Disaster Insurance and Financial Management Analysis

1. Background and Scope of Analysis

- Severe flooding in Cheongju and Incheon in July 2017, along with recurring earthquakes and typhoon damage across the Korean Peninsula, has intensified public concern over the increasing threat of large-scale natural disasters.
- Over the past decade (2007–2016), the average annual amount of property damage from natural disasters was approximately **KRW 630.8 billion**, while the average annual restoration expenditure reached about **KRW 709.9 billion**.
  - In the event of a major typhoon in 2012, the total amounts of damage and restoration expenditures rose to **KRW 1.0047 trillion** and **KRW 1.8938 trillion**, respectively.
- The increasing complexity and scale of disasters underscore the need for a **disaster-management framework with private participation**.
  - This framework disperses disaster risk across society, thereby reducing the government' s fiscal burden for recovery and promoting autonomous risk-prevention efforts among private actors.
  - Within this framework, **disaster insurance** serves as a representative policy instrument that internalizes disaster risk through market-based mechanisms.
- Among disaster-insurance programs receiving government support for premiums and administrative costs, this analysis focuses on: **the Wind and Flood Insurance** (Ministry of the Interior and Safety); **the Crop and Livestock Disaster Insurances** (Ministry of Agriculture, Food and Rural Affairs); and **the Aquaculture Insurance** & **Fishing Vessel/Seafarer Disaster-Compensation Insurance Programs** (Ministry of Oceans and Fisheries). These programs are hereafter collectively referred to as "**disaster insurance.**"
  - Among them, the Wind and Flood, Crop (a branch of the Crop and Livestock Disaster Insurances), and Aquaculture Disaster Insurance programs operate a **national reinsurance scheme**, under which the government covers a portion of annual losses meeting predefined criteria, in addition to providing fiscal support for insurance premiums and operating costs.

2. Major Fiscal Programs and Budget Status

- Fiscal projects that subsidize disaster insurance premiums for insured individuals include: the **Wind and Flood Insurance Program** (Ministry of the Interior and Safety); the **Agricultural Disaster Insurance Program**—encompassing crop and livestock disaster insurance (Ministry of Agriculture, Food and Rural Affairs); the **Fisheries Disaster Insurance Program**—covering aquaculture disaster insurance (Ministry of Oceans and Fisheries); and the **Fishing Vessel and Seafarer Insurance Programs**—including fishing-vessel and seafarer accident

insurance.

- The total initial budget for these fiscal programs in 2017 amounted to **KRW 438.8 billion**, representing a **46.2% increase** from the 2013 initial budget of **KRW 300.2 billion**.
  - Among them, the **Fishing Vessel and Seafarer Insurance Programs** recorded the lowest growth rate (35.1%) between 2013 and 2017, whereas the **Fisheries Disaster Insurance Program** exhibited the highest growth (263.7%).

Table 1: Budget Status of Disaster Insurance Programs, 2013–2018 (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: Since 2018, operating expenses for crop disaster insurance have been recorded as a separate sub-program (1031–301). For comparability, these amounts are included in the Agricultural Disaster Insurance totals.

- The **Agricultural and Fishery Disaster Reinsurance Fund** operates a national reinsurance scheme designed to protect insurance providers against catastrophic risks. The **2018 operational plan for this fund** estimated the fund' s size at **KRW 330.5 billion**.
  - As of 2016, cumulative reinsurance payments from the fund totaled **KRW 365.3 billion**, compared with cumulative reinsurance-premium income of **KRW 113.1 billion**, indicating a fiscal shortfall of approximately **KRW 252.2 billion**.

Table 2: Agricultural and Fishery Disaster Reinsurance Fund: Annual Formation and Utilization, 2005–2016 (Unit: million KRW)

Category	2005–2011	2012	2013	2014	2015	2016	Total
Fund Formation							
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" denotes the sum across items.

Note: "Recovered idle funds" refer to the recall of unutilized balances; "Idle-fund operations" refer to the temporary management of surplus funds.

- After enrolling in the national schemes, insurance companies such as NongHyup Property & Casualty and Suhyup also enter into private reinsurance contracts to

transfer residual risks to private reinsurers (e.g., Korean Re).

- Between 2011 and 2016, total insurance payments made to policyholders by program are shown below. Notably, owing to typhoon damage in 2012 (Bolaven and Tembin), payments reached **KRW 715.3 billion**.

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-insurance payouts (2011–2016).

Note: The sharp increase in 2012 corresponds to typhoon damages (Bolaven, Tembin).

3. International Case Studies

- **International experience offers several key implications for the institutional design of disaster insurance schemes.**

Table 4: Summary of International Cases

Country / Institution	Establishment and Context	Institutional Characteristics and Policy Features
United States: California Earthquake Authority (CEA)	Established following the 1994 Northridge earthquake to provide a stable supply of residential earthquake insurance.	Responsible for premium setting and risk underwriting under statutory requirements of actuarial soundness. Compensation limits are predefined, and the scheme does not entail unlimited liability for losses.
France: State Reinsurer (CCR)	Private insurers are legally required to attach a natural disaster coverage clause to standard fire insurance policies. The state-owned reinsurer, Caisse Centrale de Réassurance (CCR), provides reinsurance for such policies.	Reinsured risks ultimately benefit from an explicit and unlimited sovereign guarantee, ensuring solvency in extreme events.
Netherlands: Terrorism Reinsurance Pool (NHT)	Created in the aftermath of the September 11 attacks to restore the supply of terrorism insurance and to mitigate market withdrawal. A joint reinsurance pool composed of domestic insurers, the Dutch government, and international reinsurers.	At inception, government-backed guarantee tranches applied higher premium rates in lower coverage bands to encourage private participation.

Source: Summarized by the National Assembly Budget Office based on publicly available information from respective national reinsurance authorities and program documents.

  - *First*, both insurance premiums and reinsurance rates should be actuarially grounded so as to reflect the underlying distribution of risks and to avoid cross-subsidization across regions or risk classes.
  - *Second*, the rationale and scope of government intervention in the insurance market must be clearly justified, particularly when addressing market failures such as adverse selection or systemic risk.

  - *Third*, an enabling environment should be established to ensure that private insurers and reinsurers can participate sustainably and pursue reasonable profits, thereby maintaining long-term market stability.

- The three cases illustrate contrasting approaches to managing catastrophic and correlated risks. The CEA demonstrates actuarial discipline in premium determination to mitigate moral hazard and adverse selection. The CCR highlights the stabilizing role of an explicit state guarantee in sustaining private insurance supply for low-probability, high-impact events. The NHT exemplifies a hybrid model that balances public guarantees and private capital participation, thereby maintaining risk-sharing efficiency in markets exposed to systemic shocks.

- **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 to prevent high, inappropriate, or discriminatory rates.
  - 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 insurers are more likely to contract with high-risk policyholders due to insufficient information about policyholders' accident risk. 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 after insurers sharply curtailed the availability of terrorism insurance, creating a market vacuum.
  - By contrast, the need for intervention through the **CEA** established after the 1994 Northridge earthquake 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 **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 Findings

4.1. Appropriateness of Premium-Rate Structures in Disaster Insurance

- **Compliance with statutory premium-rate calculation**
  - Article 11 of the *Wind and Flood Insurance Act* requires that premium rates 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.
  - As of 2017, however, the Management Map had not yet been completed and was scheduled for publication in April 2018. In addition, no discount or surcharge mechanism was in place to reflect the frequency of damage for individual insured assets.
- **Appropriateness of discount and surcharge schedules**
  - Premium rates can be decomposed into **experience-rated** components, which capture a policyholder' s historical loss experience, and **performance-rated** components, which reflect the physical characteristics and risk-mitigation performance of the insured object. Balanced application of both is essential to align premiums with underlying disaster risk.
  - The **Livestock Disaster Insurance** and **Fishing Vessel/ Seafarer Insurance** programs maintain relatively weak performance-based discount and surcharge mechanisms.
  - In contrast, the **Crop Disaster Insurance** program applies a performance-based schedule that adjusts premiums according to (i) the presence of disaster-prevention facilities, (ii) crop variety, and (iii) eco-friendly cultivation practices, for which a surcharge is imposed.
  - In the **Crop** and **Aquaculture Disaster Insurance** programs, only **17%** and **37%**, respectively, of the 2016 surcharge burden (the surcharge applied to the base premium) was actually borne by policyholders after excluding the government-subsidized portion. This outcome limits the intended function of surcharges in mitigating **adverse selection** and **moral hazard**.

- **Need for differentiated fiscal support for vulnerable groups**
  - **Logistic regression results based on the 2016 Farm and Fishery Household Economy Survey (Statistics Korea)** indicate that smaller business scale and lower income are associated with a lower probability of purchasing agricultural or fishery insurance.

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

	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						
<1 ha (= 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 income. Households with multiple heads were excluded. Standard errors are reported in the S.E. columns. ***, **, and * indicate significance at the 1%, 5%, and 10% levels. Missing entries denote variables omitted from a given specification.

Table 6: Logit Estimates: Determinants of Aquaculture Insurance Take-Up

	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 multiple heads were excluded. Standard errors are reported in the S.E. columns. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

- **Recommended improvements**
  - **Wind and Flood Insurance:** Accelerate completion of the Wind and Flood Insurance Management Map and introduce a discount and surcharge mechanism that incorporates each insured object' s historical loss experience.
  - **Across disaster insurance programs:** Strengthen and institutionalize performance-based discount and surcharge schedules to improve risk alignment.
  - **Crop, Livestock, and Aquaculture Disaster Insurance:** Consider increasing premium subsidy rates for low-income farm and fishery households, and integrate the insurance take-up rate of vulnerable groups into program performance indicators for systematic monitoring and evaluation.

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

- **Government operation of national reinsurance to support stable private insurance operations**
  - By funding source, national reinsurance takes two forms: (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 program 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, which generates loss-ratio random draws after fitting multiple probability distributions to historical observations of loss ratios.
  - The available loss-ratio observations for **crop** and **aquaculture** disaster insurance are limited in size, which constrains highly precise distribution fitting and simulation.
  - Accordingly, rather than selecting a single distribution with the best goodness-of-fit, this report examines how the estimated fiscal requirements of national reinsurance vary across alternative candidate distributions.
- The simulation procedure consists of three steps.
  - **Step 1 (Distribution fitting).** Historical loss-ratio data are fitted to two versions of the **exponential** distribution, one with the lower bound of the support fixed at zero (standard case) and one with the lower bound not fixed (unconstrained), and to a **mixture gamma** distribution.
    - ▷ Because disaster-related losses may combine multiple event groups, multimodality can arise, and a heavy tail is likely. In addition to the unconstrained exponential distribution used in the commissioned study by the Agricultural Policy Insurance & Finance Service, this report also employs a mixture gamma distribution, which captures multimodality and heavy-tail behavior more effectively, as a complementary specification. (The mixture gamma distribution follows the definition in the original

report.)

- **Step 2 (Random draws).** For each candidate distribution, **5,000** random loss ratios are generated using the parameters estimated in 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**.

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

Year	Crop High-risk	Crop Middle-risk	Crop Low-risk	Crop Pilot	Aquaculture
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: Risk-band composition and loss ratios may vary by compilation date. Aquaculture payouts include outstanding claims reserve (OS).

Sources: Crop insurance data from NongHyup P&C. Aquaculture data from the Agricultural Policy Insurance & Finance Service. Compiled by the National Assembly Budget Office as of December 31, 2016 (UY basis).

- The fitted results for high-risk, mid-risk, and pilot groups indicate that the **mixture gamma** distribution captures multimodality and heavy-tail behavior more effectively than the **exponential** distribution. This is consistent with the literature, where mixture gamma models improve tail probability estimation relative to lognormal and nonparametric methods, and finite mixtures accommodate multimodality and heterogeneity.

- Given the limited sample size, the focus is on how fiscal needs vary across distributions rather than on identifying a single best-fitting distribution.
- Relative to the exponential, the **mixed gamma** assigns higher probability to large-loss events, which yields a more conservative assessment of the fiscal soundness of national reinsurance.

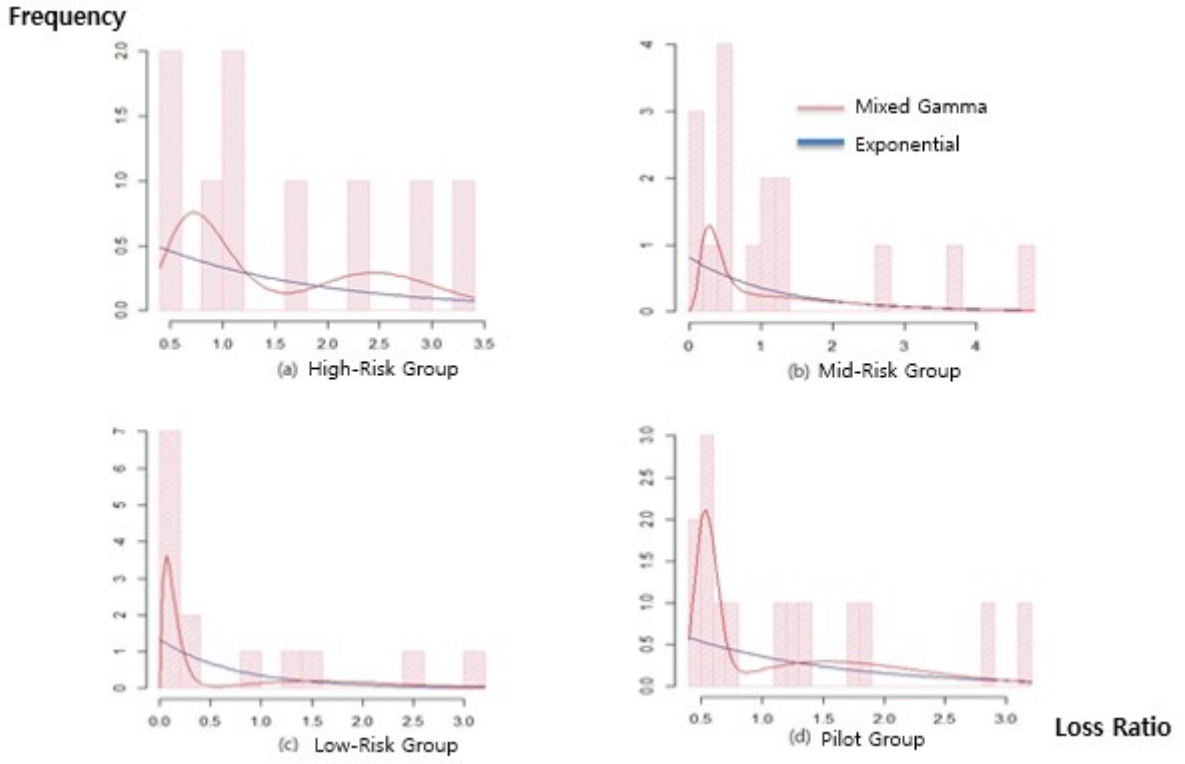

Figure 1: Fitted Distributions of Historical Loss Ratios by Risk Band

- The appropriate national reinsurance rates for 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 including extreme observations appear in parentheses.

- Based on these rates, the average annual fiscal loss under the current excess-loss national reinsurance for crop disaster insurance is estimated as follows. Results are shown for the experience loss-ratio approach and for simulations under exponential (unconstrained) and mixed gamma specifications.

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

Risk band	Premium (2016)	Experience-method	Simulation: Exp.	Simulation: Mixed 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, that is, payouts exceeding inflows under the excess-loss 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 framework to **Aquaculture Disaster Insurance**, the estimated average annual fiscal loss under excess-loss national reinsurance is given below. Results are reported for the experience loss-ratio approach and for simulations under exponential (unconstrained) and mixed 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.	Simulation: Mixed gamma
Aquaculture Disaster Insurance	24,273	-38,934	-28,861	-47,988

Note: Negative values denote expected fiscal losses, that is, payouts exceeding inflows under the excess-loss scheme.

- **For excess-loss national reinsurance financed via the Reinsurance Fund, two questions merit 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 continued need for 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, the weak linkage to reinsurance premium inflows requires the pursuit of financing through **general or special accounts** rather than 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 aims to reduce fiscal losses in national reinsurance by converting the **Crop Disaster Insurance** scheme from the current **excess-loss model** to a **profit-sharing model**.
    - ▷ The profit-sharing model applied to **30%** of the portfolio in 2017 and **50%** in 2018.
  - 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 **transferred to the state**, as illustrated below.

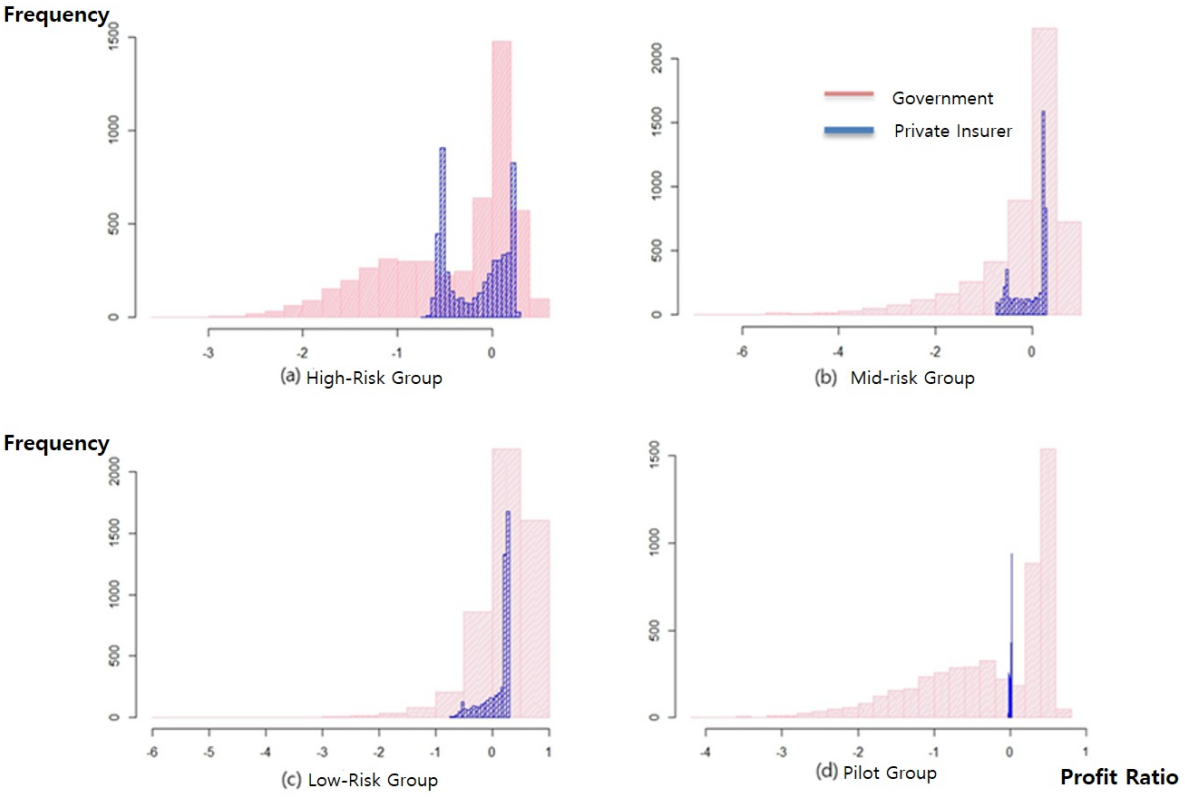

Figure 2: Sample Distributions of Government and Insurer Return Rates under Profit-Sharing

- The **2017 asset management plan** for the Agricultural and Fishery Disaster Reinsurance Fund did **not account** for changes in required liquidity resulting from the partial introduction of profit sharing **(30% in 2017)** when estimating adequate liquidity levels.
- **Safeguard against potentially higher fiscal risks for the state if the national reinsurance system transitions to a full profit-sharing framework.**
  - The Ministry of Agriculture, Food and Rural Affairs plans to expand the share of the profit-sharing model from **50% in 2018** to **100%** over time.

4.2.3. Potential Rent-Seeking from Excessive Ceding Practices

- This subsection examines private reinsurance cession and retention patterns across three program types:
  - 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 (combined private proportional and private excess-loss reinsurance with national reinsurance)**: Crop Disaster Insurance.**
- Type 1 programs show *moderate to high net retention* at the primary level and reasonable retrocession by Korean Re, a leading reinsurance company. In contrast, Type 2 programs exhibit *very low primary net retention* (approximately 10%) and *high Korean Re retrocession*, potentially weakening incentives for risk management and raising concerns about **rent-seeking through excessive ceding**.

Table 11: Type 1 – Private Reinsurance Snapshot, 2016
(*Unit: million KRW*)

Program	Primary written premium	Ceded premium	Net retention	Korean Re inward	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 retained 100% of inward cessions from the National Federation of Fisheries Cooperatives (Suhyup), so no retrocession was recorded.

Source: Compiled by the National Assembly Budget Office from ministerial submissions.

- In **Type 1**, primary insurers retain approximately half or more of the risk, so excessive outward cession is less problematic. For Livestock Insurance, Korean Re' s retrocession rate (60.0%) is below the 2016 specialty-lines average (64.9%). For Fishing Vessel and Seafarer programs, Korean Re retained all inward risks.

Table 12: Type 2 – Private Reinsurance Snapshot, 2016
(*Unit: million KRW*)

Program	Ceded premium	Net retention	Korean Re inward	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 based on Ministry of Oceans and Fisheries data. Under national reinsurance, post-catastrophe layers remain with the state; private proportional cessions mainly apply to lower loss-ratio bands (e.g., below 180% for Wind and Flood, below 140% for Aquaculture).

Source: Compiled by the National Assembly Budget Office from ministerial submissions.

- In **Type 2**, primary net retention is approximately 10%, and Korean Re cedes a large share overseas (88.3% for Wind and Flood; about 67% for Aquaculture). Such structures may weaken incentives for risk management and operational efficiency at the primary level and, when combined with national reinsurance, may encourage **rent-seeking through excessive ceding**.

- **Type 3 (Crop Disaster Insurance)** combines private proportional and private excess-loss reinsurance with national reinsurance. The process involves the following stages:
  - **Step 1 (Primary to 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 and KRW 54,600 million to Korean Re).
  - **Step 2 (Private to 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 to Korean Re excess-loss).** For retained portions above a **110%** loss ratio, NH P&C and the private insurers purchased excess-loss coverage from Korean Re, paying **KRW 16,876 million**.
  - **Step 4 (Korean Re to overseas).** Of the **KRW 162,313 million** that Korean Re received proportionally in Steps 1 and 2, it retroceded **87.0%** (**KRW 141,136 million**) to overseas reinsurers and fully retroceded the excess-loss layer from Step 3.

- In **Step 4**, Korean Re' s retrocession rate is extremely high (87.0%), far above the specialty-lines average (64.9%). Combined with national reinsurance on catastrophe layers, this multi-step structure reduces domestic risk retention, increases outward premium flows, and creates potential for **rent-seeking behavior** through systematic cession of low- to mid-layer risks.

- Overall, contracting across disaster insurance programs is heavily concentrated with Korean Re, which retrocedes a substantial portion of reinsured risks abroad —particularly for Wind and Flood and Crop programs. In Type 2 programs, the low primary retention ratio (around 10%) undermines incentives for prudent underwriting and claims control. These findings suggest the following policy directions:
  - Promote a gradual increase in **primary net retention**, conditional on insurers' demonstrated risk-assessment capacity.
  - Review **cede commissions and proportional ceding thresholds** to prevent excessive cession of profitable risk layers.
  - Enhance **transparency in retrocession chains** (e.g., disclosure of net-to-gross ratios by layer and counterparty) to mitigate potential rent-seeking.
  - Align the **design of national reinsurance** to strengthen primary-level incentives for risk mitigation and efficient claims management.