

Why Should an Insurance Firm Charge for Frictional Costs?

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Abstract

In this paper, we establish a premium principle that calculates the premium as the sum of present values of claim liability, normal business expense, income tax and frictional cost. The principle provides a “fair” premium in the sense that it generates a fair return on capital. In other words, it automatically produces the correct cost of equity capital without knowing its value. The frictional cost is defined as the sum of all expenses incurred by the firm that exceed the “normal” level or category. We discuss the sources of frictional costs and techniques for quantifying them. If a firm manages its market cap instead of book value, the frictional cost needs to be restated by incorporating its impact on the franchise value.

Keywords

Fair premium principle, frictional cost, cost of capital, franchise value.

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1 Introduction

Insurance premium provides funds for paying policy claims. It also covers underwriting, claim adjustment, and administrative expenses. Moreover, the premium should include a profit margin so that, after paying off claims and various expenses, the firm produces enough profits for the shareholders. The premium amount is “fair” if it compensates shareholders for the cost of capital but does not overcharge policyholders. Obviously, it is important for a firm to know its fair premium, although actual premium level swings up and down depending on the market condition.

In this paper we propose the following premium principle

$$\begin{aligned} \text{premium} = & \text{PV loss} + \text{PV expense} \\ & + \text{PV income tax} + \text{PV frictional cost} \end{aligned} \tag{1.1}$$

where PV stands for the present value at an appropriate risk adjusted discount rate. The discount rate for losses reflects the market or the systematic risk. Similar premium formulas have appeared in actuarial literature, for instance Vaughn (1999), Cummins et al. (2000), Myers and Read (2001), Exley and Smith (2006). We will present a more rigorous treatment. We define the frictional cost as the sum of all costs that exceed the normal level or normal category for conducting the insurance business. This is slightly different from some common definitions of frictional cost. It has a wider scope. With this definition we prove that equation (1.1) produces the fair premium. It generates the shareholder expected rate of return but not more.

The frictional cost has been a central issue in enterprise risk management. It includes a board range of costs, most of which are recorded as expenses in financial statements. However, they are not normal business expenses, but consequences of extraordinary events. Many recent papers have associated the frictional cost with the fact that an insurance firm holds capital. Thus it is often called the frictional cost of capital. Other terms used include the “surplus cost” by Myers and Read (2001), and the “risk management cost” by Cummins et al. (2000). In Hancock et al. (2001), Froot et al. (2004), Estrella (2004), Perold (2005), etc. the frictional cost is considered consisting of costs of holding capital and costs of financial distress. Mango (2005) splits it differently, into a capital occupation cost and a capital call cost. These classifications provide valuable high level views. Summarizing

frictional costs into a few categories may reduce the workload of quantifying them.

For pricing purpose we need to look at costs beyond those associated with capital, for example unexpected expenses caused by system breakdown or other process failure. In fact we intend to include all costs that affect the financial statements. In traditional ratemaking, for various reasons, many costs hitting the financial statements are not considered essential to normal insurance business, thus are not covered by premium. We propose to call all the “abnormal” costs, whether associated with capital or not, the frictional cost. The boundary between the normal expense and the frictional cost is inevitably vague. But in total they should account for all negative impact on profit. If the frictional cost is not fully compensated by premium, the shareholder return would be reduced. Pricing of frictional costs is still in its infancy. One approach is to list all relevant events and analyze their consequences. Tripp et al. (2004) used this procedure to quantify operational risks.

From shareholders’ point of view, the insurance firm performs two tasks: (1) investing capital in financial markets; and (2) issuing insurance policies and settling claims. If premium is charged according to (1.1), the premium, plus its investment income, is just enough to “cover” all costs of the insurance operation. Notice that the insurance operation (2) has volatile outcomes. Actual profit may turn out to be positive or negative. (1.1) only guarantees the premium covers all costs on the present value bases. We prove equation (1.1) produces the fair premium, that is, the combined operation (1) and (2) generates exactly the shareholder required return on capital.

For a stock firm, the shareholder required rate of return is called the cost of capital. It is a key concept in corporate finance. In traditional ratemaking insurance policies are priced to cover claims, underwriting and administrative expenses and certain judgmental profit margin. Only recently industry leaders began to use the ROE as a profit measure. Presumably the target ROE matches the cost of capital. Therefore, estimation of the cost of capital becomes a key issue. It is usually derived from past stock performances using statistical methods. This practice, however, has some apparent weakness. A firm’s business, internal operation, and market conditions change from year to year. Thus sample statistics from past data have poor stability and predictive capacity. Professionals have not

agreed on which financial model, among the CAPM, the FF3F, etc., is best for projection. Some refined estimates of cost of capital differ greatly according to data and approaches used, see Cummins and Phillips (2005) and Swiss Re (2005). Our premium principle is an alternative to the ROE approach. It automatically produces the correct cost of capital, whose value we need not know.

In the above discussion, expenses and frictional costs are evaluated against the firm's book value. Shareholders, customers and regulators use accounting reports to measure a firm's performance. So managers have the incentive to manage the book value. However, the book value omits the firm's capacity of earning future profits. This capacity, called the franchise value, can be considered the difference between the firm's market cap and the book value (Hancock et al. 2001, Froot et al. 2004, Exley and Smith 2006, Panning 2006). Both book value and franchise value should be actively managed. The premium principle (1.1) holds in this expanded territory, but frictional costs need to be restated to reflect changes in franchise value.

The paper is organized as follows. In Section 2 we introduce our setup of splitting an insurance firm into the insurance operation and the capital investment. For the firm to benefit shareholders, the insurance operation has to add value. Section 3 reviews market valuation of assets and claim liabilities. Expenses and income taxes do not have market value. We explain in Section 4 how to use the discounted cash flow (DCF) models to estimate their present value. In Section 5 we clearly define the frictional cost and discuss some modeling issues. Section 6 contains a proof that equation (1.1) produces the "fair" premium. Section 7 shows one advantage of the premium principle: it automatically provides the correct cost of capital. In Section 8, we point out modifications needed for the impact of franchise value. Section 9 concludes the paper with additional thoughts.

2 How Does an Insurance Firm Create Value?

From the point of view of shareholders, the operation of an insurance firm may be described as follows. The shareholders contribute capital, creating underwriting capacity so the firm may issue insurance policies. The firm invests premium and capital in financial markets. The asset is used to pay policy claims as they come up, and to cover operating expenses, including salaries, fees, rents and equipment.

The leftover asset, or the *net asset*, goes back to the shareholders.

Since the firm invests its asset mainly in financial securities, shareholders view the firm as an investment intermediary: they entrust their funds to the firm, and let the firm manage their investments. Naturally, shareholders expect that this way works better than direct investing. Some of the advantages are obvious. A firm pools together a large amount of cash so is able to create greater diversification. It also incurs less investment expense. But these benefits are better provided by mutual funds. The main advantage of investing in insurance firms is that the insurance operation creates value.

We now examine how insurance adds value on top of the financial market investment. Fix a time period, say one year, beginning at year 0 and ending at year 1. Let c be the initial capital, which consists of net assets from previous operations and any new contribution from shareholders. For simplicity assume the firm has no unpaid loss or expense from previous operations. It issues new policies at year 0 with a total premium p . The aggregate policy loss is a random variable L , which is paid at year 1. Usually some expenses are paid at policy issuance, like acquisition expenses, and others paid later. We assume p stands for premium net of all upfront expenses, and all other expenses is a random variable X paid at year 1. The initial asset, $p + c$, is invested in a portfolio of bonds and stocks, with a random rate of return R . Then the net asset at year 1 is

$$Y = (p + c)(1 + R) - L - X. \quad (2.1)$$

Here we assume X includes all underwriting, claims, investment expenses and taxes. Then, if the firm is liquidated at time 1, shareholders would receive amount Y before their income tax. (Note that Y is after the corporate income tax but before the personal income tax.)

If, instead of entrusting the capital c to the firm, the shareholders invest it directly in the same bond and stock portfolio to earn the same rate of return R , then they will receive $c(1 + R)$ pretax. The difference between the two investments is

$$V \equiv Y - c(1 + R) = p(1 + R) - L - X. \quad (2.2)$$

This is the gain added by the firm. V is a random variable that may come out positive or negative. The present value of V , denoted by v , measures the value of

the insurance operation. Notice the significant difference between this and some other profit measures, like the ROE (return on equity), the RAROC (risk adjusted return on capital), or the EVA (economic value added, introduced by Stern Stewart & Co.). All those measures rely on some benchmark cost of capital, which is not needed for our analysis.

To calculate v , we need to estimate present values of assets, insured losses and various expenses. They are treated separately in the following three sections.

3 Market Value of Assets and Liabilities

Valuation of assets has been studied extensively in finance literature. Bodie et al. (2002) is a standard reference on the subject. Among the many valuation models, the Capital Asset Pricing Model (CAPM) is arguably the most basic and insightful. In its simple mathematical formulation, all fundamentals of asset pricing come to light. The price is set by market competition. It reflects a tradeoff between investors' expected return and the volatility of the return. The return is a reward for the market or systematic risk. Diversification reduces unsystematic risks, so is an important objective of investment. The CAPM has been modified and extended in many ways, in an effort to improve its accuracy. Our theory does not rely on any specific valuation model. We implicitly assume the financial market is efficient and competitive, so permits little arbitrage opportunity; and all assets are traded near their fair values.

In contrast, liability valuation is less well developed. There is no secondary market to set the price for most liabilities. In practice, insurance firms use various discounted cash flow (DCF) models to calculate the present value. A policy claim is a series of uncertain cash flows. The market value may be calculated by discounting the expected cash flows at a risk adjusted interest rate, or by discounting them at the risk free rate and then adding a risk load. Babbel et al. (2002) compares three commonly used DCF approaches. Older pricing schemes consider only a policy's own risk. More advanced models extend a capital market principle to liabilities: the price of a policy is determined not only by its own uncertainty but also by how it is correlated with the market. In such a model, all policies are "connected" and their prices are derived all at once in a market equilibrium. Notable examples include Bühlmann (1980), Borch (1990), Taylor (1995).

Recently, the accounting boards, including the IASB and the FASB, have taken initiative to establish an international standard for valuing liabilities. The intended value, called the market value or the *fair value*, is market based rather than firm-specific, and incorporates only systematic risks. For untraded liabilities, the value is the amount “settled between knowledgeable, willing parties in an arm’s length transaction” (the Fair Value Task Force 2002, p.1). Ultimately, the standard will unify various models used by firms and actuarial researchers. Details of this development can be found in Fair Value Task Force (2002) and Conger et al. (2004).

In this paper we take the fair value of liabilities as given. Use l to denote the fair value of loss L . l could be calculated by one of the DCF models. Risk aversion of insurers implies the risk load is positive, or equivalently, the risk adjusted discount rate is less than the risk free rate. But some argue that since most liabilities are uncorrelated with capital markets, they do not have systematic risk; therefore the risk loads should be zero. Further evidence is needed to clarify this issue. The fair value of liability is consistent with the market value of asset. For example, a combined holding of \$100 stock and \$70 insurance liability is valued at \$30; and it is exchangeable for any \$30 stock. The value is independent of which insurer holds the liability. In particular, the insurer’s capital level is irrelevant.

4 Present Value of Normal Expense and Income Tax

In equation (2.1), X represents all costs incurred by a firm other than claim payments. We divide X into the following three groups: the normal expense E , the income tax T , and the frictional cost F . Denote their present values by e , t and f , respectively. The DCF is the general framework for valuing these costs. In this section we discuss the first two groups.

4.1 Normal business expenses

Normal expense E consists of two categories. The first is the allocated loss adjustment expense, now called the defense and cost containment expense in the US. It is associated with specific claims. It is often grouped together with the corresponding loss in reserving and pricing. Its present value is thus calculated using the same discount rate as used for loss. The second category comprises other costs

in conducting normal insurance business. The CAS ratemaking principle, Actuarial Standards Board (1988), identifies the following expense groups: unallocated loss adjustment; commission and brokerage; other acquisition; taxes, licenses and fees; and general administrative. In pricing, actuaries use the Insurance Expense Exhibit (IEE) and internal data sources to estimate the expense cash flows and discount them at the risk free rate (Taylor 1994). The risk free rate seems a reasonable choice, since normal expenses contain little systematic risk. They vary within a small range and are largely uncorrelated with losses and investments. e is thus the sum of present values of the two categories.

e is a standard component of insurance premium. Unlike assets and insured losses, expenses cannot be exchanged in a market. e is a firm-specific quantity. But to the firm and its shareholders, \$1 of e is not different from \$1 of l as both represent a \$1 loss in firm value or profit. The value of e is independent of the investment of assets, since the discount rates are either the risk free rates or some liability discount rates.

4.2 Income taxes

The income tax, T , is usually excluded from premium calculation. But in the Myers-Cohn and other fair premium models, income taxes are an important consideration. Taylor (1994) compares the effect of income tax in several well-known fair premium models. There are two kinds of income taxes, one on the underwriting profit and the other on the investment income of capital. Their tax rates may be different. Tax charges are based on estimated accounting income, which follows a set of complex rules about earned premium, incurred loss, realized capital gain, etc. (again see Taylor 1994, for a full account). Here we briefly discuss the present value of income tax for the one-period model.

The total expense excluding income tax is $E + F$. From equation (2.1), the underwriting profit, including the investment income on premium, is $p(1 + R) - L - E - F$. Tax on underwriting profit equals the tax rate times this amount. Since the present value of underwriting profit is $p - l - e - f$ (estimation of f comes later in Section 5), this amount times the tax rate gives us the tax on underwriting profit. The other tax charge is based on the investment gain on capital, cR . The present value of R equals $r/(1 + r)$, where r is the risk free rate. So the present value of this tax equals the average tax rate times $cr/(1 + r)$. Different classes of

bonds and stocks have different tax rates. The average tax rate thus depends on the investment portfolio. To sum up, t is a simple function of present values of other cash flows and tax rates.

“Double taxation” is a term used often in finance. Shareholder income is taxed twice, first at the corporate level and then at the personal level when a shareholder sells the stock. The corporate tax is an extra cost when compared with direct financial market investment.

5 Frictional Costs

5.1 Definition of frictional costs

We name the third expense group, $F = X - E - T$, the *frictional cost*. It represents expenses beyond the normal level required for conducting insurance businesses. Normal expenses are budgeted in the business plan, and are incorporated in premium. A few expense types are conventionally excluded from premium calculation, like charitable contributions and lobbying expenses (Werner 2004). They are classified into F by our definition. Expenses of normal types occasionally exceed normal levels due to extraordinary events. These constitute the greater part of F . For example, the marketing expense is normal and planned; but an error in marketing strategy may greatly increase its amount. The excess amount thus goes into F . One can see that there is no definite boundary between the normal expense and the frictional cost. We may characterize the former as recurring, ordinary and conventionally planned, and the latter as non-recurring, extraordinary, and “all other”. The classification of a particular item may differ by firm and from one year to another. The key is that E and F should sum up to the total amount of non-income-tax expense. Moreover, frictional costs can also appear as raised claim costs or reduced premium. If a claim fraud inflates a payment from \$100 to \$120, the \$20 is a frictional cost. If a collection problem results in a premium loss, the amount of loss is also classified as frictional cost. Similarly, separation of frictional costs from premium and claim data relies mostly on judgment.

The term frictional cost has been used in literature with slightly different meanings. It is often associated with the fact that an insurance firm holds capital. Hancock et al. (2001), Froot et al. (2004), Estrella (2004), Perold (2005), among many others, consider the frictional cost as the sum of agency cost and the cost of

financial distress. Agency costs arise from the separation of ownership and control in stock firms. Managers tend to make decisions for their own benefit rather than that of the shareholders. Typical agency costs include premium loss from lost business opportunity, and expense from unnecessary merger and acquisition. The cost of financial distress appears in many forms. Firms in financial trouble incur higher expense in dealing with regulators and auditors, and in defending lawsuits. Their profit declines because of deterioration in opportunity, productivity, and employee morale. The cost of financing also rises. Froot et al. (2004) and Chandra and Sherris (2005) contain in-depth discussion of these costs as well as the direct bankruptcy cost. Merton and Perold (1993) point out financial firms experience greater frictional costs than productive firms, since the former is more “opaque” to customers and shareholders. Note that our definition of F captures many items that belong to neither the agency cost nor the cost of financial distress. Examples include unexpected expenses due to system error or other process failure.

Frictional cost is closely linked to the *operational risk*. Tripp et al. (2004) define the operational risk as “the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events”. It is roughly an aggregate of all risks other than core insurance risks. Tripp et al. (2004) list more than one hundred operational risk *causes*, and identifies their *consequences*. Many of the causes may appear at the same time to threaten a firm’s profitability and even solvency. In actuarial literature, the operational risk and the frictional cost have been studied separately. On close examination, however, the frictional cost F approximately equals the aggregate consequence of operational risks.

5.2 Modeling frictional costs

Quantification of frictional costs is still in its infancy. Premium calculation requires the present value f . In the DCF framework, we need to estimate cash flow F and select appropriate discount rates. As just discussed, the frictional cost is not a separate accounting entry. It may appear as increased losses or expenses, or as reduced premiums. One accounting item may contain both the normal cost and the frictional cost. So historical frictional costs are not readily identifiable from financial reports. Moreover, since many frictional costs result from non-recurring events, past F ’s have little predictive power.

Tripp et al. (2004) recognize the difficulty of forecasting F using experience data, and propose a more feasible approach. They find that working from causes is more effective than from consequences. One should start out by constructing a list of risk factors that may contribute to F , then identify the consequence of each cause as a possible increase in loss, in expense, or a possible reduction in premium. Each consequence is modeled by a random variable, which may be derived using some standard techniques: statistical curve fitting, frequency-severity analysis, Bayesian statistics, expert opinion, or practical trial and error. Care should be given to correlations between risk factors and to avoidance of double counting. Since F is expressed as part of the expense, one need to convert a premium decrease or a loss increase to an equal amount of expense. Adding up all the consequences we obtain the aggregate frictional cost F , which is a random variable with a known probability distribution.

The discount rate for frictional costs has not been discussed in literature. The risk free rate does not seem appropriate. Some frictional costs are correlated with investment or liability risks, hence are subject to systematic risk. For example, both the fraud level and the asset return are linked to macro-economic conditions. So the risk adjusted discount rate for fraud cost is likely to be less than the risk free rate. Restructuring costs, which may be huge sometimes, also tie to the business cycle.

A high level approach of modeling the frictional cost may also help. Accept the view that frictional cost is largely composed of the agency cost and the cost of financial distress. The former is an increasing function of the amount of capital, and the latter an increasing function of the probability of default. Hancock et al. (2001, p.17) state some rough ranges for these costs. Other papers, including Estrella (2004), Perold (2005), Chandra and Sherris (2005) and Zhang (2006), model the present value of agency cost as a constant times the amount of capital, and the present value of cost of financial distress as a constant times the price of the default option. The constants depend on the firm's business risk, operating environment, etc. This approach reduces the estimation of f to the determination of two constants.

6 A Fair Premium Principle

In the preceding sections, we reviewed the fair market values of assets and liabilities, the present values of normal expenses, income taxes, and frictional costs. We emphasized the frictional cost since it is a newcomer in the ratemaking arena. We now prove the present values l , e , t and f are sufficient for determining the fair premium.

The fair premium is defined as the amount of premium that “provides shareholders with a fair return on capital but no more” (Taylor 1994). The shareholder capital is c at time 0. Right after policies are issued and the premium and capital are invested, shareholders hold the following two investments: (1) an investment portfolio purchased with capital c ; and (2) an insurance portfolio consisting of investments purchased with premium p , and contingent liabilities for claims, normal expenses, income taxes, and frictional costs. In equation (2.2), the outcome of the insurance portfolio is denoted by a random variable V , whose present value is $v = p - l - e - t - f$. The value of the firm, that is, the combined value of the two investments, is thus $c + v$. (Here we assume all assets are bought at their fair prices.) Note that the insurance portfolio is not a publicly tradable financial instrument, so does not have a “market” value. But we have shown how to use the DCF approach to value all its components.

If the shareholders invest in the capital market directly, their investment is worth c . So v is the “value added”. (This “value added” is on the present value basis, while the EVA by Stern Stewart & Co. is a function of future values.) If $v < 0$, the insurance operation reduces the shareholder wealth; while if $v > 0$, this amount is added to the shareholder wealth instantly (right after the issuance of the policies). Since insurance markets are not always competitive, it is possible to create positive v by charging higher premiums. But this violates the definition of fair premium. The fair premium p is derived by setting $v = 0$, that is

$$p = l + e + t + f. \tag{6.1}$$

This fair premium principle improves the Myers-Cohn model (see Taylor 1994) by explicitly addressing the frictional cost; without it the firm under-charges the policyholders. (Notice that e and t are functions of p themselves. So p needs to be solved from (6.1).) (6.1) is drastically different from some other premium principles, like the internal rate of return (IRR) model. It does not use the cost

of equity capital (more on this in the next section). More importantly, equation (6.1) is *derived* from the simple idea that shareholders should retain their value c after issuing policies. Higher or lower premium charge is deemed unfair to either the policyholders or the shareholders.

Equation (6.1) determines the total premium of the firm. Premium for an individual policy is obtained by allocating each component in (6.1). For the i th policy we write $p_i = l_i + e_i + t_i + f_i$. l_i is the present value of the loss to the policy. Calculation of e follows conventional ratemaking rules. For t_i we consider the income tax on underwriting profit and that on investment return on capital separately. Allocation of the underwriting tax should be straightforward after l_i , e_i and f_i are obtained, and that of the capital investment tax follows the allocation of capital, which is another vigorously studied issue. Split of f by policy has not been discussed in literature. Viewing F as the aggregate consequence of a list of risk factors, we may try to allocate each of the consequences. Another approach relies on the high level view that the frictional cost is the sum of agency cost and the cost of financial distress. Thus allocation of f again reduces to capital allocation.

7 An Alternative to Cost of Capital

For a stock firm with no debt, the cost of capital is the shareholders' expected rate of return on their investment. In the CAPM paradigm, what determines the expected rate of return is the systematic risk of the stock. For an insurance firm with given amount capital, book of business, and investment strategy, the higher the premium, the higher the return and the lower the risk. Therefore, at a particular premium level the return exactly compensates the risk. Clearly, this is the fair premium given by equation (6.1).

Firms have been using the cost of capital as a guidance for premium charge and a performance measure. Familiar methods include the ROE, the RAROC and the EVA. They all require accurate forecast of the firm's cost of capital. Unfortunately this is no easy task. First, the riskiness of a firm depends on many variables, including firm size, capital level, mix of business, investment strategy, and operating efficiency. No two firms are alike. So a firm cannot copy a competitor's cost of capital, or even use it as a reference point. Second, firms and

markets change from year to year. Historical return data do not come from stable experience. So standard statistical methods inevitably produce distorted results. Third, researchers have not found a reliable model for predicting future costs of capital. Well-known models like the CAPM or the Fama-French Three-Factor all have weaknesses. Besides, the model parameters (β and others), as just discussed, cannot be estimated without distortion. Neither can they be easily extrapolated to future years. Cummins and Phillips (2005) and Swiss Re (2005) recently estimated the cost of capital for some industry sectors. Their results vary considerably according to method and data used.

We now prove premium p calculated in (6.1) automatically produces the required rate of return. So our approach is an alternative to the cost of capital models. We begin with a familiar fact in investments: any asset purchased at fair price provides a fair expected rate of return. An investor with \$100 may choose to buy a bank CD, a treasury bond, the IBM stock, or an S&P 500 index fund. These assets have different levels of risk and different expected returns. But as long as they are fairly priced, each has an expected return on \$100 exactly offsetting its risk. It is not necessary or practical for the investor to know his expected return and the exact risk/return relationship. He only needs to make sure the securities are fairly priced. In Section 6, we split an insurance firm into two components, an investment portfolio purchased with capital and an insurance portfolio. The firm has a fair value $c + v$. So its expected rate of return—(expected return)/($c + v$)—exactly offsets its risk. Since the shareholder capital is c , if $v > 0$ ($v < 0$), the expected return would over-compensates (under-compensates) the shareholders. Therefore, only if $v = 0$, or p satisfying (6.1), the firm generates the fair expected rate of return.

For pricing purpose, the frictional cost is more important than the cost of capital. Assume we attempt to use the ROE model for premium calculation and have obtained the cost of capital accurately. To calculate the expected return we need estimate losses, expenses, income taxes, and frictional costs. So the frictional cost is indispensable. But once all these components are obtained and properly discounted, equation (6.1) readily produces the correct premium; and the cost of capital is not needed.

Insurance firms are required to invest assets conservatively. Because liabilities

and frictional costs are highly risky, the shareholders' investment, i.e., the firm's stock, is much riskier than the assets. For investors, one reason to buy insurance stocks is to introduce the risks of liabilities and frictional costs into existing investments to create desired diversification. Our approach of valuing the insurance operation is in the spirit of the net present value (NPV) rule in capital budgeting (for a standard reference see Ross et al. 2002, Ch.9). Corresponding to our splitting a firm into two components, investment of capital and insurance, we may regard the shareholders as making investment in two steps. They hold the capital investment initially. Then they consider whether to add the project—insurance. The NPV of the project is v . So they take on the project only if $v \geq 0$. Notice that the NPV is not obtained by discounting the overall insurance cash flows. The PVs are calculated separately for premiums, claims, expenses, frictional costs, and income taxes.

The capital investment is a sub-portfolio of the total asset investment. In Section 6 we assume the capital portfolio contains the same fraction of every security in the asset portfolio. So they have the same rate of return, R . This assumption is not necessary. Financial managers sometime assign investments differently, to create duration match between assets and liabilities, for instance. Our results stay the same no matter what part of the asset portfolio is associated with the capital. The actual return of the capital portfolio varies with the associated investments. But equation (6.1) relies on present values, not actual outcomes.

However, how the total asset is invested does affect the fair premium. We have ignored the solvency issue in our discussion. If $L + X$ turns out greater than $(p + c)(1 + R)$, the firm becomes insolvent. It stops paying claims after all assets are exhausted. Therefore, the real claims liability is not L , but something less. And the fair premium should be reduced accordingly. For well-capitalized firms this premium effect is small. We do not discuss it further in this paper. Many papers, including Cummins et al. (2000), Myers and Read (2001), and Exley and Smith (2006), address the insolvency risk explicitly. Zhang (2006) studies how the premium credit changes with capital level.

8 From Book Value to Market Capitalization

For the firm described in Section 2, the net asset at time 1 is $V + c(1 + R)$. The value $c + v$ is the firm's *economic book value* at time 0. The book value, by definition, equals the market value of assets minus the present values of all liabilities. Customers and regulators use the book value to measure a firm's financial strength. Investors use it as a base for valuation of the stock. But a firm usually stays in business indefinitely. Through past operation it builds a "brand name" that is indispensable for future profits. This is reflected in the *franchise value*, which is outside the book value. For a stock firm the total value of outstanding shares is called its market capitalization, or the *market cap*. A convenient definition of franchise value is the difference between the market cap and the book value. Exley and Smith (2006) analyze a multiyear model and demonstrate that "franchise value is the present value of economic profit discounted at the cost of equity."

The book value has been the main concern of firm management. The franchise value is often regarded as "invisible" and uncontrollable by internal events. But since franchise value is part of the shareholder wealth, ignoring it may lead to suboptimal decisions. History has shown significant difference between the ROE and the stock return. Exley and Smith (2006) studied this "ROE bias". Part of the bias is created by the missing franchise value in ROE calculations. Hancock et al. (2001), Froot et al. (2004), Exley and Smith (2006), Panning (2006), among others, called for attention to franchise value related issues.

Insurance premium should cover all scenarios that destroy shareholder wealth. Such a scenario may appear explicitly as a negative accounting cash flow, or implicit as a deduction in franchise value. A change in franchise value is no less important than a cash flow. The fair premium principle (6.1) remains applicable in the expanded view. But frictional costs need to be reevaluated. For example, if a marketing expense of \$100 increases the franchise value by \$70, then it represents only a \$30 net expense, which is the amount added to F . If a strategic error reduces premium by \$100 and also costs \$5 in franchise value, then it contributes \$105 to F . Firm restructuring often hits the current year financial statement hard. Hopefully it creates a big jump in franchise value that more than offsets the hit. Costs of raising capital are also expected to be offset by the increase in franchise value. Although it is impossible to precisely quantify any effect on franchise value,

getting a rough estimate is better than completely ignoring it.

9 Conclusion

We derived a fair premium principle in Section 6. Since an insurance firm invests its asset mostly in financial securities, we can decompose the firm into a capital investment and an insurance operation. Insurance premium has to cover all costs; otherwise the insurance operation destroys the shareholder wealth, and the shareholders are better off investing in financial markets directly. Among the insurance costs we singled out the frictional cost and gave it a detailed treatment. The frictional cost, by our definition, has an “all other” nature. It has a wider scope than the agency cost and the cost of financial distress. To model frictional costs and estimate their present values, we suggested a link between them and the consequences of operational risks.

Reinsurance expense is one cost we did not discuss in this paper. Just as insurance firms charge policyholders for various expenses and profits, reinsurers charge ceding firms similarly. In addition, ceding firms incur expense maintaining reinsurance treaties and bear credit risks. These costs should ultimately be borne by policyholders. A complete premium formula also includes a credit for insolvency, which we briefly discussed in Section 7.

We mentioned in Section 5 that, either by convention or by regulatory requirement, premium does not cover all expenses. Sometimes the market condition forbids a firm to charge full actuarial premium. But managers should know how much the premium deficiency will cost the shareholders, and take action accordingly.

Our method is an alternative to the ROE or other models based on the cost of capital. We also pointed out in Section 7 that, for pricing purpose, the cost of capital is not really needed. Insurance ratemaking thus boils down to estimation of the four present values in equation (6.1). For the present value of frictional cost, modeling the cost and determining the discount rate are both challenging. Another unsettled issue has been the valuation of losses. Hopefully the ongoing movement of fair value accounting will eventually build a solid foundation. Further research is also required for breaking down firm level charges to individual policies.

Capital allocation plays a big role here.

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