An Ideal Crisis

by Shane Whelan

Risk modelling is a risky business, but the burden of risk model failure is often borne by society in general rather than the firm in particular. This division of the ultimate cost ensures that risk models systemically underestimate the risk, as they are designed to capture only that part of the risk borne by the firm. In short, the risk models that underestimate risk will drive out the more reliable risk models that entail a lower return on their increased capital.

The underlying dynamic is simple. Consider Firm X that puts all its capital, made up of 50 percent equity and 50 percent of borrowings, into a venture that has, say, a 50 percent chance of doubling the investment and a 50 percent chance of losing it all. The expected payoff of the investment is the sum of the probability of each outcome times its payoff. In this example the expected payoff is simply the return of the original investment (that is, 0.5 times twice the capital plus 0.5 times nil). However, that is not the expected outcome for the firm's equity holders: their expected payoff is one and a half times their original investment, (calculated as 0.5 times [four-times the equity holder's original investment less loan of once their investment] plus 0.5 times nil). The equity holders are clearly incentivized to invest in the venture as it amply rewards their portion of the risk, even though it is not rewarding the overall risk run.

The stylized example above is oversimplified in just one material aspect: the risk could be quantified precisely. In practice, payoffs of ventures in the real world cannot be determined, as Keynes famously remarked, by "strict mathematical expectation." This observation means that the odds must be regarded as guesses—at best educated guesses. And it is the firm, and its risk models, that are regarded as providing the most educated guesses as it is in their chosen specialty. Incentives to bias risk measurement for those most expert in measuring it can be expected to lead to recurring disasters as risk periodically leaks out from firms to be mopped up by the rest of society.

The simple model applies to the property developer, mainly funding his activities from bank loans; to the buy-to-let investor or owner-occupier almost entirely funded by banks; and, to the banks themselves whose liability is limited to their capital base. And so we have the systemic underpricing of risk in the property market bursting the banks that were meant to hold it back in the fall of 2008.

Ever since debtor prisons were abolished in favor of lenient bankruptcy laws and limited liability allowed to firms, society created the incentive to misprice risk and therefore the inevitably of such episodes. According to this explanation, the world can point its finger at the United States who, first amongst nations in modern times, allowed unrestricted limited liability to firms from 1811 (beginning in New York state) and, from 1833, began repealing harsh treatment of defaulting debtors. Even today the United States remains to the fore with some of the most lenient bankruptcy laws in the world. This analysis is, however, only part of the explanation for the current system failure, and the proposal to repeal the laws is perhaps not the least costly solution: such laws arguably enabled the emergence of modern innovative economies.

Modern economies are based on the premise that all the main players look after themselves. The bankruptcy and limited liability laws gave property speculators and banks a put option on society so they could walk away from losses above their capital base, yet enjoy all the gains of such speculation. They acted in what they believed were their own interests. It seems that society—well aware of what was happening—did not effectively look after its own interest and now must pay the price.

Society, of course, appoints a financial regulator to look after its interests in this regard. The aim of regulation is designed to keep the probability of insolvency sufficiently low so that the direct and indirect damage caused by insolvency is set equal to the broad social ills of an inefficient overcapitalization of the industry. The expected payoff to the shareholder, when the financial regulator understates

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the real probability of default, is increased at the expense of society as our example showed; as the shareholder maintains greater exposure than is reasonable with the risk capital employed. The regulator must ensure the shareholders factor into their decision-making the risks that will ultimately be borne by society (so regulation is designed to "internalize the externalities"). This requires a reasonably accurate model of the behavior of the extreme left tail of outcome distributions and ensures, in the current case, that banks are suitably capitalized.

The current dominant methodology for banks assessing their capital needs (or, indeed, hedge funds) is based on estimating the value-at-risk (VaR)—that is, the capital that is needed so that the probability of needing more is sufficiently low (say, 1-in-100 or 1-in-1,000 chance). For speculative assets, one typically fits a distribution to possible returns and works out the implied VaR from this. It is well-known that the Normal distribution tends to underestimate the probability of extreme movements (the failure of the hedge fund, Long Term Capital Management, was a dramatic reminder of this; see Jorion (2000)). A more common approach of late is to fit a Student t-distribution to historic returns with the degrees of freedom selected so that the kurtosis of the Student t-distribution matches that of the sample kurtosis (see, for example, Jorion (2002)). This typically produces a higher VaR, but still appears to understate the true risks run. Berkowitz & O'Brien (2002) studied how risk models employed by six large multinational banks performed in practice. They reported that losses can substantially exceed the VaR and raised the concern that such occurrences may be correlated across the banks—indicating the possibility of a systemic risk across the banking sector when it comes to such extreme falls.

There were, of course, many more warnings that banks and other financial companies were significantly understating the risks in their portfolios. A growing literature was showing that the kurtosis of the return distribution of speculative assets does not exist (that is, the sample kurtosis will tend to infinity as the sample size increases) and that therefore; the VaR, and the extent of the expected loss once the VaR was exceeded, was considerably higher than was previously believed (see Whelan (2003), Chapter 4, for an overview of the literature). The closer we look, the bigger the investment risk appears. Simultaneously, there were some tell-tale signs that the financial services industry was coming to appreciate the magnitude of the risks and had busied itself over the last couple of decades in passing on investment risk to where it is least appreciated. Within the sphere of an actuary's influence, investment guarantees on pension and life products were withdrawn or reduced, defined benefit schemes were wound up, risk was transferred to members via defined contribution arrangements, and even reinsurers began setting limits to their ultimate exposure (the development of so-called "finite" reinsurance).

So, according to the assessment above, one might conclude that actuaries should get higher marks than bankers for their arithmetic. Yes, but society is not primarily concerned with who gets their sums right. Keynes knew, and the limited liability and bankruptcy laws enshrine the view, that getting the sums wrong is often better:

> "it is probable that the actual average results of investments…have disappointed the hopes that prompted them… If human nature felt no temptation to take a chance, no satisfaction (profit apart) in constructing a railway, a mine, or a farm, there might not be much investment merely as a result of cold calculation."

The world banking crisis allows us to point the finger at the bank regulators who got it wrong by failing to enforce capital requirements commeasurable with the risks run. No disapprobation applies to the pension and life assurance regulators who allowed actuaries get their sums right and quietly pass on the risks to individual savers. But which leads to the greater cost to society? To solve the banking

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crisis, each economy must now redistribute the losses to those that can bear them by some mechanism or other. However, it is difficult to envisage a solution to the greater misallocation of risk in society—there is unlikely to be an acknowledged crisis and certainly no bail-out of all of those individual pensioners who learn too late the true cost of investment risk.

The economic system that has developed over the last couple of centuries comes with embedded periodic crises due to its inevitable mispricing of risk. That is our system, and it is the best yet devised. What we can do is choose the type of crisis we get. The current loud global banking crisis, insisting on the simple if unpleasant measures, is altogether more preferable than the future silent problem of individual pensioners, isolated and ignored in their increasing poverty.

Selected References

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