Self-referential **risk**

*Even good models and successful product innovations can cause problems when their very success exposes them to the paradox of self-referential risk. **David Rowe** emphasises the importance of analysing such feedback effects in our risk assessments*

Richard Libby,

chief credit officer at Barclays Global Investors, has made an interesting observation about model risk.[1] He argues that it is not poor models that present the most serious dangers. To be sure, overreliance on the sometimes spurious robustness of certain models can cause painful losses for some market participants. This occurred in 2005 when the market standard Gaussian copula model for valuing collateralised debt obligations was used as the basis for attempting to hedge tranches of different seniority. Like all expensive lessons, manifestations of the limits of a model's reliability are usually internalised quickly. Today, such cross-tranche hedging is done much less aggressively in light of the perceived instability of the model implied hedge ratios.

Libby argues that more serious issues can arise when good, even great, models are exposed to what he calls the paradox of self-reference. When such models achieve near-universal adoption, they often change the larger environment in which they function. Their very success can induce market changes that undermine the effectiveness of such models. A frequently cited example is the impact of portfolio insurance contributing to the market correction of October 1987. At the time, the Black-Scholes model was widely employed with an effectively flat implied volatility curve. While portfolio insurance appeared to work well when applied on a small scale, its growing use eventually had feedback effects on the market that undermined the ability to conduct the necessary hedge adjustments.

What is true of models is arguably also true of some innovative products. Collateralised securities based on subprime mortgages were originally seen as a way to attract high-risk investors into this area. Their participation provided first-loss protection for senior tranches, thereby facilitating additional funds from more conservative investors. When these securities became wildly popular, driven partly by an intense thirst for yield, they led to historically unprecedented volumes of subprime mortgages being originated starting in 2005.

Analysis of subprime mortgage behaviour over the previous decade tended to show default rate distributions with an understandably high mean but fairly modest variance. This tended to support the conclusion that senior tranches had a very low probability of suffering default losses given the significant first-loss protection afforded by the more junior tranches. This historical behaviour reflected an environment in which subprime defaults were largely driven by idiosyncratic events such as the death of a primary bread winner, a large uninsured loss or sudden medical expenses. As such, these defaults exhibited the effect of significant diversification.

What was not adequately considered was the impact of steadily rising home prices during this period and how stagnant or even falling prices would alter the default experience for such mortgages. Not only that, but the very success of subprime mortgages meant that a downturn in housing prices would have a potentially broader impact by acting on a larger base of poorly collateralised debt. Greater numbers of foreclosures and accompanying forced sales of homes were bound to create further downward pressure on prices. Hence, the very success of the subprime mortgage market opened it up to more extreme downside risk when a correction eventually materialised.

Perhaps the biggest lesson to be learned from the current crisis is a renewed appreciation of the law of conservation of information. No data set can yield more information than it contains, regardless of how fancy the quantitative analysis applied to it might be. Therefore, we always need to give careful attention to whether the underlying data driving our conclusions is adequate, covers enough history and represents a sufficiently large sample.

We also need to be unafraid to fall back on common sense. Sophisticated quantitative analytics is an essential tool for making sense of a very complex world. Nevertheless, such techniques can act as a barrier to understanding if they prevent us asking basic questions about data adequacy and the structural plausibility of underlying models. Finally, we need to bring renewed awareness of how pernicious feedback effects can undermine both models and product innovations that appear highly successful for prolonged periods. ■

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[1] Libby R, 2007, *Metamathematical Finance: Model Arbitrage and Market Complexity*, an unpublished transcript of the keynote address to the Credit Risk Summit in London, October 10