

COMMENTARY

The Future of Finance and Financial Economics

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The last eighteen months have witnessed extraordinary financial market disruptions, a contagion of bank failures or near failures, an unprecedented loss of confidence in the global financial system, and wide-ranging strategies by governments of major economies to unlock credit markets and restore confidence in their respective banking systems. Relative unpreparedness for the disruptions triggered by the subprime mortgage crisis originating in the United States in 2007 has prompted serious questioning of the focus and usefulness of academic finance and the lack of transparency in some components of the global financial system. This article provides an overview of major questions that have surfaced and the issues that are likely to be areas of focus for years to come.

Undoubtedly the modern financial system has a pervasive influence over economic performance and well-being in contemporary economies, and the events of the past eighteen months have highlighted the significance of this influence. The spectacular growth of the global financial system relative to the growth in global output over the past decade has resulted in a historically high ratio of global financial assets to global output. In the context of the current economic and financial crisis, this has prompted searching questions about the sustainability of this ratio and of the relationship between financial structure and systemic instability in the global economic system. In 2007, the measured economic output of the entire world was worth around \$54.5 trillion.¹ The total market capitalization of the

world's stock markets was \$65.2 trillion, 19.6 percent larger. The total value of domestic and international bonds was \$79.8 trillion, 46.4 percent larger. The notional value of derivative products was \$786.4 trillion, 1,343 percent larger.² By 2007, the global economic base underlying these global financial markets was just 5.8 percent. These developments, particularly in the derivatives markets, have focused attention on the role played by the financial services sector in propagating itself as a result of preoccupation with financial risk rather than on economic risk.

Is There a Systemic Failure in Academic Finance and Economics?

As the current financial crisis has unfolded and its dimensions have become more evident, the responses of policymakers and academics reflect a loss of confidence in the prevailing paradigm of financial regulation. Financial tools typically used by individuals and institutions to confront the future have suffered a loss of credibility, and well-established finance models are increasingly viewed as incapable of providing acceptable remedies.

Dale (2008) and Colander et al. (2008) reflect these perspectives. Dale contends that the events in the past eighteen months not only illustrate the fracturing of the world's financial system but the

¹ World Economic Output Database, <http://www.imf.org/>

² World Federation of Exchanges, <http://www.world-exchanges.org/> and Bank for International Settlements, <http://www.bis.org/>

discrediting of an academic discipline. With over 4,000 university finance professors worldwide and thousands of finance research papers published each year, Dale notes that despite these considerable academic resources devoted to finance research, our understanding of the behavior of financial markets does not appear to be any greater than it was in 1929-1933.

While the past decade has witnessed some progress in the development of financial soundness indicators (FSI), this was not enough to provide early warning signals that could have been acted upon to mitigate the effects of the subprime mortgage crisis. It is this failure that has prompted Colander, et al. (2008) to ask whether there is systemic failure in the academic disciplines that provide the theoretical underpinnings of financial models. These authors argue that the global financial crisis has revealed the need to rethink fundamentally how financial systems are regulated and how models of financial markets are designed. They point out that over the past three decades economists have largely developed and come to rely on models that disregard key factors—including heterogeneity of decision rules, revisions of forecasting strategies, and changes in the social context—that drive outcomes in asset and other markets. As a result, most models, by design, offer no immediate guidance on how to think about or deal with the recurring phenomenon of financial crises.

This was amply illustrated by the fact that the majority of finance professionals and economists failed to warn policymakers about the threatening system crisis and ignored the work of those who did. At the same time, many of the financial economists who developed the theoretical models upon which the modern financial structure is built gave limited attention to the fragility of their models. Colander et al. argue that finance professionals and economists have an ethical responsibility to communicate the limitations of their models and the potential misuses of their research. The failure to adequately do so in their view represents an ethical breakdown.

Consideration of what constitutes an ethical code for finance professionals and economists is likely to be one of the hotly debated topics in years to come.

The Role of Mathematics and Mathematical Statistics

Mathematical statistics has played a pivotal role in the development of modern finance. By the mid-1970s there was a well-established theory that showed how to eliminate risk through portfolio management and hedging strategies. The consolidation of this theoretical approach was based on an equation that is of the same mathematical type as the heat equation in physics, and this served to make finance a subject of interest to mathematicians. By the end of the twentieth century, the influence of mathematics was evident in finance models that relied on notions of Brownian motion, stochastic differential equations, and dynamic hedging.

Treating the behavior of prices (e.g., stock prices) as comparable to the structure of randomness found in nature (e.g., the movement of particles of pollen in water) was an important step in utilizing insights from mathematical statistics to make a tremendous breakthrough in finance. While the notion existed that stock prices moved at random and it was impossible to make predictions about them, Black and Scholes (1973) recognized that there was a way of protecting investors from market fluctuations. The development of a mathematical model to control risk through a financial contract such as an option provided a way of figuring out how to evaluate and price options. This meant that a formula could be found that would calculate the correct price of an option at any moment in time just based on the current price of a stock and other financial variables. The Black-Scholes option pricing model did just that by neutralizing risk. In the process, the case was made for more trading in financial markets as a result of risk elimination strategies.

Mathematical approaches to calculations of Mortgage Backed Security (MBS) and Collateralized Debt Obligation (CDO) risks are based on the calculation of a regular credit risk based on Merton's normal jump-diffusion model (1976).³ This model, based on Brownian motion, hinges on a critical condition that the sum of work of all external forces directed towards this system must be equal to the sum of the system's responses. In other words, this system does not and should not have any external influence, which can change the pattern of particle movement.

Utilization of this mathematical approach in financial markets requires for conformity that the system be free of external influence. In the build-up to the current financial crisis, several conditions undermined this conformity. These include artificially high credit ratings and the treatment by investors of securitized products—some based on subprime mortgages—as equivalent to higher quality securities. In addition, mortgage-issuing organizations were not issuing mortgages with the intention of holding the mortgage, but rather packaging them as soon as possible. Many mortgages were resold through MBS and CDO trading and ended up in the hands of investors, who could not control the original issuing process and often did not have clear title to the underlying assets.

Major financial mathematical models have been designed under conditions of a perfect market with market participants assumed to exhibit rational behavior. The pre-crisis real-estate markets of 2006 and early 2007 show that

some of the major players, such as credit agencies, derivatives market makers and real-estate brokers, did not act according to these rules of behavior. As a result, simulations and calculations of investment risk based on widely known pricing models did not adequately describe the market conditions observed in early 2007 and 2008. As Wilmott (2000) noted, there needs to be more solid foundations in future finance models including recognition that volatility is uncertain and that when there is risk of default in a contract, risk-neutrality may not be the most useful framework to utilize.

Financial Regulation – Will there be a new paradigm?

Worldwide financial and economic crises are hardly new, and historically they have had a tremendous impact beyond the immediate economic consequences of unemployment and inflation. Examples can be found in Kindleberger (1996) and Minsky (1986).

A recent study by Reinhart and Rogoff (2008) suggests that there is not much that is different in the current financial crisis when viewed in a long, sweeping historical context. The aftermath and sources of financial crises have the same fundamental driving forces. What tend to differ are the triggering mechanisms and the policy responses. At the same time, these findings underscore a connection between financial structure and systemic (in)stability that has been relatively neglected in the modern finance literature.

It is conventional wisdom in the finance literature to posit that there is no predictable relationship between financial structure and system-wide instability. However as the current financial crisis has evolved, the validity of this proposition has been seriously undermined. The record of financial crises indicates that financial markets present certain dangers. How societies respond to these dangers reflects the prevailing financial regulation paradigm. A transparency approach to financial regulation views

³ The Black–Scholes model is based on Brownian motion and normal distribution of security returns. However, two empirical phenomena have received much attention: (1) the asymmetric leptokurtic features (i.e., the return distribution that is skewed to the left and has a higher peak and two fatter tails than those of the normal distribution), and (2) the volatility smile (i.e., convex to the option's exercise price) which should not be observed if the Black–Scholes model is correct (the B-S model implies a constant volatility). Many studies have been conducted to modify the Black–Scholes model to explain the two empirical phenomena. See Kou (2002) for a review of related works.

information deficiencies as the primary marketplace danger and emphasizes providing more information to investors (for example, mandatory disclosure rules) as an appropriate response to financial crises. Alternatively, the portfolio management approach to financial regulation views risk as the primary marketplace danger. According to this paradigm of financial regulation, the appropriate response is the construction of a sound portfolio. This involves the use of diversification and hedging strategies, and financial regulation is aimed at facilitating the development of such strategies.

The current financial crisis has prompted proposals from the transparency and portfolio management approaches, and financial regulation currently has the task of managing these tensions. The historical record of financial crises has shown that financial regulation is often incapable of perfect solutions. The advent of the current financial crisis has exposed weaknesses in the portfolio management approach and has prompted calls for the design of a new paradigm of financial regulation. Going forward, the role and characteristics of financial regulation will be primary areas for financial scholarship and policy debates.

Democratizing Finance: A cure for massive financial instability?

Robert Shiller, in his book *The Subprime Solution* (2008), contends that the key to preventing severe future financial crises and the mitigation of their aftereffects is to extend the application of sound financial principles throughout society. This democratization of finance would occur through a well-established information infrastructure that reached out to all its members; derivative markets for both owner-occupied and commercial real estate; well-developed retail products such as continuous-workout mortgages, home equity insurance, and livelihood insurance that facilitate risk management for individuals; and default options

that naturally lead people to use risk-management devices intelligently.

These elements according to Shiller would drastically reduce inefficient pricing in the market for owner-occupied homes. Exaggerated swings of home prices, reflecting speculative thinking, would be tempered by the market actions of international investors and thus would be far less likely to cause the kind of disruptions we have been seeing in the current subprime crisis. A major source of business instability, fluctuations in real-estate investment, would also be rationalized.

A critical aspect of these proposals is to use available technology to achieve that goal. For example, a new information infrastructure would combine elements such as promoting comprehensive financial advice, establishing a consumer-oriented financial watchdog, adopting default conventions and standards that work well for most individuals, improving the disclosure of information regarding financial securities, and creating large national databases of fine-grained data pertaining to individuals' economic situations.

The history of finance over the centuries has been one of gradual expansion of the scope of markets. Over time, more and more kinds of risks have been traded and, as the events of the past eighteen months have shown, there are more and more opportunities for hedging those risks. Shiller argues that now is the time to encourage the further development of markets in a way that truly democratizes them, so that the markets cover the specific risks that ultimately matter to individuals. He proposes the creation of a truly liquid market for real estate, especially the single-family homes that constitute the single largest asset of most households. This would involve the creation of markets for long-term claims on incomes—individual incomes, incomes by occupation, incomes by region, and national incomes. These markets are important because they represent livelihood risk, the most important risk that each individual faces. Markets for occupational incomes — such as futures,

forwards, swaps, and exchange-traded notes — will ultimately make it possible for people to hedge their lifetime income risks. These new markets are intended to create a general infrastructure for risk management that fosters wider participation among the public and the democratization of finance. Ironically, the implementation of some of Shiller's proposals hinges on continued innovation in the types of financial instruments that have played a central role in the build-up to the current financial crisis. However, Shiller's framework places less emphasis on the notion that derivatives are risky and peripheral to genuine investment and more on them being flexible, efficient, and capable of opening up new investment opportunities.

Some Lessons from a Retrospective Look at the History of Modern Finance

Just over a decade ago, Miller (1999) summarized the key turning points in modern financial theory in an article titled "The History of Finance: An Eyewitness Account." He focused on five major contributions which have significant implications for academic research and financial practice. Starting with Markowitz's portfolio management model, Miller acknowledged the contribution of mathematical statistics in the development of the mean-variance algorithm for portfolio selection. He noted, however, that averaging past returns does not necessarily provide reliable estimates for the return expected in the future. As a result, the mean-variance algorithm was not viewed as being very helpful in selecting optimal portfolios.

Nonetheless, Markowitz's model provided the basis for Sharpe's capital asset pricing model (CAPM) which implies that the distribution of expected rates of return across all risky assets is a linear function of each asset's covariance with the market portfolio. By providing new insights into the nature of risk, the CAPM had a tremendous influence on the development of the financial sector (e.g., mutual fund growth); and as empirical research expanded to test the CAPM,

there were important innovations in theoretical and applied econometrics.

From Miller's perspective, two other contributions that represented important turning points in the evolution of modern finance—the efficient market hypothesis (EMH) and the Modigliani-Miller (MM) propositions on capital structure—provided important insights about the functioning of capital markets. In particular, they addressed what equilibrium looks like and what forces are set in motion when equilibrium is disturbed.

Option pricing represented the fifth contribution that Miller identified as a critical breakthrough in modern finance. Not only did the Black-Scholes model provide a solution to a long-standing puzzle in finance, it also demonstrated how derivatives can serve to complete the market for securities by substantially reducing, if not eliminating, the constraints on high leverage imposed by ordinary securities.

In Miller's view, of the five developments, options theory had the greatest potential for 'reconstructing' modern finance. He felt that agency theory is best left to the legal profession, behavioral finance is best left to the psychologists, and research on asset pricing and corporate finance had reached the phase of rapidly diminishing returns.

In retrospect, the behavior, conduct, and performance of the financial sector since Miller wrote his 1999 article have shown that the promise of finance is yet to be fulfilled. There have been significant changes in the financial structure of many economies and heightened integration of financial markets globally. The size of derivative markets has grown tremendously, and the pervasive influence of the financial sector is widely recognized. Nevertheless, the current financial crisis has exposed the fragility of the global financial system, the weaknesses of major finance models, and the ease with which markets that price securities based on regular price discovery through transparent trading can become illiquid, thereby increasing reliance on pricing based on statistical models.

The current financial crisis provides a number of insights for the future. First, there is a need for researchers to incorporate a stronger interpretive dimension in their financial scholarship. This includes discussion of the implications of their assumptions and research findings for broader issues such as financial structure, financial sector practice, and their impacts on economic activity. Second, diversification does not automatically work against systematic risk and there needs to be greater recognition that integration of portfolios can increase uncertainty, counterparty risk, and even systemic risk. Third, it is to the advantage of the finance profession to continue its focus on codifying standards of conduct and knowledge relevant to practitioners. This includes greater transparency in the securitization of financial instruments. Fourth, there is an important distinction to be made between diversification and dispersion. Fifth, future mathematical financial models will likely benefit from augmenting randomness with uncertainty. Sixth, there needs to be increased attention given to systematic data collection to support ‘crash’ modeling and greater urgency in the development of comprehensive financial soundness indicators. Consideration of these issues will likely result in legacies of the current crisis that outweigh the adverse consequences associated with the addition of ‘toxic assets’ to the finance lexicon.

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Biography

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