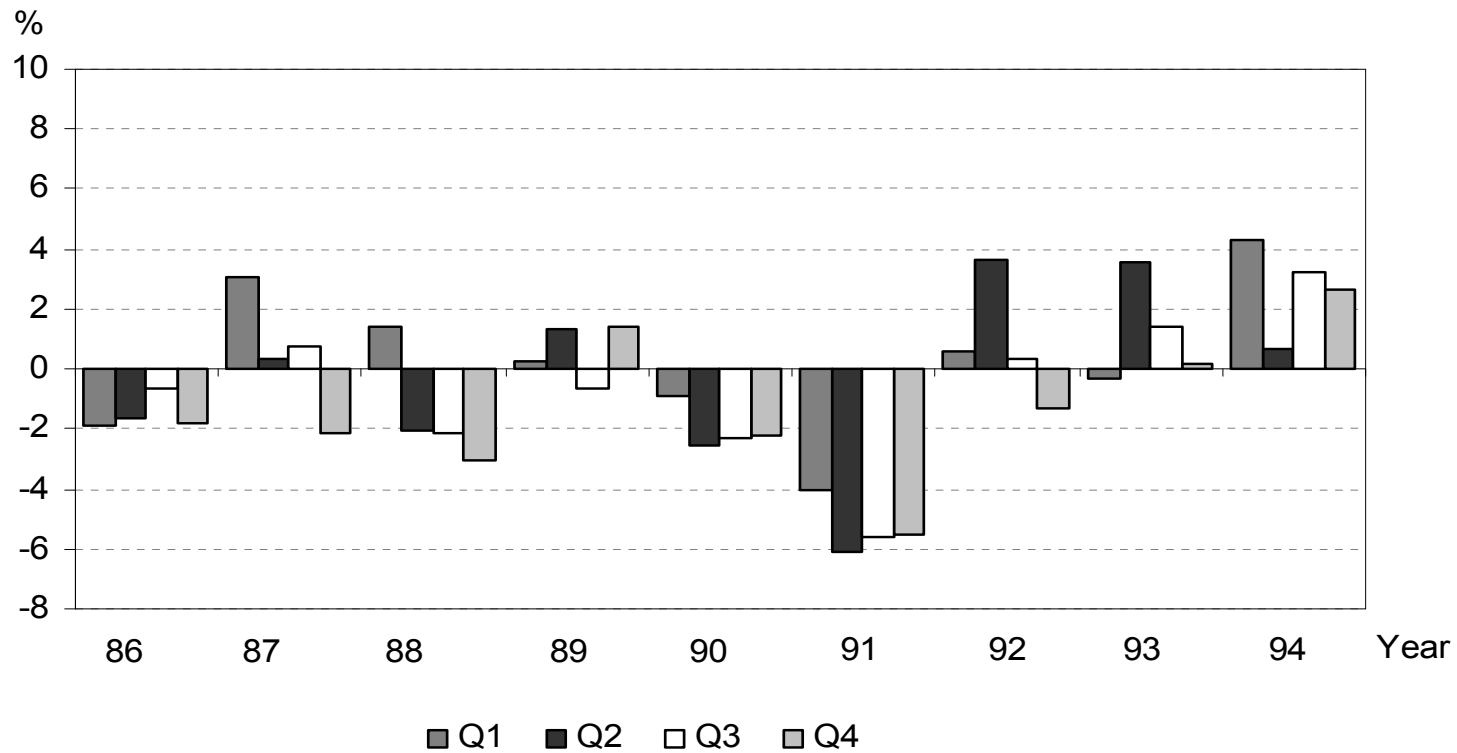
3. Model (1)

- The model is an **extension of the basic linear model** that allows some model parameters to be drawn from a probability distribution.

- Called **mixed model** since the model parameters contain both fixed and random effects.

- Variables are used:

  - *Z(ij)* **age** of an individual *i* at time *j*
  - **d(i) duration** of the career of an individual *i*
  - *b(j)* the change of **GDP** at time *j*

3. Model (2)

- The **linear mixed model** where <u>random</u> parameters u_{i0} and u_{i1} are associated with an <u>individual</u> under consideration.

$$y_{ij} = \beta_0 + u_{i0} + (\beta_1 + u_{i1})z_{ij} + \beta_2 z_{ij}^2 + \beta_3 z_{ij}^3 + \beta_4 d_i + \beta_5 b_j + \varepsilon_{ij}.$$

- The <u>fixed</u> parameters $\beta_0\ \beta_1\ \dots\ \beta_5$ are coefficients associated with the entire <u>subdata</u>. Error terms ε_{ij} are assumed to be independently and normally distributed.

Here we assume that the joint distribution of u_{i0} and u_{i1}

- multivariate normal with the expected value zero;
- independent of the random errors.

3. Model (3)

- The same model is estimated for **each quartile** and for both **genders** => **8 submodels**

- The **estimation period** covers the period from 1975 to 1985. The rest of the data 1986 -1994 for **testing predictions**.

- Substantial **variability** both between wage groups and genders. Examples:
  - GDP significant only for women's Q II
  - Duration of career significant only for Q Is
  - Different functional forms for age (square, cubic).

# 3. Model – potential application

- The **old** system computed the pensionable wage – the base wage for all benefit calculations – for each job separately by **averaging the last 10 years** in each job. This procedure ignores earnings differences among workers in the other years.

- The **new** system bases the **pensionable wage on all earnings** and **does not distinguish among jobs** in different sectors of the economy. The earnings-related pension will be calculated directly as a percentage of the annual earnings.

- A critical factor is to determine what kind of benefits the new system would provide to different employee groups => **Individual subgroup models are needed!**

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4. Predictions

- When assessing **the solvency** of a scheme pension experts are mainly interested in predicting **average** wages.

- Instead, in system development, individual variation in wages is essential - **a high average wage does not guarantee an adequate pension for all members of the group**.

    – Hence predicting individual salary growth is very important for planning purposes and risk assessment.

4. Predictions (2)

Examples of individual wage predictions and actual values (men).
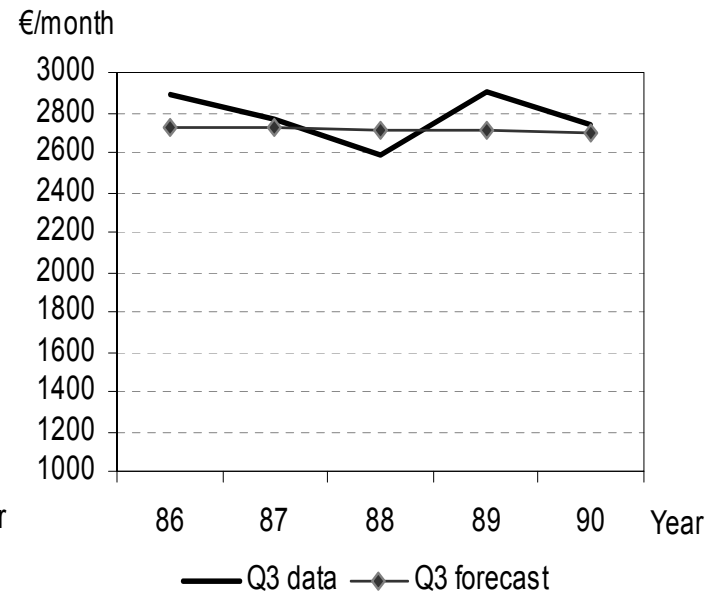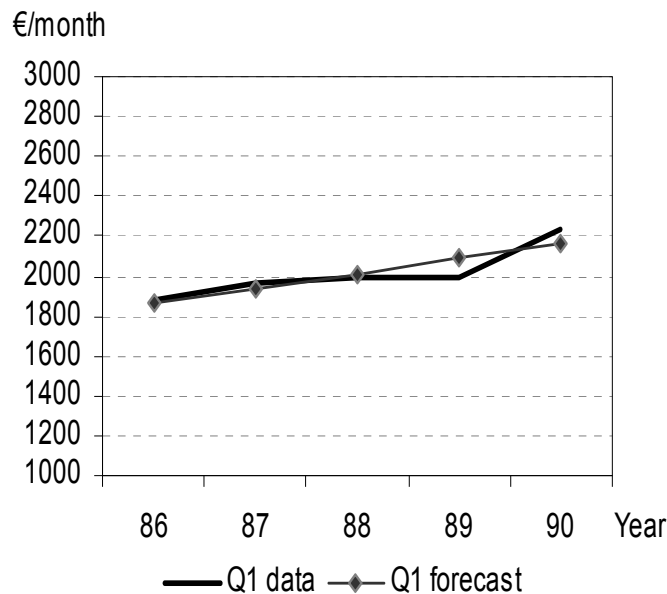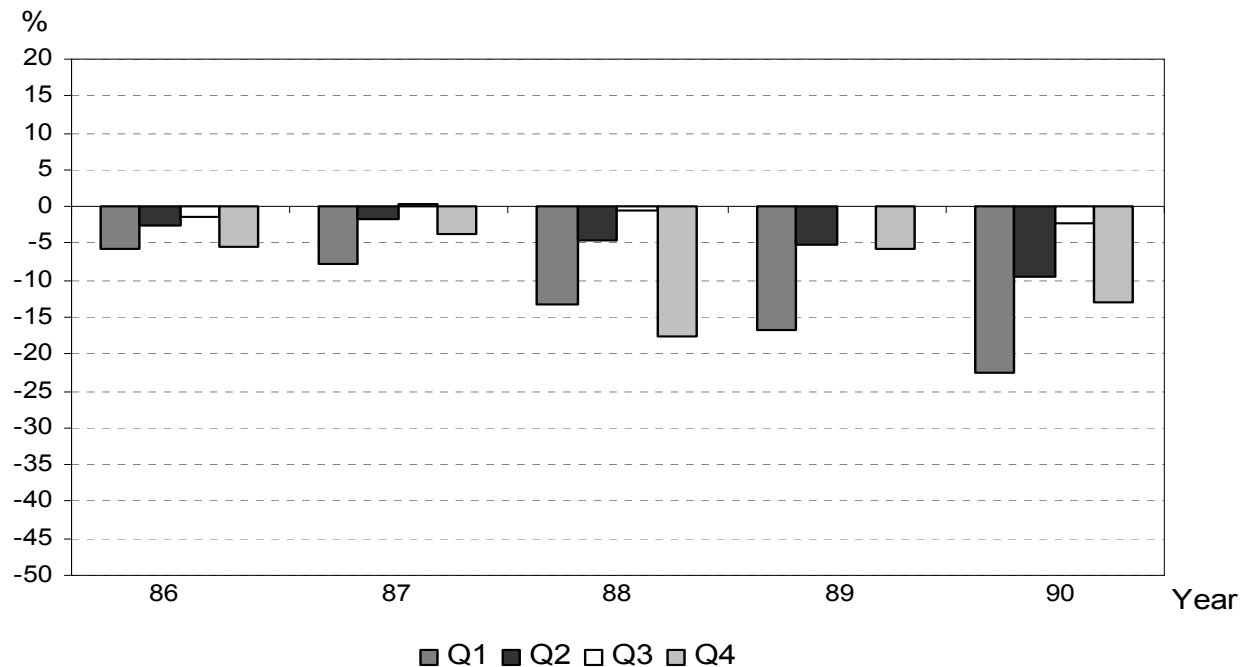
4. Predictions (3)

- The <u>wage quartile</u> was reflected in the model specification in a number of ways.

- Next we consider <u>group level</u> predictions.
  - The middle quartiles (Q2 and Q3) are well predicted. The first and fourth quartiles are rather more challenging to predict. This holds for both men and women.

  - The deep recession is certainly a factor affecting wage risk especially for Q1s.

4. Predictions (4)

- The estimation and forecasting periods are
  - Estimation period: 1975 – 1985 (Normal economic growth);
  - Forecasting period I: 1986-1990 (Normal economic growth);
  - Forecasting period II: 1991-1994 (Deep recession).
- First predictions were needed for the exogenous variable GDP => Holt-Winters predictions for GDP were made
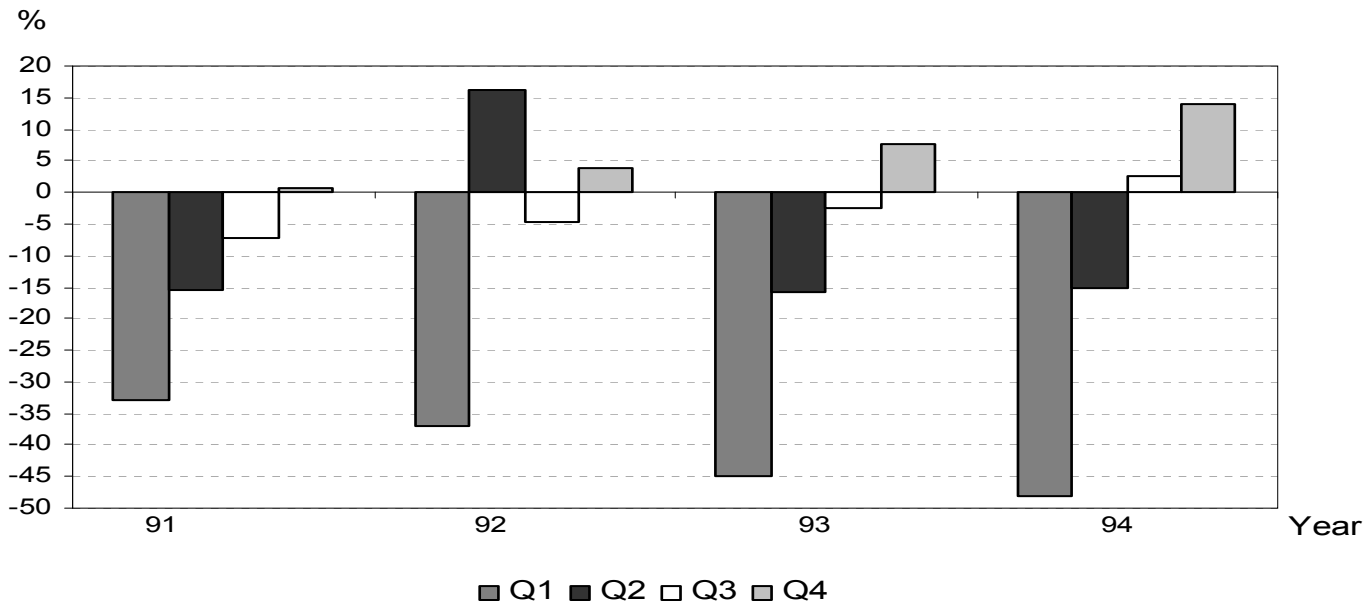
4. Predictions (5)

Absolute **prediction error** as percentage of mean wage 1986-1990 (men).

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4. Predictions (6)

Absolute **prediction error** as percentage of mean wage 1991-1994 (men).

5. Conclusions (1)

The model specifications and prediction results allow for the following general conclusions:

- The wage formation seems to be essentially different in different wage quartiles. **Better forecasts** may be obtained by using **quarter-specific models**.

- **Individual variation** within a wage quartile is **large** and an important risk factor.

- The workers in the **lowest quarter** have difficulty in maintaining their wages in periods of depression. In this study the link with wages in other groups is much weaker.

5. Conclusions (2)

- The **prediction errors** for the **middle-wage quarters** seem to be considerably smaller than for the low and high-wage groups. There is some indication that the middle quarters can be predicted quite accurately several years ahead.

- The prediction tests **emphasize understanding of the economic conditions** under which the past observations were obtained.

- For severe economic situations, **judgemental scenario** testing is an **invaluable additional** tool, because anticipating recessions is extremely difficult.

2nd PBSS COLLOQUIUM
Helsinki, Finland 21-23 May 2007

IMPLEMENTING a PENSION PLAN ALONG WITH the AGE of the PLAN PARTICIPANT

by

Maria Economou, Steven Haberman

HELLENIC ACTUARIAL SOCIETY

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How to approach the issue of fairness?
The accrual function M(x)

$$
M(x) = \begin{cases} 0, & x \prec a \\ \displaystyle\int_a^x m(t)dt, & a \leq x \prec r \\ 1, & x \geq r \end{cases}
$$

It represents the fraction of the actuarial value of future pensions accrued as an actuarial liability at age x under the actuarial cost method.

What are the possible candidates for application to pension funding methods?

- The Power function

- The Truncated Exponential

- The Truncated Pareto

Why this choice?

The Uniform distribution is the special case of the Power function when p =1.
Under Uniform distribution, m(x), M(x) coincide with the benefit accrued under the Normal Cost and Actuarial Liability for the Projected Unit Credit.

THE MODEL

- DEFINED BENEFIT PENSION SCHEME

- INDIVIDUAL COST METHODS

- STATIONARY POPULATION, entry age α, retirement age r

- SALARY FUNCTION: $g(t) = s_\alpha * e^{\tau(x-a)}$

- ONLY RETIREMENT BENEFITS are ALLOWED

- INITIAL PENSIONS are a FIXED PERCENTAGE, b, of FINAL SALARY. THEY INCREASE by β(x) i.e. $\beta(x) = e^{\beta(x-r)}$

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$$NC_x = \begin{cases} B_r * m(x) * (Dr / Dx) * \bar{a}_r^{(\delta-\beta)}, & \alpha < x < r \\ \\ 0, & x > r \end{cases}$$

$$AL_x = \begin{cases} B_r * M(x) * (Dr / Dx) * \bar{a}_r^{(\delta-\beta)}, & \alpha < x < r \\ \\ B_r * \bar{a}_x^{(\delta-\beta)} * e^{\beta*(x-r)}, & x > r \end{cases}$$

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Categorisation of m(x), Cooper & Hickman 1967

- If m´(x) >0 the actuarial cost method associated with m(x) is an accelerating actuarial cost method.

- If m´(x) <0 the actuarial cost method associated with m(x) is a decelerating actuarial cost method.

- Power function may be categorised as either a decelerating (p<1) or an accelerating cost method (p>1).

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m(x) development under different distributions, at specific ages (α=30,r=65)

age	Pr, p=0.3	Pr, p=0.8	Pr, p=1	Pr, p=1.5	TEl σ=30	TEl σ=40	TEl σ=50	Preto k=0.3	Preto k=0.8	Preto k=1.5
35	0.033	0.034	0.029	0.016	0.041	0.038	0.036	0.040	0.044	0.050
40	0.021	0.029	0.029	0.023	0.035	0.033	0.033	0.033	0.034	0.035
45	0.016	0.027	0.029	0.028	0.029	0.029	0.029	0.029	0.028	0.026
50	0.013	0.026	0.029	0.032	0.025	0.026	0.027	0.025	0.023	0.020
55	0.011	0.024	0.029	0.036	0.021	0.023	0.024	0.022	0.019	0.016
60	0.010	0.024	0.029	0.040	0.018	0.020	0.022	0.020	0.017	0.013

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Comparison between the traditional and the new defined cost methods in terms of Normal Cost and Actuarial Liability at age x

Actuarial Cost Method	Normal Cost, NC_x $a \leq x \leq r$	Actuarial Liability, AL_x $a \leq x \leq r$
Current Unit Credit	$$\frac{s_x}{S_r} * \frac{D_r}{D_x} \, \ddot{a}_r^{(\delta-\beta)}$$	$$\frac{1}{S_r} * S_x * \frac{D_r}{D_x} * \ddot{a}_r^{(\delta-\beta)}$$
Projected Unit Credit	$$\frac{1}{(r-a)} * \frac{D_r}{D_x} \, \ddot{a}_r^{(\delta-\beta)}$$	$$\frac{x-a}{r-a} * \frac{D_r}{D_x} \, \ddot{a}_r^{(\delta-\beta)}$$

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Comparison between the traditional and the new defined cost methods in terms of Normal Cost and Actuarial Liability at age x

Actuarial Cost Method	Normal Cost, NC_x $a \leq x \leq r$	Actuarial Liability, AL_x $a \leq x \leq r$
Entry Age Normal	$\dfrac{s_x}{s_a * {}^s\ddot{a}_{\overline{a:r-a\rvert}}} \dfrac{D_x}{D_a} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$	$\dfrac{{}^s\ddot{a}_{\overline{a:x-a\rvert}}}{{}^s\ddot{a}_{\overline{a:r-a\rvert}}} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$
Power function	$p * \dfrac{(x-a)^{p-1}}{(r-a)^p} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$	$\dfrac{(x-a)^p}{(r-a)^p} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$

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Comparison between the traditional and the new defined cost methods in terms of Normal Cost and Actuarial Liability at age x

| Actuarial Cost Method	Normal Cost, NC_x $a \leq x \leq r$	Actuarial Liability, AL_x $a \leq x \leq r$
Truncated Exponential	$\dfrac{1}{\sigma} * \dfrac{1}{1-e^{(\frac{r-a}{\sigma})}} * e^{\frac{x-a}{\sigma}} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$	$\dfrac{1-e^{-\frac{x-a}{\sigma}}}{1-e^{-\frac{r-a}{\sigma}}} * \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$
Truncated Pareto	$\dfrac{\dfrac{k}{a} * \left(\dfrac{a}{x}\right)^{k+1}}{1-\left(\dfrac{a}{r}\right)^k} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$	$\dfrac{1-\left(\dfrac{a}{x}\right)^k}{1-\left(\dfrac{a}{r}\right)^k} \dfrac{D_r}{D_x} \ddot{a}_r^{(\delta-\beta)}$

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Normal Cost under the new and traditional cost methods

Age	CUC	PUC Unif	Pr p=1.5	TrE σ=30	TrE σ=40	TrE σ=50	Par k=0.3	Par k=0.8	EAN
35	0.04	0.06	0.04	0.09	0.08	0.08	0.09	0.10	0.08
40	0.06	0.08	0.07	0.10	0.09	0.09	0.09	0.10	0.09
45	0.09	0.11	0.10	0.11	0.11	0.11	0.11	0.10	0.11
50	0.14	0.14	0.16	0.12	0.13	0.13	0.12	0.11	0.13
55	0.22	0.18	0.23	0.13	0.15	0.15	0.14	0.12	0.15
60	0.34	0.24	0.34	0.15	0.17	0.19	0.17	0.14	0.17
64	0.50	0.32	0.47	0.17	0.20	0.22	0.20	0.16	0.19

NC(x)
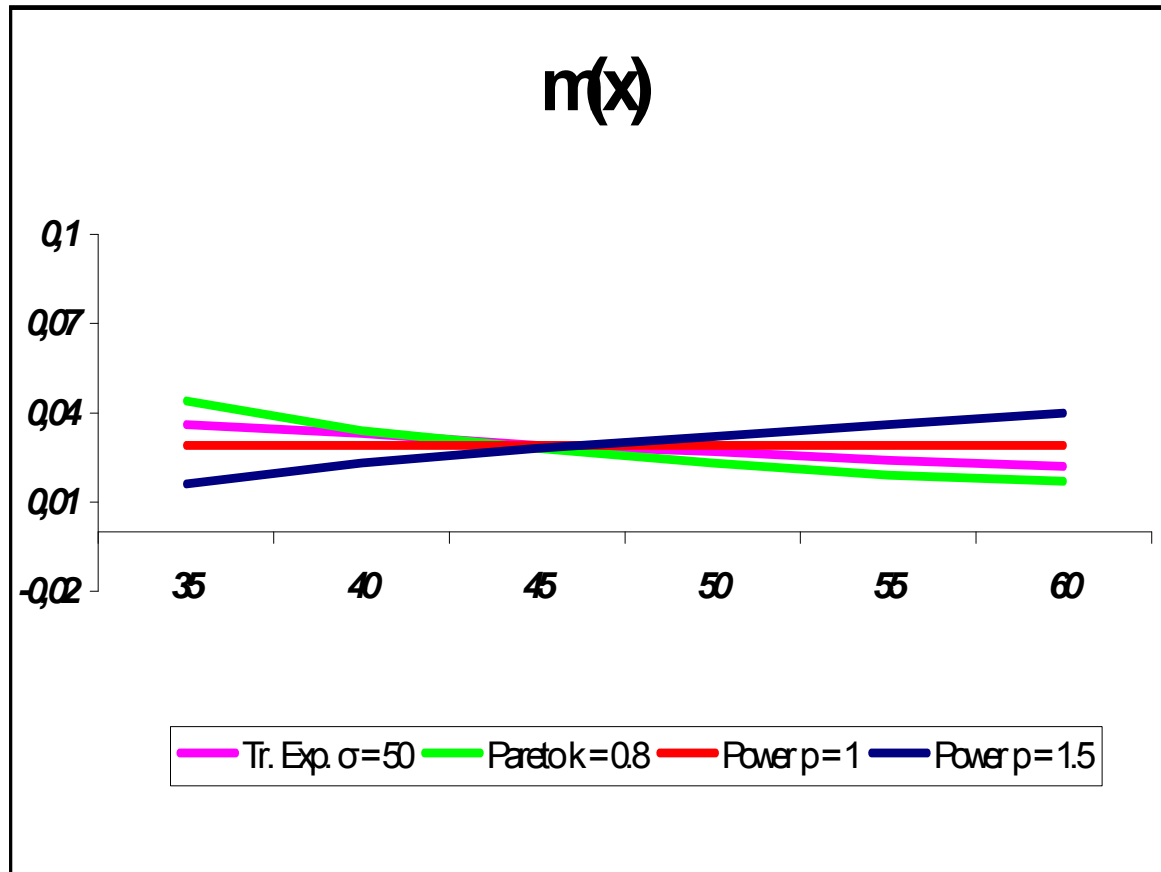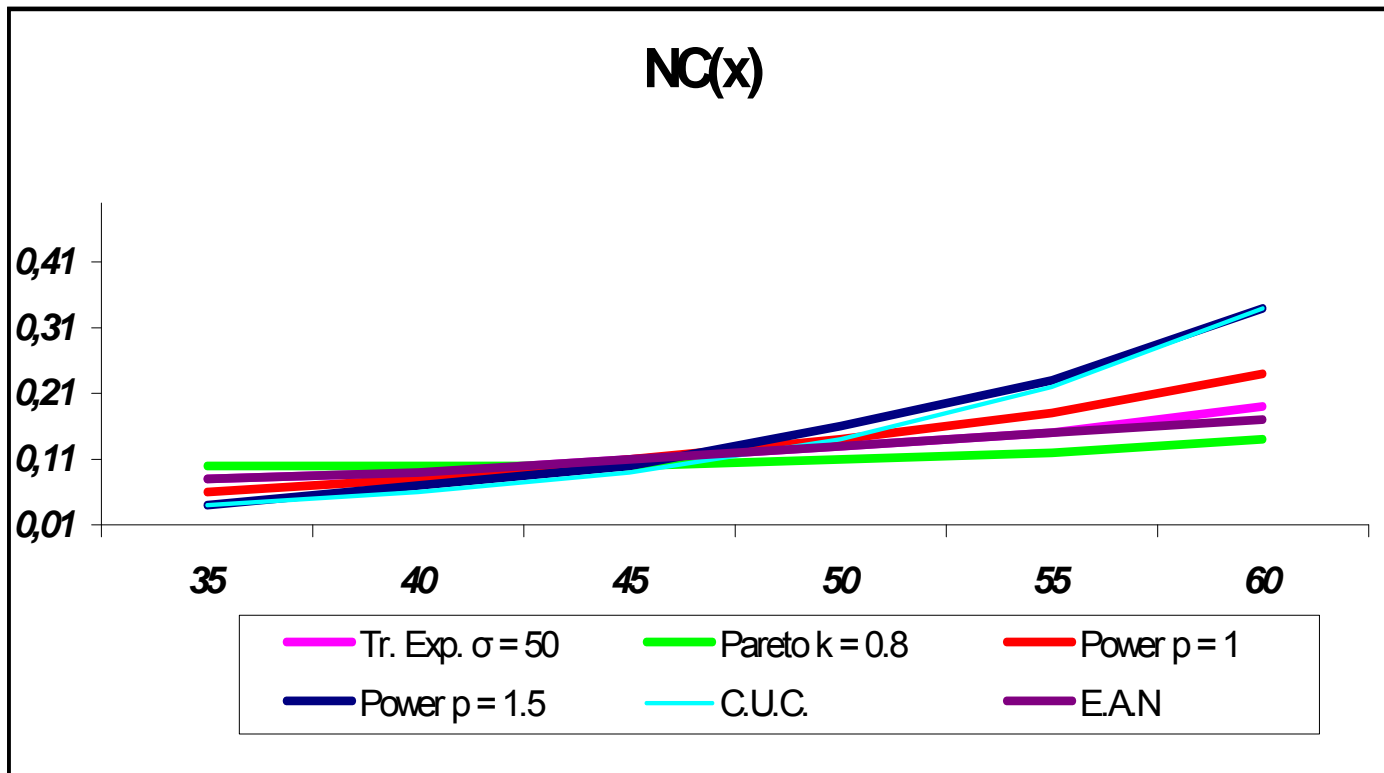
Actuarial Liability under the new and traditional cost methods

Age	CUC	PUC Unif	Pr p=1.5	TrE σ=30	TrE σ=40	TrE σ=50	Pr k=0.3	Pr k=0.8	EAN
35	0.19	0.31	0.12	0.49	0.44	0.42	0.48	0.55	0.43
40	0.54	0.81	0.43	1.17	1.08	1.02	1.13	1.27	1.06
45	1.13	1.58	1.03	2.10	1.98	1.90	2.04	2.21	1.96
50	2.14	2.75	2.08	3.40	3.25	3.15	3.30	3.50	3.24
55	3.84	4.54	3.84	5.22	5.07	4.97	5.11	5.30	5.08
60	6.74	7.35	6.80	7.87	7.75	7.68	7.77	7.91	7.77
64	10.6	10.78	10.63	10.93	10.90	10.88	10.90	10.94	10.91

AL(x)
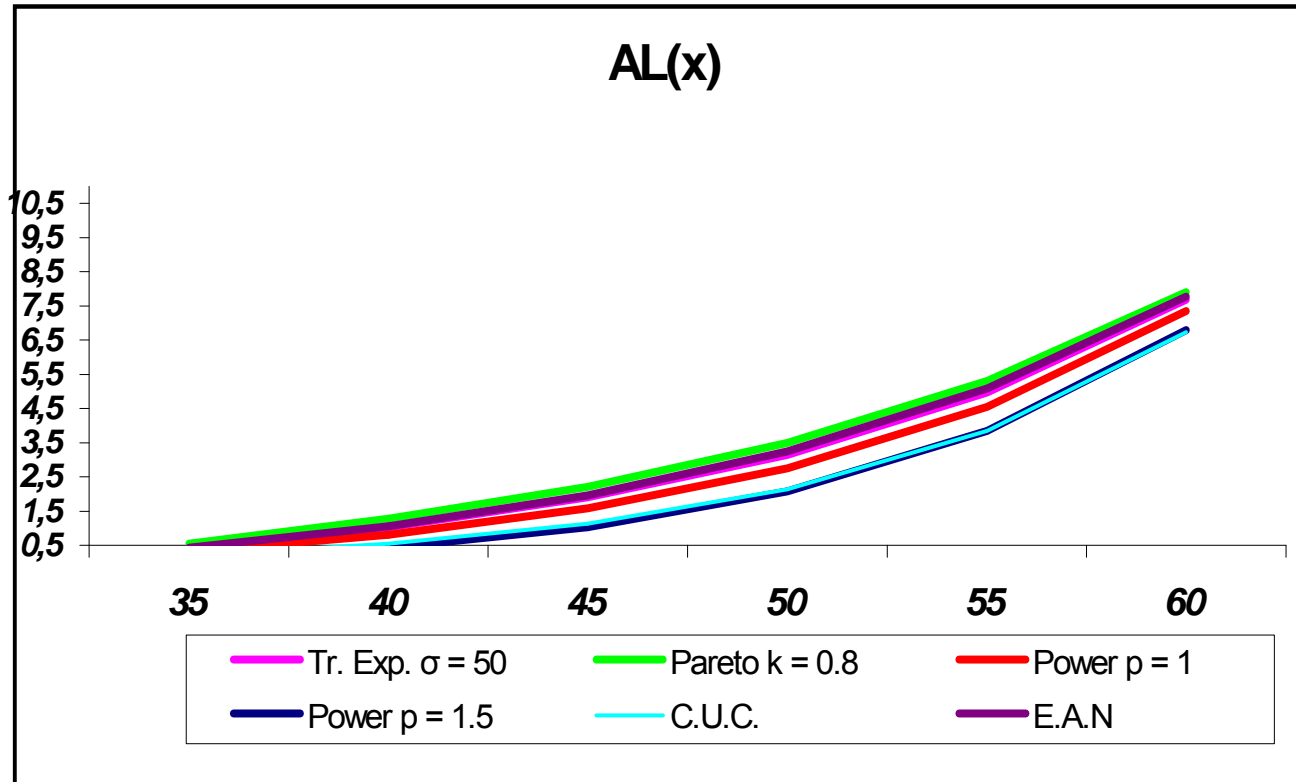
The New Cost Methods

- $NC(t) = \int_{a}^{r} h(t+r-x) \cdot m(x) \cdot e^{-\delta \cdot (r-x)} \cdot dx$

- $AL(t) = \int_{a}^{r} h(t+r-x) \cdot M(x) \cdot e^{-\delta \cdot (r-x)} dx +$

  $+ \int_{r}^{w} h(t+r-x) \cdot e^{\beta \cdot (x-r)} dx$

h(t): the density at time t of the amount of newly incurred age r pensions.

Proposition:

Bowers et al (1986): Consider two accrual functions $M_I(x)$, $M_{II}(x)$.

If $D(x) = M_I(x) - M_{II}(x)$ is such that $D'(\alpha) > 0$

and $D'(x) = 0$ has exactly one solution, $\alpha < x < r$,

then $AL_I(t) > AL_{II}(t)$.

Comparison of the new defined cost methods in terms of the Accrued Liability at time t

$$^{CUC}AL(t) <\ ^{PUC}AL(t) = AL(t)_{(Uniform)} < AL(t)_{(Truncated\ Exponential)}$$

$$^{CUC}AL(t) <\ ^{PUC}AL(t) = AL(t)_{(Uniform)} < AL(t)_{(T\ Pareto,\ k<1,\ k<p/d)}$$

$$AL(t)_{(Power,\ p>1)} <\ ^{PUC}AL(t) = AL(t)_{(Unif)} <\ ^{EAN}AL(t)$$

- The above conclusions are as those derived from the comparison in terms of the AL at age x.

Concluding Comments

If the benefit is allocated in higher proportions as age increases, the Normal Cost values are very similar when they are calculated either under the Current Unit Credit method or using the Power function,p>1. On the other hand, if it is allocated in lower proportions as age increases, they are very similar under the Entry Age Normal the Truncated Exponential and the Truncated Pareto methods.

Among the different accrual functions, a lower Actuarial Liability may be expected from the accelerating cost methods than from the decelerating ones while the Normal Cost follows the opposite trend.

- THANK YOU !

2nd PBSS COLLOQUIUM
Helsinki, Finland 21-23 May 2007

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Legal Funding Rules on DB Plans in Japan and in the U.S.

Yosuke Fujisawa, F.I.A.J

Sumitomo Trust & Banking Co., Ltd.

fujisawa@sumitomotrust.co.jp

1. Introduction

I don't believe we need as strict funding rules in Japan as the PPA* in the U.S. However, I think there are some important lessons for us in Japan to be learned from the PPA.

- In the U.S., between 2000 and 2002, investments reached their all time low. This period was called the "Perfect Storm". It brought serious funding shortfalls in DB plans**.

  – At the same time, Japan faced a very similar situation .

- In the U.S., the PPA was enacted in order to make the finances of DB plans and the PBGC*** sound.

  – In Japan, some DB plans had serious funding shortfalls because of bad investment performance in the same period. However, it hasn't become a political problem like in the U.S. because, in Japan, there is no pension benefit guarantee system like the PBGC

*Pension Protection Act of 2006 **Defined Benefit Pension Plans   ***Pension Benefit Guaranty Corporation

2. History of DB plans

U.S.

Generally speaking, legal funding rules are mainly to protect employees. However, in the U.S., the funding rules of ERISA* exist primarily to protect the PBGC rather than employees.

1974 : "ERISA" enforced. ⟶ Minimum Funding Standard

1987 : "Pension Protection Act of 1987"

1994 : "Retirement Protection Act of 1994"

2000 ~ 2002 : Perfect Storm

⟶ PBGC crisis arises.

2004 : "Pension Funding Equity Act of 2004"

2006 : "Pension Protection Act of 2006"

*Employee Retirement Income Security Act of 1974

2. History of DB plans

Japan

1962 : "Tax Qualified Pension Plans"

1966 : "Employees' Pension Funds"

1997 : "Going-Concern*" and "Non-Going-Concern**"   introduced.

   (only to "Employee's Pension Funds")

2001 : "DC Law***"

2002 : "DB Law****"

2007 : "DC & DB Law" amended

2012 : "Tax Qualified Pension Plan" abolished

Employers, who have "Tax Qualified Pension Plans", are thinking about shifting to the other pension plans, or even abolishing them.

*a funding rule under continuing a DB plan   **a funding rule under terminating a DB plan

***Defined Contribution Pension Law   ****Defined Benefit Corporate Pension Law

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3. Pension Benefit Guarantee System

Japan

- The "DB Law" doesn't provide a pension benefit guarantee system like the PBGC.

- In Japan, we are trying to reconsider whether to introduce a pension benefit guarantee system or not.

> When do we need a pension benefit guarantee system? We need it in case of extreme circumstances, such as company bankruptcy.

> It is important to increase plan assets in preparation for the issue of "Non-Going-Concern".

> It is also important to have preferential rights of contributions.

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4. Legal Funding Rules - Before PPA -   U.S.

Funding shortfall

Accrued Liability

Plan Assets
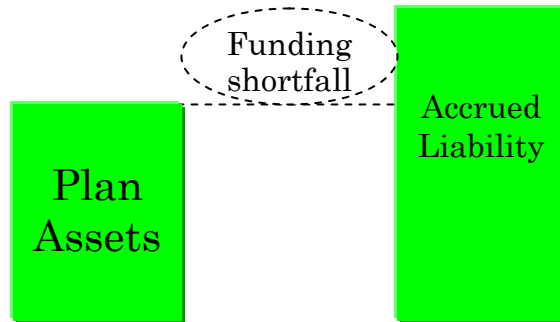
- The amortization period of funding shortfalls is from 5 to 30 years for "Single-Employer Defined Benefit Plans".

- DB plans are required to maintain a special account called "Funding Standard Account". "Credit Balance" results, for instance, if contributions in excess of the minimum required contributions are made.

Since the "Perfect Storm", investment performance has improved. However, there were some employers who reduced required contributions by applying the "Credit Balance". Therefore, overall, the funding level of DB plans has not improved since the "Perfect Storm".
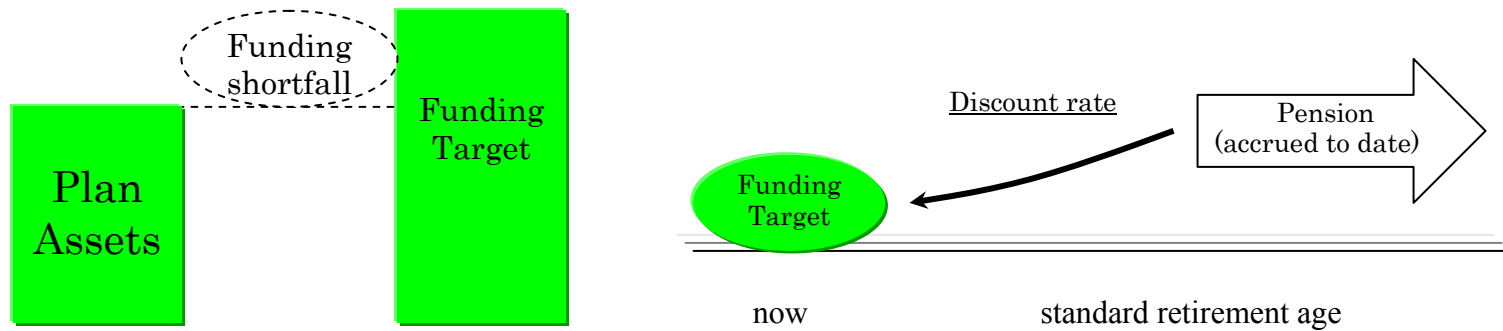
4. Legal Funding Rules - Before PPA - U.S.
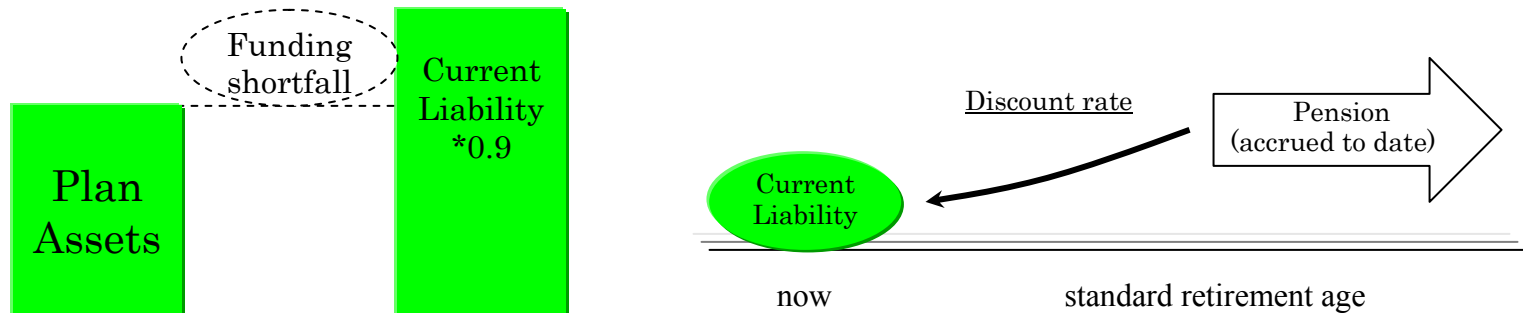
- Both "Current Liability" and plan assets can be smoothed.

"Smoothing" enables employers to contribute steadily without having to compensate for short term fluctuations in market value. However, in actual fact, employers delay contributing more when investment performance is bad. In the case of the "Perfect Storm", employers put off addressing their funding shortfall.

5. Legal Funding Rules - PPA -

U.S.

Funding shortfall

Plan Assets

Funding Target

Discount rate

Funding Target

Pension (accrued to date)

now   standard retirement age

- If plan assets are less than 100 percent of "Funding Target", employers have to contribute more in order to make up their funding shortfall over 7 years.

The PPA reduces the amortization period dramatically. That leads to greater contribution to DB plans. As a result, I think employers are starting to think about freezing DB plans or even abolishing them or shifting to a DC plan.

6. Legal Funding Rules – DB Law -

Japan

Going-Concern

Funding shortfall

Actuarial Liability

Plan Assets
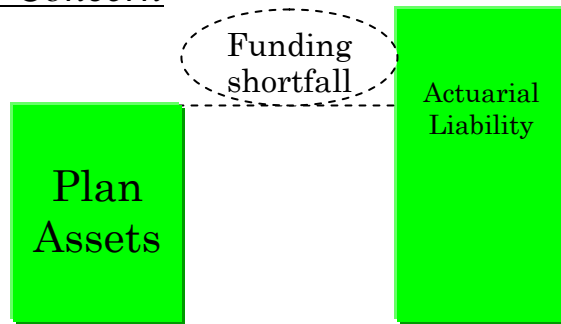
- The assumed interest rate of "Actuarial Liability" is decided by employers based on the expected investment return rate.

- If the funding shortfall is more than the "Tolerant funding shortfall", employers have to contribute more in order to cover their funding shortfall
- The amorization period of funding shortfalls varies from 3 to 20 years. Once employers decide the amortization period, the employers cannot extend that period anymore, only reduce it.
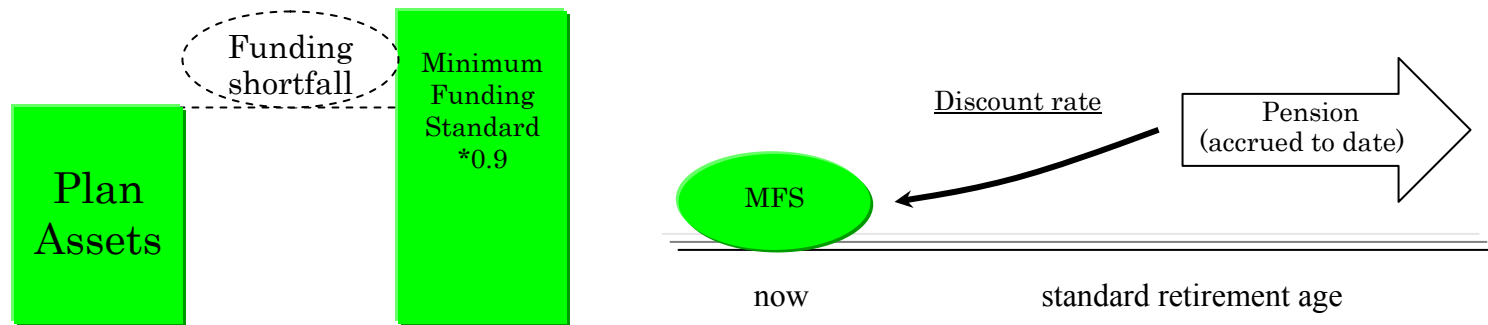
Employers hesitate to contribute big charges through short period amortization because they can't lower the big charges by extending the amortization period in case of excess contribution burden.

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6. Legal Funding Rules – DB Law -

Japan

Non-Going-Concern

- **According to "Non-Going-Concern", plan assets are compared to the 90 percent of "Minimum Funding Standard".**

- **If plan assets are less than the 90 percent of "Minimum Funding Standard", employers have to contribute more in order to cover their funding shortfall.**

- **Even if the plan assets are less than 90 percent of**

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6. Legal Funding Rules – DB Law - Japan

- The assumed interest rate of "Minimum Funding Standard" is decided by the Minister of Health, Labor and Welfare. It's the average return rate of 30-year Treasury securities for the five-year period.

- This assumed interest rate must be within a permissible range that is between 80 percent and 120 percent.

- Employers can contribute all of their funding shortfall at one time, if they so wish.

According to "Going-Concern", employers cannot contribute within 3 years. However, according to "Non-Going-Concern", they can. I believe this is because "Non-Going-Concern" is more important than "Going-Concern".

7. Conclusion

- Employers should conduct their financial management with greater awareness of "Non-Going-Concern".

- The situation must be addressed as soon as possible when plan assets are less than "Minimum Funding Standard".

- We should introduce a rule that funding shortfalls are paid off from 1, not 3, to 20 years.

- The contribution of funding shortfalls should have preferential rights, when plan assets are less than "Minimum Funding Standard".

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See you tomorrow

at

Marina Congress Center