Editorial

Making risk transparent

Regulators and rating agencies have worked to make the risk of financial firms transparent to key stakeholders. A key challenge has been to benchmark the quality of a risk management programme in terms of both a risk governance perspective as well as the value-add that such a programme provides for revenue-generating business units. Many a risk management programme has looked great on paper until it failed to prevent dramatic losses in extreme markets.

The failure to make the risks transparent in the subprime market has wreaked havoc on both Wall Street and Main Street. The market has witnessed the unravelling of structured investment vehicles, the marking down of illiquid portfolios, the struggles associated with rolling over financing (such as short-term asset-backed commercial paper), foreclosures and so on. If the risks of the subprime market were accompanied with warning labels that made them transparent then the current chaos on Wall Street and Main Street might have been substantially reduced.

There has been an accelerating positive trend toward proactively using complex risk models for competitive advantage in the financial markets. Quantitative finance is being used to drive product development, pricing and performance measurement, as well as for achieving desired risk-adjusted returns. Quantitative finance is a well-defined, mature discipline that is becoming increasingly important as global financial markets continue their exponential growth. Yet, over and over again, the shock of extreme volatile markets has demonstrated that the use of quantitative financial approaches is a double-edged sword.

Sophisticated firms which understand the strength and limitations of quantitative tools and financially-engineered products have been able to reap the benefits from their wide deployment. Further, sophisticated firms are able to slice and dice their risk into user-friendly transparent dashboards as well as append warning labels that serve to highlight the amount of model risk contained in those dashboards. On the other hand, if firms fail to appreciate the amount of model risk embedded in their risk management programme then many of these firms will run the risk of experiencing dramatic losses in the so-called highly improbable markets.

BENCHMARKING THE QUALITY OF RISK MANAGEMENT

It can be useful to benchmark the quality of risk management in terms of the policy, methodology and infrastructure dimensions.

Benchmarking the quality of risk management goes well beyond looking solely at the formal activities of the risk management organisation. The

benchmarking exercise should include examining the quality of the risk-adjusted return policy decisions made around the type of business strategies in which management and ultimately the board choose to engage (such as investing in the collateralised debt obligation subprime residential mortgage market). It also includes benchmarking the quality of the risk management performed by each of the organisational units that touches a business transaction from cradle (such as the operational function that writes the initial trade ticket) to grave. It also includes looking at how the models, as well as the supporting infrastructure, are deployed to measure risk in both normal and extreme markets. Models that work well in normal markets often do not work well in abnormal markets.

Characteristics of policies at the core of a superior risk approach include the idea that the tolerance for risk is integrated and consistent with business strategies and vice versa. Policies should also call for risk measures to be back-tested. It is also essential that policies call for limits on the amount-at-risk to be expressed in meaningful terms and reflect a desired tolerance for risk. Finally, policies should call for risk to be properly disclosed internally and externally on a drill-down and integrated portfolio-management basis.

Characteristics of methodologies at the core of superior risk solutions contain the idea that risk and stress-test methodologies are predictive of actual losses and integrated across all risks and all books of business. Further, mathematical models should be properly vetted and positions should be properly valued. It is essential that the methodologies used to control risk should also be used to run the business as well as utilised for such things as economic and regulatory capital management, pricing and performance measurement (ie pass the 'use test').

Significant practical and analytical progress has been made in measuring financial risk on an integrated basis. Measuring operational risk remains a significant challenge. Key model risk challenges for measuring operational risk include accounting for long modelling time horizons, a significant divergence of expert opinion with respect to self-assessment and lack of uniform global regulatory standards. A key challenge has also been to secure adequate levels of internal and external loss data to calculate the amount of operational risk. One looks forward to the day when state-of-the-art analytical tools for operational risk measurement can help operational managers improve their day-to-day management of risk.

A firm can have great policies and methodologies but will be unable to reap their benefits without a superior risk infrastructure. Characteristics of infrastructure at the core of superior risk solutions include the idea that the appropriate risk team is in place with the right quantitative financial skills. In addition, a superior risk infrastructure calls for an integrated operational and risk-software environment which integrates data management, risk analytics and reporting in a flexible manner. A superior risk infrastructure provides the risk team and its business partners with the appropriate tools to accomplish its mandate. Organisations that have an integrated risk-data infrastructure are able to obtain a competitive advantage. For example, there is significant value to having

timely access to market data, transaction data and legal data.

MODEL RISK

It is useful to categorise model risk into risk caused by model error and risk caused by implementing a model incorrectly. Model error refers to the case where the model might contain mathematical errors or, more likely, be based on simplifying assumptions that are misleading or inappropriate. Implementing a model incorrectly refers to the case where the model might be implemented incorrectly, either by accident or as part of a deliberate fraud.

Model error

The most frequent error in model building is to assume that the distribution of the underlying asset is stationary (ie unchanging), when, in fact, it changes over time. For example, practitioners know that volatility is not constant. Practitioners find themselves engaged in a continual struggle to find the best compromise between complexity (to better represent reality) and simplicity (to improve the tractability of their modelling). For example, practitioners often assume that rates of return are normally distributed. However, empirical evidence points to the existence of 'fat tails'. In these fat-tail distributions, unlikely events are, in fact, much more common than would be the case if the distributions were normally distributed.

Models can be oversimplified by underestimating the number of risk factors that must be taken into account. Further, model risk arises as models are derived under the assumption that perfect capital markets exist. The lack of liquidity in extreme markets, where liquidity dries up and correlations move toward 1, is also a major source of model risk. The first generation of value-at-risk (VaR) models was ill-equipped to capture the risk of extreme events. It is necessary to complement VaR by using coherent scenario analysis which incorporates macroeconomic scenarios and stress testing.

Implementing a model incorrectly

Even if a model is correct and is being used to tackle an appropriate problem, there remains the danger that it will be wrongly implemented. For example, some implementations rely on numerical techniques that exhibit inherent approximation errors and limited ranges of validity. In models that require a Monte Carlo simulation, large inaccuracies in prices and hedge ratios can creep in if insufficient simulation runs or time steps are implemented.

An important component of model risk is the failure to get the input data right. The lack of proper input data results in the classic 'garbage in, garbage out' phenomenon. For example, the input data utilised to select the risk model that best fits the data may be incomplete. Further, the input data to estimate model parameters of the risk model (such as volatilities and correlations) may be invalid.

An important question, then, is how frequently should input data be refreshed? Should the adjustment be made on a periodical basis, or should it be triggered by an important economic event? For example, should parameters be adjusted according to qualitative judgments, or should these adjustments be purely based on statistics? The statistical approach is bound to be in some sense 'backward looking', while a

human adjustment can be 'forward looking', ie it can take into account a personal assessment of likely future developments in the relevant markets.

MITIGATING MODEL RISK THROUGH EDUCATION

Model risk can be mitigated through implementing ongoing educational programmes that make model risk transparent. These educational programmes reveal both the power and limitations of risk models in both normal and extreme markets. For example, experience suggests that firms with superior risk management approaches work to mitigate model risk by ensuring that their risk managers and financial engineers are well trained and experienced in both the practical and academic aspects of quantitative finance.

Institutions can build this capability internally or partner to buy it externally. For example, financial institutions are increasingly partnering with academic institutions to train the next generation of financial engineers. These financial engineers are trained to be able to communicate the strength and limitations of these quantitative approaches throughout the organisation. For example, one such programme is the masters degree in financial engineering (MFE).

The MFE programme prepares students for analytically-sophisticated jobs with financial institutions as well as for financial service providers (eg financial software and consulting firms). The programme serves students seeking a comprehensive analytically-deep financial engineering knowledge that is academically rigorous and balances the focus between theory and application. The programme provides students with the knowledge to integrate financial theory, analytics and practical know-how. These skills are in high demand.

The MFE is an attractive alternative to a PhD programme in finance for those students interested in technical careers in financial industries rather than academic careers. The level of analytical sophistication required for MFE students is higher than that required of students in the MBA programme. Students might prefer the MFE because it would meet their career goals in less time than would the PhD programme. It differs from the MBA programme in that MFE students will only take courses directly related to finance theory and practice.

The demand for best-of-breed risk management quantitative approaches has opened up new career opportunities in finance for individuals with strong financial engineering skills who wish to work in financial services. The significant speed placed on the pervasive implementation of best practice risk management will continue to necessitate a massive demand for financial engineers. A premium will be placed on obtaining well-educated financial engineers who are also capable of helping to make risk transparent.

CLOSING COMMENTS

The good news is that rating agencies and regulators are placing increased pressure on firms to upgrade the quality of their risk management programmes. The rating agencies are rating the quality of a firm's risk management programme which in turn is being used as a key factor in assigning a credit risk rating. Regulators have introduced programmes to make regulatory capital measures more risk-sensitive through such programmes as Basel II and

Solvency II. The caveat is that if the pressure from rating agencies and regulators would somehow disappear overnight then the overall emphasis on risk management would be dramatically reduced.

Journals, such as this one, are adding value by helping to make the risk transparent. Universities, risk associations, risk consulting firms, risk software and hardware firms along with data integrators are influencing and driving the implementation of superior methodologies and infrastructural platforms. Over time, one would expect to see a more standardised and harmonised approach across verticals within the financial space to make the risk transparent (eg banks, securities firms, insurance companies, asset managers, energy trading firms, etc).

Boards are increasingly demanding that their organisations have in place competent risk managers and well-trained financial engineers. Boards are also increasingly more accountable and legally liable for risk management. Senior management in well-run organisations is placing greater emphasis on the firm becoming more risk-literate. Senior managers are becoming more focused than before on improving their knowledge and understanding of risk management in order to meet their fiduciary responsibilities. The chief risk officers in these well-run firms are utilising the backing of the board and senior management to adopt best-of-breed risk management approaches through a substantial upgrade in the firm's risk policies, risk measurement and infrastructure capabilities.

Financial innovations, model development and computing power are engaged in a leap-frog game. Financial innovations call for increased model complexity, as well as require more computing power, which in turn calls for more comprehensive data to feed the models. As described above, reliance on models to price, trade and manage risks carries its own risks.

Stakeholders are learning the hard way that they must demand that risk be made more transparent or else they might fall victim to unexpected large losses. The addiction and herd-like behaviour that has led to taking on more risk in the subprime market speaks volumes to the collective failure of the key stakeholders to understand model risk. Sir Isaac Newton rightly pointed out that 'We can calculate the motions of heavenly planets, but cannot predict the madness of people'.[1]

Reference

1 Spencer, J. (1820) 'Anecdotes', W. H. Carpenter.

Dr Bob Mark
CEO, Black Diamond Risk, USA and Editorial Board Member, Journal of Risk Management in Financial Institutions