

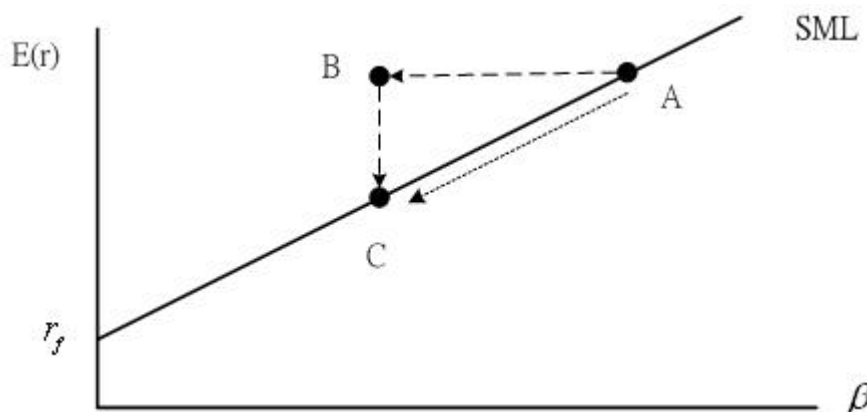
Chapter Two : Theory Discussion

< 1 > Why is risk costly to insurance company

1.1 CAPM theory

Before considering the circumstance in which risk management can increase firm value, let us first consider when it can not make such an increase. According to Kleffner and Doherty (1994), under the CAPM theory, a insurance company's stock is also valued according to expected earnings and systematic risk (β), thus yielding the relationship between expected return and β . This firm's β and expected return are shown at Point A as Figure 2-1. When insurer cedes his risks, as the concept demonstrated by Doherty (2003), there would be two situations:

Figure 2-1 Systematic Risk



1. If reinsurers do not charge a risk premium : reinsurance reduces the insurance company's beta without reducing expected earnings (from A to B). Consequently, the stock is underpriced and the price rises, the expected return would fall to position C. This rise in price would be a capital gain to existing shareholders and would signal a reward for insuring the risk.
2. If reinsurers do charge a risk premium : reinsurance reduces the beta and

reduces expected earnings (from A to C) . Thus, the stock is still correctly priced and no price adjustment occurs in the firm's stock

According to the capital asset pricing model (CAPM) theory as above, does managing risk benefit shareholders? The answer is no, if the party assuming the hedge prices it correctly. Of course, shareholders can benefit if the reinsurer underprices the reinsurance policy. But this hardly a justification for risk management; it is a justification for buying underpriced assets. It is not different from the firm's buying other assets which are less than its market value. We can generalize this argument from the simple capital asset pricing model that diversifiable risk is not priced in the capital model. Since risk should not be problem for publicly held firms under CAPM theory. Thus, one will have the question that whether a shareholder would want a firm to spend cash to decrease the volatility of its cash flows when the only benefit of risk management is a decrease in share return volatility. We will also wonder why risks are costly to firms.

< 2 > The reasons why risk is costly to insurance company.

2.1 Tax effect-Convex

According to Culp (2001) , the tax function facing typically are convex¹, especially the progressive income taxes.² It means that reducing in earning

¹ C. Culp (2001) , 192

² In Taiwan for profit-seeking enterprise income taxes is progressive taxes, its tax bracket and are as follows:

volatility required can reduce expected tax. The nonlinearity in tax functions gives rise to an interesting relationship between risk and expected tax liability. For a non-life insurance company, risk management can reduce the risky earnings streams.

The importance of risk management is as above, but we cannot ignore the ability of the firm to carry forward losses to future tax periods. That is, negative income this year can be used as a deduction against future earnings. Even though carrying forward losses to future tax periods will decrease tax advantage of reducing risky earnings, provided that carrying forward losses to future is limit (such as amount or period), there is still a tax advantage to reducing risky earnings.

According to Income Tax Act (amend-2004/7/21), Article 39:"*Losses incurred in the operation of business in previous shall not be included in the computation for the current year provided, however, that in the case of a profit-seeking enterprise organized as a company that keeps a complete set of account books, uses the Blue Returns as provided in Article 77 in the years such losses occurred and in the year of declaring such losses, or such losses have been duly certified by a certified public accountant and declared within the prescribed period, taxation may be made on its net income after deduction of losses incurred in the preceding five years as*

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1. Companies with a total taxable income of below NT\$50,000 are exempt from the profit-seeking enterprise income tax.
 2. Companies with a total annual taxable income of below NT\$100,000 are levied a tax of 15%. Total tax should not exceed the half the income amount over NT\$ 50,000.
 3. 25% is levied for portion of income which exceeds NT\$100,000.

verified and determined by the local collection authority-in-charge.”: It means that, under Income Tax Act Article 39 in Taiwan, provided that carrying forward losses to future is limit within five years, there is still a tax advantage to reduce risky earnings.

2.2 Costs of financial distress

If a firm becomes bankrupt, any transaction costs, such as legal fees, court fees, and accounting cost will be borne ex post by the creditors,³ thus these cost will be ex ante anticipated in the value of the bonds or stocks. Besides, firms will encounter other large indirect costs as the likelihood of bankruptcy increase, such as the inability to retain good employees, the loss of financial flexibility, under investment problem, loss of sales due to decreased consumer confidence. Note that many of these costs are in incurred even if the firm does not enter bankruptcy.

2.3 Agency cost

Apart from the transaction costs, the prospect of future financial distress will cause many other problems. These transaction costs are agency costs known as “under investment problem” and “asset substitution”. The under investment problem arises because: (1) With risk debt outstanding, managers may, while acting in the shareholders best interest, not invest in NPV projects because the payoffs go to the debt holders (2) As the likelihood of bankruptcy increase, shareholders would refuse to contribute funds for positive NPV projects if shareholders must contribute cash, but all project’s benefits accrue to bondholders

³ N. Doherty (2003) , 204-207

Jensen & Meckling's (1976) , the asset substitution problem occurs when low-risk assets are substituted by high-risk assets once a risky fixed claim is issued, hence resulting in wealth transfer from bondholders to stockholders.⁴

To illustrate why the asset substitution problem would occur, now we assume a firm that faces no risk and has a certain value of NT\$160M, and the face value of the debt is NT\$150M. It can be choose a new project that will have an expected value of Zero, but a down side risk of NT\$ 30M loss together with an upside potential of NT\$ 30M profit is shown as the follows :

Earnings	Probability
- NT\$ 30M	50%
NT\$ 30M	50%

If the project is successful, it will benefit shareholders whose claim increases from NT\$10M to NT\$40M. On the other hand, if the project fails, the shareholders claim only from NT\$10M to zero. If shareholders adopt the project, the new value of equity will be :

$$1/2(\text{NT\$}10\text{M} + \text{NT\$} 30\text{M}) + 1/2(0) = \text{NT\$} 20\text{M}$$

In summary, it offers the shareholders a chance of substantial gain, but little loss, as they can deflect any loss to the bondholders. In effect, the shareholders are playing a “heads I win, tails you lose” game with the bondholders. Naturally such games are very attractive to the shareholders.

⁴ M. Jensen and W. Meckling (1976), 305-360.

This attraction to shareholders can lead to “asset substitution problem”. The firm raises debt, promising to undertake a low-risk project, but having secured the funds, it then substitutes a high-risk investment causing a wealth transfer from bondholders to shareholders. However, there is a catch for the shareholders. Bondholders anticipate that shareholders will be tempted to seek out such risky investment projects, and accordingly, bonds will be discounted to reflect this potential expropriation. This hurts shareholders, for it increases the cost of debt. Shareholders are hoisted on their own petard when they secure funds from bondholders, they are tempted to risk those funds in highly uncertain ventures.

Insurance company may also incur another kind of “asset substitution problem”. If Policyholders anticipate that the insurance company will be risky. They will ask a premium discount to reflect the risk. To maintain the business, the insurer usually would accept the discount. When the entire premiums are discounted, the insurance company will be more risky than before. Consequently the next year policyholders will seek more discounts to reflect the risk.

2.4 Cost of external financial

The most straightforward method for increasing the value of a firm is to increase expected cash flows. However, access to positive net present value projects requires that a firm possess sufficient capital to finance the investment. Risk management is shown to be a valuable tool in providing access to cheaper internal funds that can be used for investment. Due to a variety of additional costs, raising funds from external sources is particularly costly compared with using

internal funds. Consequently, generating cash internally is valuable since it protects access to good investments. Since internal cash flows are subject to a variety of external risks, hedging these risks ensures the firm to have the cash available to make value-enhancing investments. Without hedging, corporations must finance losses with internal funds or by raising external capital (by issuing stock, debt, borrowing from a bank, etc.). Either way, this reduces the future capacity of firms to finance good projects.

Raising external funds (by issuing equity for example) is often quite costly due to transactions costs and agency costs. More important are the costs of information asymmetry.⁵ These extra costs often reduce the corporation's access to positive net present value projects.

< 3 > The cost of risks to insurers

3.1 Concept of the cost of risks

Since risk is costly to insurance company, risk management will become valuable. In particular, risk management becomes valuable when the cost of bearing risk inside the firm is more than the price required by capital markets to bear the risk. This will be the case when actual financial markets do not behave as the perfect financial markets assumed above.

⁵ Neil Doherty, "Integrated Risk Management: Techniques and Strategies for Reducing Risk", McGraw Hill, 2003, 212

Overall object of risk management for “for-profit” business is value maximization. Business value depends on expected future net cash flows and risk associated with these cash flows. It is known that making risk management decisions to maximize business value requires an understanding of how risk and risk management methods affect (1) the expected value of net cash flows and (2) the compensation required by stake holder

The reduction in business values that arises from risk is known as the cost of risks. The cost of risks is a general concept that applies to all types of risks. However, in this paper, we focus on pure risks and the cost of pure risks. If the cost of pure risks is defined to include all pure risk-related costs from the perspective of shareholders, a business can maximize its value to shareholders by minimizing the cost of pure risks. To see this, note first that an appropriate definition of the cost of pure risks is the reduction in value to shareholders that occurs due to the presence of pure risks. The definition implies :

$$\text{Cost of pure risks} = \text{Value without pure risks} - \text{Value with pure risks} \quad (2.1)$$

Then :

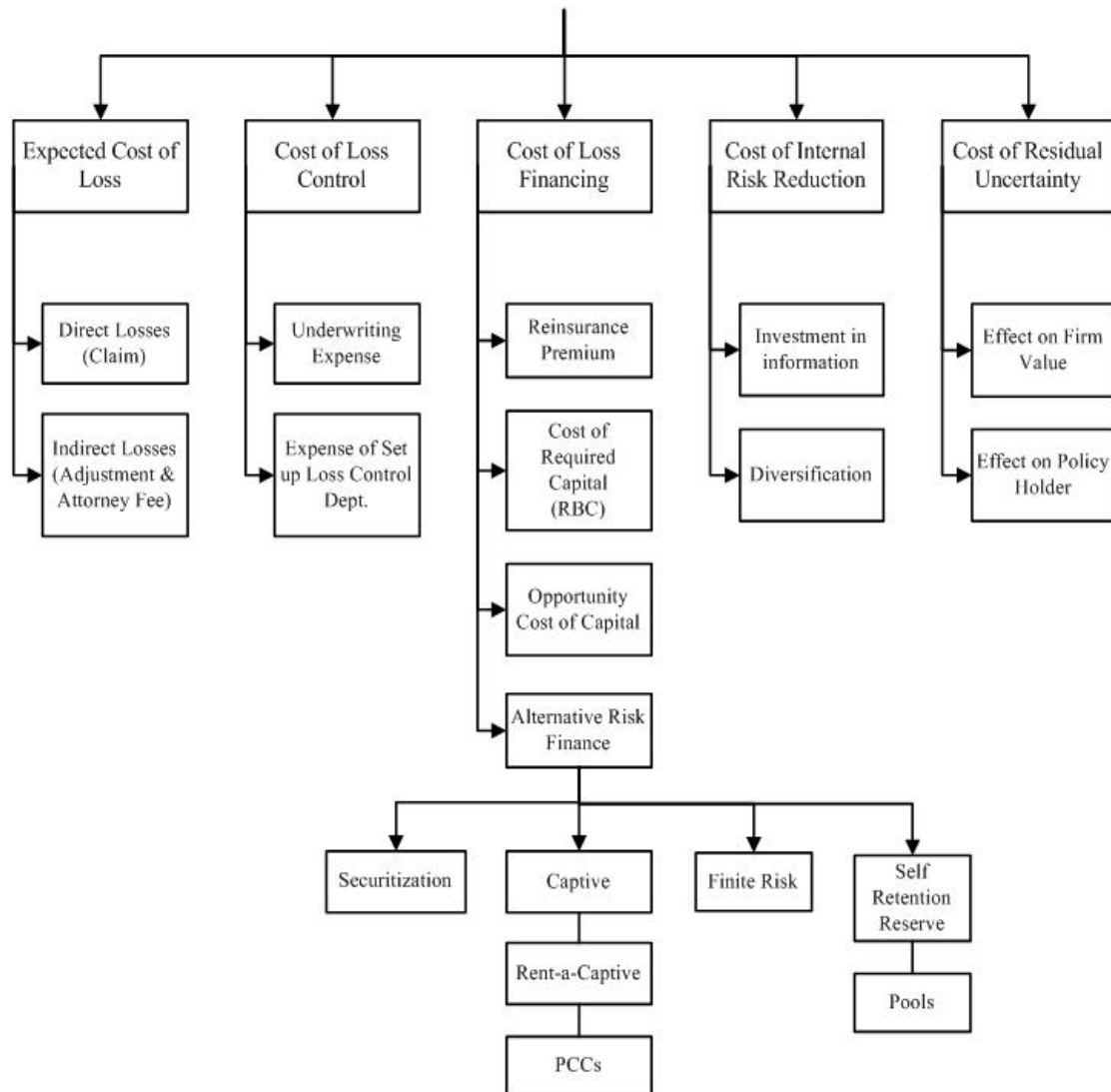
$$\text{Value with pure risks} = \text{Value without pure risks} - \text{Cost of pure risks} \quad (2.2)$$

Equation(2.2)implies that firm can seek for maximized value by minimizing the cost of pure risks. Unlike perfect financial markets, a firm can increase its firm value by decreasing its cost of risks through risk management strategy (Shiu and Stulz 2000). Based on the above reason that we illustrated, as long as costs are defined to include all the effect on value of risk and risk management, minimizing the cost of pure risk is the same thing as maximizing value.

3.2 Components of the cost of underwriting/pure risks of non-life insurance company

Following the structure by Harrington & Niehaus(1999), the cost of risks includes : (1) the expected cost of loss, (2) the cost of loss control, (3) the cost of loss financing, (4) the cost of internal risk reduction, (5) the cost of residual uncertainty. For non-life insurance industry, components of the costs of underwriting/pure risks can be illustrated as Figure 2-2 :

Figure 2-2 Component of the Cost of Underwriting (Pure) Risk -- for non-life insurance Industry



Expected cost of loss

The expected cost of loss includes the expected costs of both direct and indirect losses. For non-life insurance companies, direct loss means the insurance claim and indirect loss means the other expenses which derive from insurance claim.

Cost of loss control

For non-life insurance, the major cost of loss control is underwriting expenses, and improving underwriting performance can reduce the expected loss ratio, information asymmetric about the insured hazard, and avoid adverse selecting. Thus more and more insurance companies are turning to advanced data analysis and predictive modeling techniques to improve underwriting performance. Analyzing data from a variety of internal and external sources and applying internal business rules allows organizations to identify lower risk opportunities. Similarly, applying computerized rules-based approaches to claims helps improve fraud detection rates and reduce claims costs significantly. Apparently, improving underwriting performance mentioned above will incur costs or expense. Such a cost, for insurance company, belongs to cost of loss control

Cost of loss financing (retain/transfer)

Cost of loss financing is the cost of managing the sources and uses of funds available to pay for loss. For insurance company, the cost of loss financing includes reinsurance premium, or any other cost of risk financing method (such as unfunded reserve, funded reserve, borrowed funds, captive reinsurer, commercial reinsurance, contractual transfer, hedging, or any other ART methods).

Cost of internal risk reduction

The Cost of Internal Risk Reduction includes the costs associated with achieving and maintaining the diversification. For insurance company, the cost of internal risk reduction includes costs associated with coinsurance or controlling the aggregated possible maximum loss per risk/per event. It also includes the cost of obtaining more data to forecast and analysis the risk portfolio.

Cost of residual uncertainty

Residual uncertainty will reduce firm value through the effect on expected net cash flows as we illustrated above. Residual uncertainty will increase the cost of capital, costs of financial distress and agency cost. For an insurance company, residual uncertainty might also reduce the price that customers (the insured) are willing to insure.

Cost tradeoffs

As the same as other types of pure risks, a number of tradeoffs also exist among the cost of underwriting/pure risks for insurance industry, such as : (1) Expected loss(net claim payment)and cost of loss financing(reinsurance); (2) Expected loss (net claim payment) and cost of loss control (Underwriting); (3) cost of loss financing (reinsurance) and cost of residual uncertainty. Those tradeoffs may occur within the same time. As mentioned above, the optimal risk management strategy is to maximize firm value by minimizing cost of pure risk. So before we analyze the decision of risk management strategy, we should analyze the cost of pure risk of each risk management strategy and its tradeoff relation.

< 4 > Assessment of risk management strategy

For non-life insurance companies in Taiwan, when it comes to the underwriting risk in particular, commercial reinsurance has been the major risk management strategy in the past. One may doubt that whether commercial reinsurance is always the optimal risk management strategy for all non-life insurance companies.

From Equation 2.2 we know that if the firm seeks for maximized value, it can do so by minimizing the cost of pure risks. Unlike perfect financial markets, a firm can increase its firm value by decreasing its cost of risks through risk management strategy based on the above reason that we illustrated. Thus, as long as costs are defined to include all the effect on value of risk and risk management, minimizing the cost of pure risks is the same thing as maximizing firm value. So it means that when we assess a risk management strategy, we should first evaluate whether it can decrease its cost of risks.