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THE CERTAINTY PREMIUM

Previously,[2] we wrote about the problem finance theorists have with the business of risk transfer and the many explanations they have proposed to explain why hedging in general and insurance in particular should exist. The basic problem, deriving from the Capital Asset Pricing Model (CAPM), is that well-diversified investors should not care about risks that are uncorrelated with the market. Therefore it should be of no value (beyond actuarial expectations) to hedge such risks.

Modern CFOs, ever more pressed to justify every dollar of expenditure, are increasingly asking their risk managers: precisely *how* do insurance and hedging translate to increments of firm value? Explanations include nonlinearities in the corporate income tax, costs incurred in going bankrupt, external financing costs being higher than internal funding by retained earnings (see especially

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Froot et. al. 1993 and Froot & Stein 1998), incomplete diversification, and other features of an imperfect world.

Another set of explanations revolves around stakeholders (other than investors) who put a premium on certainty. These may include suppliers, employees, and customers. We wrote, "Mayers and Smith (1990) highlight the fact that probability of bankruptcy is an integral element of product quality. These stakeholder premiums can be significant drains on earnings. Garven and Lamm-Tennant (1997) include an explicit term for this, the default cost function, in their theoretical model of the value of an insurance firm."

This article explores more thoroughly the area of insurance customer risk aversion.

PROSPECT THEORY

There is a rich literature in the interface of psychology, human behavior, and economics known as behavioral decision theory or prospect theory. It deals with subtleties of people's response to uncertainty, and can be regarded as a "second order correction" to the "first order" approximation of the more familiar economic utility theory. It can help explain observed nuances in people's preferences, such as the framing effect, where the way a decision situation is phrased, despite its unchanged underlying reality, affects how people respond to it. Kahneman & Tversky (1979) is considered a milestone in prospect theory.

Prospect theory differs from utility theory in two important respects. First, rather than probabilities, it uses "decision weights" which tend to overweight small probabilities. Second, rather than use utilities which are functions of net wealth, it uses "values" which are functions of gains and losses from an ever-changing reference point. Losses are disvalued more than (monetarily equivalent) gains are valued. This logic leads to what is known as the "certainty effect" – that people place high value on eliminating the smallest chance that a purchased product or service will fail them.

It should not be surprising that personal insurance is affected by the certainty effect. If an insurance policy is worth $100 from a reliable company, what is a policy worth from a company with a 1% probability of going bankrupt? Surely the marketplace will price it at less than $99. But by how much? Can we quantify it? Can we measure the "certainty premium" and build it into our business plans?

LOOKING AT THE NUMBERS

Stewart & Stewart (2001) write: "Much of the scholarly empirical work on prospect theory in general and the certainty effect in particular has been in laboratory experiments, such as testing a sample group's aversion to risk. Laboratory experiments have the advantage of control but the disadvantage of not coming from real economic life. Some examples of the certainty effect have been drawn from such areas of life as overbetting longshots at the track and betting on lotteries... But those examples are not from mainstream economic activities. By any measure, insurance is a mainstream economic activity."[1] Examples of such laboratory studies are given in Wakker et. al. (1997), who say "people demand about a 30% reduction in the premium to compensate them for a 1% chance that their claim will not be paid."

Grace, Klein, and Kleindorfer (hereinafter, "GKK") (2001) is an example of a "field study" dealing with peoples' behavior, not just their opinions. They were given access to the Insurance Services Office's (ISO) extensive, detailed database of residential insurance transactions affected by catastrophe risk over the four-year period 1995-1998. This was supplemented by public information on insurer financial and organizational characteristics and the demographic and economic characteristics of residential households at a ZIP code level. Part of what GKK attempted was to relate A. M. Best ratings and price (that is, insurance premiums) to quantity of homeowners insurance purchases. They fit linear regression models

[1] The main point of Stewart & Stewart is to sound an alarm about a potential insurance crisis: if it becomes widely perceived that insurers are unwilling or unable to pay claims (to an extent large enough to trigger the certainty effect), then the industry will suffer disproportionately for it.

for homeowners non-cat, homeowners cat, and homeowners combined lines of business, separately in Florida and New York.

They found some substantial relationships. In Florida, all other being things equal, an A- company can expect homeowners sales of only 67.6% the volume of an A+ company. However, other comparisons in Florida were ambiguous, and in New York, the relationships did not hold up to statistical scrutiny at all.

GKK surmised that their anomalies might have been the result of the state guaranty funds shielding consumers from the full impact of the risk of insurer insolvency. They were able to test this in Florida by splitting the policies into two groups – those with coverage A limits below and those above the $300,000 state fund limit. These were, respectively, shielded and not (fully) shielded from the risk of insolvency. Rerunning the regressions on the high-value homes, they found that compared to an A+ company: an A company can only expect 88% the homeowners volume, an A-, 65%, and a B company, 59%. The results were even more dramatic when they examined cat cover by itself. There, the ratios were 89%, 50%, and 34%, respectively.

Epermanis and Harrington (E&H) (2001) studied 5,515 firm-years of data (1992-1996) on insurers that had been assigned letter ratings by A. M. Best. About 18% of those exposures represented a situation where the rating had been changed from the previous year; upgrades and downgrades were roughly equal. They regressed written

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premium growth (they did it separately for premium direct and net of reinsurance; the results weren't much different) against ratings changes, controlling variously for size of firm, line of business, and existing rating.

They were concerned with a "market discipline" hypothesis, so they investigated premium growth not only in the year of the change, but in the year following and the year before. They found some strong evidence that growth in the prior year is associated with a subsequent downgrade, especially for highly rated companies and commercial writers.

While their dataset was in many ways broader than GKK's, E&H could not disentangle price and quantity, leaving one to speculate on how firms changed prices following an upgrade or a downgrade. Nonetheless, all other factors equal, it appeared that being highly rated is worth an additional 5.9% per annum growth in direct written premium. Upgrades suggest a subsequent increase in the premium growth rate, but this is only statistically significant for low-rated firms (3.1% increase in growth rate), and small commercial firms in the year following the upgrade (4.6%). Downgrades suggest a subsequent decline in the premium growth rate, and this is fairly significant for both the year of and year subsequent to the downgrade (-4.9%); it is especially dramatic for the subsequent year of a downgrade on an already low-rated firm (-10.9%).

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Phillips, Cummins, and Allen (PCA) (1998) propose a theory of insurance pricing based on an analysis of the market value of assets and liabilities being equal to the value of the insurance firm (to its equity holders) plus the value of the claims (to the policyholders). The key quantity is the market value of the "insolvency put" that shareholders have in the company. PCA marry this orthodox finance-theoretic approach with empirical data: 90 property-liability or multiline insurers' experience in 1988-1992, with a total of 315 company-years of observations. Their conclusions about pricing revolve around their regressions where the value of the insolvency put is one of the predictor variables. Roughly speaking, if there is an X% chance that a valid claim will not be paid, then the buyers of the policy require a discount of 10X% to 20X% off the premium. This held more significantly for well-rated companies (X% much less than 1%). Poorly rated companies (over 3% chance) were not penalized nearly so much, perhaps not at all. The authors speculate this may be due to the impact of state guaranty funds.

A paper by Sommer (1996), while preceding PCA, is cited in PCA and is in fact based on earlier work by Cummins. Sommer takes the same theoretical stance as PCA, but differs in his approach to statistical modeling and analysis. His data is older than PCA's (1979-1988 instead of 1988-1992), but there is more of it (10 years by 142 firms). Sommer directly uses GAAP capital and its volatility

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(and a few other things) as regressors. In particular, he computes volatility from historical asset returns and liability accumulation rates whereas PCA back into implied volatilities from market equity and returns. This has the effect of conducting the analysis in the "objective" world rather than the "risk neutral" world as PCA did.

Sommer's regressions suggest that increases in a firm's equity-to-asset ratio (the mean in his sample was 0.342) are rewarded by price premia. Increases in the standard deviation of that ratio (the mean in his sample was 0.133) are penalized by price discounts. The magnitudes of both coefficients are around 3. Say a firm is operating at parity (insurance premiums equal to expected claim values) and at the mean values for those two parameters. The regression says that if its equity-asset ratio were instead 0.375, or its standard deviation were instead 0.10, then it would be selling at a 10% markup. Under certain assumptions, Sommer's results line up well with PCA's.

CONCLUSION AND NEXT STEPS

The "certainty effect" is real, and the "certainty premium," while not easily measured, is clearly substantial. Consumers appear to demand compensation at rates of upwards of 10 times actuarial expectations for their willingness to bear a small amount of risk in their insurance purchases. Letter grade differences in ratings are rewarded by double-digit market share differences and substantial changes in growth rates.

We are currently working with leading academics to develop a comprehensive market theory for the value of reinsurance. Our objective is to be able to project the traditional two axes of "risk" and "reward" onto a single "reward" axis. This should be particularly enlightening for the new generation of insurance CFOs, who have sophisticated backgrounds in finance theory and may be questioning the value of reinsurance practices.

The value of stability through reinsurance is closely related to capital requirements: both capital and reinsurance provide security to the policyholders. Such a value analysis will therefore have implications for capital requirements. Finally, the capital requirements and reinsurance value measures could be used to look at the relative costs and benefits for the insurer to expand or contract writings in various lines of business.

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