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Using Financial Econometrics to Measure Risk

By PETER C B PHILLIPS, JUN YU and ERIC GHYSELS

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Turbulence in the world of banking and finance over the last two years has riveted media attention on the financial industry, exposing practices, products and risks in the industry to widespread public scrutiny.

Questions continue to be asked about the management and regulation of an industry whose performance is now seen to affect the world's financial health and its prospects as much as it does national savings and individual retirement funds.

In Toronto at the June 13-20 Summit conference, central bank governors and finance ministers of the industrialised and emerging-market countries reaffirmed commitments on delivering existing fiscal stimulus plans. They resolved to increase International Monetary Fund resources immediately by US\$250 billion and expand new arrangements to borrow and initiate market borrowing as might be needed to meet G-20 goals of fiscal stability. These measures reflect the growing recognition of the importance of global cooperation on matters of high finance.

Which is all to the good as the world confronts the difficulty of sustaining economic recovery in the face of rapidly unravelling problems of sovereign debt, real estate markets that are still highly leveraged, and consumer debt burdens that compromise fiscal expansion and threaten recovery.

Behind this very public world of high finance and media commentary, there lies a smaller, less visible world of analysts, technicians and academics. These are the people who help design and assess the financial products that are the wherewithal of the financial world.

Their tools measure the volatility of the market and quantify risk. Their products appear in financial boardroom submissions, central bank economic papers and G-20 financial analyses on which recommendations and policy decisions rest. Their toolroom is the world of financial econometrics where technical research is conducted on financial modelling and where empirical measures of volatility and risk are evaluated.

Financial econometrics was born in academe but it is now the technical and computational pillar on which the financial industry depends for its practical work on asset pricing and risk measurement. It is here that the fundamental ideas of finance theory are confronted with the reality of observation. What does this toolroom of financial econometric research have to offer financial industry practice during a time of global financial crisis? What tools fashioned here might help central bankers and regulators in their new daunting task of surveillance of financial markets? What can the toolroom do to enable a city-state such as Singapore to become a major financial hub in Asia?

Take the notion of market volatility. Seminal work by Robert Engle (2003 Nobel laureate in economics) made practitioners aware of the fact that risk, as measured by volatility, has a predictable pattern. That idea has since transformed daily practice in asset allocation throughout the financial industry.

Take the Basel regulatory framework for risk management. Their infrastructure of recommendations rests on the foundation of econometric expertise on risk measurement and assessment. Take the

practical world of financial trading, which is now conducted at the speed of light by computers on electronic platforms using algorithmic formulae. These formulae rely on short-term predictable patterns in trading. They spring from models built in the toolroom of econometrics.

Simple Solutions

Years of research in financial econometrics have produced the tools that redefine these industry practices. The process is a two-way street. Practitioners often come up with simple solutions - such as the volatilities that are implied by transacted derivative prices or useful concepts such as value at risk - that trigger a flurry of academic research. Events matter too. Crises change research agendas. Macroeconomists used to ignore financial market frictions as they believed in market efficiency, but they no longer do so. Financial econometricians are now challenged to think about how to measure systemic risk and how to test for bubbles.

As Niall Ferguson put it in his astonishing history *The Ascent of Money*, “nothing illustrates more clearly how hard human beings find it to learn from history than the repetitive history of stock-market bubbles”. The dot-com bubble, the subsequent US housing bubble and the recent financial crisis all underscore the need for better tools and early-warning systems on market exuberance, which some of the latest research in financial econometrics provides. These early-warning techniques are now being implemented by macroeconomic surveillance teams of some central banks in the Asia-Pacific region.

Every crisis is different. Recent events put the spotlight on complex financial products that were virtually impossible to appraise in terms of risk. Rating agencies used outdated models to assess risk and there was little data to make sound estimates of the risk characteristics of the new products. But the elements of human weakness that are involved remain the same and they resonate in former Federal Reserve chairman Alan Greenspan’s celebrated phrase “irrational exuberance”.

While greed, euphoria and fear are inevitably part of financial markets, financial econometricians are sharpening their diagnostic tools for assessing financial markets, reshaping portfolio models to accommodate extreme risk and devising early-warning alerts of market exuberance.

One of the ingredients to successful financial centres of the future will be their use of the toolroom of financial econometrics to help regulators respond swiftly and effectively to the consequences of human weakness that have so often triggered crises in the past. Singapore is now particularly well-placed to take advantage of this toolroom with the Risk Management Institute at the National University of Singapore and the Sim Kee Boon Institute for Financial Economics at Singapore Management University, which are devoted to pursuing these goals. In so doing, Singapore might join the vanguard of financial centres such as London and New York which already have strong links with the financial econometrics circuit.