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Measuring the Market Value of Risk Management

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FEW WOULD ARGUE THAT RISK MANAGEMENT is not valuable to organizations. It improves quality control and processes, mitigates damage and downside, and generally increases the operational efficiency for all types of companies. While we can quantify and measure these benefits at the business line level, understanding the more holistic value of risk management remains elusive. In particular, organizations are struggling with how to best determine the market value of risk management strategies. One promising framework, which draws on techniques and concepts from actuarial science and financial economics, not only provides the ability to quantify market value but can also drive greater consistency in assessing risk-return tradeoffs across a range of risk management efforts.

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Before delving into this framework, let's take a step back and examine how financial risk modeling, cash flow discounting and dividend policy are used in determining market and franchise value.

At a very simplified level, a firm's earnings equation might look like this:
Earnings = Revenues - Expenses

Some portion of earnings is retained or reinvested back into the company. The remainder is distributed or returned to the shareholders:

Distributed Earnings = Revenues - Expenses - Retained Earnings

This distributed earnings stream is a fundamental driver of the value of an ownership stake. In fact, equity analysts attempt to forecast the value of publicly traded firms based in part on estimates of future earnings patterns. They convert a stream of earnings into value through cash flow discounting—converting a possible series of earnings payments spread out in the future into a single net present value (NPV). This is based on the fundamental economic premise that money in hand today is worth more than money in the future.

In mathematical form, the discounted dividends model of equity valuation looks like:

Shareholder Wealth = NPV (Expected Future Dividend Stream)

Generally speaking, there is no rigid relationship between a firm's market value and the capital it holds. If market value is less than capital, a firm is a takeover target because it could be liquidated at a profit. Conversely, if the market value is above the capital, the excess market value is called franchise value. The aim of management is often said to be the creation of shareholder value but, more specifically, the objective is to build franchise value.

DISTRIBUTE OR RETAIN EARNINGS?

All companies regularly face the decision of allocating net revenues (profits) between retained earnings and dividends or share buy-backs. A central issue is the opportunity to invest retained earnings and the cost of financing alternatives. A firm can finance new projects or investments through either internal (retained) or external capital sources. Under the theory of perfect capital markets, a firm should distribute all earnings it does not need in the immediate future and simply issue more equity to finance new initiatives. However, in the real world, returning money to shareholders and reissuing equity incurs transaction costs. Even worse, if a firm finds itself in financial distress and needs external financing to keep operations afloat, potential investors may be unsympathetic in the price they charge for that financing. The high cost of such distressed financing is an incentive to retain earnings as an internal capital cushion.

CAPITAL POLICY IN AN INSURER

This earnings distribution question is structurally similar to the capital decision facing insurers—a decision that actuarial science has studied for decades. Initially the insurer capital decision was framed as, "Select an initial capital amount so as to minimize (or at least control) the probability of ruin—the point where the capital runs out." Policyholders should care about this probability because it represents the likelihood their insurer will not be able to pay future claims.

In 1957, Bruno de Finetti proposed changing the focus from ruin probability to the value of shareholder dividends distributed to owners. The equation for insurer capital under his optimal dividends model is:

Change in Capital = Profits - Dividends

The objective is the maximization of owner wealth rather than the minimization of ruin:

Shareholder Wealth = Maximum {Expected Value [NPV (Future Dividend Stream)]}

Since companies are faced with an infinite variety of dividend strategies, the challenge is to pick out the best one to maximize shareholder wealth. In the model above, the future stream of dividends is discounted back to the NPV at some appropriately chosen risk-adjusted discount rate. And because profits—and therefore dividends—are unpredictable, the average (expected value) must be taken over the range of possibilities. The result is the discounted dividends model for valuing a firm.

DIVIDEND STRATEGY

The possible paths of future dividends depend on the starting point, i.e., the amount of capital in hand today. Too little capital, and the high probability of insolvency means that dividends may not stream for very long. Adding a little capital might be worth a lot in terms of shareholder value.

On the other hand, with a lot of capital, additional infusions of capital may not do much to change the future of dividends and, therefore, shareholder value. The

relationship between the level of a firm's capital and its market value is not a straight line but a curve, specifically the M-curve.

Similar to the questions in the ruin theory, we are still asking about initial capital and risk management strategies. But the first question is: What is the optimal dividend strategy? De Finetti solved this in a simple case with no risk management. It amounts to a "barrier" strategy, in which all excess capital above a threshold level is returned by dividends or share repurchases to the owners. No such returns are made when capital is less than the threshold.

Over the next 50 years, researchers used increasingly sophisticated mathematics to extend de Finetti's model in a number of directions, including risk management and the possibility of recapitalization. Our focus is on a form of these models that we call the de Finetti-Levy Asset Value of Optimized Risk, Equity and Dividends (FLAVORED) model:

Change in Capital = Predictable Earnings - Random Losses + Capital Inflows - Dividends

Here, the random losses follow a so-called Levy distribution, combining "normal" fluctuations with catastrophic jumps. A particular novelty of this model is that the level of predictable revenue can be a function of the current level of capital. This reflects the now well-established phenomenon of insurance customer risk aversion. Customers want their insurer to pay claims

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when and if the need arises. If they feel the insurer is not on completely solid financial ground, they penalize the insurer by not accepting premiums as high as they would tolerate otherwise. This penalty exceeds the actuarial "fair value" of the risk of nonpayment of claims.
The other new element here is the capital inflow. Shareholders would consider this a "negative dividend" or worse, because it comes with a cost.

The market value equation for a FLAVORED model looks like this:

Shareholder Wealth = Maximum {Expected [NPV (Future Dividends - (1+k)(Future Inflows))]}*
In this equation, the factor "k" is the cost of raising external capital. Under normal circumstances, a large firm can expect to issue new equity with underwriting and administrative fees totaling around 5% or so. However, the financial distress of a firm after a catastrophic loss might not be considered "normal circumstances" and could raise the factor k significantly. In conditions of extreme uncertainty, there is a chance that investors in the capital markets could require expected capital gains amounting to several multiples (i.e., hundreds of percent) as a cost of injecting new capital.

THE VALUE OF RISK MANAGEMENT

So what, then, is the value of risk management? When properly publicized, risk management can be an important ingredient in managing public perceptions, and it can help companies avoid scandals and reputation-damaging headlines. Moreover, by reducing earnings volatility, risk management evades the "signaling problem" where equity analysts are not sure whether a downturn is merely a temporary fluctuation or a sign of deteriorating earnings potential.

While these are very real benefits, it is hard to put a price on them. Yet "doing" risk management incurs direct costs, whether it is buying an insurance contract or instituting a safety program. And even though risk management may yield monetary benefits such as cost savings, those savings are often not enough to offset the direct costs. This is particularly true of risk transfer programs; one cannot expect to collect consistently more in claims than one pays for insurance. Ultimately, the intangible benefits of risk management may not be sufficient to convince a hard-nosed CFO to cut a check for a particular initiative.

In economic terms, the market value of a risk management program is the difference between the market value of the firm with the program and the value of the firm without the program. FLAVORED models provide a framework for calculating how risk management protects franchise value.

Risk management affects the change-in-capital equation in two ways. The net costs may decrease predictable earnings and therefore dividend flows, but more importantly, risk management favorably alters the probabilities of random losses. Risk management, therefore, reduces the likelihood that a catastrophic loss will push a firm into bankruptcy—a development that would stop dividend flows altogether. Additionally, a firm with a solid risk management program is less likely to reach the point of financial distress, which leads to customers who are less willing to do business, employees that are less willing to stay on board and business partners that are less willing to extend credit on favorable terms. It is also less likely that a firm will have to turn to capital markets to raise money (at a net cost) to continue normal operations.

All of these effects can be captured and quantified in a FLAVORED model. By examining a firm's value as it would operate with or without a particular risk management strategy, we can compute the contribution of the strategy to shareholder value and pinpoint the most favorable option.

AN EXAMPLE

Setting up and solving a FLAVORED model is a complex operation. The relationship between levels of capital and the probability distribution of profit and loss must be formulated, and numerous parameters such as the discount rate, growth rate and external capital costs must be estimated. The solution proceeds by computer-based numerical methods applied to the optimization of stochastic differential equations.

Nonetheless, we can gain insight into the method by considering a highly simplified example. Consider an insurance company with $10 billion in capital and $5

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billion of franchise value, adding up to a total market cap of $15 billion. The insurer faces the risk of hurricanes and earthquakes, with a probability of 2.5% that it would sustain $2 billion or more in losses in a year and a 1% probability of losing $2.5 billion or more. In addition, a $2 billion loss will trigger a ratings action, which in turn would require significant price cuts to retain business volume. Such price cuts, if maintained, would effectively wipe out the $5 billion franchise value. With substantial uncertainty in the capital markets, we can assume that post-catastrophe external financing would be unavailable.

This hypothetical firm has an opportunity to buy an excess-of-loss catastrophe reinsurance program attaching just under $2 billion and providing $500 million in limit. At what price would the program add value to the firm? The assumptions combine to suggest there is a 2.5% probability that a catastrophe will cause the firm to lose its $5 billion in franchise value. The reinsurance program would reduce that probability to 1%. The benefit of this reinsurance program to shareholder value is the reduction in the expected loss of franchise value. Ignoring complicating factors such as the time value of money, the effect of the reinsurance premium on the level of capital, etc., this value is approximately (2.5% - 1%) * $5 billion = $75 million. Therefore, if the premium for the program is less than $75 million (or 15% rate on line), it would provide a net increase to shareholder value.

AVOIDING NAVEL GAZING

By focusing on sources of franchise value, the approach outlined by the FLAVORED model provides a comprehensive method for assessing the impact of risk management initiatives. Potentially any risk to franchise value—operational as well as financial or catastrophe—can be represented in a systematic way, allowing the market value of risk management programs to be calculated and compared with a single yardstick.

By focusing on shareholder value, companies can avoid ineffectual "navel gazing" when assessing the benefits of risk reduction and the costs of risk management initiatives. The risk/reward preferences that truly matter are not those of management, but those that stem from the larger business environment, which also includes customers, employees, business partners and investors. ■