Finance Theory and Future Trends: The Shift to Integration

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Risk is the central element that influences financial behavior. Measuring that influence, and analyzing ways of controlling and allocating risk, requires sophisticated mathematical and computational tools. Indeed, mathematical models of modern finance practice contain some of the most complex applications of probability and optimization theory. Those applications challenge the most powerful computational technologies.

These are two essentially different frames of reference for trying to analyze and understand innovations in the financial system. One perspective takes as given the existing institutional structure of financial service providers, whether they be governmental or private sector, and examines what can be done to make those institutions perform their particular financial service more efficiently and profitably.

An alternative to this traditional institutional perspective—and the one I favor—is the functional perspective, which takes as given the economic functions served by the financial system and examines what is the best institutional structure to perform those functions. The basic functions of a financial system are essentially the same in all economies, which makes them far more stable, across time and across geopolitical borders, than the identity and structure of the institutions performing them. Thus, a functional perspective offers a more robust frame of reference than an institutional one, especially in a rapidly changing financial environment.

It is difficult to use institutions as the conceptual "anchor" for forecasting financial trends when institutional structures are themselves changing significantly—as has been the case for more than two decades, and which appears likely to continue well into the future.

During the past 25 years, finance theory has been a good predictor of future changes in financial practice. That is, when theory seems to suggest that an institution, instrument, or a service "should be there" and it is not, practice has evolved so that it is. Placed in a normative context, current theory has been a fruitful source of ideas for subsequent innovations in finance practice.

Market Completeness

The Black-Scholes option pricing theory is, of course, the most celebrated instance. However, it is surely not a singular case. Elementary state-contingent securities, developed as a theoretical construct by Kenneth Arrow in 1953 to explain the function of securities in risk-bearing, were nowhere to be seen in the real world until the broad development of the options and derivative security markets.

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This article is an edited version of a speech delivered at the October 1999 Financial Management Association International Annual Meeting and was originally published in Risk magazine, July 1999.

As we all know, it is now routine for financial engineers to use digital options and other Arrow-like derivative instruments in analyzing and creating new financial products. More broadly, Arrow's notion of "market completeness," long treated as a purely theoretical concept, is now seen as a (nearly) achievable long-run goal for real-world financial markets.

Finance theory thus plays useful dual roles: as a positive model for predicting the future direction of financial innovation, changes in financial markets and intermediaries, and regulatory design, as well as being a normative model for identifying new product and service opportunities. Although framed in the positive context of "what will the trends be?," the following remarks could apply equally in the normative context of "what *should* the trends be?"

Let's try to use finance theory, specifically the functional perspective, to talk about future trends in both financial products and services: households, non-financial firms, and governments.

Households

As a result of major technological innovation and widespread deregulation, the household sector of users in the more fully developed financial systems have experienced a major secular trend of disaggregation—also called disintermeditation—of financial services.

Some see this trend continuing, with existing products such as mutual funds being transported into technologically less-developed financial systems. This may be true, especially in the intermediate future, with the widespread growth of relatively inexpensive Internet access. However, the creation of all these alternatives combined with the deregulation that made them possible has its consequences.

Deep and wide-ranging disaggregation has left households with the responsibility for making important and technically complex micro financial decisions involving risk, such as detailed asset allocation and estimates of the optimal level of life cycle saving for retirement. These are decisions they had not had to make in the past, are not trained to make in the present, and are unlikely to execute efficiently in the future, even with attempts at education.

The availability of the Internet may help to address some of the information-asymmetry problems for households with respect to commodity-like products for which the quality of performance promised is easily verified. However, the Internet does not solve the "principal agent" problem with respect to more fundamental financial advice dispensed by an agent.

For this reason, I believe the future trend will shift toward more integrated financial products and services, which are easier to understand, more tailored towards individual profiles and permit much more effective risk selection and control.

The integrated financial services in the impending future, unlike the disaggregated financial services of the recent past, will focus on the customer instead of the product as the prime unit of attention. That is, the service begins by helping the customer design a financial plan to determine his optimal life cycle needs and then finds the products necessary to implement that integrated plan in a cost-efficient manner.

The past generation has seen explosive growth in asset management. Since 1974, US mutual fund assets alone have increased 125-fold from $48 billion to around $6 trillion. In this time, the financial services industry has made great strides in developing and improving portfolio allocation and performance measurement. However, the central objective function employed, even in sophisticated practice, is still the same basic mean-variance efficient-frontier criterion developed by Markowitz, Tobin, and Sharpe in the 1950s and 1960s. This criterion, based on a static one-period model of maximizing the expected utility of end-of-period wealth, is simply not rich enough to capture the myriad of risk dimensions in a real-

world lifetime financial plan.

The household products and services of the future will be much more comprehensive and integrative. They will marry risk control and protection with optimal savings plans for lifetime consumption-smoothing and bequests. To arrive at the necessary integrated lifetime consumption and asset-allocation decisions, more advanced financial models are required than have been used in the past.

The underlying analysis will have to combine the traditional efficient risk-return trade-off for the tangible-wealth portfolio, accounting for human-capital risks and returns, hedging the risks of future reinvestment rates and relative consumption goods prices, incorporating mortality and other traditional insurance risks as well as income and estate tax risks.

In the new environment of these integrated retail products, success for financial service providers will require much more than simply these decision models and performing an advisory role. They should also expect to undertake a principal intermediation role as either issuer or guarantor to create financial instruments that are simpler for households because they eliminate "shortfall" or "basis" risk.

Paradoxically, making the products more user-friendly and simpler to understand for customers will create considerably more complexity for their producers. The good news for the producers is this greater complexity will also make reverse engineering and "product knock-offs" by second-movers more difficult and thereby, protect margins and create franchise values for innovating firms. Hence, creativity in financial engineering and the technological and transactional bases to implement that creativity, reliably and cost effectively, are likely to become a central competitive element in the industry.

A key element of the success of these highly integrated, user-friendly products in the household sector will be to find effective organizational structures for ensuring product performance: that is, that the contingent payments promised by the products are actually paid by the issuing institution. The need for assurances on contract performance is likely to stimulate further development of the financial guarantee business for financial institutions.

In general, the greater complexity in products combined with the greater need for contract performance will require more elaborate and highly quantitative risk management systems within financial service firms and a parallel need for more sophisticated approaches to external oversight.

All of this will significantly change the role of the mutual fund, from a direct retail customer product to an intermediate or "building block" product embedded in the more integrated products used to implement the consumer's financial plan. The fund of funds is an early, crude example. In the future, the position and function of the fund will be much like that of individual traded firms today, with portfolio managers, like today's CEOs, selling their stories of superior performance to professional fund analysts, who then make recommendations to retail "assemblers."

As we know, commercial marketing is very different from retail marketing, and some fund institutions may have difficulty making the transition. How and what institutional forms will perform the retail assembly and distribution functions is not clear.

It does seem, however, that a fully vertically integrated financial service firm that limits its front-end assembly operation to using only its own funds and products will be at a distinct disadvantage, because it will not gave the breadth of high-quality building blocks with which to assemble the best integrated products.

Non-Financial Firms

Common practice for the management of the corporate pension fund is to treat it as if it

were the only asset of a firm that has pension promises as its only liability. Improved management of pension assets is to consider them as an integrated part of the firm's total assets. Indeed, taking into account risks on both sides of the balance sheet is fundamental to providing effective financial services to non-financial firms in general. Enterprise risk management is one term for such a unified approach. The movement from tactical to strategic application of currency, interest rate, commodity and equities hedging is already under way. Progress is being made in combining market and traditional insurance risk management, quantifying operational risk and integrating market and credit risks.

Another important area for future development is the management of factor risks, particularly labor. Firms can be leveraged with their explicit and implicit labor contracts in a parallel fashion to the more traditional financial leverage with debt. Both temporary-employee firms and consulting firms serve the function of "labor intermediaries," allowing more efficient management of the risks for both those who supply labor and those who demand it. Their rapid growth, both in the US and abroad, is probably a good measure of the significance of these factor risks to enterprises. The point, again, is integrated risk management for firms.

Governments

A consequence of all this prospective technological change will be the need for greater analytical understanding of valuation and risk management by users, producers, and regulators of financial services. Furthermore, improvements in these products and services will not be effectively realized without concurrent changes in the financial "infrastructure," the institutional interfaces between intermediaries and financial markets, regulatory practices, organization of trading, clearing, settlement, other back-office facilities, and management information systems.

To perform their function as both user and overseer of the financial system, governments in the future will need to both understand and make use of new financial technology. This new financial technology is critical to the provision of risk-accounting standards, designing monetary and fiscal policies, implementing stabilization programs, and financial-system regulation.

There is already a major effort underway, almost worldwide, with respect to restructuring the institutional roles played by government and the private sector in providing pension benefits during retirement.

Country Risk

However, most intriguing about the prospective financial development surrounding government is the measurement and management of country risk. While in Asia last year, I was asked about the Asian crisis. How do we explain different countries' relative performance and the variations in performance across regions? And what do we do about it?

This stimulated a chain of thought. In particular, it prompted another question: how much of what we observe ex post is a consequence of ex ante different risk profiles? After all, Taiwan is heavily into electronics but produces no automobiles. More generally, few, if any countries, are well-diversified when measured against the world market portfolio—the theoretically best-diversified portfolio if all assets, including human capital, were traded or could be hedged and there were no transaction costs.

In thinking about the performance issue and its implication for evaluating policy, I was drawn to the technology of a well-studied problem in risk and performance measurement for investment management and financial firms. This is the problem of

configuring all the decomposition and reintegration of risk-factor exposures that must be determined within a financial institution before the aggregate risk measures, such as value-at-risk, can be applied. I believe that this technology, if properly adapted, can be used to measure country risk exposures.

In practice, measuring the differences in country exposure is not a simple task, as many asset classes are not traded at all. But, technically, this is the same problem faced in the risk measurement of non-traded assets and liabilities in financial institutions. In short, it is like the VAR and stress-testing challenges extended to include non-traded assets and liabilities. However, as with the application to financial institutions, I see this as a tough engineering problem, not one of new science—we know how to approach it in principle and what we need to model, but the challenge lies in actually doing it.

As with conventional applications, country risk exposures give us important information about the dynamics of future changes that cannot be inferred from the standard "country" accounting statements, or the country balance sheet, country income, or flow-of-funds statements. That is, information not extractable from even a mark-to-market accurate listing of the value of assets including foreign reserves or from the trade flows or capital flows.

As we discover with more conventional applications of risk management systems, once we can measure our risk exposures, it is difficult to resist exploring whether we could improve things by changing those exposures. Take Taiwan, for example. Suppose it decided to try to align its risk exposures more with the world portfolio. In the past, that might lead to an industrial policy to develop an automobile industry. Very inefficient.

However, as we know from modern contracting technology, it is now feasible to separate decisions about risk exposure from decisions about investment. Instead of physically building a new industry, we can imagine Taiwan implementing its risk policy by entering into swap contracts in which it is a payer of the returns on a world electronics portfolio and a receiver of the returns on a world automobile portfolio.

Would such a swap be feasible? It is certainly structurally attractive. On the ability to pay, Taiwan is a net payer when electronics outperforms autos and a net receiver when electronics underperforms. There is no moral hazard or major asymmetric information problem for the country's counterparties, because payments are not based on country-specific performance in an industry.

For the same reason, it avoids the political/economic issue that the country's government can be accused of "giving away" its best assets, as sometimes happens when foreigners buy the shares of its industries, because the country gets to keep its "alpha." Expropriation risk is also minimized both because there is no principal exposure and because (returning to the first structural point) the likely ability to pay is aligned with the liability. Finally, while the useful implementation of such a swap obviously requires a large-size market, there are natural counterparties: other countries seeking alignment.

These points seem to mitigate the usual incentive information asymmetry problems for transactions with sovereigns. The technical problem involved with building a set of surrogate portfolios to use as benchmarks for risk measurement and contract specification are understood. Initially at least, using mixtures of traded indexes as the underlying asset for swap purposes would surely make the liquidity much better and settlement elements easier. Contract credit risk is important, but here too we know a lot about designing solutions, whether by a combination of mark-to-market collateral, purchase of private-sector performance guarantees, or efforts involving government and quasi-government institutional guarantees.

While the benefits of country-risk management systems and the associated markets would be expected to accrue to all, those in smaller countries with developing financial systems

have the greater potential to benefit. With more concentrated investment opportunities, they should gain disproportionately from developing global access for capital and, perhaps more importantly, from more efficient allocation of risk.

Moreover, if they design their financial system using the most up-to-date financial technology, these countries can "leapfrog" existing systems in terms of efficiency. And, in so doing, they can dramatically reduce the cost of investment capital and thereby materially increase national wealth.

With the developed countries, Japan in particular, and the emerging ones both making major changes in their financial systems at the same time, this may be an especially opportune time to explore country risk management. It is certainly an opportune time to be a finance professional, engineer, or architect.