

Economists' Hubris – The Case of Risk Management

By **Shahin Shojai**, Global Head of Strategic Research, Capco &
George Feiger, Chief Executive Officer, Contango Capital Advisors

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In this, our third article in the economists' hubris series, we look at the shortcomings of academic thinking on financial risk management, a very topical subject. In the previous two articles, we examined and rejected the notion that contributions from the academic community in the fields of mergers and acquisitions [Shojai (2009)] and asset pricing [Shojai and Feiger (2009)] were of practical use. Economists have drifted into realms of sterile, quasi-mathematical and a priori theorizing instead of coming to grips with the realities of their subject. In this sense, they have stood conventional scientific methodology, which develops theories to explain facts and tests them by their ability to predict, on its head.

Not surprisingly this behavior has carried over to the field of risk management, with an added twist. Like the joke about the man who looks for his dropped keys under the street light because that is where the light is rather than where he dropped the keys, financial economists have focused on things that they can 'quantify' rather than on things that actually matter. The latter include the structure of the financial system, the behavior of its participants, and its actual ability to capture and aggregate information.

A Framework for Thinking about Financial Risks

The recent (and ongoing) financial crisis has made it clear that every participant in the financial system, from the individual investor through banks and brokers up to central banks, needs to think of a three-level analysis of risk:

- At the level of the individual financial instrument.
- At the level of a financial institution holding diverse instruments.
- At the level of the system of financial institutions.

A *financial instrument* might be a credit card or a residential mortgage or a small business loan. In the U.S., risks in many such instruments have been intensively studied and have proven moderately predictable in large pools. For example, a useful rule of thumb is to equate the default rate on national pools of seasoned credit card balances to the national unemployment rate.

A *financial institution* holding a diverse portfolio of such instruments might be a bank that originates them and retains all or some, or an investing institution like a pension fund or a hedge fund or an insurance company (or, indeed, an individual investor with a personal portfolio).

The *system of financial institutions* is the total of these individual players, in particular, embracing the diverse obligations of each to the others. A bank may have loaned unneeded overnight cash to another bank or it may have borrowed to fund its portfolio of tradable securities by overnight repurchase agreements; a hedge fund may have borrowed to leverage a pool of securities; an insurance company may have guaranteed another institution's debt, backing that guarantee by pledging part of its own holding of securities;

and an individual may have guaranteed a bank loan to his small business by pledging a real estate investment, itself leveraged by a mortgage.

We would summarize the academic approach to risk management (enthusiastically adopted by the financial institutions themselves) as the sum of the following propositions:

- The risks of individual financial instruments follow a stationary probability distribution;
- The enterprise risk of a financial institution is measured by treating the institution as the portfolio of the individual instruments that it holds; and
- As markets price instruments rationally, there are really no systemic risk issues not captured in the pricing of assets.

Unfortunately, recent events have shown each of these propositions to be false.

Stationarity of Instrument Risks

This is the foundation of all risk management modeling. As anyone who has tried to model instrument risks knows, they are not stationary but depend on the sample period chosen, a simple fact that we will return to again and again. This non-stationarity is not simply an empirical observation, *it is endogenous to the way that markets operate*. The recent crisis has highlighted one fundamental cause, namely moral hazard in the securitization process, and it is worth examining this in detail.

The statistics on mortgage defaults and losses were derived from one particular era in mortgage lending, when lending banks retained on their balance sheets the loans that they made. Because of this, the originators were obliged to work hard to understand the financial prospects of their borrowers at the time of origination and to closely monitor the portfolio thereafter.

The development of securitization allowed originators to package mortgages and sell them, all risks included, to third-party investors who had no detailed knowledge of the mortgage business or the borrowers. To mitigate this lack of knowledge, a class of “risk evaluation intermediaries,” otherwise known as the rating agencies, stepped in. Their method of risk mitigation was to create diversified pools of loans, basing diversification on loss statistics from the previous world of retained risk. The banks and other originators were transformed from risk-aware lenders to financial engineers of mortgages. Their income no longer came from borrowing spreads less any loss experienced as a result of defaults, but strictly from fees from manufacturing mortgage pools. Is it any wonder that the quality of underwriting deteriorated, and in a way that was hard to detect for some time?

The rating agencies never had access to the underlying borrowers and so could not assess their true state of health. That information was not even with the originators, who had stopped caring about collecting that kind of information when they started selling the mortgages to other investors [Keys et al. (2010)]. So, the rating agencies had to use history to rate these instruments, or the credit quality of any insurer who had provided credit enhancement to the security [Fabozzi and Kothari (2007)]. Neither the credit enhancer nor the rating agency had any idea about the underlying quality of the borrowers. Add to that the moral hazard of the rating agencies, which supplied ratings for the bond buyers but were paid by the bond originators. Hence the “actual risk statistics” of the resulting mortgage-backed securities systematically deteriorated relative to those of the earlier era. Consequently, all that was needed to bring the house of cards down was a correction in house prices, which is exactly what happened. (The house prices were grossly inflated by

the system-wide credit bubble that the risk management modelers did not see, but we will address that below.)

Portfolio Modeling of Enterprise Risk

The academic approach to modeling enterprise risk is to assume a stationary distribution of the correlations among the instruments and to model the institution as the portfolio of the instruments that it holds. As anyone who has attempted to estimate the variance/covariance matrices of financial instruments knows, these distributions vary markedly according to the sample period chosen for estimation. Therefore, the statistically trained have used various weighting schemes to create 'more relevant' data; for example, weighting recent data more heavily than older data using some distributed lag scheme. A more productive approach would be to recognize that these correlations are not stationary because, again, of the way that markets evolve.

We can give three examples of these endogenous causes:

- Real economic 'causation.'
- 'Convergence of trading behavior' in the financial system we have created.
- Adherence to false notions of 'market efficiency,' which causes neglect of credit-fueled valuation bubbles.

Let us start with *causation*. Unlike the predictably random movements of electrons in an atom, economic events sometimes have causes that bear rather sharply on the correlation among instruments. It is easy to give a practical illustration. Some time ago, one of the authors had a client with what was, supposedly, a well-diversified portfolio – equities, bonds, real estate, and even some direct business interests. Unfortunately, all the investments were located in or were claims on businesses in Houston, Texas. When the price of oil collapsed, so did the value of the portfolio. There was a common causal factor in the returns of each part of this specific portfolio.

It would have been difficult, but not impossible, to have calculated beforehand the variance/covariance matrix of returns in Houston conditional on the price of oil, or of returns in the Midwest conditional on the health of General Motors – let alone to then create the probability distribution of the fate of these causal factors. Certainly this was not done for the loss factors for portfolios of mortgages originating in, say, Las Vegas during the boom.

Consider now *convergence of trading behavior*. Correlations of returns of assets like European and U.S. and emerging stock indices, various commodities, and the like have been highly variable but clearly rising over the past 15 years [Ned Davis Research]. A combination of deregulation of global capital flows, development of sophisticated capital market intermediaries operating globally, and data and trading technology have enabled more and more money to be placed on the same bets at the same time. And so it is. Harvard and Yale used to be virtually unique among institutions for investing heavily in timberland and private equity and hedge strategies. Now everyone is doing it and the returns are falling while the volatility and the correlations are rising.

And consider finally *credit-fueled valuation bubbles*. As we have demonstrated [Feiger and Shojai, 2009], asset markets do not price efficiently, no matter what your professor said in business school. Reinhart and Rogoff (2009) have demonstrated that for centuries, valuation bubbles funded by excess credit creation have occurred in all economies for which we have decent records. Why do investors not simply recognize these and "trade them away," as the efficient markets hypothesis would imply? It is not so easy, because

while the bubbles are 'obvious,' when they will burst is not. Smithers (2009) explains this in eloquent terms. However, if you think about it, had you started shorting the tech bubble aggressively in 1998 you would have been bankrupt well before the end. As Keynes said, the markets can remain irrational longer than you can remain solvent. Real estate, we might say, is an asset worth what someone will lend you to buy it. When the lenders thought that real estate prices would always go up, they lent freely and the price of real estate was pushed up by the buyers. When credit availability collapsed with the balance sheets of the banks, real estate prices fell along with every other leveraged asset. The correlations went toward one.

Modeling Systemic Risk

Once we acknowledge that valuations can undershoot and overshoot, we can explain systemic risk that is, essentially, broad loss of liquidity in most assets. *Why pay more for something today than it is likely to be worth tomorrow?*

Consider the example of the collateralized loan obligation (CLO) market in 2008. Several hundred billion dollars of corporate loans were held in CLOs on the largely invisible books of offshore hedge funds and underwriting institutions (via off-balance-sheet vehicles), in structures leveraged 20 times and more. The leverage came from major banks and insurance companies that, we should remember, devoted the bulk of their other business activities to making loans to entities like companies and real estate developers and to each other. They in turn raised their liabilities by issuing bonds and commercial paper to pension funds, insurance companies, mutual funds and individuals.

As panic spread about the falling value of collateralized debt obligations (CDOs) backed by mortgages, some of the loans in the CLOs started falling in price in secondary trading (the market making provided by the same banks that were providing the leverage to the CLO holders and the CDO holders). This precipitated margin calls on the holders that they could not all meet. With leverage of 20 times, falling loan prices meant that a fund's equity could quickly disappear so the only recourse was to dump loans and deleverage as quickly as possible. We sat at our Bloomberg screens in amazement as blocks of hundreds of millions or billions of loans were thrown out for whatever bid they could get. Would you have bought at that time, even if you thought that almost all of the loans were ultimately money-good, as we indeed did think? Of course not, because in the panic it was certain that the prices would fall further, which they did.

Normally the market makers would buy bargains but they were providing the leverage – and they were holding trading inventories that were tumbling in price. So they withdrew the leverage and reduced their inventories and so forced prices down further. This killed the hedge funds but also inflicted losses on other holders, including their own balance sheets, and created credit losses on the loans extended to the leveraged CLO holders. Now the banks were in trouble themselves. So they dried up the interbank lending market, essential for liquidity in the world trading system, and their commercial paper appeared risky and fell in price, damaging the money market fund industry that held a large part of liquid assets in the U.S.

We need not elaborate on this history, but you can see why the stationary variance/covariance matrix of the enterprise risk management models did not turn out to be relevant. And, consequently, why the core of academic work on risk management did not turn out to be relevant. And indeed, as we emphasized in our previous paper, how insidious the concept of market efficiency has been in blinding market participants to the nature of real risk by implying that it has already been priced in to all assets as well as it can be.

Implications for Value at Risk

We have not explicitly referred to value at risk (VaR) until now, although it is the universal tool used for enterprise risk management. It is, of course, a product of that view that the enterprise is the portfolio of the instruments it holds and all the issues we have addressed above. Specifically, VaR is an attempt to “represent” the maximum loss that a firm is likely to accept within specified parameters, usually expressed as a confidence interval over a set time horizon. If we use a 95% confidence interval and the firm’s portfolio of investments is estimated to have a one-day 5% VaR of \$100 million, there is said to be a 5% probability that the portfolio would fall in value by more than \$100 million over a one-day period; in other words, a loss of \$100 million or more on this portfolio is expected on 1 day in 20. We have spent the bulk of our effort to this point showing the difficulty in the key clause “is estimated to have” and will dwell on this no further.

It is important, however, to explore a number of other problems with concepts like VAR even if we *could* do a far better job of estimating conditional probability distributions of outcomes. These derive primarily from deep problems in the capture and aggregation of information, and we address these below. We wish first to apply our concept of endogenous evolution of market risk to two tools that the same economic theory that gave us VaR tells us can act as risk mitigators: collateralized central clearing and alteration of the incentives of market participants.

The Role of Collateral and Incentives

Collateral, whether in the hands of a central counterparty or put up over the counter against individual transactions (the equity cushion in all those leveraged CLOs), is claimed to allow the system to absorb unanticipated shocks. That may be, but the question is, how much collateral is enough? Here we come back to the stationary joint probability distribution of asset prices, which defines the likely magnitude of these unanticipated shocks, and we can start over with the arguments with which we began this paper. On reflection, systemic risk renders collateral least helpful when you need it most. Think of something as simple as a mortgage on a house. The collateral is the down payment, which is the lender’s cushion against default. If your house goes on the market in ‘normal times,’ say because of a divorce, all will be fine and the lender is likely to recoup his loan. If a real estate bubble has collapsed and every house on your block is for sale, the cushion is non-existent. This is not an easy problem to solve. Smithers (2009) proposes dynamic collateral requirements driven by rules on market value versus ‘true value’ and provides compelling evidence for the existence of techniques for estimating the ‘true value’ well enough for purposes of setting collateral and capital cushions.

Let us now turn to incentives, particularly the notion that if incentives are paid in deferred common stock of the originators, there will be a much lower likelihood of moral hazard driving endogenous changes in risk. We believe that such attempts will fail the test of practical reality because they are not compatible with the way we have organized our financial markets.

- They are incompatible with a free market for talent. Institutions that attempt long deferral of incentive payments into restricted vehicles will experience loss of their highest performers to institutions that do not do this. You can see this happening right now on Wall Street.
- The way in which we choose to measure corporate performance encourages the opposite, namely short-term risk taking for near-term results. We measure results quarterly and annually even though the economic cycle takes place over years, not

quarters. Who doubts that any financial institution CEO who dropped out of playing in late 2006 would have lost his job and his key staff long before the markets collapsed? Is this not the meaning of the infamous remark by Chuck Prince, former CEO of Citi, that “as long as the music is playing we have to dance.”

- The proposed holding periods for the restricted incentive payments are always some calendar interval. The economy does not oblige by revealing the implications of systemic risk provoking actions like credit bubbles over short periods.

Deep Operational Problems

To this point we have explained the defects of current economic models of risk management in terms of their inability to grasp the endogenous nature of the development of risks and the interconnection of risks across institutions. These are, in essence, issues that arise in asset valuation. The discussion has assumed that individual institutions know their own holdings and cross-obligations and seek to draw inferences about the risks that they are thereby incurring. In fact, for the particular problem of risk management, we need to understand that it is highly unlikely that any institution of significant size is even at this starting position – of knowing where it actually stands at any moment. This uncertainty at the foundation derives from limitations likely in both *human behavior* and *IT*.

The human behavior issue is easy to understand. There is a lot of *employee compensation* at stake in the measurement and management of risk, because the entire purpose of enterprise risk management is to attempt to limit the size of the risks that the enterprise takes. And that means limiting the size of the gambles on which the members of the enterprise get paid. While academic literature does account for personal greed, and a number of papers have been written on the subject by Michael Jensen and his many colleagues and students of the subject [Jensen and Meckling (1976)], it is usually overlooked when it comes to subjects that deal with anything other than corporate finance. For some reason, there is an assumption that, just like investors all behave rationally, individuals are also mostly honest when they assess the risks that they take.

Financial executives certainly have the motivation to reduce the allocation of risk to their activities if their compensation takes the form of an option on the bank; that is, if they share in the gains and not the losses. Given the complexity of modeling many of the instruments that financial institutions are dealing with, it is only natural that they will be collecting underestimated risk profiles from the traders and financial engineers. Moreover, their supervisors, the management, know that if the bank gets close to failure, the government will probably bail it out if it is important enough to the local economy or the globe.

The IT limitations are a consequence of the organizational and operational structures of all but the smallest financial institutions. Financial institutions of any size and complexity are typically managed in a variety of silos that report what they do in a variety of incompatible ways. As a result, most institutions have major difficulties in aggregating the risks of their credit and market instruments, let alone the firm’s operational or liquidity risks. For example, many institutions combine credit and foreign exchange instruments within the same divisions, while others keep them separate. Some combine structured instruments with the fixed-income division, others with equities. In some firms foreign exchange, credit, and equities each have their own analytical teams, who compete rather than cooperate, and who are different, in turn, from the analytical team working for the CFO.

An even more basic problem is that there is just too much information to deal with. Risk management teams face a hosepipe of data that they have to decipher, and its contents change with every trade.

Today, very few financial institutions of any size have not undergone a series of mergers or acquisitions, with the pace increasing over the last decade. Indeed, the current financial crisis has resulted in the forced merger of very large institutions, themselves layers of technically incompatible accounting systems. The result is a spaghetti-like infrastructure of protocols and technologies that are simply unable to communicate with one another [Dizdarevic and Shojai (2004)]. Incompatible systems make the development of viable enterprise-wide risk management close to impossible. Sadly, our practical experience shows that this situation will persist for many years to come. Despite the huge annual investments made by major financial institutions, different systems supporting different instruments are simply unable to share information in any meaningful way. This means that no matter how remarkable insightful conceptual risk models may be, the data that they will be dealing with will remain seriously inadequate.

Slit Our Wrists or What?

We realize that these are depressing conclusions. The appropriate response is not to despair of doing anything, however, but to recognize that what we need to do must be seen in the light of the very large conceptual and practical limitations to enterprise or systemic risk management that we have explained. For our part, we draw the following conclusions:

- Quantitative modeling must be seen as research rather than as an actionable management tool. Management judgment and common sense must take the front seat rather than the back seat. The reverse seating arrangement brought us to where we are today.
- Because the knowledge to second-guess business decisions is hard to acquire, we must make the motivations work for rather against risk limitation. Subtle ways require analysis that we can't yet undertake. Hence we need to resort to cruder tools such as preventing risk transfer from risk originators via securitization. Another fundamental tool is limitation of leverage in all forms of transactions, no matter what the models say.
- Clever deferred compensation and restricted stock schemes are too easy to game. Moreover non-regulated entities like hedge funds will always escape these nets. The first steps above will reduce the (falsely measured) profitability of risk taking in regulated financial institutions enough to automatically limit compensation.

We must recognize that not everything can be regulated and, more important, financial transactions slip away from the regulated sector. By late 2007, more credit was provided to the U.S. economy from securitization than from the deposit-taking banking sector. Systemic risk will always be able to arise from the unregulated sector, for the reasons we have developed in this paper. So far there don't appear to be any very effective solutions for this problem.

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