Catastrophe Risks and Reinsurance in Japan

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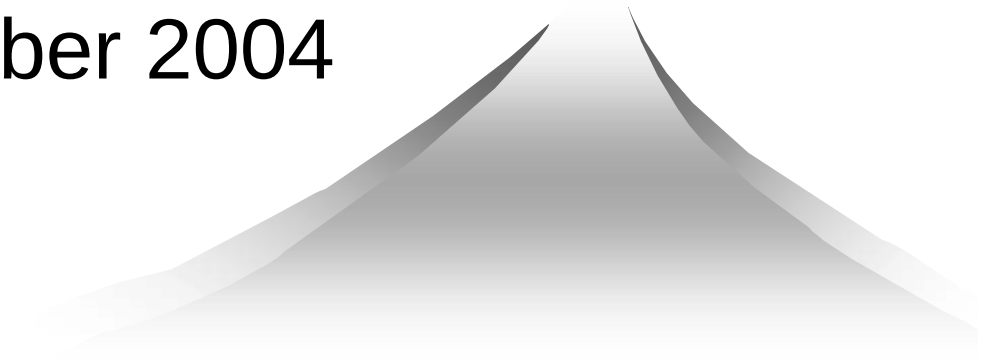
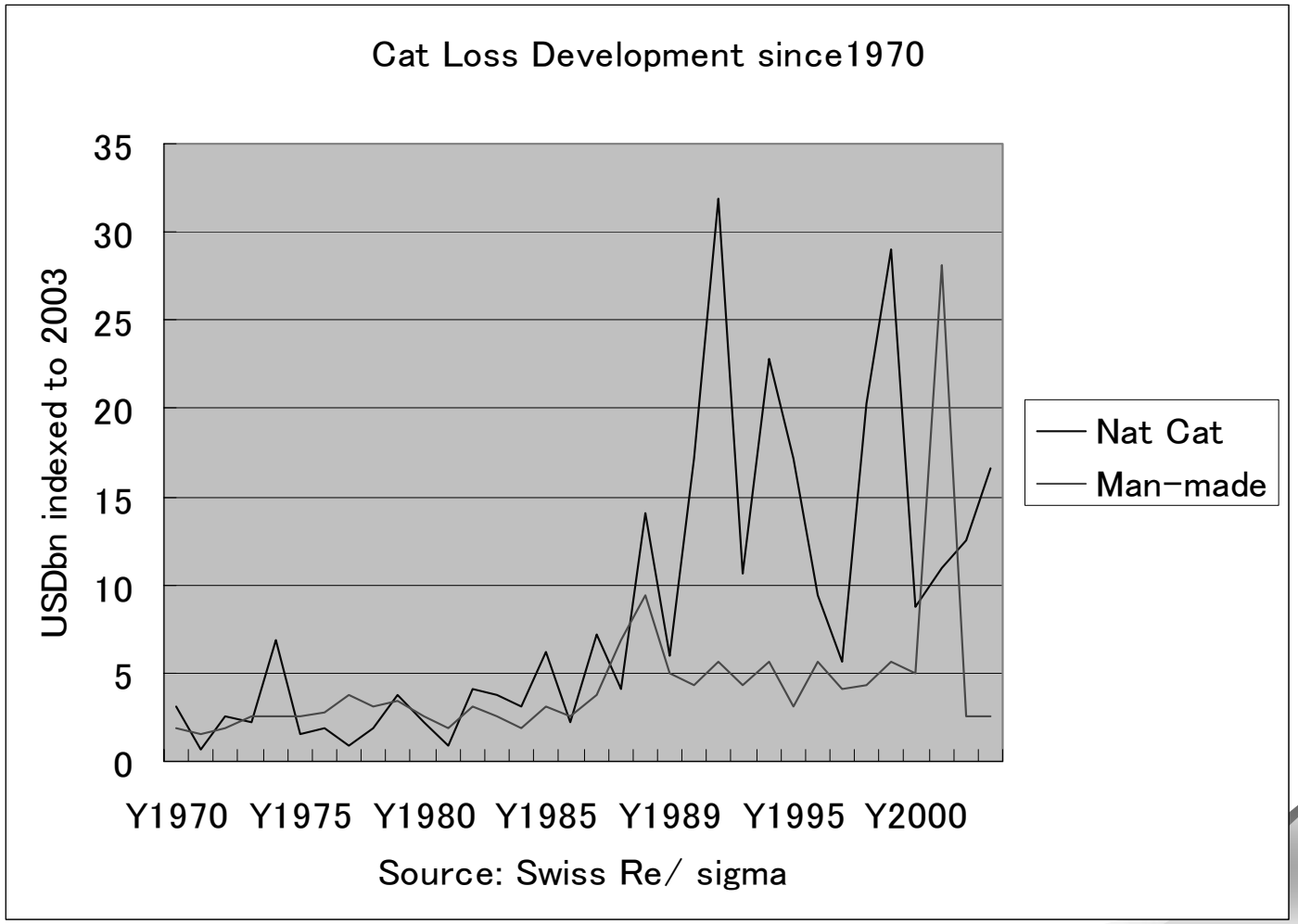


Agenda

1. Brief Introduction
2. Characteristics of Coverage for Natural Perils in Japan
3. How Natural Catastrophe Risks are managed by insurers
4. Supervisory Framework for Catastrophe Risks and Reinsurance

1.Brief Introduction

Trend for higher Catastrophe Losses



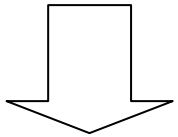
Top 30 Insured Losses 1970-2003

	Insured Loss (US$Million)	Victims	Date	Event	Country
1	21,062	3.025	11/9/2001	Terrorist Attack	US
2	20,900	43	23/8/1992	Hurricane Andrew	US, Bahamas
3	17,312	60	17/1/1994	Northridge Earthquake	US
4	7,598	51	27/9/1991	Typhoon Mireille	Japan
5	6,441	95	25/1/1990	Winterstorm Daria	France, UK
6	6,382	110	25/12/1999	Witerstorm Lothar	France, CH
7	6,203	71	15/9/1989	Hurricane Hugo	Puerto Rico, US
8	4,839	22	15/10/1987	Storm in Europe	France, UK
9	4,476	64	25/2/1990	Winterstorm Vivian	Europe
10	4,445	26	22/9/1999	Typhoon Bart	Japan
11	3,969	600	20/9/1998	Hurricane Georges	US, Caribbean
12	3,261	33	5/6/2001	Tropical Storm Allison	US
13	3,205	45	2/5/2003	Thunderstorms	US
14	3,100	167	6/7/1988	Explosion Piper Alpha	UK
15	2,973	6,425	17/1/1995	Great Hanshin EQ	Japan

	Insured Loss (US$Million)	Victims	Date	Event	Country
16	2,641	45	27/12/1999	Winterstorm Martin	France, Spain
17	2,597	70	10/9/1999	Hurricane Floyd	US
18	2,548	38	6/8/2002	Floods	Europe
19	2,526	59	1/10/1995	Huuricane Opal	US, Mexico
20	2,288	26	20/10/1991	Forest Fires	US
21	2,277	-	6/4/2001	Hail, Flood & Tornadoes	US
22	2,220	246	10/3/1993	Blizzard, Tornadoes	US, Mexico
23	2,090	4	11/9/1992	Hurricane Iniki	US, Pacific Ocean
24	1,959	23	23/10/1989	Explosion in a plant	US
25	1,899	-	29/8/1979	Hurricane Frederic	US
26	1,870	39	5/9/1996	Hurricane Fran	US
27	1,859	2000	18/9/1974	Tropical Cyclon Fiti	Honduras
28	1,827	100	4/7/1997	Floods	Poland et al
29	1,804	116	3/9/1995	Hurricane Luis	Caribbean Sea
30	1,707	6	27/4/2002	Storm	US

Source: Swiss Re / sigma

- Of 30 largest losses, 27 attributes to Natural Catastrophes.
- Of these 27 losses, 21 occurred in or after 1990.
- Some peak losses also occurred in Japan.



- The increasing trend of catastrophe losses in recent years is apparent, and Japan is not exceptional.
- The trend is a result of increasing insurance density, possibly combined with the global warming, though it is difficult to prove.

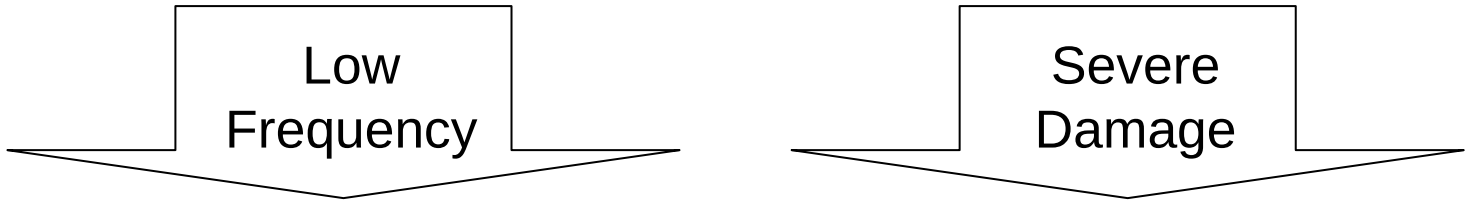
2. Characteristics of Coverage for Natural Perils in Japan

- Japan is prone to natural disasters due to its natural circumstances i.e. geographical location, weather etc., and we have the following.

  - Earthquake
  - Windstorm
  - Flood
  - Volcanic Eruption
  - Hailstorm
  - Heavy Snow etc.

(1) Earthquake Insurance in Japan

◻ Characteristic of Earthquake Risks



- ●The law of large numbers not applicable
- ●Less insurability

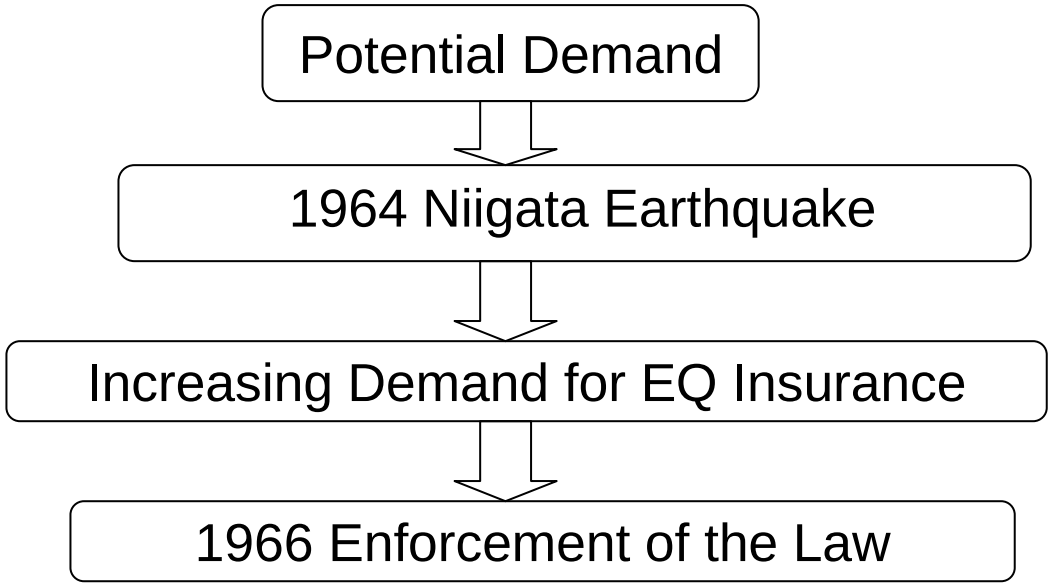
◻ Two types of Earthquake Insurance in Japan

(a)Residential Earthquake Ins. – Government Support

(b) Commercial Property EQ Ins. – Private Companies

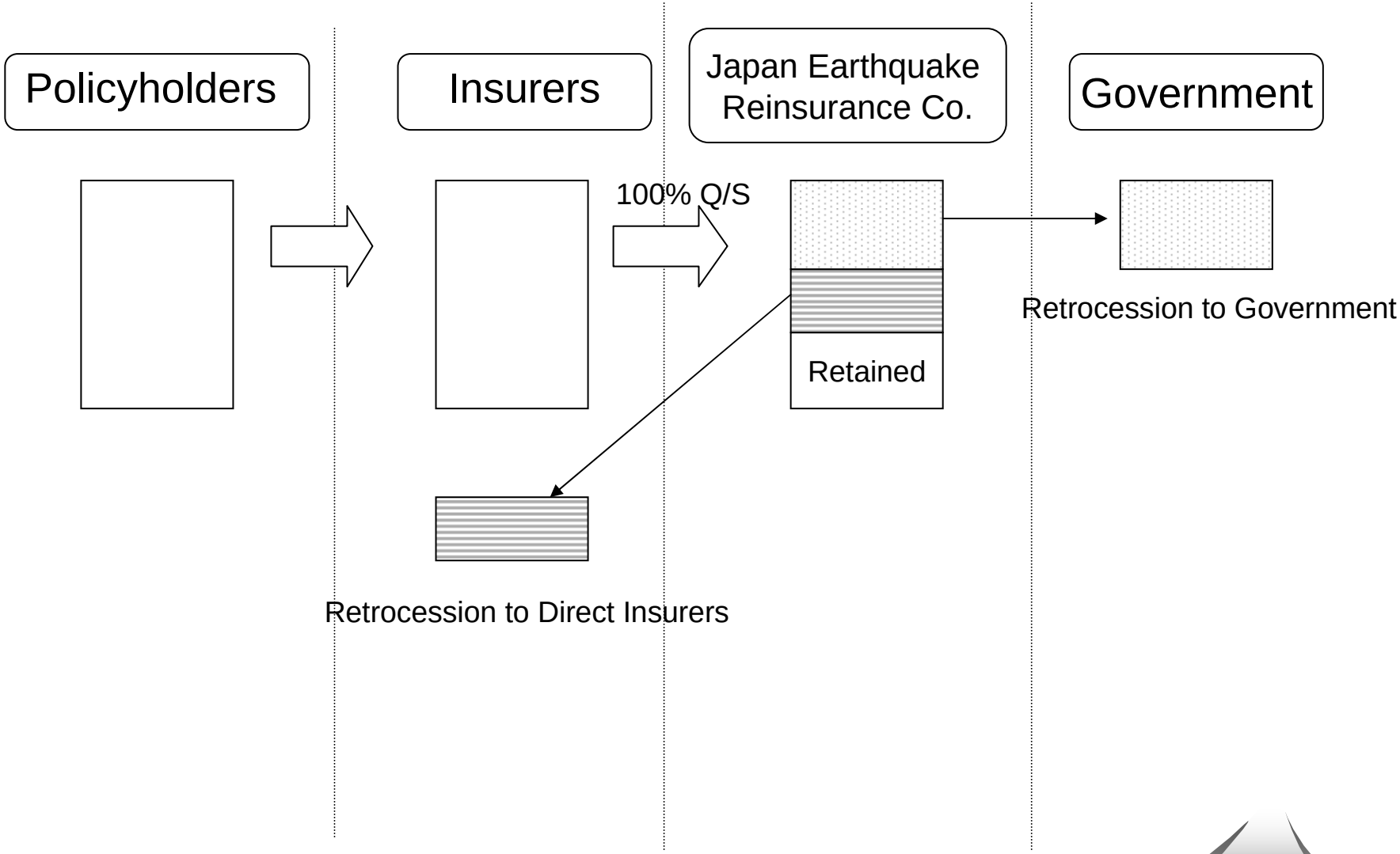
(a) Residential Earthquake Insurance

- This insurance program is managed based on “ The law concerning Earthquake Insurance”.
- The objective of the law is to provide wide distribution of Earthquake insurance through government support.

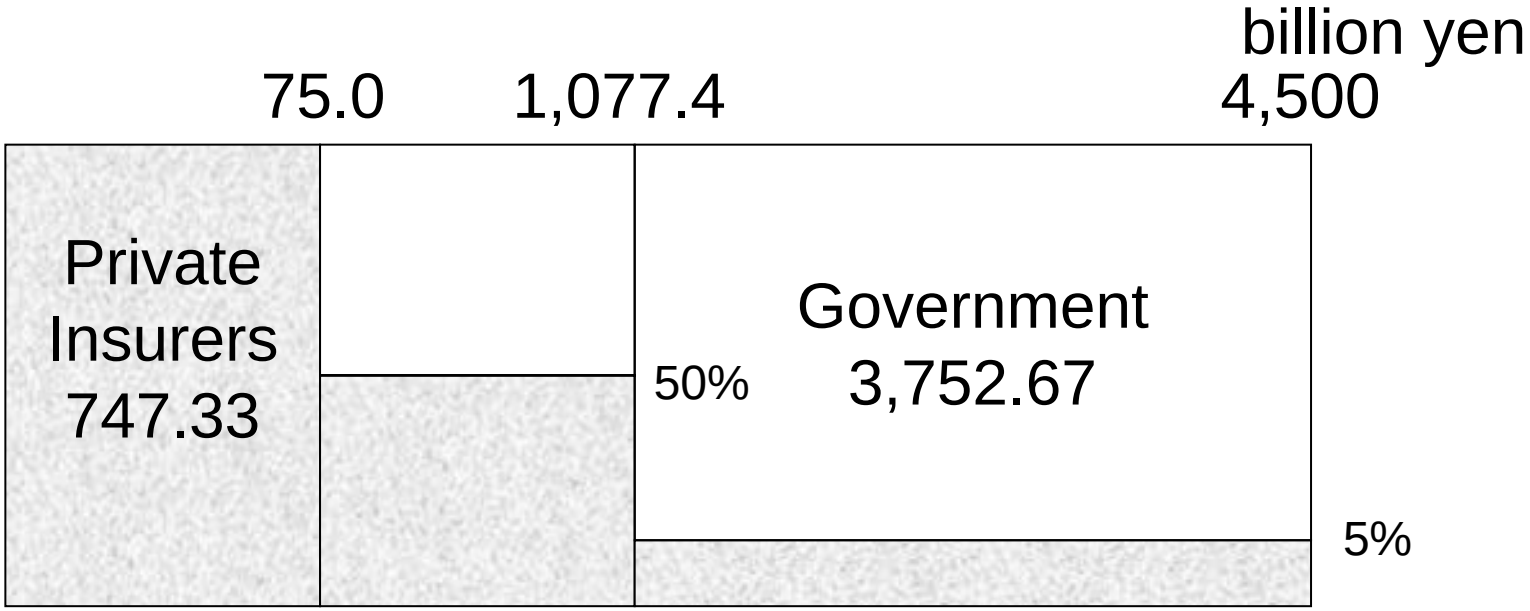


- Reinsurance is arranged automatically under a government budget-supported scheme.

● Reinsurance Flow of Residential Earthquake Insurance



- Reinsurance Scheme



(A) Up to 75 b yen----------Private insurers liable for 100%.
(B) Over 75b up to 1,077.4b----Government liable for 50%.
Private insurers liable for 50%.
(C) Over 1,077.4b up to 4,500b--Government liable for 95%.
Private insurers liable for 5%.

(b) Commercial Earthquake Insurance

- Insurance coverage for commercial and industrial earthquake risks in Japan was introduced in 1956.
- Earthquake cover is given by private insurance companies as an extension to the standard policy.
- No support by the government, and capacity depends on reinsurance.
- Careful control of the aggregates especially in concentrated area.

(2) Wind and Flood Coverage in Japan.

- Natural perils covered under standard property policy

Line	Type of Policy	Wind, Hail & Snow	Flood
Personal Lines	Homeowners' Fire Policy	○	×
	Houseowners' Comprehensive Fire Policy	○	△
Commercial & Industrial Lines	Commercial Fire Policy	○	×
	Commercial Comprehensive Fire Policy	○	△
	Industrial Fire Policy	○	×

Flood can be covered by Extension

○: Covered under Standard Wordings

△: Partially covered under Standard Wordings

×: Not covered

3.How Natural Catastrophe Risks are managed by insurers

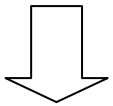
(1) Accumulation control

(a) Commercial Earthquake

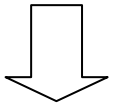
- Earthquake coverage is only given as an extension of the standard policy.
- The number of policies is limited.
- Control of accumulation is relatively easy.
- Accumulation per Zone is monitored and controlled in day to day underwriting.

(b) Wind /Flood

- Wind cover is basically provided in all fire policies.
- Flood cover is basically provided in all comprehensive fire policies.



-The number of policies is enormous.
-Daily monitoring and control of accumulation is rather difficult.

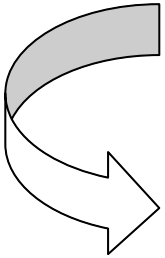


-To grasp and control actual accumulation is essential, but to arrive at more realistic and meaningful assessment of their financial risk involved, they need to use some other tools.

(2) Assessment of Maximum Possible Loss

(Traditional approach - "As if")
-To estimate MPL based on the past records.
-Applying past losses to the insured values that exist now.
-Good to know a single, simple, individual loss.

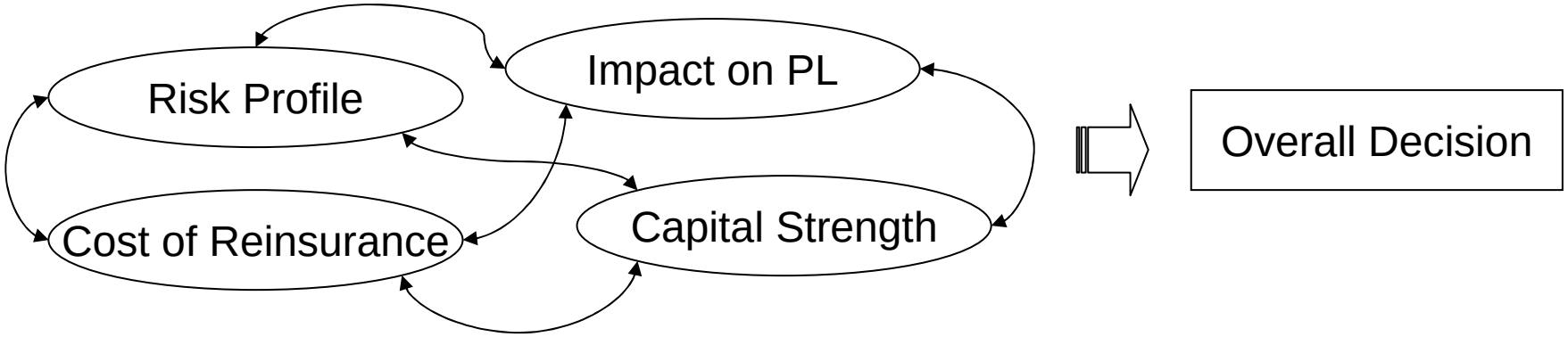
(Current approach – "Probabilistic")
-The computer simulation of all the possible losses that could happen within a long period of time.
-This type of model also makes it possible to understand the relationship between loss potential and occurrence frequency.



Insurers are increasingly using these models.
Some have in-house models. Some depend on professional companies.

(3) Fixing Retention Level

- The Factors in the decision



- Management is fully involved in the decision process, because how much they can/should retain those largest risks is one of the most significant issues.
- Some insurers have their own model for the simulation of their optimum retention.

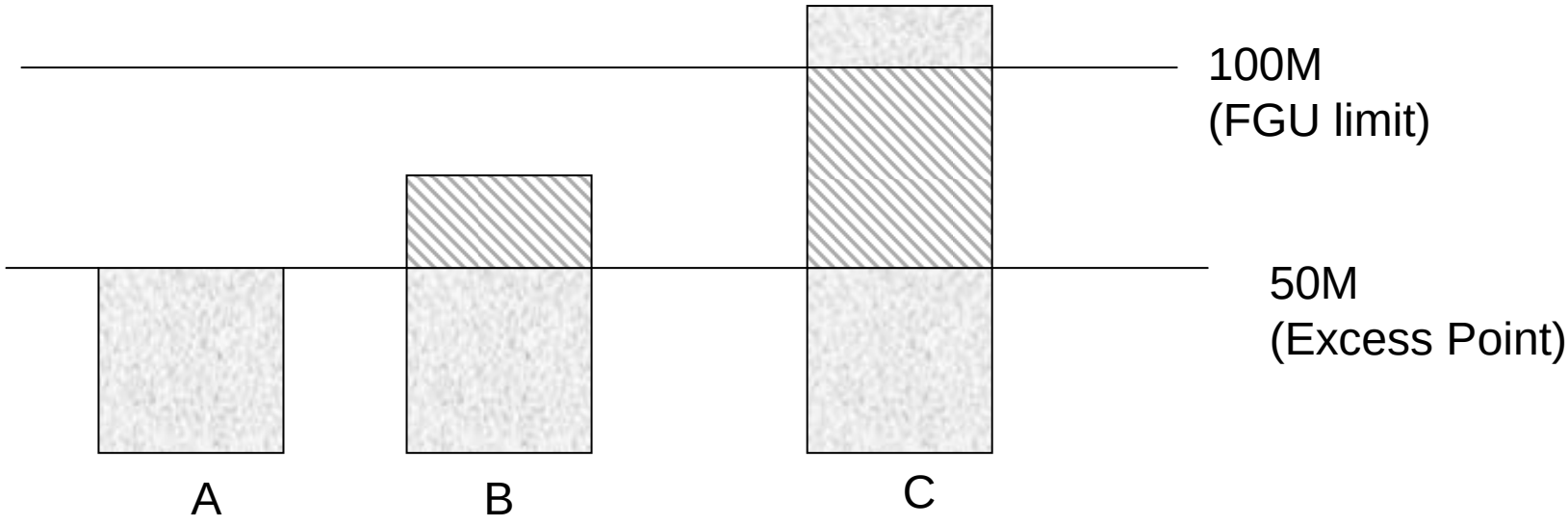
(4) Arrangement of Reinsurance

- The amount exceeding the retention is reinsured.

(a) How?

- Typical reinsurance arrangement is Catastrophe Excess of Loss Cover.
- This works for the accumulation of numerous individual losses *on any one event basis.*
- The reinsurer agrees to indemnify the insurer for the portion of the loss amount exceeding the agreed amount (retention).
- The covers are often divided into layers, and the price is determined by the loss potential of the layer.
- Reinsurers are increasingly using the model for the assessment of the exposure and the price.

- Catastrophe Excess of Loss cover.



- The loss in event A falls within 50million retention and no recovery.
- The amount exceeding 50million is borne by the reinsurer in event B.
- The loss in event C exceeds the upper limit. The reinsurer is liable to pay 50mio, and the remaining loss falls to the direct reinsurer.

(b) How much ?

- Insurers usually arrange the cover up to their Maximum Probable Loss estimated, and to know their exposure they utilize the model mentioned in (2).

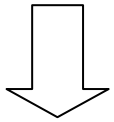
(example of the FGU limit)

Typhoon: The amount of loss with 50 year return period

Earthquake:The amount of loss with 250 year return period etc.

(c) To whom?

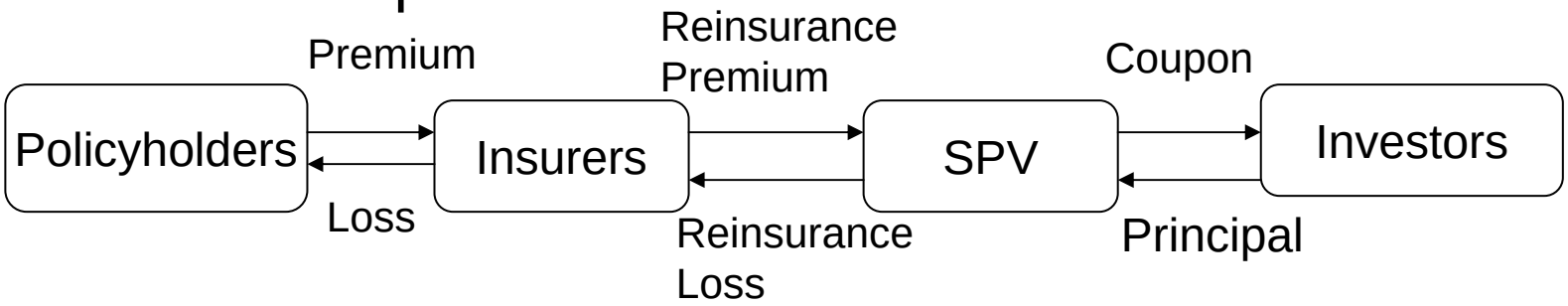
- Insurers need support from overseas reinsurers, and they need both large capacity and long term commitment.



- Each insurer has its own security check system to select quality reinsurers who can support its program on long term basis.

(5) Catastrophe Bond

- Reinsurance Capacity is limited, and approach to the Capital market is alternative.
- Basic concept



- Pros and Cons for insurers/investors
- Current status in Japan: Since Tokio Marine issued the 1st Cat Bond for their earthquake risks in 1997, several insurers have issued, but the overall presence of cat bonds is not significant at this stage.

4. Supervisory Framework for Catastrophe Risks and Reinsurance

(1) Strengthened review of Reinsurance

"Guidelines for reinsurance"

Key points made clear for insurers on their risk management through reinsurance.

(Reinsurance Strategy)

- Proper reinsurance strategy reflecting their risk profile to be approved *by the board of management.*

1) the limit of retention both for per risk and per event basis.

2) the security standard for their reinsurers.

3) the control over the concentration of reinsurers.

(Internal control system)

- To check the performance of the strategy.
- Statistical analysis of the results, reinsurance assets etc.

“Monitoring system”

- Whether insurers are following the above “Guidelines” is strictly checked by the onsite inspections by our inspection bureau.
- At the same time, we, at the supervisory bureau, conduct offsite monitoring periodically.

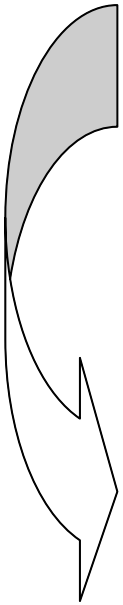
[Key points]
- review of their reinsurance strategy
- statistical analysis : reinsurance premium/claim recovery per class, per type
- risk based approach: amount of Gross PML and Net PML and their methodology to work them out
- security : the list of 5 largest reinsurers

Comparison among insurers of similar size and similar risk profile.

(2) Reserves

- On top of risk management through reinsurance, insurers need to have proper reserves for potential cat losses retained.

<1> Unearned Premium Reserves



Current method

- To set up reserves for unearned portion of the actual premium written.

This is OK if the premium is adequate, but if not, insurers need to set up reserves additionally.
The adequacy of premium on natural catastrophe risks especially draws our concern, because of the trend of longer term policies and competition in the market.

Requirement from 2005 accounts

- Insurers need to set up unearned premium adjusted, if necessary, for the large natural catastrophes losses with the return period of more than 30 years.
- For the purpose of the above, the appropriate fund (premium) for the potential natural catastrophes needs to be calculated with scientific approach.

<2>Catastrophe Reserves

- Nature of Natural Catastrophe Risks
  - Frequency is low and severity is high.
  - The law of large number does not work in short period of time.
- Unearned Premium Reserves are withdrawn, when the underlying original contracts expire. But insurers need to set up extra reserves which will look after the catastrophe losses of above nature.

Current Accounting Requirement

- Insurers are required to set up Catastrophe Reserves annually for future potential Catastrophe Losses, and the reserve is accumulated(basically not withdrawn until a large loss actually occurs).

- This is calculated based on the premium income(e.g. 3% or more of net premium income for fire business) etc.

Requirement from 2005 accounts

- Insurers are required to set up annual catastrophe reserve fund scientifically calculated for the potential large loss(instead of certain percentage of premium).

- If accumulated cat reserve of an insurer is not large enough for its loss with the return period of 70 years, the insurer is required to reach this level with planned manner.

<3>Quantification of Natural Cat Reserve

(Typhoon Simulation)

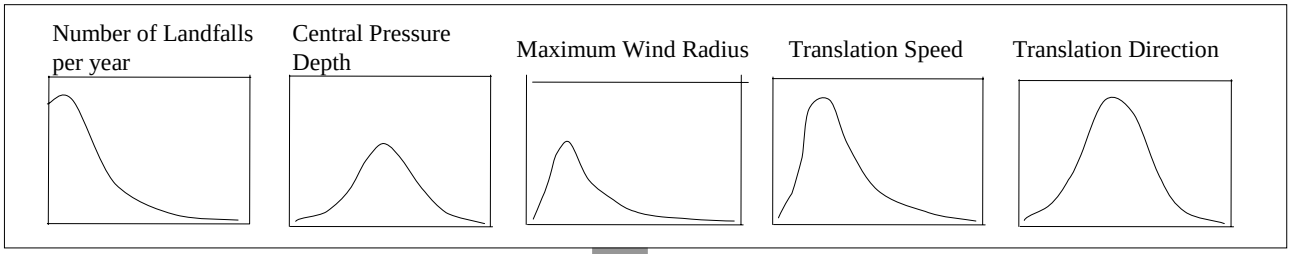
- In order to grasp the necessary amount of reserves mentioned above, we need to have the “Risk Curve” which shows the relation of probability(occurrence frequency) and damage(loss potential), and necessary premium (fund) for future possible losses.

- In order to accurately prepare the “Risk Curve”, we need to generate a large number of hypothetical typhoons by simulations based on the scientific research into the physical characteristics of typhoons.

Typhoon Simulation

Past Typhoon Data

Analysis is made to work out *Probability Distribution* of *Parameters* which represent the characteristics of Typhoons, based on the historical data and scientific research and theories.



Generating Random Numbers and applying them to these parameters

Generating Virtual Typhoons

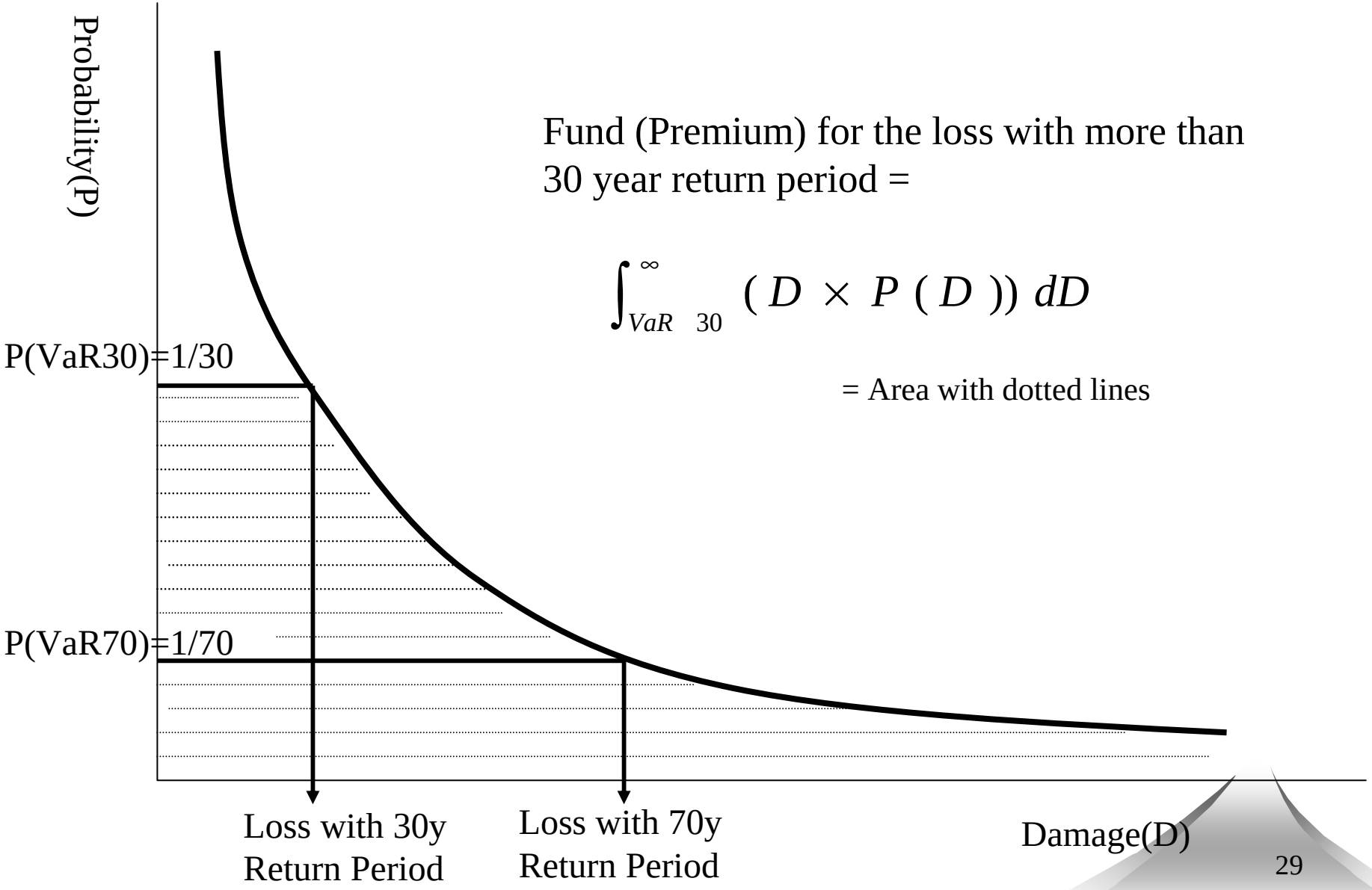
Damageability

Max Wind Speed

Estimated Typhoon Loss

10,000years

Risk Curve



Fund (Premium) for the loss with more than 30 year return period =

$$\int_{VaR_{30}}^{\infty} (D \times P(D))\, dD$$

= Area with dotted lines

(4) Regime of Solvency Margin for Cat risks

- Whether Catastrophe Risks retained by insurers are appropriate in relation to their margin of solvency is the most crucial concern in terms of the protection of policyholders.
- FSA keeps watchful eyes on the trend of SM ratio periodically, and takes early warning action if it falls below 200% based on the insurance business law.

$$\frac{SOLVENCY \quad MARGIN}{1/2 \times (\sqrt{A^2 + (B + C)^2} + D + E)}$$

A= Ordinary Insurance Risks

B= Interest Rate Risks

C= Asset Management Risks(incl. Credit risks on reinsurance recovery)

D= Catastrophe risks

E= Business Management Risks

□ Each of the above risk is calculated by the detailed formula and added together considering its correlation each other.

D= Catastrophe Risks

- Whichever is the higher , ***a)*** or ***b)***

a)= Estimated loss amount of the recurrence of Great Kanto Earthquake.

b)= Estimated loss amount of the recurrence of Typhoon Mireille

Calculation formulas for *a)* and *b)* are detailed per each class of business.

Adjustment to above b) is to be made:

- Typhoon Mireille produced the largest "*insured*" typhoon loss, but not large enough considering its return period of 40 years.

- We will require b) to be replaced by the typhoon with the return period of 70 years in line with our requirement for minimum Cat reserve.

Thank you!