



American Finance Association

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Source: *The Journal of Finance*, Vol. 36, No. 4 (Sep., 1981), pp. 949-953

Published by: Blackwell Publishing for the American Finance Association

Stable URL: <http://www.jstor.org/stable/2327559>

Accessed: 27/11/2009 08:33

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Reinsurance under Conditions of Capital Market Equilibrium: A Note*

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HAVING ACCEPTED A CONTINGENT liability under an insurance contract, the insurer has an insurable interest in the subject of the insurance policy and can insure all or part of that liability with a second insurer. This reinsurance agreement protects the first insurer (known as the primary or ceding insurer) against unusually large claims, since it permits the risk to be broken down into smaller units which can be absorbed easily by individual insurers. These agreements are commonly placed with other direct insurers and with specialist reinsurance companies usually holding internationally diversified portfolios.

The reinsurance agreement affects the risk return structure of the insurer's liability portfolio and consequently affects the risk-return characteristics of the insurer's common stock. The insurance literature has long assumed such reinsurance is an important procedure and much attention has been devoted to analyzing its use. Explicit statements of the objectives of reinsurance can be found in most insurance texts.¹ These texts commonly stress the portfolio risk effects of reinsurance, that is, the reduction in the probability of the failure (or "ruin") of the insurance fund and the stabilization of returns to its owners.² The subdivision of policies and the spreading of risk between insurers permits each insurer to hold a more completely diversified portfolio of liabilities than would be available without reinsurance.

Apart from explicit statements, the bulk of analytical literature on optimal reinsurance agreements has assumed risk reduction to be the objective. In earlier works, such as Vajda [15] and Ohlin [11], the benefits of reinsurance were identified in the reduction of the variance of the insurer's loss distribution. Subsequently, writers such as Borch [3, Chs. 1-11]; Buhlmann and Jewell [5]; Du Mouchel [6]; and Gerber [7] have used utility analysis to isolate the effects of reinsurance and to identify the properties of the optimal reinsurance treaty. Here, reinsurance is studied as a bilateral risk-reducing device arranged between two or more risk averse insurers. The Pareto condition has been evoked to define the optimality of a reinsurance treaty and, not surprisingly, it is shown to depend upon the form and parameters of the participating insurers' utility functions. The equilibrium conditions for reinsurance have also been established by Borch [3,

* We appreciate useful comments of Emelio Venezian and Alan Kraus.

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¹ See Riegel et al., [14] pp. 121-25; Green [8] pp. 161-63, 4th ed., and Johnson [9].

² A secondary function for reinsurance also arises from regulation. Required reserves are constrained by the level of net (i.e., after reinsurance) premiums rather than direct premiums. Therefore, reinsurance can be used to release reserve funds which can provide a basis for further premium expansion. This function is not challenged in our paper. Reinsurance is also occasionally used to "run off" the liabilities of an insurer exiting from the market.

Ch. 10] and Plessacco [12]. The concept of equilibrium used arises from trading possibilities between risk averse insurers within the insurance market.

Despite the fact that the insurance literature has been extensively concerned with reinsurance, it has never made clear the reason for its assumption that reinsurance is valuable. The reason for this oversight rests on the failure of the literature to relate reinsurance to the securities markets in which the insurer's financial claims are traded.

The purpose of this note is to establish the effect of reinsurance on the insurer's common stock when it is traded in an efficient capital market. Specifically, in Section I, we show that reinsurance, as a method of reducing the riskiness of returns to the owners of the insurer, is redundant in conditions of capital market equilibrium. Shareholders of the insurance company can reduce risks associated with contingent liabilities under insurance contracts by diversifying their personal portfolios.

However, the equilibrium conditions do support an alternative rationale for reinsurance which arises from the risk aversion of insureds. In Section II, we argue that reinsurance can increase the value of the insurance company when premium income is not independent of the risk of insurance company ruin.

I. The Irrelevance of Reinsurance

In order to establish that reinsurance designed to reduce the riskiness of the insurer's common stock is economically redundant, in this section we assume that the premium insurance buyers would be willing to pay for a given nominal insurance contract is independent of the probability of the insurance company's ruin.

In the absence of agency and bankruptcy costs, the insurer's common stock is a claim on the portfolio of assets and contingent liabilities (insurance policies) held by the company. In efficient financial markets,³ the value of the insurance portfolio—ergo the value of the insurer's common equity—is equal to the algebraic sum of the values of individual assets and contingent liabilities in the portfolio. It can be easily shown that changing the composition of the insurer's portfolio by transacting assets and contingent liabilities at market clearing prices may alter the systematic risk and thereby the equilibrium expected return of the insurer's common stock.⁴ But such exchanges will not affect the value of the insurer's common stock.

Since reinsurance involves exchange of contingent liabilities and assets between insurance companies, it may reduce the systematic (and total) risk of the insurer's common stock. But, in efficient financial markets where the reinsurance transactions, in addition to the direct transactions, are consummated at market clearing prices, the reduction in the systematic (and total) risk of the insurance portfolio will not alter the value.

Consequently, when insurance premiums are perfectly inelastic with respect to insurer's ruin probabilities, exchanging liabilities and assets at market prices

³ The capital market equilibrium conditions require that both the securities held in the asset portfolio and the insurance policies be priced according to the same equilibrium mechanisms. See, for example, Quirin and Waters [13], Biger and Kahane [2], and Kahane [10].

⁴ Proofs based on mean-variance CAPM are available on request from the authors.

offers zero total gains from trade and is “irrelevant” to the shareholders of the ceding and the reinsurance companies.

II. Demand Induced Reinsurance

The proposition about irrelevancy of reinsurance to the shareholders of the ceding company is based on the assumption that policy premiums earned by the insurer are independent of the insurer's probability of ruin. Consequently, the total risk of the insurance portfolio has no bearing on the value of the company's shares.

When this assumption is removed, however, it can be shown formally that the value of the insurance company can be increased through use of reinsurance at market prices. Since purchasers of insurance policies are, by definition, risk-averse and are incompletely diversified—otherwise they would self-insure—the premium they would be willing to pay for a given insurance contract would be inversely related to the probability that the insurance company will default on that contract due to bankruptcy. In other words, rational risk-averse insureds will pay a lower price for a policy when the probability of default on the part of the insurer is high.

A risky insurance policy (where the insurer cannot meet its obligations to fulfil claims) implicitly burdens the insured with involuntary self-insurance of a random amount. Obviously rational risk-averse people would not pay the same premium for a risky insurance contract as they would for a contract that would be fulfilled with a probability of one when, and if, the claim arises. In this context, policy-holders of an insurance company are akin to holders of risky debt in corporations and the analogies in the bond markets abound.

Default is directly related to the ruin probability for the insurance fund. For any given investment portfolio, the insurance company would reduce its ruin probability by reinsuring a part of its contingent liabilities.⁵ Consequently, reinsurance at market prices allows the ceding insurer to charge higher premiums and increase the expected return to its shareholders above the equilibrium required rate. This would lead to the concept of demand induced reinsurance which may benefit the shareholders of the insurer and explain why insurers reinsure certain types of contingent liabilities which increase their ruin probabilities but not others.

The effect of reinsurance by the insurance company is essentially the same as would be achieved by the insured spreading his risk by purchasing a portfolio of small insurance contracts from a large number of insurance companies, to reduce the risk of not collecting on the policy through the bankruptcy of a single company.⁶ Indeed, many large corporate risks are handled on this basis with each insurer writing a fraction of the risk. But transaction costs and possibilities for

⁵ This has been extensively analyzed in the actuarial literature. See, for example, standard texts such as Buhlmann [4] and Beard, Pentikainen, and Pesonen [1].

⁶ Some important legal differences may arise since the insured does not have privity of contract with the reinsurer. Thus, whilst the reinsurance contract may reduce the probability of ruin for the direct insurer, the recovery by the insured of any reinsurance payments will be subject to the procedures of liquidation. It is also clear from this analogy that the value of reinsurance to the insured depends indirectly on the ruin probabilities of the reinsurers.

adverse selection due to asymmetric information often dictate that the more practical solution is to write a single contract with an insurer who in turn reduces the risk of ruin by reinsuring with many other companies. The effectiveness of this course depends on the ruin probability of the reinsurer who may in turn seek further reinsurance. Thus the web of interconnecting contracts between insurers can become complex. Obviously, the equilibrium allocation of risks through reinsurance would be reached in the insurance market when further reallocation of risks among insurance companies ceases to have any favorable impact on the share values of the insurance and reinsurance companies involved in the transactions.

III. Conclusions

Unlike previous explanations, the demand-induced theory of reinsurance is entirely consistent with the capital market equilibrium in a mean-variance world. This theory explains why reinsurance is compatible with the share price maximization objective of the insurance companies. More importantly, it implies that even in the absence of regulations designed to protect policyholders' interests, there is sufficient motivation on the part of insurance companies to spread risks through reinsurance.

An even stronger case for reinsurance can be made if the equilibrium in the industry is extended to include the supply of insurance services in a perfect market. In the absence of transactions costs, any outstanding opportunities for spreading risks through reinsurance are incompatible with a long-run competitive equilibrium in the insurance industry. In a perfect market the insurers will have to reinsure to survive. The existence of transaction costs, however, imposes a limit on the extent of risk spreading through reinsurance. But since reinsurance contracts can be negotiated on an insurer's whole portfolio as well as upon the individual liabilities, the transactions costs are proportionately small, and the degree of risk spreading achieved is substantial.

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