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Comparative Advantage of Japanese Insurers in Loss Portfolio Transfer - A Post-Loss Finite Risk Insurance

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I. Introduction

The current Chairman of the U.S. Federal Reserve, Dr. Ben Bernanke, stated before Congress in 2008, *"If there is a single episode in these entire 18 months that has made me more angry, I can't think of one other than AIG (American International Group)."* We still clearly remember the shocking news from the U.S. in the fall of 2008 about AIG's fall and the government's decision to bailout America's second largest, formerly AAA-rated, insurance company. AIG's fall was due to its huge accumulated losses of more than $25 billion and increased collateral requirements related to its CDS (credit default swap) business portfolio. Now, as almost two years have passed since this historic incident, we need to pause for a moment and seriously question why the professional risk management company AIG failed in managing risk.

CDS is a financial contract by which AIG provides insurance for its clients to cover their credit risk, but it is not a genuine insurance contract. This financial instrument simply acts as an insurance contract. Similarly, in the insurance market we can purchase a credit insurance,

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which is a genuine insurance contract and serves the same purpose. In fact, in the current financial climate, we can observe many financial products for insurance risk, or insurance products for financial risk in both markets. This fact well explains the recent convergence of insurance and finance in the business of risk management, in which sophisticated instruments to insure or finance risk have been invented at a tremendous speed along with the development of financial engineering. Like AIG, many other insurance and reinsurance companies have been selling financial contracts with insurance risk as a part of their risk management business. With these innovations in risk contracts and diversification in their business portfolio, insurance companies must have developed a comparative advantage[1)] over insured companies.

Mayers and Smith (1982) stated that, because of economies of scale and gains from specialization, insurance companies have developed a comparative advantage in providing risk management services such as processing and administering claims, and loss-prevention project assessment. If this statement is still valid, insurance companies must have comparative advantages in all risk contracts, regardless of whether they are insurance or financial contracts. This study aims to examine whether or not, and to what extent, insurance companies have comparative advantages in these new risk contracts. The answer to this important question might explain the failure of AIG.

For this ultimate purpose, this study directs our attention to a typical example of new risk contracts that have frequently appeared since the late 1980s. In this study, we will first analyze and discuss finite risk[2)] among other financial/insurance innovations, mainly because a loss portfolio transfer contract is a special structure generally called "finite risk" insurance. Therefore, we need to distinguish the finite risk from traditional insurance with respect to its purpose, and also its use and style in risk management. Then, we examine a loss portfolio transfer, a post-loss type of finite risk, from the viewpoint of an insurer's comparative advantage. Here, we will analyze the data and develop the hypothesis that an insurance company which commits to a loss portfolio transfer contract must have assumed its comparative advantage over insured companies when it exchanges a loss portfolio. Using the Monte Carlo simulation approach, the study tests this hypothesis and examines the economic value created for the insurer by the loss portfolio transfer. We will use actual data from Japanese insurance companies, operating costs, and interest rates to simulate cash flows for our hypothetical case, so as to quantify the economic value from this risk contract.

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1) Comparative advantage is often used in the international trade theory in economics to explain why countries trade. For example, the U.S. has a comparative advantage in wheat because it has wheat-producing acreage not available in Japan. This concept is based on factor immobility, since the land cannot be moved (Smithson (1998)).

2) The expression "finite risk" is used as a generic term. It can also be called as "blended insurance," "financial insurance," or "structured program."

II. Summary of Related Literature

There is a paucity of research papers on finite risk and its loss portfolio transfer in academic literature and far less in Japan, although the insurance industry has observed numerous finite risk contracts worldwide since the late 1990s. In fact, numerous news media have reported finite risk contracts between insurance companies, as well as between an insurance company and an insured company. However, in many cases, these are used by captive insurance companies.

In Japan, the earliest contract was the one in 1998, in which Daihyaku Life Insurance Co. signed an agreement with RGA Life Insurance Co. for RGA to become Daihyaku's "reinsurer" for selected life insurance contracts. Since then, we have identified several similar reinsurance contracts between an insurance company and a reinsurance company in Japan. Surprisingly, we observed a finite risk contract in Japan between an insurance company and an insured company in 2004. It was reported to the media as the first finite risk contract between Sompo Japan and the energy company SINANEN Co. Ltd, which had a three-year term with a total coverage of 450 million yen, and 50 million or 65 million yen self-insured retention per accident and per facility, depending on conditions, covering losses related to soil contamination as a result of accidental oil leakage. The report stated that the risk contract was created in response to the changes made in Japan's Soil Contamination Law in 2003.

Among Japanese academic literature, Hiyoshi (2000) was probably the first who introduced various types of finite risk contracts as an alternative risk transfer method, besides insurance. In his literature, he explained the basic structures according to which these finite risk contracts were categorized into chronological stabilization programs, post-loss funding programs, adverse development cover programs, and finite quota share reinsurance, among others. Most of the finite risk contracts in his literature referred to business cases sampled from overseas experience, mostly in the U.S. and Europe.

Referring to overseas cases, Yoshizawa (2001) pointed out that the Japanese risk management was very slow in response to such overseas movement of new risk finance contracts because these contracts have a problem of ambiguity as to how they should be treated regulatorily and legally in Japan. A similar discussion was demonstrated by Okazaki (2009), who raised the question of treating such a contract as a genuine insurance contract. He illustrated the recent argument in the global insurance industry that an insurance contract requires a subjective condition in which an insurer bears a significant insurance risk with the likelihood of it paying a significant amount of the insured's losses.

Among the overseas academic literature, Culp and Heaton (2005) argued the uses and abuses of finite risk reinsurance by insurance companies, illustrating the investigation and litigation by the Securities and Exchange Commission against AIG on its finite deals. Hulburt (2005) provided a similar analysis of the AIG and General Re scandals, and subsequently proposed reform measures for insurance accounting. From these scandals, we can suspect that AIG committed to many new risk contracts such as finite risks and CDS.

Along with these concerns and problems raised by the academics, insurance regulators in some countries have identified similar abuses and mistreatment of finite risk contracts committed by insurance companies with good reputation. Besides the AIG case, for example, HIH Insurance Company filed for bankruptcy in 2001 because of its excessive underestimates of reserves and overestimates of profit which had been concealed by using finite risk contracts. The failure of Taisei Insurance Co. and other Japanese insurance companies in 2001 was examined by Maeda (2010), who demonstrated in his article that, unlike the HIH failure, the Taisei, Nissan, and Aioi Sonpo failures in Japan were due to poor management, mostly by assigning responsibility to their agents.

III. Loss Portfolio Transfer as a Finite Risk

The management of risk using either loss retention, insurance, or financial instruments is often called “risk financing.” According to the Insurance Institute of America (2006), risk financing refers to a conscious act or decision not to act that generates the funds to pay for losses or offset the variability in cash flows that may occur. Since the late 1980s, the development of financial engineering has contributed to the creation of numerous new risk financing contracts by not only using the insurance market, but also the capital market for funds of loss indemnity. For example, catastrophe-linked bonds (also called CAT bonds) are now offered in the capital market, in which the interest and/or principal fluctuate according to natural catastrophes such as earthquakes. Insurance companies, reinsurance companies, or investment bankers offer risk financing contracts such as over-the-counter weather derivatives (that are linked to temperatures, snow or rain falls), contingent debt, contingent capital, CAT swaps, catastrophe put options, as well as other contracts. However, these derivative contracts are financial contracts in which the underlying asset is linked to natural catastrophes or once-considered insurance risks. The zero betas of catastrophic bonds have attracted institutional investors, particularly because their investment portfolio can be diversified further with the zero beta assets.

Another type of risk financing uses a combination of insurance and finance for indemnity of losses. For a non-insurance company, a captive insurer has become a common vehicle for financing its own insurance risk. Typically, non-insurance companies establish their own subsidiary companies overseas, in which the parent company accumulates funds to prepare for future losses. Most of the captive insurers cede[3] out a portion of insurance premium income for a reinsurance contract so that the reinsuring company indemnifies the excessive loss beyond their maximum ability. According to an annual tally of captives by *Business Insurance*, there are well over 5,000 captive insurers worldwide. There are over 70 captives

3) Ceding means transferring a portion of risk to a reinsurance company.

established by respected Japanese companies (Maeda (2005)).

Setting aside its own loss funding company, such as a captive insurer, provides numerous advantages to the parent company. A reserve fund consisting of earned premiums, surplus and paid-in capital is created for losses. For example, it can generate positive cash flows if the fund is invested in financial assets until losses are actually paid. In a traditional insurance contract, however, this positive cash flow from investment is assumed to be the profit of the insurance companies. In addition, through this captive insurer, the parent company can capture the difference in risk costs if the price of risk in the domestic insurance market is higher than the price in the international insurance market. Further, the company is able to structure its insurance scheme so that the difficult-to-insure risks can be covered through the self-funding scheme. For further discussions on risk financing and captive insurers refer to Maeda (2005) and Maeda and Sakai (2007).

Finite risk is often used by these captive insurers to hedge a portion of their excessive loss. This is similar to a captive with respect to its feature of self-insuring risk. However, finite risk, differs in such a manner that most of the funds for losses are facilitated by a loan commitment or a line of credit committed by a counter-party, namely by an insurance company or a reinsurance company. Figure 1 depicts the structure of a blended loss finite risk. Finite risk has numerous features that are quite different from general insurance[4). Finite risk has a 'finite' amount of coverage over a 'finite' time period. In general, an insurance contract lasts for a year and is renewed annually. In a traditional insurance contract, the insurer's liability is virtually limitless for the length of one year except that the maximum insurance amount is entirely paid out in a single event. In contrast, finite risk offers coverage for a certain risk over a multiple year time horizon, typically ranging from three to five years, or sometimes more, and the insurer's liability is limited by a fixed amount. Because of this limit on liability, insurers are now willing to underwrite difficult-to-insure risks by a finite risk. Moreover, most of the coverage is self-funded or the loan commitment is provided by the insurer. Additionally, insurance excess coverage is provided on top of the fund. The source of insurer profit is not insurance premium driven, but rather fee driven.

The premiums paid into the finite risk are accumulated in an "experience account" as shown in Figure 1, out of which losses are paid immediately up to a certain limit. Interestingly, the counter-party insurer manages this experience account. A positive balance in the experience account receives a predetermined interest rate, while the company is charged a predetermined amount of interest on the loan if the balance becomes negative.

With this mechanism, insured companies can minimize the costs related to losses, and thus, their earnings stabilize because the costs are spread over multiple years. This mechanism provides protection to a company's balance sheet and hence, we argue that this is the greatest advantage of using the finite risk. Companies can, therefore, manage the loss and earning

4) Here, we refer to general insurance as property and casualty insurance, or non-life insurance.

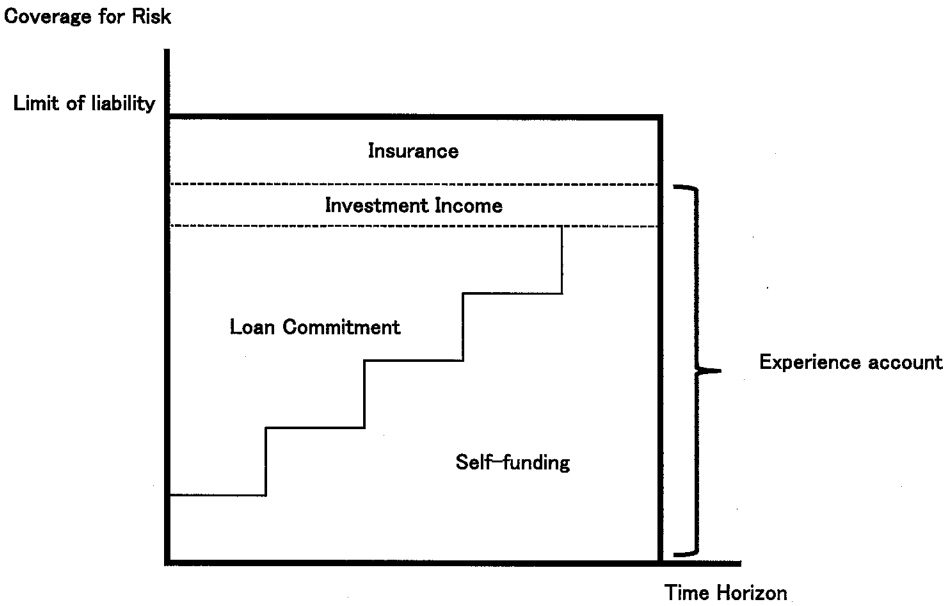

Figure 1: Sample Structure of Finite Risk
(Source: Rupp R.V., modified by the author)

volatility effectively. Counter-party insurers, however, take into account the company's credit risk and the interest rate risk, as well as the underwriting risk, to calculate insurance premiums. Premium calculations, therefore, differ significantly for finite risk.

The existence of this experience account provides the company an opportunity to share investment profits on funds with the insurer, which encourages the company to control its risk. Good loss experience, or a consequential reduction in loss payments by risk controls, may lead to maintaining a positive balance in the experience account until maturity. The ending balance of the experience account will be disbursed to the company along with the fund's investment income. Should a catastrophic loss occur and exceed the limit of the experience account, the excess loss insurance coverage begins and the loss is paid by the insurance up to that limit. Figure 1 shows a layer of insurance coverage on top of the experience account. This structure is not always the same between finite risk contracts. In general, it is said that no two types of finite risk are identical as every finite risk is tailored to a specific need of a company.

However, finite risk contracts can also be disadvantageous to the insured companies. The companies should consider the opportunity cost of their capital tied up with the experience account. Typically, the positive balance in the experience account is credited with a short-term interest rate such as Treasury bill rates and short-term government bond rates. If the company's cost of capital is above this credit rate, its commitment to the finite risk contract becomes an opportunity cost to the company. Moreover, the company should consider that the limit of both the experience account and the insurance is adequate for a possible catastrophic event. If such a catastrophic event happens early during the contract term and the company uses the limit, it suddenly becomes vulnerable to a future loss with no further funding, loan commitment, or insurance coverage after the event. The company must then prepare for another risk financing scheme while having the obligation of paying the loan's interest and principal payments on the original contract for the rest of the contract term. This adverse possibility necessitates that companies select the risk for finite risk carefully. Liability risk such as the risk of product liability or environment impairment liability would be more appropriate for finite risk contracts than the risk of natural disasters.

In general, finite risk has two broad categories: One is a prospective type of finite risk for pre-loss financing, while the other is post-loss financing, which pays for known losses. Post-loss finite risk serves distinct purposes. Loss portfolio transfer is a type of post-loss finite risk contracts and can offer a favorable risk financing solution for insured companies which self-insure risks to a large extent. Loss portfolio transfer involves the transfer of a portfolio of previously incurred losses for a premium. Through the loss portfolio transfer contract, the company can convert unknown liabilities for loss payments to a known quantity.

Companies favor loss portfolio transfer primarily for two reasons: First, the loss portfolio can facilitate corporate transactions, such as mergers and acquisitions that might otherwise be hampered by questions about the cost and size of prior liabilities that are unrealized or incurred-but-not-reported (IBNR) losses. Secondly, the company would no longer need to devote operational and administrative resources for handling the claims. Once a contract of portfolio loss transfer becomes effective, the responsibility shifts to the insurer that manages the loss portfolio and will handle future claim payments of the cases that have already occurred. It is, therefore, assumed that a professional risk management company, such as an insurance company, can capitalize its comparative advantage in handling future claims more efficiently and effectively than the company does.

IV. Comparative Advantages of Insurers in Loss Portfolio Transfer

We have identified the advantages and disadvantages of using finite risk as well as loss portfolio transfer from the standpoint of insured companies. If the company can reduce the volatility of future cost of risk and fluctuation in the investment return on its loss fund through the use of loss portfolio transfer, counterparty insurers must have assumed those risks via the contracts.

We argue that the insurers are willing to commit to loss portfolio transfer and finite risk because of their comparative advantages over insured companies. As a result, the insurance companies must have generated economic values to the shareholders. One of the comparative advantages comes from the insurer's claim handling experience. With a vast amount of historical loss data and professional loss adjusters from their long-time experience in claim handling, insurance companies must have capitalized the learning curve effect, and then operate much more efficiently in loss payments than insured companies can do.

The other advantage comes from an insurer's specialized capabilities as an institutional investor, giving it the ability to invest and create a reserve fund with financial assets. Like life insurance companies, which have expertise in long-term financial investments, general insurance companies utilize a merit of scale economies, for example, to efficiently invest in short-term financial assets. They may have expertise in finding the optimal investment opportunities to match the maturities of their liabilities. Further, the advantage may come from their capital-raising capabilities by capitalizing on their good investment rating.

Among those possible comparative advantages, this paper proposes to test the comparative advantages with respect to the insurer's investment and claim handling.

V. Simulation Approach and Data

Base Case Scenario. To test our hypothesis as to whether or not, and to what extent Japanese insurers have comparative advantages in a loss portfolio transfer, this study takes a simulation approach using @Risk[5] software for Monte Carlo simulation method. Monte Carlo simulation method is a general technique of numerical integration developed by Metropolis and Ulam (1949).

Our simulation assumes a base case scenario where a Japanese company has accumulated a portfolio of self-insured general and product liability losses. The company has reserves on outstanding losses equal to 8 million yen and IBNR loss reserves amounting to 2 million yen, for a total of 10 million yen. In addition, the company has purchased 2 million yen coverage in excess of the expected losses of 10 million yen. It is estimated to take 10 years before all known and unknown losses are closed. To eliminate all of its outstanding claim liabilities, the company commits to a loss portfolio transfer contract with an insurance company and will pay premiums in annual installments in return for the future obligations.

We use this size of loss portfolio because we believe that the result can provide a good implication for our study. The base case is neither a large nor a small contract but more of an average within our industry experience. If we compare it to the size of SINANEN's finite risk contract introduced in Section II, ours is not an outrageous size. This portfolio size provides a reasonable base case, which leads us to a somewhat representative conclusion.

5) We used the 5.0 Professional Version of @Risk software, Palisade Corporation. This is risk analysis spreadsheet add-in software to MS Excel.

Loss Coverage Formula

As depicted in Figure 1, finite risk is formulated so that the following conditions (1) and (2) are satisfied to successfully manage risk:

$$\sum_{t=1}^{n} L_t \le n \times P + \sum_{t=1}^{n} I_t + W \quad (1)$$

$$I_t = (t \times P - \sum_{t=1}^{n} L_{t-1}) \times (1 + i_t) \quad (2)$$

where n denotes a term of finite risk (a contract term in years); t denotes a time (year) ($t = 1,2,\cdots n$); i_t denotes the rate of return from investment during the t th year (percent); P denotes a premium paid annually into the experience account except the insurance premium for excess coverage (JPY); L_t denotes the actual loss payment in the t th year (JPY); I_t denotes the investment return on the loss fund in the t th year (JPY); and W denotes the insurance amount (JPY).

Financial Statement Model

Based on the loss coverage formula, we can create a financial statement model on a spreadsheet. For each year over the length of the contract, we create the income statement model of the experience account where the operating profit is expressed in terms of premiums, investment incomes, loss payments, and operating expenses. The operating profit after tax is carried over to the following year for subsequent loss payments and further investment. In our model, we take the effective tax rate to be 40 percent, which is considered the average effective corporate tax rate in Japan. In the financial statement model, we model premiums, investment incomes, and loss payments to follow each best fitted distribution with the parameters that we have taken from past loss data from the insurance industry and financial market data available in Japan.

Premium Calculation

We calculate the premiums in a manner that the pure premium, the expense loading, and the risk loading equal the gross premium. The distributions are based on the annual loss of premium for general liability losses in Japan, for which we refer to the data of net claims paid by general liability lines of business in Japan (from 1978 to 2008). We allow the insurer's probability of default to vary between 0.02 and 0.5 percent. These default probabilities correspond to the average default probabilities reported by the A.M. Best Company for insurers and reinsurers (including Japanese companies) rated A++ to B+. In addition to the expense loading and the pure premium, the insurer also receives an actuarial risk loading. We use conventional statistical techniques to establish this risk loading.

We assume that the insurer charges the company four different risk premiums associated with the loss portfolio transfer: First, the net present value of expected losses; second, the premium for premature loss payout; third, the premium for interest rate risk; and fourth, the premium for additional coverage in excess of expected losses. In addition, the insurer charges a fee for facilitation of the contract. However, we ignore the charging fee in this case because it varies significantly among insurance companies. The total of these premiums divided by the contract term years, 10 years, is the annual premium income in the experience account.

Loss Payment Pattern

For premium calculations of this contract based on the value of the loss portfolio, we need to calculate the net present value of the expected loss payments (L_t). To do so, the calculation is based on how much loss is expected to be paid each year and what pattern the payment will follow over the 10 years. For this loss pattern, we refer to the data of loss development factors for general liability including product liability provided by SIGMA Actuarial Consulting Group, Inc. According to its data, the "paid to" ultimate loss development factors for each year over the 10 years are 9.201, 4.031, 2.397, 1.776, 1.489, 1.333, 1.236, 1.180, 1.140, and 1.114, respectively. The proportion of the paid loss as a percentage of total losses is then calculated to be 10.8, 13.9, 16.9, 14.6, 10.8, 7.86, 5.89, 3.84, 2.97, and 2.05 percent, respectively, for each year over the 10 years. We change the patterns so as to conduct a sensitivity analysis, in which we can analyze the effects of a change in the claim handling capabilities.

We use these loss development patterns to apply for the expected loss payments to calculate premiums. However, in simulation, we take into account the volatility of actual payments compared with the expected ones because the timing and the amount of each payment affect the insurer's economic value created by the contract. We assume that an outcome distribution of actual payments for each year follows a Gaussian distribution, truncated at the minimum and maximum historic losses. The density function of the Gaussian distribution, $f(x)$, is given as follows:

$$f(x)=\frac{1}{\sqrt{2\pi\sigma^2}}e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$

where μ is the mean and σ is the standard deviation.

For the loss distributions and historic losses, we use data for commercial general liability insurance based on the annual issues of *Statistics of Japanese Non-Life Insurance* provided by the Insurance Research Institute. The data indicates 52.24 percent and 3.26 percent as the mean and standard deviation of loss ratios for general liabilities. From this fact, we obtain 6.24 percent as the coefficient of standard deviation from the mean value, which is applied to each standard deviation for each paid loss. To close the loss account, we assume that the insurer pays the remaining obligations of loss payments by the end of the contract term. These assumptions are conservative and also typical of the industry's business practice.

Interest Rates

We use the insurer's systematic risk indicated as its beta in conjunction with the capital asset pricing model[6] to determine the cost of capital of the insurer and the investment return on the reserve fund in the experience account. We use the market implied rate of return on Japanese government bonds (JGB) for our simulated risk-free rate as well as for the discount rate used to obtain the net present value of the loss portfolio.

Tokyo Stock Exchange, Inc. publishes beta values of the companies listed in the Tokyo Stock Exchange. However, we obtained the beta values of only seven Japanese insurers; namely, Nipponkoa Insurance Company, Ltd, Sompo Japan Insurance, Inc., Nissay Dowa General Insurance Company, Ltd, Aioi Insurance Company, Ltd, The Fuji Fire and Marine Insurance Company, Ltd, Tokio Marine Holdings, Inc., and T&D Holdings, Inc. We assume that these companies are the representative insurers of the Japanese market. The beta values for these companies show an average of 1.067 and a standard deviation of 0.317 with a minimum value of 0.60 and a maximum value of 1.47 during the 60-months period from January 2005 to December 2009. We simulate the systematic risk of the finite risk asset with a uniform distribution ranging from 0.5 to 2 as a base case scenario. We change the range of these parameters so as to conduct another sensitivity analysis, in which we can analyze the effects of a change in the insurer's investment strategies.

We simulate values for the risk-free rate using a Gaussian distribution truncated at the minimum and maximum historic values, 0.012 percent and 8.09 percent. These are the smallest and the largest values of the benchmark, which are the two-year implied yields of JGB from January 1989 to December 2008. These values are provided by Thompson Reuters. The mean value and the standard deviation for the distribution are 1.80 percent and 2.21 percent, respectively.

We simulate the values of market returns using a Gaussian distribution truncated at the minimum and maximum historic values, -1.80 percent and 2.54 percent. These are the smallest and the largest values of annualized percent returns calculated from the monthly TOPIX (Tokyo Stock Price Index) prices including dividend returns from January 1989 to December 2008. The data is provided by Thompson Reuters. The mean value and the standard deviation for the distribution are -0.025 percent and 0.70 percent, respectively.

To investigate the financial market's effect on the value, we simulate the above base case, this time using the market data for the first 10 years from 1989 to 1998, and then do the same

6) We assume that the capital asset pricing model is valid. The model provides that each security's expected risk premium increases in proportion to its beta value: $r - r_f = \beta(r_m - r_f)$., where r is the security's expected return; β is the beta value of the security; r_f is the risk-free rate; and r_m is the market return.

simulation for the subsequent 10 years from 1999 to 2008. The market data of 1989–1998 shows that the risk-free rate, the JGB yield, has the mean value of 3.23 percent and a standard deviation of 2.36 percent with maximum and minimum values of 8.09 and 0.24 percent respectively, while the market data of 1999–2008 shows that it has a mean value of 0.37 percent and a standard deviation of 0.31 percent with maximum and minimum values of 1.97 and -1.67 percent, respectively.

For each set of inputs, we generate a distribution of the insurer's value based on 10,000 iterations using the @Risk add-on. In our simulation model, the insurer commits to the loss portfolio transfer at time t. The insurer received the annual premium at time t, t + 1, t + 2, ⋯ t+ 10. We collect these discounted net cash flows to obtain a distribution of the net present values at t. The positive outcome of this distribution corresponds to the probability that an insurer generates value for its shareholders from the loss portfolio transfer contract. We will report this probability under different conditions.

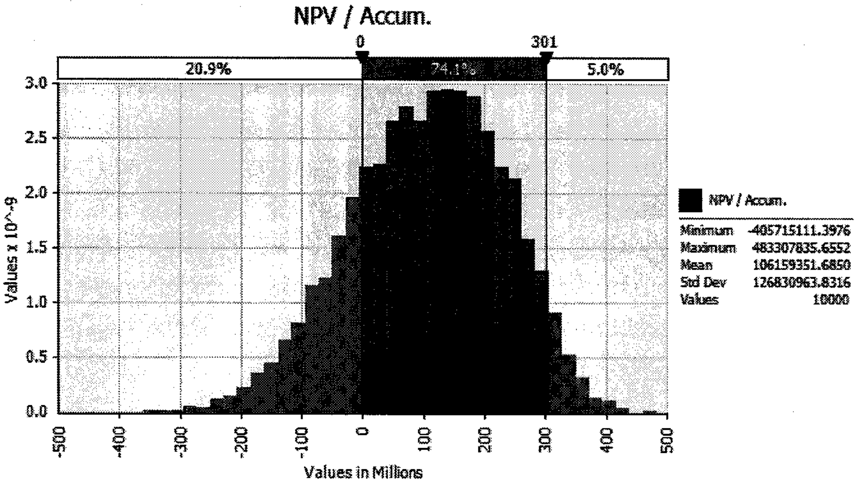

Figure 2. An Output Distribution of the Base Case Scenario for 10,000 iterations

VI. Simulation Results and Discussion

Base Case Result

Figure 2 shows the outcome of the base case scenario in which all the variables change with 10,000 iterations according to the distributions defined in the previous section. The market data used in this simulation is from the years of 1989 to 2008. The graph in Figure 2 indicates that the probability of creating negative values is 20.9 percent, whereas the probability of creating positive values is 79.1 percent. The result implies that the loss portfolio transfer contract creates positive values for the insurer with an approximate 80 percent likelihood. The average of the outcome in this scenario is 101 million yen and the standard deviation is 126 million yen. The simulation shows that the insurer has an opportunity to earn a maximum of 483 million yen. However, this outcome distribution has a significant deviation from the mean, which is unlikely in traditional insurance contracts. Even with 20 percent likelihood, the insurer suffers value losses. The loss that the insurer suffers turns out to be as much as 405 million yen.

We can infer from the result that with a loss portfolio transfer contract, the volatility of incomes is now on the insurer's side while the counter-party insured company minimizes this. Finite risk and loss portfolio transfer contracts place insurance companies in a more volatile profit-loss situation than their traditional but stable insurance business.

Outputs	Years	
	1989-1998	1999-2008
Prob. (NPV >0)	60%	100%
Mean	35	274
Std. Dev.	132	59
Max. Value	420	522
Min. Value	-500	36

(Values in JPY millions)

Table 1: Key Value Outputs Comparison Between 1989–1998 and 1999–2008

Effect of the Financial Market Environment

To investigate the effect of the market environment on the economic value, we conducted two simulations and compared the two outcomes: one base case simulation using the data from 1989 to 1998, and another using the data from 1999 to 2008. Table 1 shows the outputs of these two simulations. With the same base scenario, but with different risk-free rates and market returns, the result shows a significant difference in the two key outputs. The probability of creating a positive economic value is found to be 100 percent (zero probability of being negative) for the years 1999–2008.

On the other hand, the output of 1989–1998 shows only 60 percent as the probability of creating positive value. The mean value and the standard deviation show 274 and 59 million yen, respectively, for the years 1999–2008, while those for 1989–1998 are 35 and 132 million yen, respectively. This result indicates that the insurer should have been more willing to commit to loss portfolio transfer contracts during the years 1998–2008 than 1989–1998. The result supports our finding that most of the finite risk contracts were reported during 1998 to

2004. We found that the market environment greatly affects the decision making of an insurer as to whether or not the insurer is willing to enter into loss portfolio transfers. As discussed before, the result offers a similar implication that the insurer is now faced with a more volatile market risk.

Outputs	Systematic Risk of Finite Risk Asset		
	Beta (0.5-1.5)	Beta (1.0-2.0)	Beta (1.5-2.5)
Prob. (NPV >0)	80.3%	78.5%	76.2%
Mean	115	97	82
Std. Dev.	130	121	115
Max. Value	522	425	408
Min. Value	-373	-463	-399

(Values in JPY millions)

Table 2: Key Value Outputs Comparison Among Different Betas of Finite Risk Assets

Effect of Investment

To examine the effect of asset investment on the economic value, we simulated the base case. However, this time we changed the beta values of finite risk assets. Table 2 shows the result of these key value outputs. As explained in the previous section, we used a uniform distribution model for the beta value of the asset in the experience account, and then applied this beta to the capital asset pricing model to estimate the expected return from the investment. This test was conducted using three different ranges of variables in its uniform distribution: Beta (0.5–1.5), where the beta value varies from 0.5 to 1.5; beta (1.0–2.0), where the beta value varies from 1.0 to 2.0; and beta (1.5–2.5), where the beta value varies from 1.5 to 2.5. The beta value here means the beta coefficient, which provides the responsiveness of the return to a systematic risk. A systematic risk can be defined as the market risk that affects a large number of assets. Thus, the responsiveness to the systematic risk is in the following order: Beta (0.5–1.5) < beta (1.0–2.0) < beta (1.5–2.5).

Our results show that the simulation in which the systematic risk sets at beta (0.5–1.5) provides the highest values for all key outputs. In this simulation, the probability of creating positive values is 80.3 percent, and the mean value and the standard deviation are 115 million and 130 million yen, respectively. The result implies that rather than investing in the higher systematic risk financial assets, the insurer is more likely to increase its value by investing the finite risk asset in the lower systematic risk assets. The implication of this study is that the insurer needs expertise in selecting optimal financial investments, which changes the probability and value generations.

Sensitivity of Outputs (Actual Outputs in Parenthesis)	Amount of Paid Loss or Percent in Deferred Payments ((-) sign means deferred)				
	+ 1%	Base case	- 1%	- 2%	- 3%
Prob. (NPV >0)	-28.1 % (51.4%)	79.5%	+ 16.3 % (95.8%)	+ 20.0 % (99.5%)	+20.5% (100%)
Mean	- 107 (-1)	106	+120 (226)	+210 (316)	+361 (467)
Std. Dev.	+ 4 (129)	125	-1 (124)	-1 (124)	+0 (125)
Max. Value	-164 (325)	489	+126 (615)	+258 (747)	+380 (869)
Min. Value	-120 (- 570)	-450	+199 (-251)	+310 (-140)	+506 (56)

(Values in JPY millions)

Table 3: Sensitivity of Key Outputs to Paid Loss or Percentage in Deferred Payments

Effect of Insurer's Handling of Claims

To investigate the effect of the insurer's claim handling on the value, we conducted a sensitivity analysis. We assume that the insurer's claim handling capability is measured by the efficiency and/or the timing of the loss payments. Therefore, we simulated the base case again, but by increasing and decreasing the paid losses of the base case template by one to three percent. A one percent increase means that the insurer paid one percent more losses than expected, or paid one percent of losses earlier than the company expected. On the other hand, a one percent decrease means that the insurer paid one percent less losses than it expected or deferred one percent of the loss payment.

Table 3 shows the result of sensitivity of the key outputs. The base case shows the values of the key outputs. The values under the columns headed plus one percent, minus one percent, minus two percent, and minus three percent, show the difference in value from the base case outputs. All of these are expressed in values of million yen, except for the probability of creating a positive Net Present Value in which the value is expressed in percentages.

The result indicates that a one percent change in the amount of loss payments has a significant impact on all the key outputs except the standard deviations that turn out to be more or less the same. For example, a plus one percent change in the loss payments lowers the probability of creating a positive value to 51.4 percent from 79.5 percent (a 28.1 percent reduction in probability). In contrast, a minus one percent change in the loss payments raises the likelihood of creating a positive value by 16.3 percent to 95.8 percent. Further, if the insured lowers the loss payments by three percent the contract will create a positive value all the time (100 percent likelihood). The same result can be accomplished by a three percent payment deferral. This result implies that the insurer has a significant incentive to lower the loss payment or postpone payments, which is not beneficial to the liability holders. A control on claim handling expenses has a great impact on the value creation for the insurer.

VII. Conclusions

This study starts with a discussion of the recent trend toward convergence between insurance and finance industries with respect to risk finance instruments. We observe many cases in which insurance companies offer financial instruments to their clients for financing insurance risk, i.e., catastrophe (CAT) bonds, weather derivatives, and credit default swaps, among others. The other cases are composites of insurance and finance in one insurance contract. Among the hybrid instruments, we pay special attention to the finite risk instrument, which provides both insurance and deposit features with a line of credit facility. A loss portfolio transfer is a type of finite risk.

We argue that with finite risk insurance, insured companies can take advantage of the favorable features from both insurance and finance. Stabilizing the company's cash flows over the contract term, for example, is one such advantage. Sharing the investment returns in the experience account reserved for future loss payments is another. On the other hand, with a finite risk contract the company may face an unfavorable situation in which its experience account is exhausted in the early part of the contract term. In such a situation, the company ends up with no risk coverage for the rest of the term, while it still has an obligation of paying the premiums to fulfill the debit account.

This study proceeds to test our hypothesis that, with various benefits being provided to the insured counterpart, insurance companies in return must have comparative advantages when entering into a finite risk contract to compensate for the foregone benefit. We examined these advantages by measuring the economic value added by loss portfolio transfer, a type of finite risk. We used the insurance and capital market data of Japan to see whether or not economic value is added to Japanese insurance companies when they commit to loss portfolio transfer.

As a result of our study, we found that there is a strong likelihood of positive shareholder value generated for an insurer with a loss portfolio transfer contract. The base case brings positive values with an 80 percent probability, but the distribution of outputs shows significant deviations from the expected value. This result implies that, in most cases, committing to a loss portfolio transfer contract generates economic value for the insurer. At the same time, the risk becomes greater for an insurance company issuing a loss portfolio transfer contract than to a company issuing only traditional insurance contracts. Similar implications can be inferred from our results that the market environment significantly influences the value generated by loss portfolio transfer. Comparing two distinct market environments between the time periods of 1999–2008 and 1989–1998, the likelihood of generating positive values differs by as much as 40 percent in the base case scenario. Our study may explain that the root cause of the AIG failure was that the company probably moved into a riskier business model from the traditional insurance business by entering into various new risk contracts such as loss portfolio transfer, finite risk, and CDS, among others.

We also found that a small percentage change in the efficiency of claim handling has a significant impact on the value generated. Further, insurers need more investment expertise in selecting optimal asset investment, which also appears to be critical to the value. Overall, our findings support the notion that Japanese insurance companies have comparative advantages in loss portfolio transfer.

However, there may be room for improvement in terms of enhancing the robustness of our study. First, these findings are based on our specific assumptions that the models follow Gaussian or uniform distribution; these distributions follow the pattern of past data, among other assumptions. We admit that our base case scenario is very limited in the scope of study. Second, our study focuses on a limited time span and a limited choice of finite risk contracts only. A 10-year time horizon may not be a good choice from a practical standpoint. These areas remain open for further research in the future.

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