



FALIA Invitational Seminar in Japan
“Product Development Strategy Course”

Product Development and Control of Pricing Risk

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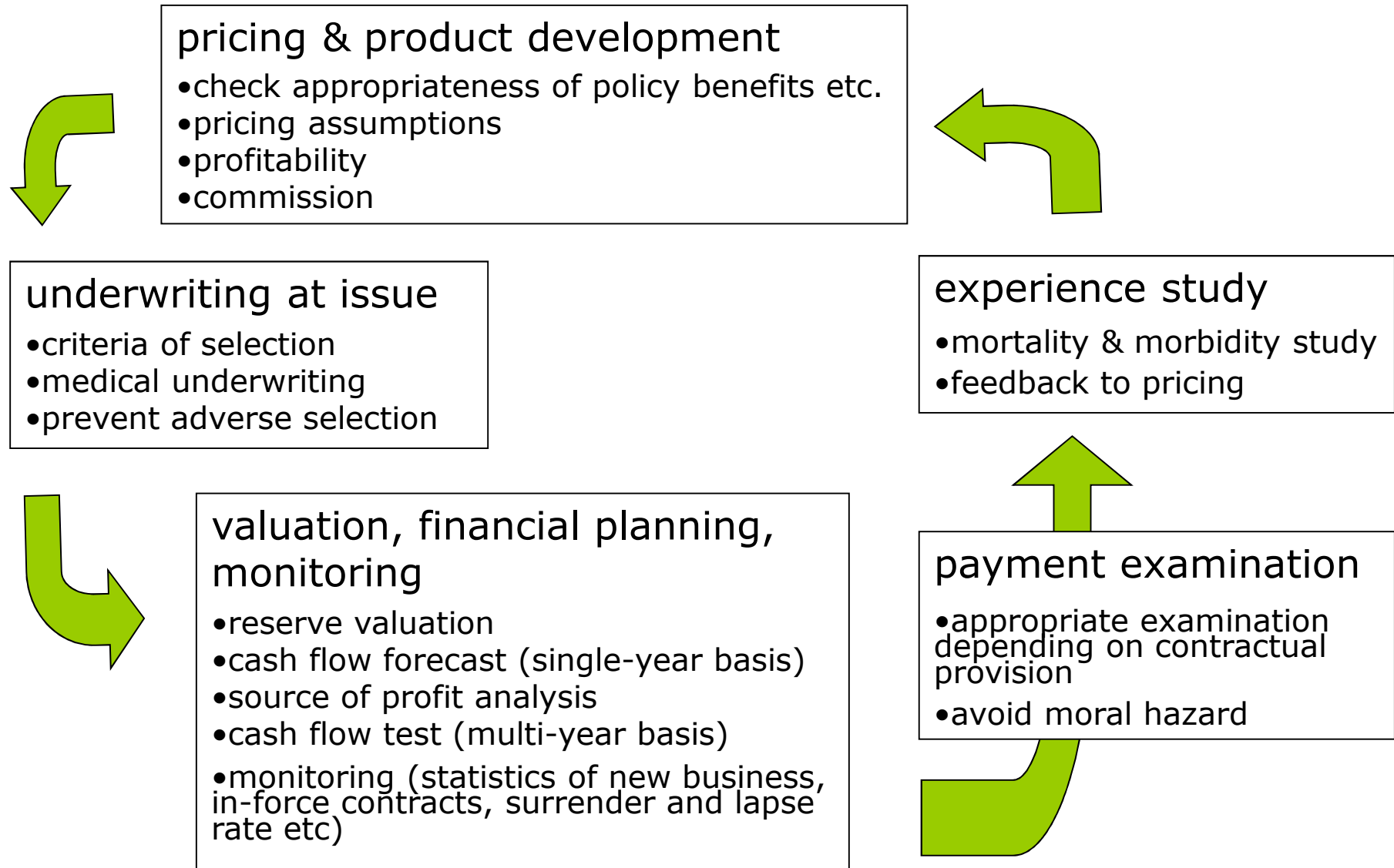
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1. Risk Management Cycle of Insurance Underwriting Business



2. Pricing & Product Development



2-1. Decision Factors for Pricing

- Competitiveness & Marketability
 - Premium Rates, Rate of Return (Policy Holders' interest)
 - Commission Rates (Agents' interest)

- Profitability & Capital Efficiency (Company's interest)
 - Profit Margin, IRR, (Operational) EV Margin

- Capital Adequacy & Solvency
 - Need to establish policy reserve properly
 - Need to follow risk management policy
 - Solvency on statutory basis is needed to be monitored periodically
 - Solvency on economic value basis is also needed to be monitored periodically.

2-2. Product Development Process

- ❑ Product Specs
 - Cooperation between Product Development, Actuary, Sales
- ❑ Expected Sales Volume
- ❑ Technical Design
 - Benefit Features, Premium Rates, Commissions, Profitability Test
- ❑ Checking Product Design & Pricing in terms of Risk Management at the time of Product Development
 - Risk management check sheet is filled to double-check adequacy of product design and pricing
- ❑ Schedule IT & Operations development
 - Feasibility for IT & Operation is checked at the time of PD.
- ❑ Prepare Documents Submitted to FSA
- ❑ Internal Approval Process
- ❑ Legal Check of Policy Wording

2.3 Risk Management at the Time of Product Development

- The appropriateness of product design and pricing shall be confirmed from a view of insurance underwriting risk management, such as specified below:
 - Assessment of product design.
 - Validation of premiums rates.
 - Verification of asset management risk.

- Appropriateness of the underwriting scope shall be validated.
 - Age limit for entry.
 - Policy term and premium payment term.
 - Maximum/minimum amount of sum assured.
 - Other items, if deemed necessary.
 - Scope of sales shall be set in view of not only sales policy but also insurance underwriting risk, if deemed necessary.

2.3 Risk Management at the Time of Product Development

- Appropriateness of the selection criteria shall be validated.
 - Criteria related to medical selection.
 - Criteria related to occupation of life insured.
 - Criteria related to financial conditions of life insured.
 - Criteria related to appropriateness of sum assured.
 - Criteria related to claim examination.

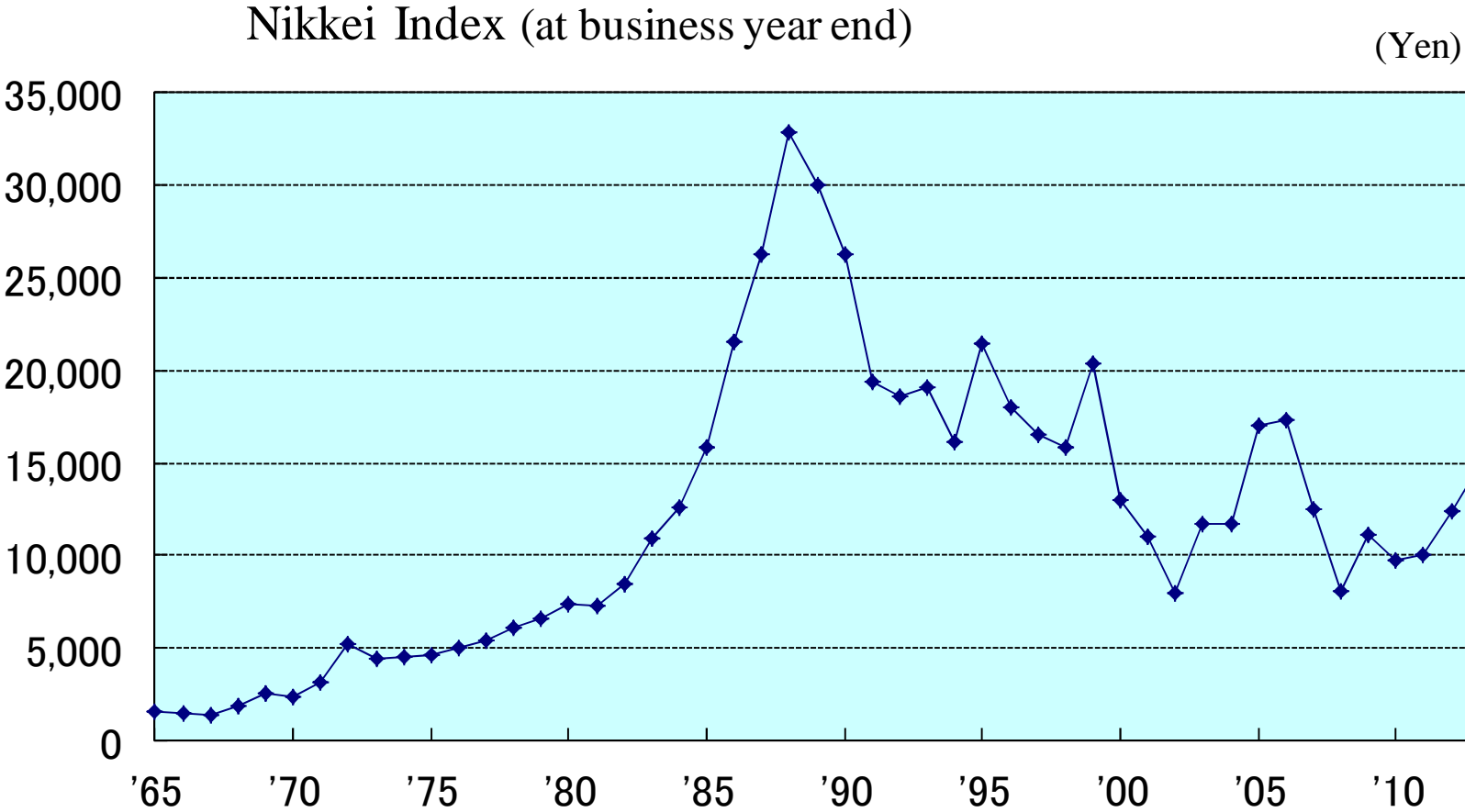
- Feasibility of operations related to new business, maintenance and claims payment shall be validated.

- Check Solvency on economic value basis as well as statutory basis.
 - Test against current market conditions such as yield curve or implied volatility

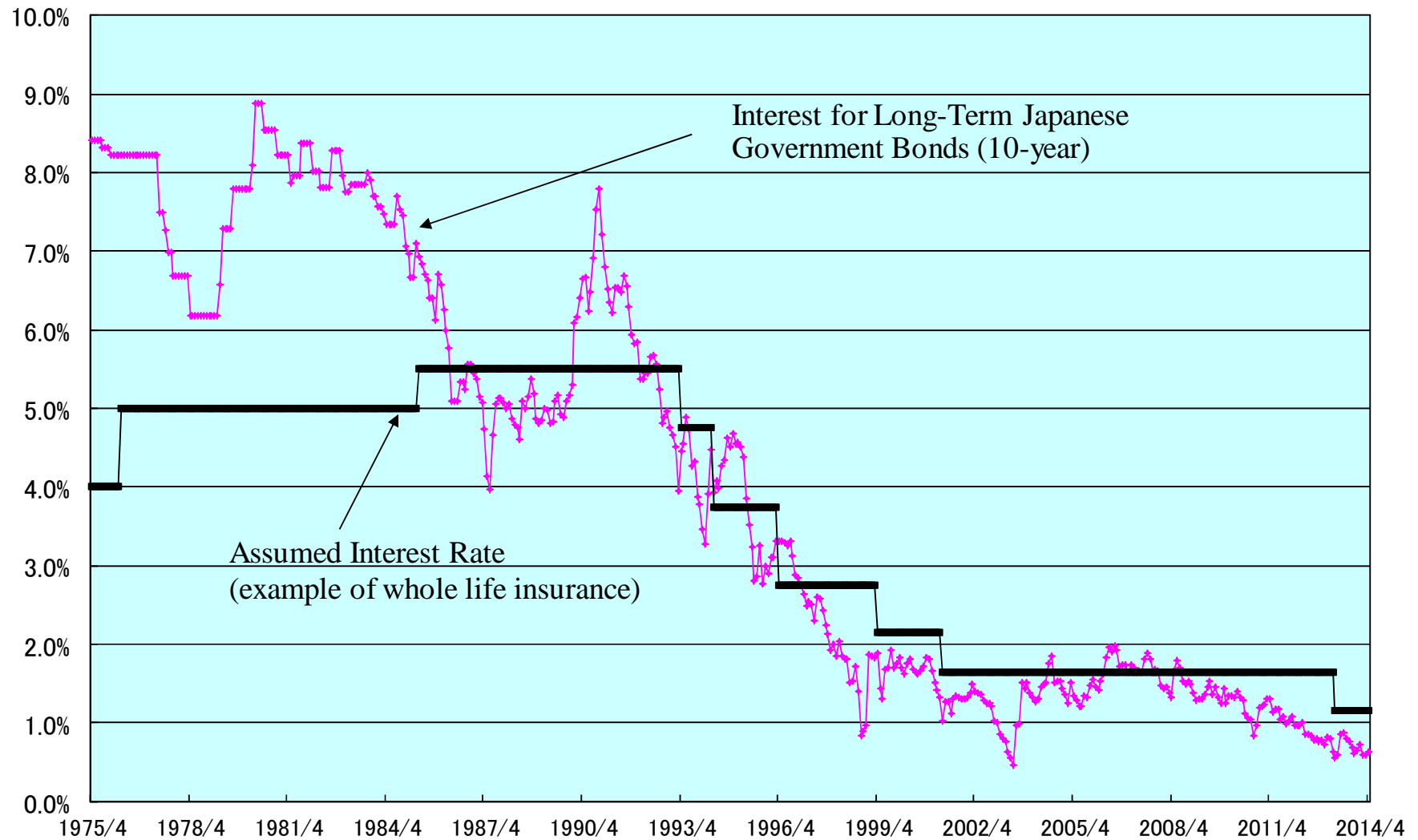
2.4 Pricing & Product Development - Topics in Japan -



2.4.1 Nikkei Index



2.4.2 Shifts in Japanese Government Bond (10yr) & Assumed Interest Rate



2.4.3 Amendments to the Assumed Interest Rate / Accrual of Negative Spread

■ 1970s~1980s

- Increases of the assumed interest rate (competition)
Highest assumed interest rate was 6.25% (10 years)
- Guarantee of a high assumed interest rate for long-term insurances
such as whole life insurance ···· 5.5%

■ Since the 1990s

- Substantial decline of market interest rates over the long term
- Repeated reductions of the assumed interest rate

■ The present

Debts from contracts with a high assumed interest rate from the past
that still remain = “negative spread”

2.4.4 Liability Reserve Balance (by Contract Year)

| Contract Year | Liability Reserve Balance (million yen) | Assumed Interest Rate |
|-----------------|--|-----------------------|
| ~ FY1980 | 849,353 | 2.75% ~ 5.50% |
| FY1981 ~ FY1985 | 1,476,834 | 2.75% ~ 5.50% |
| FY1986 ~ FY1990 | 4,773,460 | 2.75% ~ 6.00% |
| FY1991 ~ FY1995 | 4,069,241 | 2.75% ~ 5.50% |
| FY1996 ~ FY2000 | 1,655,310 | 2.00% ~ 2.75% |
| FY2001 ~ FY2005 | 2,411,145 | 1.50% |
| FY2006 ~ FY2010 | 4,092,787 | 1.50% |
| FY2011 | 1,033,390 | 1.50% |
| FY2012 | 1,046,383 | 1.50% |

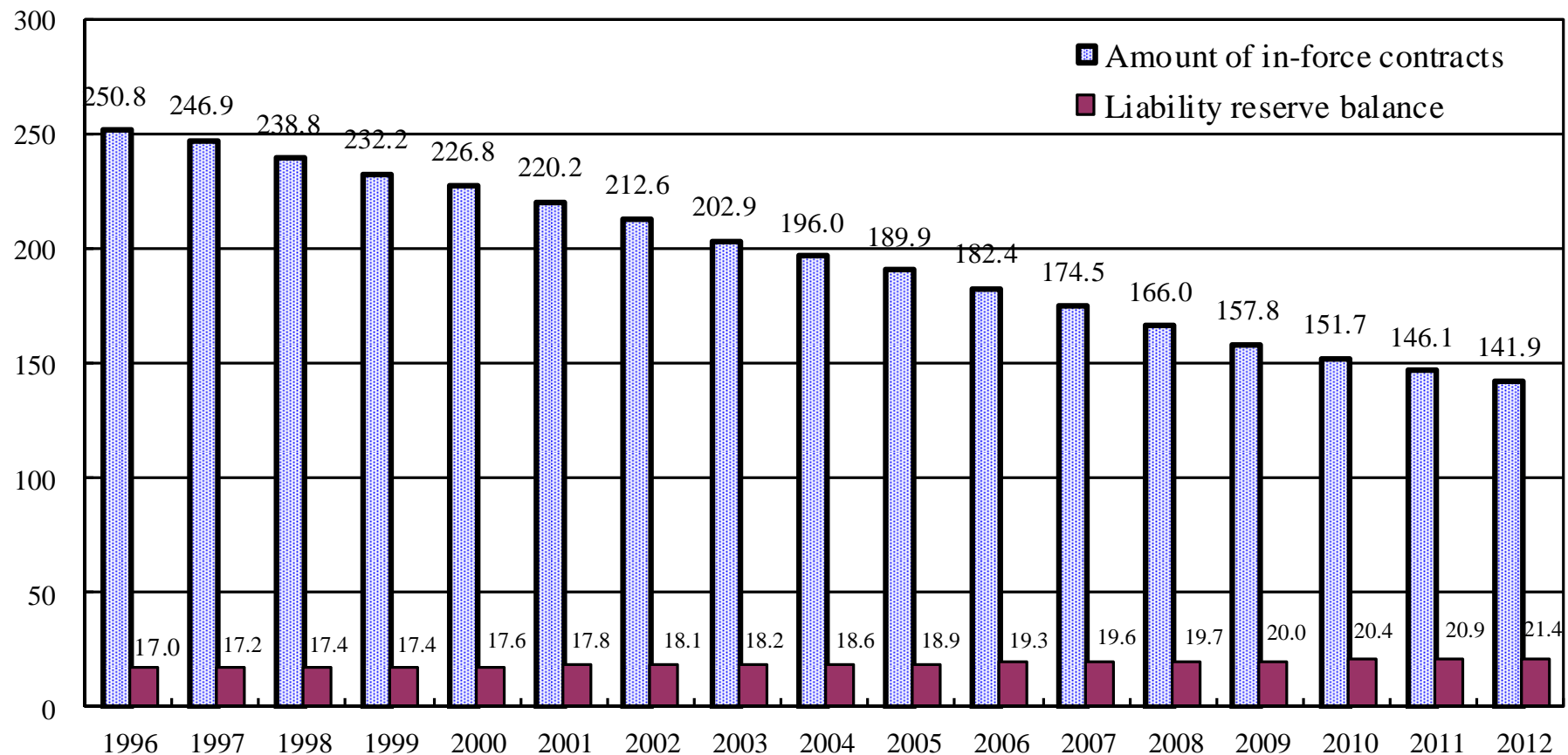
(Note 1) The value for the “Liability Reserve Balance” is the amount as of the end of FY2012. Furthermore, liability reserves for individual insurance and individual annuity (excluding separate account liability reserves and contingency reserves) are listed.

(Note 2) For the “Assumed Interest Rate” the main assumed interest rate pertaining to the liability reserve by contract year is listed.

2.4.5 Changes in the Demographic Structure and the Reduction of In-Force Contracts

Shifts in the Amount of In-Force Contracts and the Liability Reserve Balance (Individual Insurance and Individual Annuity)

trillion yen



2.4.6 8 Bankruptcies since April 1996

(billion Yen)

| | Nissan Life | Toho Life | Dai-hyaku Life | Taisho Life | Chiyoda Life | Kyoei Life | Tokyo Life | Yamato Life |
|----------------------------|-------------|-----------|----------------|-------------|--------------|------------|------------|-------------|
| Date of Bankruptcy (Y/M/D) | 1997/4/25 | 1999/6/4 | 2000/5/31 | 2000/8/28 | 2000/10/9 | 2000/12/20 | 2001/3/23 | 2008/10/10 |
| Amount of Excessive Debt | 300 | 650 | 300 | 35 | 590 | 680 | 70 | 64 |

3. Valuation and risk management



3.1 What are Standard Liability Reserves?

■ Overview

- a. Introduced through the revisions to the Insurance Business Law from FY1996.
- b. In order to ensure the solvency and retain the soundness of insurance companies, as a rule all insurance companies must accumulate standard liability reserves. This is done by utilizing the funded method (net level premium method) and the actuarial assumptions (standard interest rate and standard life table) set down by the supervisory authorities.
- c. The actuarial assumptions from the time of the contract apply until the termination of the contract (lock-in).

3.2 Standard Liability Reserves (Interest rates)

■ Standard Interest Rate

- a. Are calculated every year on the basis of the smaller of the 3-year and 10-year averages of JGB in consideration of the safety margin corresponding to the level of the subject interest rates.
- b. Safety Margin

| Subject Interest Rate | Safety Margin |
|-----------------------|---------------|
| 0.0%~1.0% portion | 0.90 |
| 1.0%~2.0% portion | 0.75 |
| 2.0%~6.0% portion | 0.50 |
| Over 6.0% portion | 0.25 |

- c. Shifts in the Standard Interest Rate

| Contract Year | Applicable Standard Interest Rate |
|---------------|-----------------------------------|
| FY1996~1998 | 2.75% |
| FY1999~2000 | 2.00% |
| FY2001~2012 | 1.50% |
| FY2013~ | 1.00% |

3.2 Standard Liability Reserves (Interest rates) (Cont'd)

- Interest rates applicable for valuation of liability reserves are becoming the rule due to the introduction of standard liability reserves
- Standard interest rates will not rise all that much in the future either
 - The current standard interest rate is 1.0%
 - The current interest for long-term government bonds is less than 1%
- ★ If the government bond goes up to 2.5%, “it will be 2020 before standard interest rates rise from 1.0% to 1.5% (roughly 6 years later)”

3.3 Standard Liability Reserves(Life table)

■ Standard Life Table

- a. The life table is created by IAJ* as actuarial assumptions for standard liability reserves and is validated by Commissioner of FSA**.

* IAJ : Institute of Actuaries of Japan

** FSA : Financial Service Agency

- b. They are created from experiential data from life insurance companies.

3.3.1 Changes in the Population Mortality Rate

Males (Unit: ‰)

| Age | 1990 | 1995 | 2000 | 2005 | 2010 |
|-----|-------|---------------|---------------|---------------|---------------|
| 20s | 0.83 | 0.75 (90) | 0.63 (76) | 0.56 (67) | 0.51 (61) |
| 30s | 0.78 | 0.79 (101) | 0.77 (99) | 0.74 (95) | 0.69 (88) |
| 40s | 1.55 | 1.44 (93) | 1.47 (95) | 1.43 (92) | 1.28 (83) |
| 50s | 4.05 | 4.06 (100) | 3.92 (97) | 3.57 (88) | 3.17 (78) |
| 60s | 11.32 | 10.66 (94) | 9.23 (82) | 8.83 (78) | 8.10 (72) |
| 70s | 26.41 | 26.24 (99) | 23.84 (90) | 21.23 (80) | 18.42 (70) |

Females (Unit: ‰)

| Age | 1990 | 1995 | 2000 | 2005 | 2010 |
|-----|-------|---------------|--------------|--------------|--------------|
| 20s | 0.30 | 0.29 (97) | 0.25 (83) | 0.26 (87) | 0.24 (80) |
| 30s | 0.42 | 0.40 (95) | 0.38 (90) | 0.37 (88) | 0.36 (86) |
| 40s | 0.89 | 0.83 (93) | 0.78 (88) | 0.75 (84) | 0.71 (80) |
| 50s | 2.17 | 2.11 (97) | 1.96 (90) | 1.76 (81) | 1.67 (77) |
| 60s | 4.81 | 4.57 (95) | 3.83 (80) | 3.64 (76) | 3.40 (71) |
| 70s | 13.24 | 11.82 (89) | 9.99 (75) | 8.90 (67) | 7.67 (58) |

Numbers in parenthesis represent the index for when 1990 has been set at 100.

3.3.2 Increase in average life expectancy of Japanese

Average life expectancy at 60

| Based on Population Life Table | | Male | Female |
|-----------------------------------|--|-------------|-------------|
| Year | 1965 | 15.20 years | 18.42 years |
| | 1970 | 15.93 years | 19.27 years |
| | 1975 | 17.38 years | 20.68 years |
| | 1980 | 18.31 years | 21.89 years |
| | 1985 | 19.34 years | 23.24 years |
| | 1990 | 20.01 years | 24.39 years |
| | 1995 | 20.30 years | 25.35 years |
| | 2000 | 21.44 years | 26.85 years |
| | 2005 | 22.09 years | 27.66 years |
| | 2010 | 22.75 years | 28.28 years |
| | | | |
| | Life insurance standard life table 2007 (annuitization) | 26.96 years | 34.27 years |

3.3.3 Overview of Amendments to the Standard Life Table


- The standard life table has been amended for the first time in 11 years to reflect the improvement in mortality rates in recent years, primarily for elderly, with these amendments being applied to new contracts from April 2007 onward.

- The population mortality rate is on a decreasing trend, primarily for the elderly.
 - ⇒ Increasing risk of longevity
 - ⇒ Increasing risks for after the start of individual annuity and 3rd sector (health-care, nursing care, accidents, etc.)

3.3.3 Overview of Amendments to the Standard Life Table (Cont'd)

■ Overview of the Amendments

- Reduction of the standard life table used for death protection product and annuitization, primarily for elderly generations
- Start-up of 3rd sector standard life table

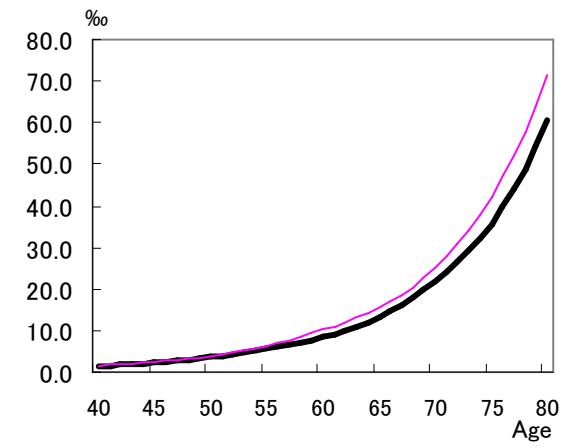
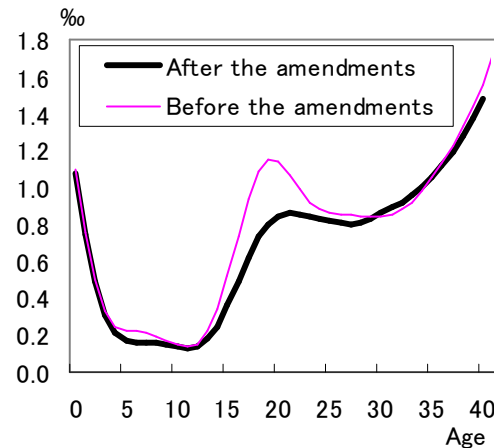
| | Life table before the amendments | | Life table after the amendments |
|---|--|--|--|
| 1st sector (for death protection product) | Life insurance standard life table 1996 (for death protection product) |  | Life insurance standard life table 2007 (for death protection product) [Amended] |
| 1st sector (for annuitization) | Life insurance standard life table 1996 (for annuitization) | | Life insurance standard life table 2007 (for annuitization) [Amended] |
| 3rd sector (for health-care, nursing, accidents, etc) | None | | 3rd sector standard life table 2007 [Start-up] |

3.3.3 Overview of Amendments to the Standard Life Table (Cont'd)

- Comparison of the standard life table (for death protection product) before and after the amendments
The range of the reductions averaged 12.4% for men and an average of 17.8% for women.

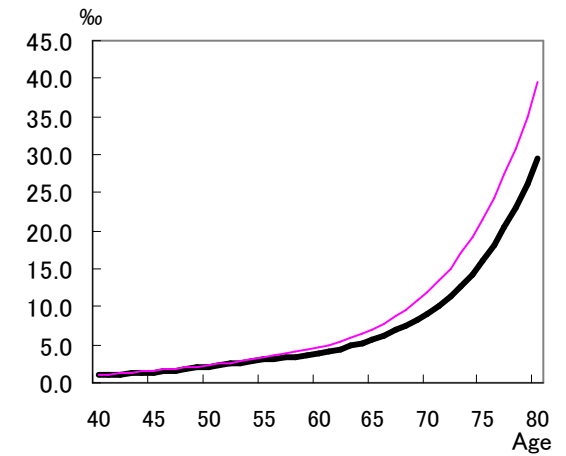
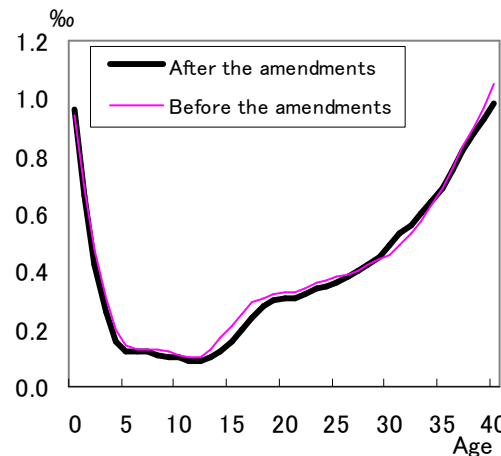
Male, for death protection product

| Age | Before the amendments | After the amendments |
|-----|-----------------------|----------------------|
| 20s | 1.14 | 0.84 (74%) |
| 30s | 0.84 | 0.86 (102%) |
| 50s | 3.79 | 3.65 (96%) |
| 80s | 71.32 | 60.39 (85%) |



Female, for death protection product

| Age | Before the amendments | After the amendments |
|-----|-----------------------|----------------------|
| 20s | 0.33 | 0.31 (94%) |
| 30s | 0.46 | 0.49 (107%) |
| 50s | 2.33 | 2.16 (93%) |
| 80s | 39.49 | 29.60 (75%) |

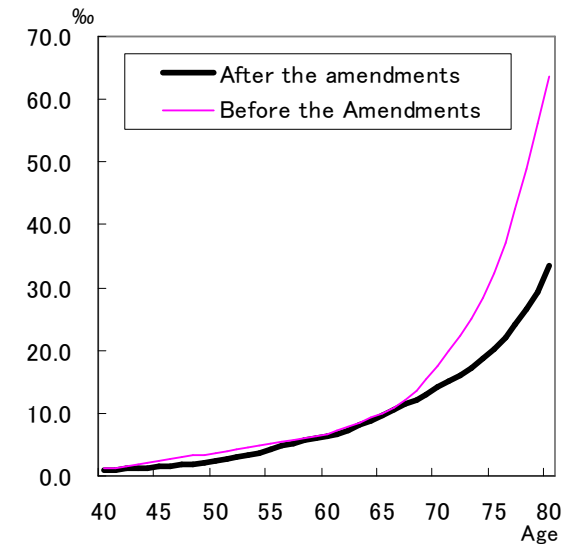


3.3.3 Overview of Amendments to the Standard Life Table (Cont'd)

■ Comparison of the standard life table (for annuitization) before and after the amendments

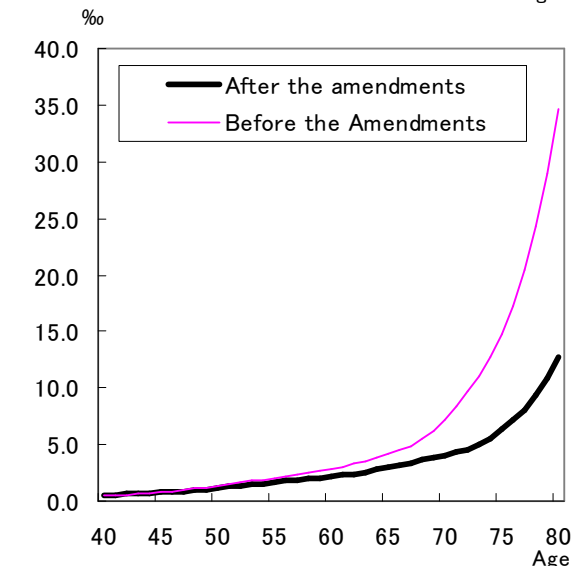
Male, for annuitization

| Age | Before the amendments | | After the amendments | |
|-----|-----------------------|-------------------------|----------------------|-------------------------|
| | Mortality rate | Average life expectancy | Mortality rate | Average life expectancy |
| 60s | 6.75 | 22.52 | 6.42 (95%) | 26.96 (+4.44) |
| 70s | 17.63 | 14.35 | 14.11 (80%) | 19.08 (+4.73) |
| 80s | 63.60 | 7.77 | 33.57 (53%) | 12.19 (+4.42) |
| 90s | 186.12 | 3.96 | 83.18 (45%) | 7.20 (+3.24) |



Female, for annuitization

| Age | Before the amendments | | After the amendments | |
|-----|-----------------------|-------------------------|----------------------|-------------------------|
| | Mortality rate | Average life expectancy | Mortality rate | Average life expectancy |
| 60s | 2.84 | 26.85 | 2.18 (77%) | 34.27 (+7.42) |
| 70s | 7.24 | 17.76 | 4.10 (57%) | 25.13 (+7.37) |
| 80s | 34.58 | 9.73 | 12.75 (37%) | 16.44 (+6.71) |
| 90s | 140.47 | 4.68 | 48.51 (35%) | 9.57 (+4.89) |



3.4 Standard Liability Reserve system - 3rd Sector -



3.4.1.1 Diversification of 3rd Sector Product

Diversification of benefit targets

Medical care activities such as hospitalization/Surgery

Hospitalization
Surgery
Outpatient
Discharged
Other medical care activities
High precision medical care, organ transplants
Home-based (terminal) medical care, special organ therapy, etc.

Diseases

Taken ill by specific diseases
External injuries
No accidents
etc.

Conditions of the body

Invalid
Nursing care
Life expectancy 6 months
etc.

Diversification of claim reasons

Diseases
Accidents
Lifestyle diseases
Women-specific ailments
Three major adult diseases
Cancer
Dentistry
Specific injuries (fracture, torn tendon, etc)
Intractable diseases
Serious chronic diseases etc.

Diversification of claim models

Lump sum, annuity (defined, living), premium payment exemption, living needs
Amount reflecting hospital inpatient days/outpatient days, reimbursement, fixed amount
Claim limits (hospitalization day limit, claim number limit, total claim limit, no limit for specific diseases, etc.)
Claim conditions (setting for fixed symptom period, hospitalized for more than OO days, waiting period)
Public health system linkage
etc.

Diversification of entry requirements

Women only, children only, pregnant women only
Relaxation of underwriting selection, no selection
etc.

Diversification of contract models

Main contract, rider
Sale of combined main contracts
Possible addition of single rider, addition only possible with other riders

3.4.1.2 Risk Features of 3rd Sector Product

★ Many “uncertain”, “non-transparent” risk features

1. Unstable rate of incidence

- Due to insufficient long-term and stable data
- Due to fluctuations in risk levels (individual difference) of insured

2. Due to influences of changes in medical technology

3. Due to influences of changes in the structure of diseases

4. Due to influences of public medical care system

5. Consumer trends

① Invasion of adverse selection

- Long-term hospitalization in order to claim benefits, unbalanced risks of the insured

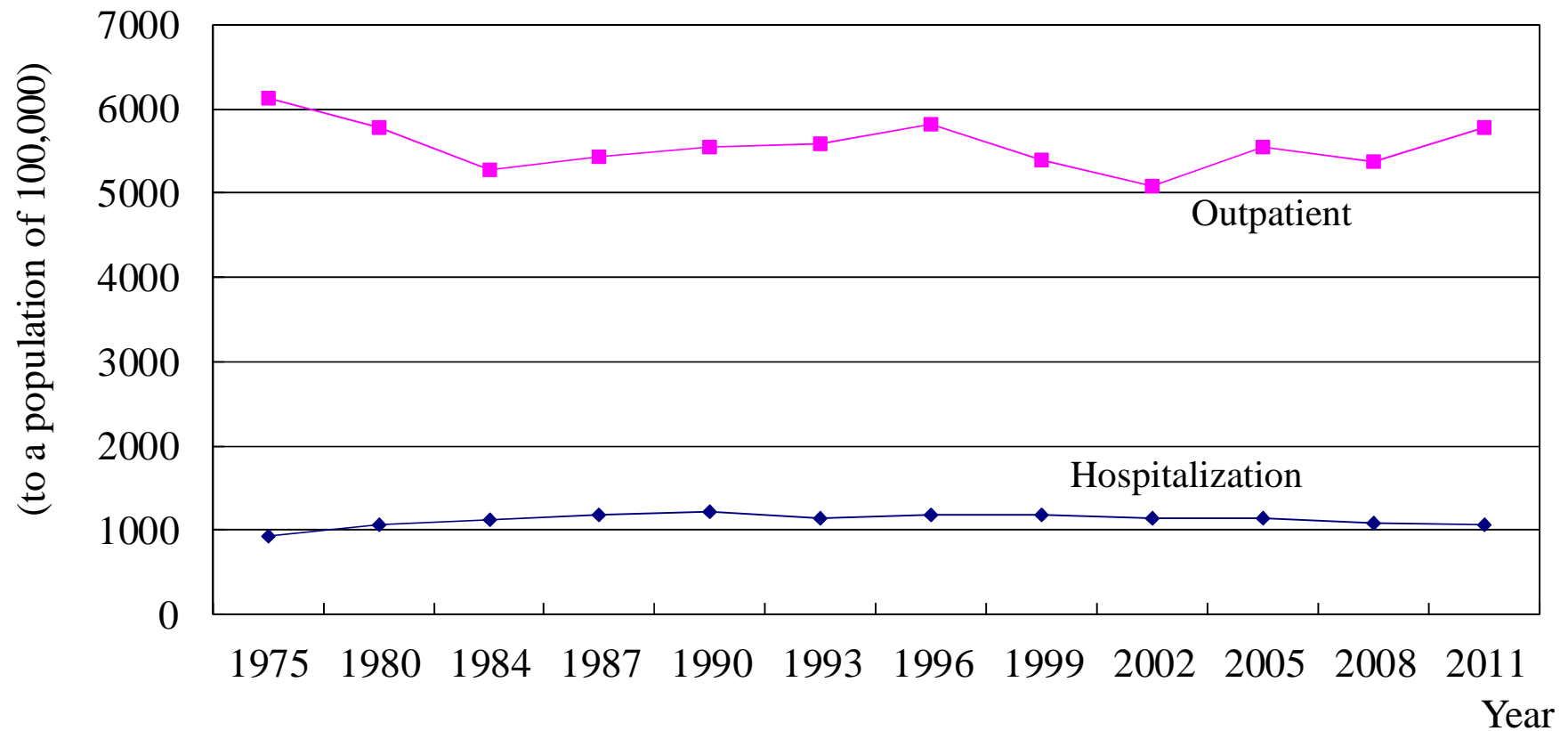
② Concentrated risks

- In general, contracts do not expire when claims, such as hospitalization benefits, are made.

Insured whose health conditions are bad and require repeated hospitalizations are more likely to continue their contracts

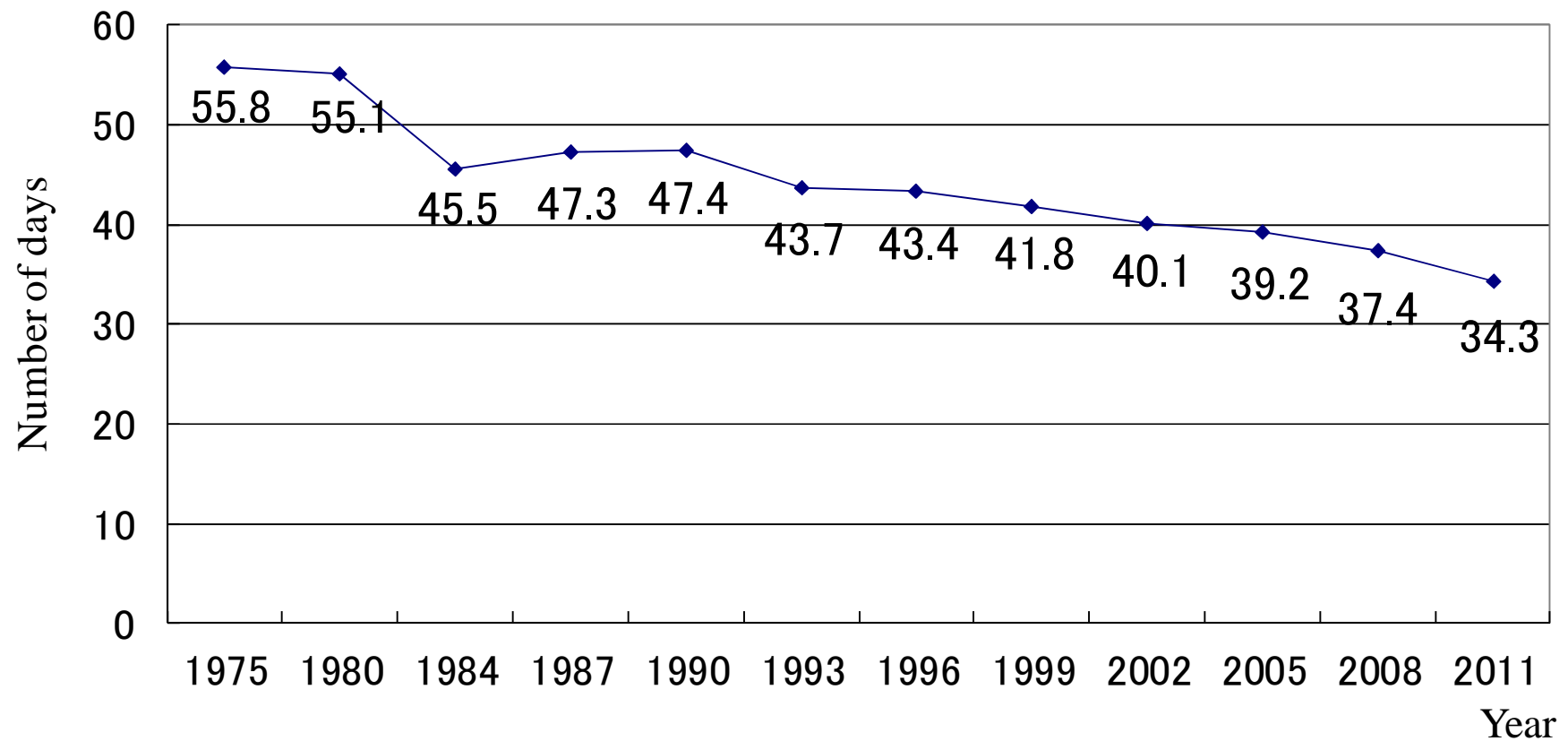
3.4.1.3 Trend of National Treatment Rate at Health Institutions

Rate of public receiving treatment is almost flat



3.4.1.4 Trend of National Average Hospital Inpatient Day

Average hospital inpatient days (per hospitalization) is decreasing



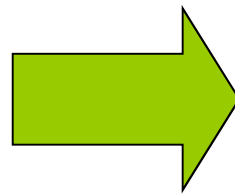
3.4.1.5 Diversification of Medical Operations

Medical operation becoming diversified with improvements in medical technology

<Medical operations covered by public health insurance>

1986

499 types

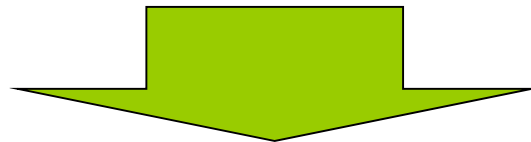


2010

1,172 types

3.4.2 Revisions to Standard Liability Reserve System (Setting Standard Mortality table for 3rd Sector Products)

- ① Declining national mortality rate (Increasing older population)
 - ⇒ worries over deterioration of health insurance expenditures due to an increasing older population requiring high rates of hospitalization
- ② Greater customer needs for 3rd sector products such as health insurance, etc.



One of the actions taken by competent authorities with a view to secure healthier financial positions for insurance companies and provide better protection for policy holders

= Introduction of [3rd Sector Standard Life Table]
(Implemented from 2007 Apr.)

3.4.3 Standard Life Table for 3rd Sector Products

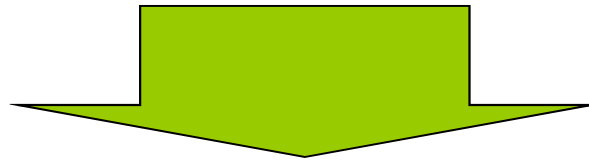
Lower mortality rates than those used in death insurances
because of accompanying living risks

| Males | ① | ② | |
|-------|-----------------|------------|------------|
| | Death insurance | 3rd Sector | $② \div ①$ |
| 50s | 0.00365 | 0.00259 | 71% |
| 60s | 0.00834 | 0.00658 | 79% |
| 70s | 0.02193 | 0.01798 | 82% |

| Females | ① | ② | |
|---------|-----------------|------------|------------|
| | Death insurance | 3rd Sector | $② \div ①$ |
| 50s | 0.00216 | 0.00135 | 63% |
| 60s | 0.00379 | 0.00264 | 70% |
| 70s | 0.00914 | 0.00670 | 73% |

3.4.4 Revisions to Medical Insurance Premiums (Company's Response to Law Revisions)

- ★ 2007 Apr. With the introduction of the “3rd Sector Standard Life Table”, Medical insurance premiums were revised
- ★ ① Declining mortality rate \Rightarrow increased premiums
- ★ ② Shortening of hospitalization \Rightarrow decreased premiums



<**Whole-life type** health insurance>

Premiums **trend to increase**

<**Term-type** health insurance>

Premiums **trend to decrease**

3.4.5 Enactment of 3rd Sector Liability Reserve Accumulation Rules

★ Introduced gradually from 2006

- ① Confirmation of adequacy of liability reserve accumulation using **stress tests**
- ② **Disclosure**
 - Disclosure of benefit claim **status** (ratio of benefit claims to the premium)
 - Disclosure of stress test implementations
- ③ **Monitoring** by FSA
 - Submission of ratio of actual claim rates to assumed claim rates to competent authorities
- ④ Securing of implementation of **right to change actuarial assumption**

3.4.6 Enactment of 3rd Sector

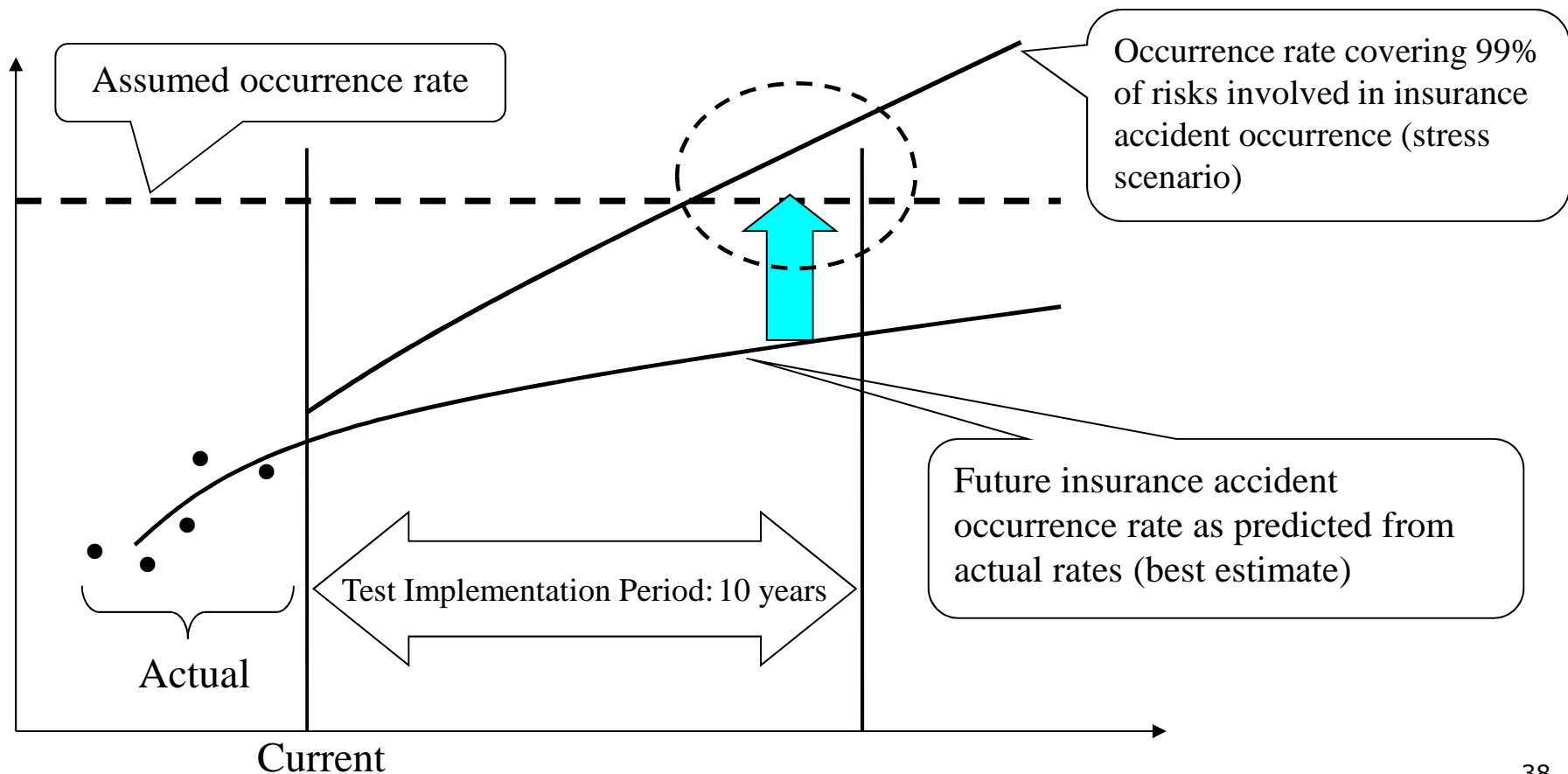
Liability Reserve Accumulation Rules

~ Implementation of Stress Test ~

- ① Confirm whether assumed insurance accident occurrence rates applicable to insurance premiums are duly covered.
- ② Using actual insurance accident occurrence rates, confirm whether standard covers 99% of risks involved in the occurrence rate during the test period (10 years in the future).
- ③ If not sufficient, to top up liability reserves or claim fluctuation reserves.

3.4.6 Enactment of 3rd Sector Liability Reserve Accumulation Rules ~ Implementation of Stress Test ~

★ Under the stress scenario, liability reserves or claim fluctuation reserves will be topped up if inadequacies are predicted for the future.



3.4.7 Enactment of 3rd Sector

Liability Reserve Accumulation Rules

~Confirmation of implementation of right to change actuarial assumption~

1. What is right to change actuarial assumption?

- when insurance accidents exceed the assumed insurance accident rate set by the premium and benefit pay-outs are difficult, insurers have the right to change the actuarial assumption and premium.

Generally noted in the policy provisions of insurance with the latest claims

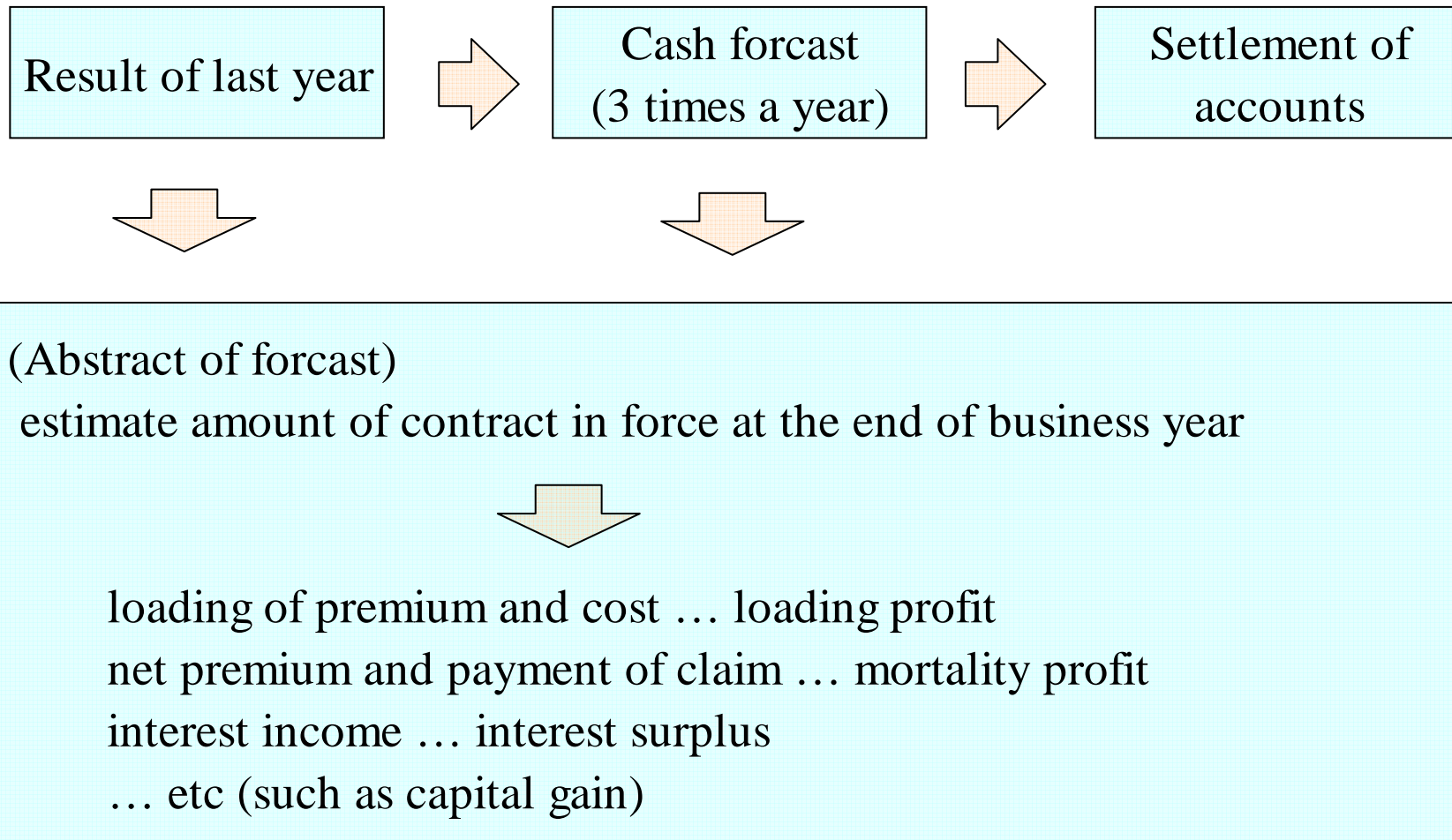
2. About the current regulations

- ① Defined exercise standard of right to change actuarial assumption (numeric standard)
- ② Explanation of rationality of assumed occurrence rate, and the exercise standard of right to change actuarial assumption when selling the insurance
- ③ Provision of information on possibility of changes to the actuarial assumption in the future to the policyholders after enrollment.

3.5 risk management



3.5.1 Risk management (single year basis)



3.5.2 Risk management (future balance analysis)

- Standard valuation system is locked in at policy signing.
 - It is obligatory to check the adequacy of reserves
based on future balance analysis

- Appointed actuaries make that judgment based on IAJ's "Practical Standards of Life Insurance Company Actuaries."
 - If reserve is lacking, then accumulation is necessary.
 - In 2007, additional reserve on whole life policy
issued before 1996 was established.

4. Experience Study (Mortality & Morbidity Study)



4.1. Overview

□ Subject

- Individual insurance / annuity

□ Classes

- 1st sector (life products)
 death benefit product / annuity
- 3rd sector (medical products)
 - ▪ ▪ feature of benefit

□ Research method

- research by fiscal year basis

□ Definition

- A/E ratio ▪ ▪ ▪ actual to expected loss ratio
- Expected rate
 - Mortality ▪ ▪ ▪ standard mortality table 2007
 - Morbidity ▪ ▪ ▪ Pricing basis

4.2 Mortality Study (Method)

- Use standard mortality table 2007
as expected mortality rate.

- Analysis by following classes
 - Sex
 - Attained age
 - Policy year
 - Cause of death
 - Underwriting method
 - Sum insured
 - Etc...

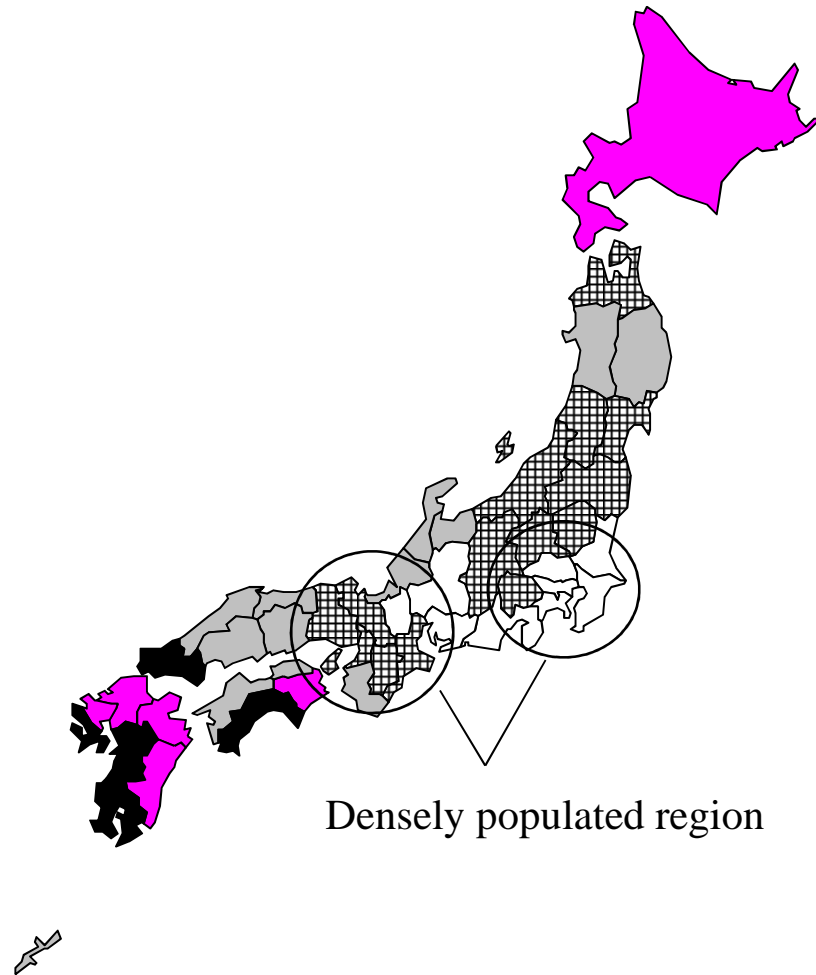
4.3 Morbidity Study (Method)

- Use Pricing assumption as expected morbidity rate.

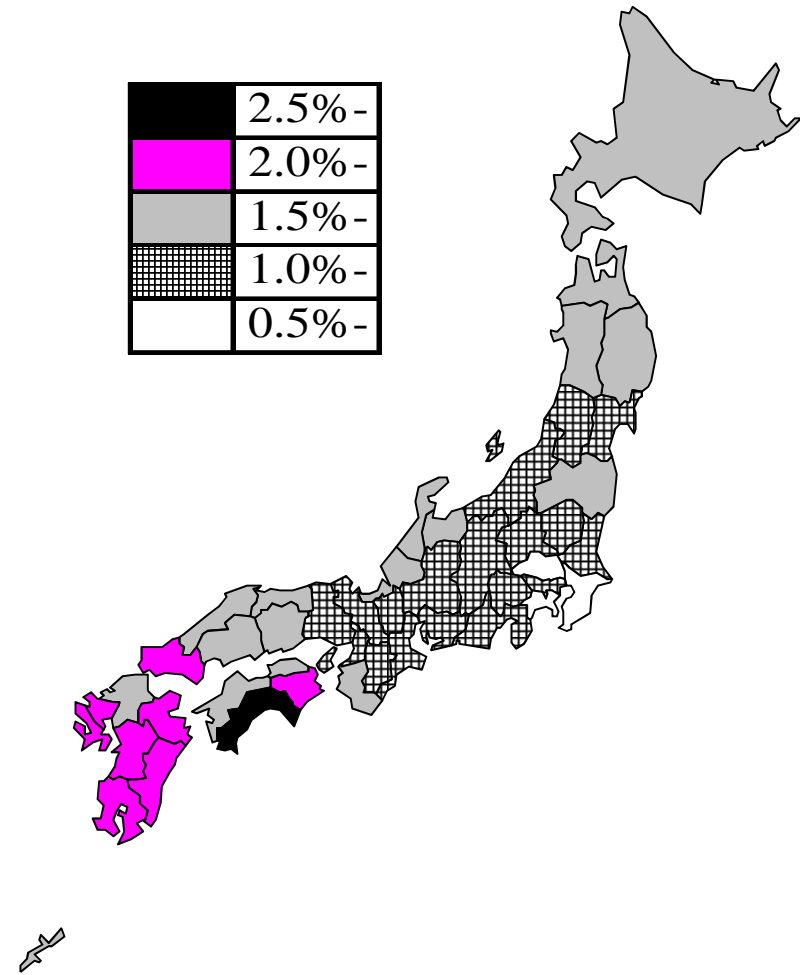
- Analysis by following classes
 - Sex
 - Attained age
 - Policy year
 - Cause
 - Sum insured
 - Occupation
 - Prefecture
 - Etc...

4.3 Morbidity Study (Result by Region)

No. of hospitalization
(per 100,000 population)

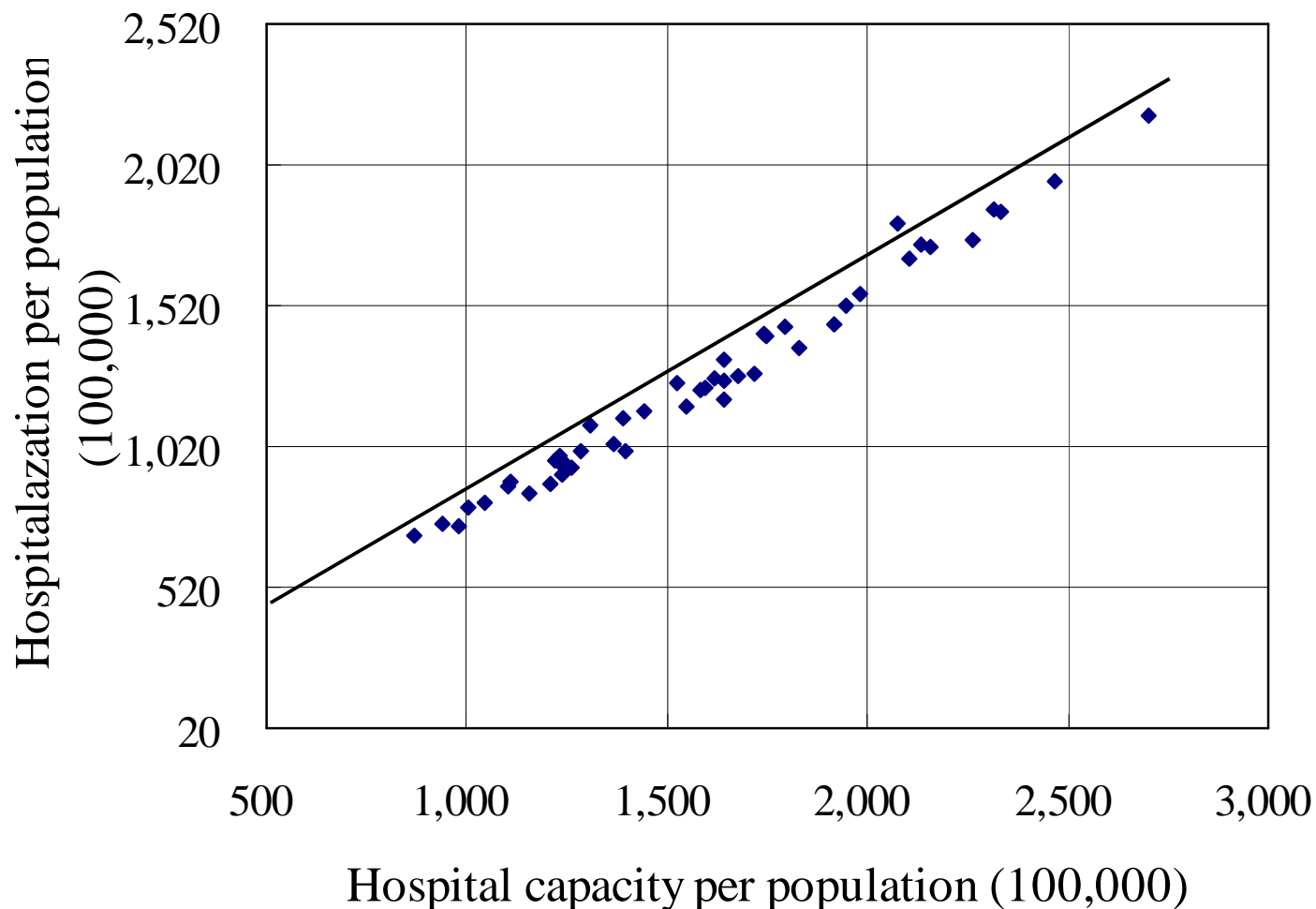


No. of beds in hospital
(per 100,000 population)



4.3 Morbidity Study (Result by Region) (Cont'd)

Corelation between hospital capacity and hospitalization by prefecture
(for sickness hospitalization)



5. Summary



5. Summary

- Building risk management cycle of insurance underwriting business is the “minimum standard” for life insurer.
 - Pricing
 - Check at the time of PD
 - Monitoring & Experience Study
 - Reserving
 - Financial Control

- Introducing risk management policy explicitly will be helpful.

(reference 1)

Effect of the East Japan Earthquake

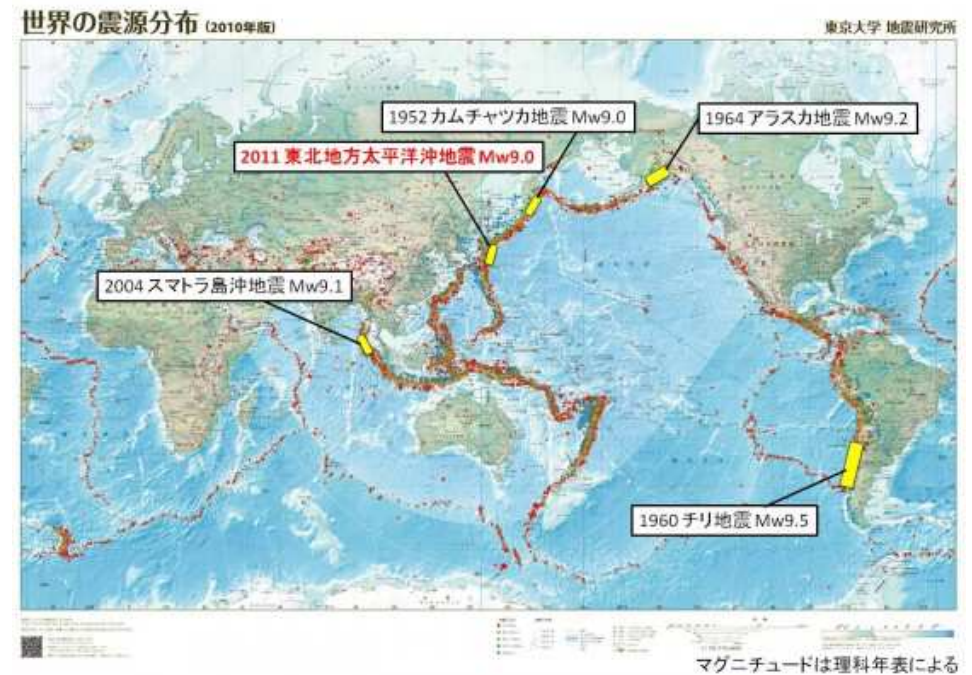
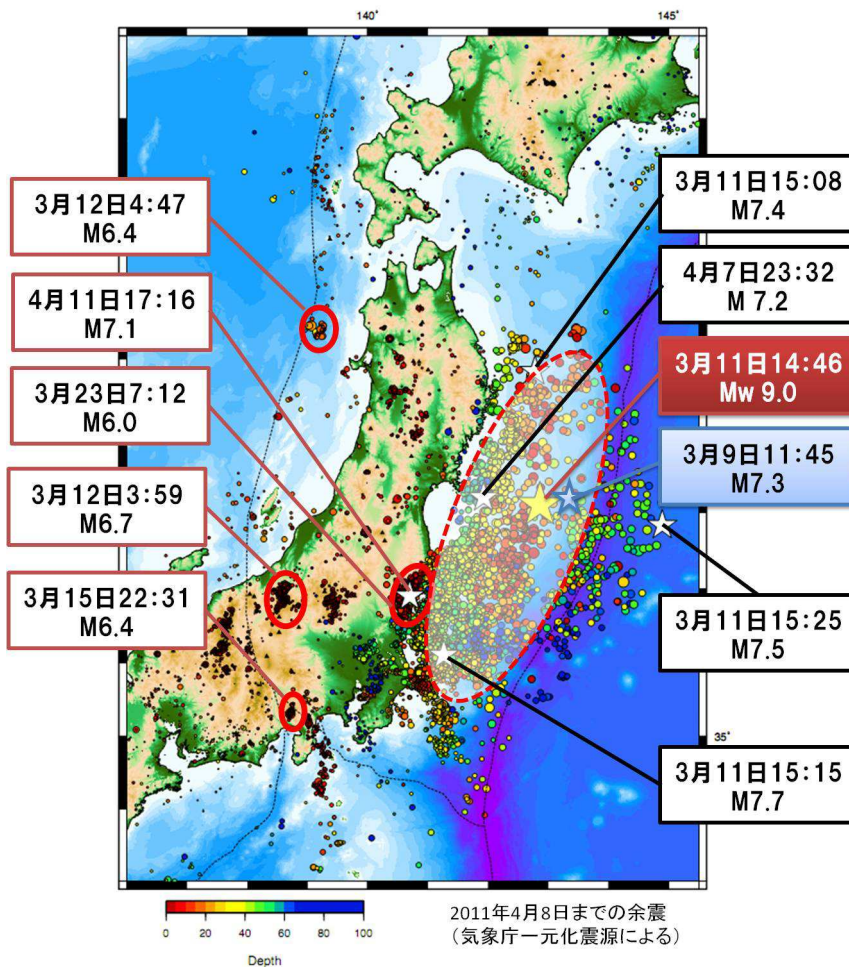


(1) Overview of the Earthquake

Date March 11, 2011

Magnitude 9.0 (greatest ever observed in Japan)

Epicenter Tohoku region

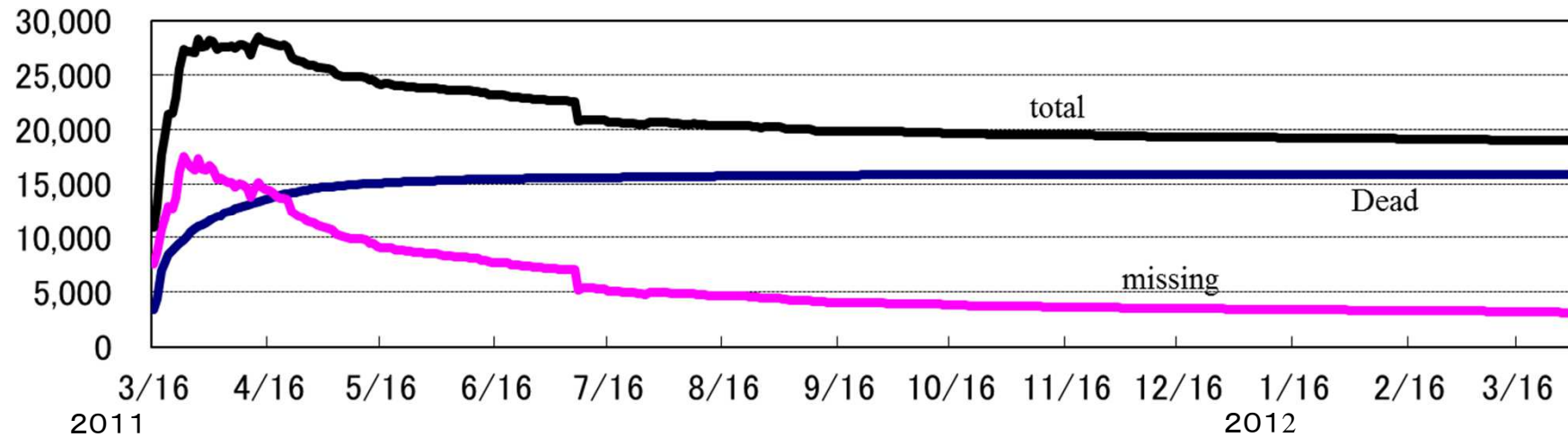


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(2) Damage (as of 31/3/2012)

Dead 15,854

Missing 3,089



(3) Effect on the mortality rate

Casualty of the earthquake (approximately 19,000) increased mortality rate of 2011 by approximately 1.5%

Deaths in Japan

| | | | | (million) |
|------|-------|------|------|------------------------|
| 2008 | 2,009 | 2010 | 2011 | casualty of earthquake |
| 1.14 | 1.14 | 1.20 | 1.25 | 0.02 |

1.5%