Disaster Insurance Implementation and Financial Management Analysis

1. Background and Scope of Analysis

- In July, severe flooding occurred in the Cheongju and Incheon regions, followed by recent earthquakes and typhoon damages across the Korean Peninsula. These events have raised public concern over the potential occurrence of large-scale disasters.
- During the past ten years (2007–2016), the average annual amount of property damage caused by natural disasters was approximately **KRW 630.8 billion**, while the average annual restoration expenditure amounted to about **KRW 709.9 billion**.
  - In 2012, when a major typhoon struck, the total amounts of damage and restoration expenditures reached **KRW 1.0047 trillion** and **KRW 1.8938 trillion**, respectively.
- The increasing complexity and scale of disasters highlight the need to establish a **disaster management system with private participation**.
  - Such a system helps distribute disaster risk across society, thereby reducing the government's fiscal burden for recovery and encouraging autonomous disaster prevention awareness among private actors.
  - **Disaster insurance** serves as a representative policy instrument within this private participation–based disaster management system.
- Among disaster insurance programs that receive government financial support for premiums and administrative costs, the following were selected for analysis: **the Wind and Flood Insurance Program** managed by the Ministry of the Interior and Safety; **the Crop and Livestock Disaster Insurance Programs** managed by the Ministry of Agriculture, Food and Rural Affairs; and **the Aquaculture and Fishing Vessel/Seafarer Disaster Compensation Insurance Programs** managed by the Ministry of Oceans and Fisheries. (Hereafter collectively referred to as "**disaster policy insurance**.")
  - Among these, the Wind and Flood Insurance, Crop Disaster Insurance, and Aquaculture Disaster Insurance programs operate a **national reinsurance scheme**, under which the government covers a portion of losses incurred each fiscal year when pre-specified conditions are met, in addition to providing fiscal support for insurance premiums and administrative costs.

2. Major Fiscal Programs and Budget Status

- The disaster policy insurance programs supported as private subsidy fiscal projects include: the **Wind and Flood Insurance Program** under the Ministry of the Interior and Safety; the **Agricultural Disaster Insurance Program** (including crop and livestock disaster insurance) under the Ministry of Agriculture, Food and Rural Affairs; the **Fisheries Disaster Insurance Program** (including aquaculture disaster insurance) under the Ministry of Oceans and Fisheries; and the **Fishing**

Vessel and Seafarer Insurance Programs (fishing vessel insurance and seafarer insurance).

- The total initial budget for these fiscal programs in 2017 was **KRW 438.8 billion**, a **46.2%** increase compared with the 2013 initial budget of **KRW 300.2 billion**.
  - Among them, the **Fishing Vessel and Seafarer Insurance Programs** recorded the lowest growth rate at **35.1%** (2013–2017), while the **Fisheries Disaster Insurance Program** showed the highest increase at **263.7%**.

Table 1: Budget Status of Disaster Policy Insurance Programs (Unit: million KRW)

Program	2013	2014	2015	2016	2017	2018 (Draft)
Wind and Flood Insurance	12,966	14,241	19,505	21,430	19,287	17,357
Agricultural Disaster Insurance	201,591	270,110	285,349	286,885	286,995	303,110
Fisheries Disaster Insurance	7,371	14,484	19,174	22,200	26,812	32,800
Fishing Vessel & Seafarer Insurance	78,222	77,523	94,016	112,650	105,663	113,260
Total	**300,150**	**376,358**	**418,044**	**443,165**	**438,757**	**466,527**

Source: Compiled from the initial budgets for each fiscal year (2013–2018).
Note: 2018, operating expenses for crop disaster insurance have been listed as a separate sub-program (1031–301). For comparison, these amounts are included in the Agricultural Disaster Insurance totals.

- Meanwhile, the **Agricultural and Fishery Disaster Reinsurance Fund** operates a national reinsurance scheme to protect insurance providers from the risk of catastrophic disasters; the **2018 operational plan** was **KRW 330.5 billion**.
  - As of 2016, the cumulative reinsurance payments from the fund amounted to **KRW 365.3 billion**, compared with cumulative reinsurance premium income of **KRW 113.1 billion**, implying a fiscal loss of approximately **KRW 252.2 billion**.

Table 2: Disaster Reinsurance Fund Management (Unit: million KRW)

Category	2005–2011	2012	2013	2014	2015	2016	Total
Funding							
Government contributions	137,800	120,500	50,000	35,000	36,540	8,587	388,427
Reinsurance premium income	27,854	8,157	12,206	14,223	24,627	26,040	113,107
Interest income, etc.	29,896	8,504	1,580	2,285	2,326	3,063	47,654
Recovered idle funds	507,173	164,507	8,549	48,850	96,619	155,072	980,770
Subtotal	**702,723**	**301,668**	**72,335**	**100,358**	**160,112**	**192,762**	**1,529,958**
Utilization							
Reinsurance payments	27,604	292,468	22,851	3,088	4,391	14,939	365,341
Fund management costs	3,439	651	634	651	648	662	6,685
Idle fund operations	671,680	8,549	48,850	96,619	155,073	177,161	1,157,932
Subtotal	**702,723**	**301,668**	**72,335**	**100,358**	**160,112**	**192,762**	**1,529,958**

Source: Annual statements of the Agricultural and Fishery Disaster Reinsurance Fund. Figures reflect cumulative flows by year; "Subtotal" is the sum across items.

  - Insurance companies (e.g., NongHyup Property & Casualty, Suhyup) conclude additional private reinsurance contracts—after enrolling in the national reinsurance scheme—to transfer part of the residual risk to private reinsurers (e.g., Korean Re).

- Between 2011 and 2016, the amounts of insurance payments made to policyholders by

each disaster policy insurance program are as follows. In particular, due to typhoon damage in 2012 (Bolaven, Tembin), **KRW 715.3 billion** was paid to policyholders.

Table 3: Insurance Payouts by Program, 2011–2016 (Unit: million KRW)

Program	2011	2012	2013	2014	2015	2016
Wind and Flood Insurance	3,243	18,930	3,808	5,581	3,217	12,199
Crop Disaster Insurance	132,628	490,978	45,088	144,978	52,851	111,464
Livestock Disaster Insurance	48,082	69,039	65,742	69,330	88,472	125,394
Aquaculture Disaster Insurance	2,735	36,383	20,916	17,909	14,135	66,367
Fishing Vessel Insurance	44,849	45,386	52,348	65,972	69,305	76,098
Seafarer Insurance	46,669	54,573	57,910	55,756	59,161	69,986
Total	**278,206**	**715,289**	**245,812**	**359,526**	**287,141**	**461,508**

Source: Administrative data on disaster policy insurance payouts (2011–2016). The spike in 2012 reflects typhoon damages (Bolaven, Tembin).

3. Overseas Case Studies

- **Overseas examples highlight the following implications for designing disaster insurance programs:**
  - Premiums and reinsurance rates should reflect actual risk.
  - Government intervention requires careful justification.
  - Create conditions for sustainable private participation and profits.

Table 4: International Case Studies on Disaster Policy Insurance: Overview and Features

Country / Institution	Establishment / Context	Key Features
United States: California Earthquake Authority (CEA)	Established to provide earthquake insurance after the 1994 Northridge earthquake.	Sets earthquake insurance premiums and undertakes insurance risk; is obligated to set premiums with actuarial soundness; compensation for earthquake damage is not unlimited liability.
France: State Reinsurer (CCR)	Private insurers are required to include a natural-disaster coverage rider in standard fire insurance products.	The state-owned reinsurer provides reinsurance for natural-disaster insurance sold by private insurers; for reinsurance risks, an unlimited state guarantee is ultimately provided.
Netherlands: Terrorism Reinsurance Pool (NHT)	Established to ensure the smooth supply of terrorism insurance after the 9/11 attacks.	A terrorism reinsurance pool involving domestic insurers, the government, and foreign reinsurers; at inception, government-guaranteed segments applied lower premiums in lower guarantee bands.

- **Premiums and reinsurance premiums that reflect actual risk**
  - In the United States, the **CEA (California Earthquake Authority)** must set premium rates based on actuarial soundness under the California Insurance Code, so that rates are not excessively high, inappropriate, or unfairly discriminatory.
  - If premium rates are not differentiated according to risk, inefficiencies such as **adverse selection** and **moral hazard** may arise. In insurance operations, adverse selection refers to the phenomenon in which, due to insurers' insufficient information about policyholders' accident risk, insurers are more likely to contract with high-risk policyholders; moral hazard refers to the phenomenon in

which, after purchasing insurance, policyholders exploit information asymmetry and engage in behaviors undesirable from the insurer's perspective (e.g., weak risk management).

- **Careful consideration of the need for government intervention in insurance markets**
  - The **TRIA (Terrorism Risk Insurance Act)** enacted in the United States after the 9/11 attacks recognized the need for government intervention because a vacuum emerged in the market as insurers drastically reduced the supply of terrorism insurance at the time of the attacks.
  - By contrast, for the **CEA** established after the 1994 Northridge earthquake, the need for intervention was unclear because private insurers were already providing coverage for earthquake damage at that time.
- **Creating an environment in which the private sector can pursue appropriate profits**
  - In the case of the Netherlands' terrorism reinsurance pool (**NHT**), the government's reinsurance premium in lower guarantee bands was kept higher than in higher guarantee bands, thereby inducing private reinsurers to actively supply reinsurance in the lower bands by competing with the government reinsurance premium.
  - In contrast, in France, the state reinsurer (**CCR**)—through reinsurance contracts with primary insurers—allows insurers to obtain the benefit of an unlimited government guarantee against disaster risk at a relatively low price, thereby limiting the participation of private reinsurers in the reinsurance market.

4. Key Finding by Key Issue Area

4.1. Appropriateness of Premium-Rate Structures in Disaster Policy Insurance

- **Compliance with statutory premium-rate calculation**
  - Article 11 of the *Wind and Flood Insurance Act* stipulates that premium rates shall be calculated by reflecting the frequency of damage for each insured object and the degree of risk indicated on the Wind and Flood Insurance Management Map.
  - However, the Management Map had not been provided as of 2017 and was scheduled for completion in April 2018, while the discount and surcharge system reflecting the frequency of damage for each insured object remained absent.
- **Appropriateness of operating discount/surcharge schedules**
  - Premium rates can be divided into **experience-rated** components (reflecting a policyholder's loss history) and **performance-rated** components (reflecting the physical characteristics and performance of the insured object). Balanced application of experience and performance rating is important to reflect actual disaster risk.
  - The **Livestock Disaster Insurance** and **Fishing Vessel/Seafarer Insurance** have relatively weak performance-based discount/surcharge systems.

  - By contrast, the **Crop Disaster Insurance** operates a performance-based schedule that provides discounts/surcharges by (i) presence of disaster-prevention facilities, (ii) crop variety, and (iii) eco-friendly cultivation (surcharge).
  - In **Crop** and **Aquaculture Disaster Insurance**, only **17%** and **37%**, respectively, of the *additional* premium burden from surcharges in 2016 (i.e., surcharge applied to the basic premium) was borne by policyholders after excluding the government subsidy portion. This reduces the effectiveness of the surcharge system intended to prevent **adverse selection** and **moral hazard**.

- **Consider differentiated fiscal support for vulnerable groups**
  - **Logistic regression based on 2016 Statistics Korea's Farm and Fishery Household Economy Survey** indicates that smaller business scale is associated with a lower likelihood of purchasing agricultural or fishery insurance.

Table 5: Logit Estimates: Determinants of Agricultural Insurance Take-Ups

	Model 1		**Model 2**		**Model 3**	
Dependent variable	Insurance take-up (1 = insured)					
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Age	−0.066***	0.008	−0.067***	0.008	—	—
Education						
Below high school (=1)	−0.098	0.150	—	—	—	—
Farm size						
<1ha (=1)	−1.379***	0.204	−1.376***	0.204	—	—
1–3 ha (=1)	−0.777***	0.202	−0.780***	0.202	—	—
Farming type						
Paddy-rice farm (=1)	−0.396	0.251	−0.398	0.252	−0.630**	0.253
Livestock farm (=1)	0.810***	0.239	0.797***	0.237	0.804***	0.238
Household head gender						
Female (=1)	−1.120***	0.271	−1.141***	0.269	−1.154***	0.242
Farm income (million KRW)	0.001	0.002	0.001	0.002	0.011***	0.003
Interaction: income × paddy-rice	0.009	0.008	0.009	0.008	0.022**	0.009
Net assets (million KRW)	0.000	0.000	—	—	—	—
Constant	5.878***	0.574	5.930***	0.567	−0.080	0.108
Observations	2,342 households					

Notes: Explanatory variables were added or excluded across models to address potential collinearity between age and education, and between farm size and farm income. Households with two or more household heads were excluded. Standard errors are shown in the S.E. columns. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Missing entries indicate that the variable was not included in the corresponding model.

Table 6: Logit Estimates: Determinants of Aquacutural Insurance Take-Ups

	Model 1		**Model 2**	
Dependent variable	Insurance take-up (= 1)			
Variable	Coef.	S.E.	Coef.	S.E.
Age	−0.045**	0.023	−0.037	0.023
Below high school (= 1)	−0.357	0.365	−0.331	0.364
Aquaculture expenditure (million KRW)	0.006*	0.003	—	—
Aquaculture income (million KRW)	—	—	0.005***	0.002
Net assets (million KRW)	−0.000	0.000	−0.000	0.001
Constant	2.543*	1.376	1.942	1.394
Observations	313 households			

Notes: Households with two or more household heads were excluded. Standard errors are shown in the S.E. columns. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

  - Nonetheless, **Crop, Livestock, and Aquaculture Disaster Insurance** do not, in practice, differentiate subsidy rates for vulnerable groups.
  - By contrast, the **Wind and Flood Insurance** applies higher national subsidies to the near-poor and recipients of the National Basic Livelihood Security program, and the **Fishing Vessel/Seafarer Insurance** applies higher subsidy rates for vessels under 10 tons.

- **Accordingly, the following improvements are needed:**
  - **Wind and Flood Insurance:** Advance the Wind and Flood Insurance Management Map project with rigor, and introduce a discount/surcharge scheme that reflects each insured object's *past loss history.*
  - **Across disaster policy insurance:** Strengthen and institutionalize *performance/based* discount/surcharge schedules.
  - **Crop/Livestock and Aquaculture Disaster Insurance:** Consider *raising premium subsidy rates* for low/income farm and fishery households, and incorporate the *insurance take/up rate of vulnerable groups* as a performance indicator for separate monitoring and management.

4.2. Validity of Risk-Sharing Structures in Disaster Policy Insurance Programs

- **Government operation of national reinsurance to support stable private insurance operations**
  - By funding source, national reinsurance takes (i) a **fund-based scheme**—provided for **Crop** and **Aquaculture Disaster Insurance** through the Agricultural and Fishery Disaster Reinsurance Fund—and (ii) a **reserve-based scheme**—as in **Wind and Flood Insurance**, which uses insurers' *loss-compensation reserves* as the funding source.
  - The fund-based scheme is further divided into (i) an **excess-loss** model that covers losses above normal levels and (ii) a **profit-sharing** model in which the government and insurers share the program's gains and losses.

4.2.1. Simulation Results on Fiscal Losses under National Reinsurance

- The simulation-based analysis of the reinsurance fund's fiscal requirements relies on Monte Carlo simulation that generates loss-ratio random draws by fitting multiple probability distributions to historical observations of loss ratios.
  - Prior to conducting the simulation, it should be noted that the available loss-ratio observations for **crop** and **aquaculture** disaster insurance are not sufficiently large to allow rigorous distribution fitting and simulation with high precision.
  - Accordingly, rather than identifying a single distribution with the best goodness-of-fit, this report focuses on observing how the estimated fiscal requirements of national reinsurance vary across different candidate distributions.
- The simulation procedure consists of the following three steps:
  - **Step 1 (Distribution fitting).** Historical loss-ratio data are fitted to (i) two versions of the **exponential** distribution—one with the lower bound of the support fixed at zero (the standard case) and another with the lower bound not fixed (unconstrained)—and to a **mixture gamma** distribution.
    - ▷ Because disaster-related damage and loss-ratio data may combine multiple groups of events, *multimodality* can arise, and there is a strong possibility of a *heavy tail*. Therefore, in addition to the unconstrained exponential distribution primarily used in the commissioned study by the Agricultural Policy Insurance & Finance Service, this report also employs a mixture gamma distribution, which can better capture multimodality and heavy-tail behavior, as a complementary specification. (The mixture gamma distribution is used as defined in the original report.)
  - **Step 2 (Random draws).** For each candidate distribution, **5,000** random loss ratios are generated using the parameters estimated from Step 1.
  - **Step 3 (Rate calculation).** For each draw, the corresponding **national reinsurance payout** is computed; the average payout across draws is then divided by **2017 premium income** to obtain the **appropriate reinsurance rate**.
- Below are historical premium income and loss ratios for Crop and Aquaculture Disaster Insurance (2001–2016).
- **The results of fitting the crop disaster insurance loss ratios by risk band and pilot programs to the exponential and mixture-gamma distributions are shown in the following graphical illustration.**
  - Excluding the **low-risk group**, the fitted results for the **high-risk**, **mid-risk**, and **pilot program** groups indicate that the **mixture-gamma distribution** captures *multimodality* and *heavy-tail* characteristics more effectively than the **exponential distribution**. This is consistent with prior findings: Venturini *et al.* (2008) report that mixture-gamma models are effective for estimating *tail probabilities* of heavy-tailed data relative to alternatives (e.g., lognormal, nonparametric methods), and Evin *et al.* (2011) note that finite mixtures (e.g., of gamma and normal components) can handle multimodality, tail behavior, and heterogeneity in observations.

Table 7: Historical Premium Income and Loss Ratios, 2001–2016 (Unit: million KRW; loss ratio in %)

Year	Crop (Premium; LR)	Aquaculture High-risk (Premium; LR)	Aquaculture Mid-risk (Premium; LR)	Aquaculture Low-risk (Premium; LR)	Pilot (Premium; LR)
2001	–	3,016 (46%)	–	–	–
2002	–	6,982 (469%)	623 (252%)	402 (126%)	–
2003	–	16,367 (276%)	534 (823%)	301 (138%)	–
2004	–	29,309 (45%)	2,200 (2%)	633 (47%)	–
2005	–	50,032 (46%)	4,172 (16%)	643 (70%)	–
2006	–	52,506 (39%)	4,547 (9%)	574 (51%)	–
2007	–	50,625 (121%)	4,477 (7%)	569 (173%)	–
2008	97 (46%)	51,226 (47%)	3,411 (9%)	687 (47%)	126 (25%)
2009	60 (103%)	54,928 (108%)	6,692 (127%)	841 (54%)	461 (10%)
2010	95 (283%)	73,579 (130%)	9,605 (150%)	3,034 (287%)	796 (179%)
2011	179 (177%)	88,019 (111%)	19,572 (96%)	3,175 (182%)	1,439 (260%)
2012	258 (228%)	104,239 (376%)	28,973 (307%)	3,621 (317%)	2,771 (1,581%)
2013	94 (110%)	142,202 (17%)	59,492 (6%)	4,372 (50%)	9,780 (125%)
2014	25 (52%)	143,404 (96%)	67,230 (14%)	5,841 (111%)	16,204 (124%)
2015	87 (94%)	164,085 (18%)	105,427 (21%)	17,734 (69%)	21,670 (101%)
2016	118 (332%)	153,699 (17%)	151,109 (33%)	19,169 (-)	24,273 (385%)
Total	**1,012 (184%)**	**1,184,218 (91%)**	**468,064 (48%)**	**61,596 (82%)**	**77,521 (254%)**

Notes: (1) The items belonging to each risk band (high/mid/low) and the pilot group, as well as their loss ratios, may vary depending on the time of compilation. (2) Aquaculture disaster insurance payouts include the outstanding claims reserve (OS).
Sources: Crop disaster insurance data from NongHyup Property & Casualty; aquaculture disaster insurance data from the Agricultural Policy Insurance & Finance Service. Compiled by the National Assembly Budget Office as of December 31, 2016 (UY basis).

- Given that disaster-insurance loss-ratio datasets are not sufficiently large to permit highly rigorous distribution fitting, this report focuses not on selecting a single "best-fitting" distribution but on **examining how the fiscal needs of national reinsurance vary across alternative distributions**.
- In short, relative to the exponential, the **mixture-gamma distribution assigns higher probability to losses arising from large-scale disasters**.
- Consequently, simulation results based on the mixture-gamma specification yield a **more conservative assessment of the fiscal soundness of national reinsurance**.

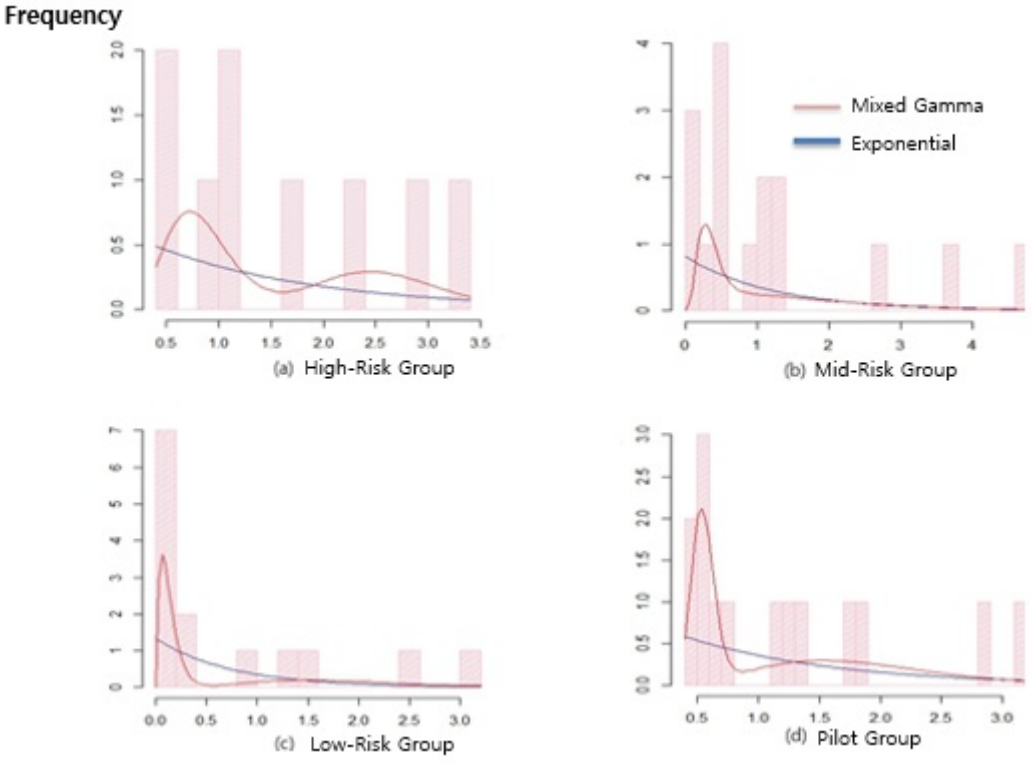

Figure 1: Fitted Distributions of Historical Loss Ratios by Risk Band

- The appropriate national reinsurance rates for the crop disaster insurance, by fitted distribution and risk band, are as follows.

Table 8: Appropriate National Reinsurance Rates by Fitted Distribution (Crop Disaster Insurance, 2016 Premium Base)*(Unit: million KRW; rates in %)*

Risk band (2016 premium)	Exponential	Exponential (unconstrained)	Mixture gamma
High-risk (118)	61.5	39.6	47.0
Mid-risk (153,699)	31.2	24.4	37.1
Low-risk (151,109)	6.3 (28.6)	6.0 (27.1)	11.9 (54.6)
Pilot program (19,169)	34.8	16.0	23.0

Note: For the low-risk band, results that include extreme observations are shown in parentheses.

- Based on the above simulation results, the average annual fiscal loss under the current excess-loss national reinsurance for crop disaster insurance is estimated as follows.
  - Estimates are shown for the *experience loss-ratio* approach and for simulation under *exponential (unconstrained)* and *mixture-gamma* specifications.

Table 9: Average Annual Fiscal Loss under Excess-Loss National Reinsurance (Crop) *(Assuming full application; Unit: million KRW)*

Risk band	Premium (2016)	Experience method	Simulation: Exp. (unconstr.)	Simulation: Mixture gamma
High-risk	118	-56	-34	-43
Mid-risk	153,699	-19,243	-23,086	-42,605
Low-risk	151,109	-4,835	-756	-9,671
Pilot program	19,169	-2,770	-1,198	-2,540
Total	**324,095**	**-26,904**	**-25,074**	**-54,859**

Note: Negative values denote expected fiscal losses (payouts exceeding inflows) under the excess-loss national reinsurance scheme.

  - Under the simulation approach, the range of average annual fiscal losses spans **KRW 25.074–54.859 billion**.
  - If the excess-loss scheme applies to **70%** of the portfolio as in 2017, the corresponding range is **KRW 17.552–38.401 billion**.

- Applying the same simulation framework to **Aquaculture Disaster Insurance**, the estimated average annual fiscal loss under the current excess-loss national reinsurance is as follows.
  - Estimates are reported for the *experience loss-ratio* approach and for simulation under *exponential (unconstrained)* and *mixture-gamma* specifications.

Table 10: Estimated Average Annual Fiscal Loss under Excess-Loss National Reinsurance (Aquaculture)
(2016 premium base; Unit: million KRW)

Program	Premium (2016)	Experience method	Simulation: Exp. (unconstr.)	Simulation: Mixture gamma
Aquaculture Disaster Insurance	24,273	-38,934	-28,861	-47,988

Note: Negative values denote expected fiscal losses (payouts exceeding inflows) under the excess-loss national reinsurance scheme.

- **For excess/loss national reinsurance financed via the Reinsurance Fund, two questions require review:** (i) whether it is necessary to maintain a *de facto fiscal subsidy* through national reinsurance, and (ii) if so, whether the funding source should be the *Reinsurance Fund* rather than the *general or special accounts*.
  - **Crop Disaster Insurance.** As the cumulative loss ratio of the primary insurance business has been stabilizing, the necessity of continuing national reinsurance that subsidizes insurers should be **carefully reexamined**.
  - **Aquaculture Disaster Insurance.** As of end/2016, cumulative claims reached **205%** of cumulative premium income, which **supports the case for fiscal subsidy**. However, because there is insufficient basis to link such support to reinsurance premium inflows, financing should **preferably be pursued through the general or special accounts**, rather than via the Reinsurance Fund.

4.2.2. Transition to Profit-Sharing National Reinsurance

- **Exercise caution in introducing and expanding the profit/sharing model of national reinsurance.**
  - The Ministry of Agriculture, Food and Rural Affairs intends to reduce reinsurance fiscal losses by changing the **Crop Disaster Insurance** national reinsurance scheme from the current **excess/loss model** to a **profit/sharing model**.
    - ▷ In **2017**, the profit/sharing model would apply to **30%** of total volume; in **2018**, to **50%**.
  - Under the profit/sharing model, the distribution of the government's loss (or return) rate is **more widely dispersed** than that of private insurers, implying that a substantial portion of disaster risk is **shifted to the state**, as illustrated below.

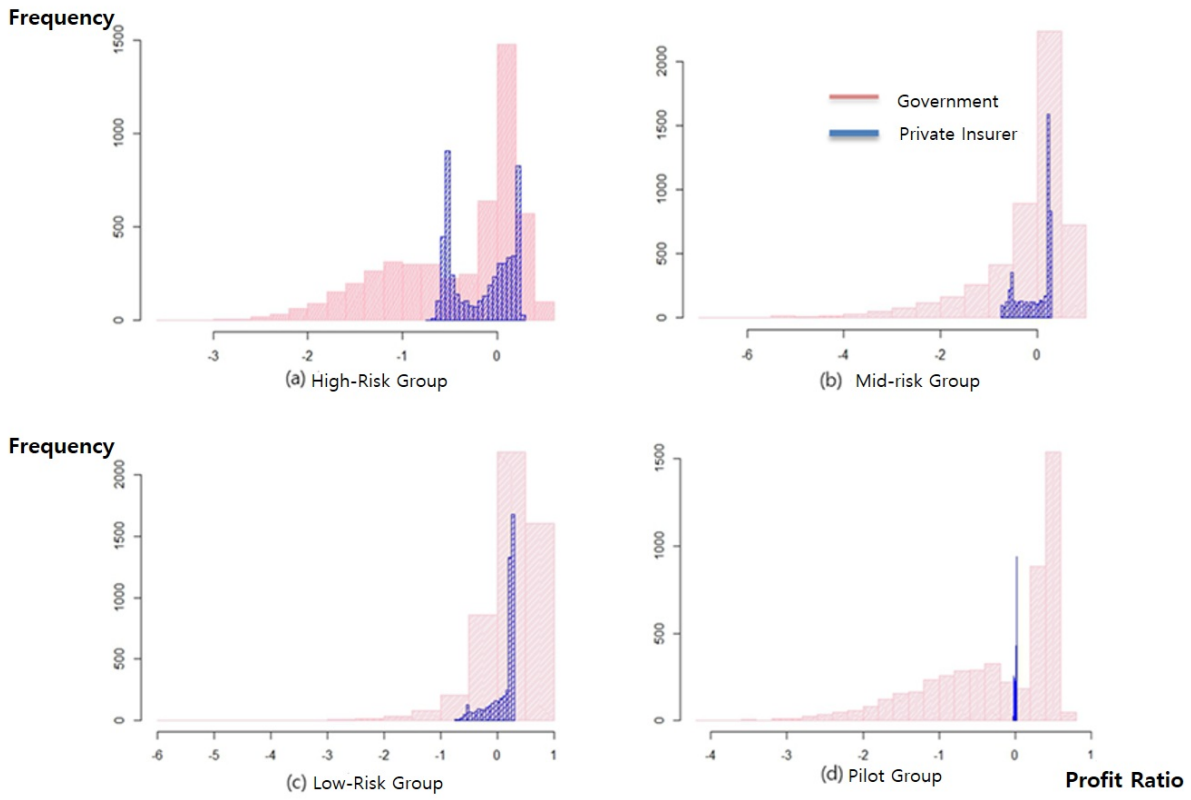

Figure 2: Sample Distributions of Government vs. Insurer Return Rates under Profit/Sharing

- The **2017 asset/management plan** for the Agricultural and Fishery Disaster Reinsurance Fund did **not account** for changes in required liquidity arising from the partial adoption of profit sharing (**30% in 2017**) when estimating appropriate liquidity.
- **Taken together, if the national reinsurance scheme is shifted to a profit/sharing model, safeguards are needed against potentially higher fiscal risks borne by the state.**
  - The Ministry of Agriculture, Food and Rural Affairs plans to expand the application ratio of the profit/sharing model from **30% in 2017** and **50% in 2018** to **eventually 100%**.

4.2.3. Potential Rent-Seeking from Excessive Ceding Practices

- This subsection reviews private reinsurance cessions and retention patterns across three groupings:
  - Type 1 (no national reinsurance): **Livestock Disaster Insurance** and **Fishing Vessel/Seafarer Accident Compensation Insurance**;
  - Type 2 (with excess/loss national reinsurance): **Wind and Flood Insurance** and **Aquaculture Disaster Insurance**;
  - Type 3 (mixed private proportional + private excess/loss with national reinsurance): **Crop Disaster Insurance**.
- While Type 1 programs show *moderate-to-high net retention* at the primary level and

reasonable retrocession by Korean Re, Type 2 programs exhibit *very low primary net retention (about 10%)* and *high Korean Re retrocession*, potentially weakening incentives for active risk management at the primary layer and raising concerns about **rent/seeking via excessive ceding**.

Table 11: Type 1 (No National Reinsurance): Private Reinsurance Snapshot, 2016
(Unit: million KRW)

Program	Primary written premium	Primary ceded premium	Primary net retention	Korean Re inward (from primary)	Korean Re retrocession rate
Livestock Disaster Insurance	123,058	50,332	59.1%	47,953	60.0%
Fishing Vessel Insurance	98,289	49,144	50.0%	49,144	–
Seafarer Accident Insurance	94,189	44,992	47.8%	44,992	–

Notes: For Fishing Vessel and Seafarer Accident insurance, Korean Re reportedly retained 100% of the inward cessions from the National Federation of Fisheries Cooperatives (Suhyup); thus no retrocession was recorded.
Source: Compiled by the National Assembly Budget Office from ministerial submissions.

- **For Type 1**, primary insurers retain roughly one/half or more of risk, so *excessive* outward cession is less of a concern. For Livestock, Korean Re's retrocession rate (60.0%) is below the 2016 specialty/lines average (64.9%), and for Fishing Vessel/Seafarer, Korean Re fully retained the inward share.

Table 12: Type 2 (With Excess-Loss National Reinsurance): Private Reinsurance Snapshot, 2016
(Unit: million KRW)

Program	Primary ceded premium	Primary net retention	Korean Re inward (from primary)	Korean Re retrocession rate
Wind and Flood Insurance	19,835	10%	19,835	88.3%
Aquaculture Disaster Insurance	28,511	10%	28,511	*about* 67%

Notes: Korean Re's retrocession rate for Aquaculture per Ministry of Oceans and Fisheries submissions. Under national reinsurance, post/cat layers remain with the state; private proportional cessions mainly apply to lower loss/ratio bands (e.g., <180% for Wind and Flood; <140% for Aquaculture).
Source: Compiled by the National Assembly Budget Office from ministerial submissions.

- **For Type 2**, primary net retention is only *about 10%*, and Korean Re in turn cedes a large portion overseas (88.3% for Wind and Flood; ∼67% for Aquaculture). Such structures can dilute incentives for primary/level risk management and operational efficiency, and, when combined with national reinsurance, may enable **rent/seeking via excessive ceding**.

- **For Type 3**, crop disaster insurance is characterized by the combination of mixed private proportional + private excess/loss reinsurance with national reinsurance as of 2016. Specific steps are as below.
  - **Step 1 (Primary → private proportional).** After joining national reinsurance (excess–loss with an attachment at **180%** in 2016), NH P&C ceded **82%** of the **150–180%** loss–ratio band to "Samsung and other private insurers" and to Korean Re, paying **KRW 248,184 million** in proportional reinsurance premiums (KRW 193,584 million to private insurers; KRW 54,600 million to Korean Re).
  - **Step 2 (Private → Korean Re proportional).** The private insurers then ceded **KRW 107,713 million** (55.6% of their inward KRW 193,584 million) to Korean Re on a proportional basis.
  - **Step 3 (Primary/Private → Korean Re excess–loss).** For retained portions above a **110%** loss ratio, NH P&C and the private insurers purchased excess–loss cover from Korean Re, paying **KRW 16,876 million**.

  - **Step 4 (Korean Re → overseas).** Of the **KRW 162,313 million** that Korean Re received proportionally in Steps 1 & 2, it retroceded **87.0%** (**KRW 141,136 million**) to overseas reinsurers; it also fully retroceded the excess–loss layer from Step 3.

- **For Step 4 in Type 3**, Korean Re's retrocession rate is *very high* (87.0%), well above the specialty/lines average (64.9%). Combined with national reinsurance on catastrophe layers, this multi/step structure can reduce primary and domestic retention, raise outward leakages, and create scope for **rent/seeking behavior** through routine cession of relatively low/to/medium layers.

- To conclude, across the disaster policy insurance portfolio, contracting is strongly concentrated with Korean Re, and Korean Re often retrocedes a large share abroad—especially for Wind and Flood and Crop. In Type 2 programs, primary retention around 10% can blunt incentives for underwriting discipline and loss/control. This leads to following policy implications:
  - Encourage **measured increases in primary net retention** tied to demonstrable risk assessment capacity.
  - Review **cede commissions and proportional ceding thresholds** to prevent over/reliance on automatic cession of profitable layers.
  - Increase **transparency over retrocession chains** (e.g., reporting of net/to/gross ratios by layer and counterparty) to curb potential rent/seeking.
  - Align **national reinsurance design** (attachment points, coinsurance) to strengthen primary/layer incentives for mitigation and claims management.