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FINANCIAL INNOVATION AND ECONOMIC PERFORMANCE

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The primary function of the financial system is to facilitate the allocation and deployment of economic resources, both spatially and across time, in an uncertain environment. The system consists of the capital markets as well as the basic payment system through which virtually all transactions clear. In today's well-developed economies, capital markets encompass the money, fixed-income, and equity markets, as well as the new and growing markets for "derivatives" such as futures and options. Capital market functions are also performed by financial intermediaries such as commercial and investment banks that provide more customized products and services—the kind that do not lend themselves to the standardization necessary to create a liquid market.

The capital markets make possible the basic cash-flow cycle in which household savings are channeled into capital investments by firms and then returned to households (via security repurchases, dividends, and interest payments) for consumption or further recycling as new savings. Through often elaborate financial securities and intermediaries, the capital markets provide risk-pooling and risk-sharing opportunities for both households and business firms. Well-developed capital markets allow separa-

tion of the providers of working capital for *real* investment (i.e., in personnel, plant, and equipment) from the providers of risk capital who bear the *financial* risk of these investments. In both an international and domestic context, this separation of real investment and risk-bearing permits specialization in production activities according to the principle of comparative advantage.

Besides these more apparent functions, the capital market also serves as a key source of information that helps coordinate decentralized decision-making in various sectors of the international economy. Interest rates and security prices are used by households (or, increasingly, their agents) in deciding whether to consume or save and how to allocate their savings among the growing variety of investments available to them. These same prices provide critical signals to managers of firms in their selection of investment projects and financing methods.

In this article, financial innovation is viewed as the "engine" driving the financial system toward its goal of improving the performance of what economists call the "real economy." I begin with an assessment of the causes and consequences of the wave of recent innovations, and then use that assessment as a basis for speculating about the future.

1. The core of the paper is a revised version of pages 263-271 of Robert C. Merton, "The Financial System and Economic Performance," *Journal of Financial Services Research*, 4 (December 1990), pp. 263-300. Other parts draw from Robert C. Merton, *Continuous-Time Finance*, Chapter 14 (Basil Blackwell, 1990) and

Robert C. Merton and Zvi Bodie, "A Framework for the Economic Analysis of Deposit Insurance and Other Guarantees," unpublished manuscript (December 1991).

Financial innovation does not, of course, proceed in a vacuum. When it happens, and what specific forms it takes, are significantly influenced by the surrounding institutional and regulatory environment. And, for a variety of reasons—including differences in size, complexity, and available technology, as well as differences in political, cultural, and historical backgrounds—the institutional mechanisms by which these functions are performed vary considerably among economies.

But the basic functions of a financial system are essentially the same in all economies—past and present, East and West. And because the functions of the financial system are far more stable than the identity and structure of the institutions performing them, this article takes a “functional” as opposed to an “institutional” approach. Given the current rate of technological advance and integration of world capital markets, this approach is likely to prove more useful not only in predicting the path of further evolution by the financial system, but in addressing the critical issue of how to regulate it. As I argue later, the adoption of a broad “functional” approach by regulators should lead to more flexible, better coordinated, and hence more effective oversight. It can also be more readily adapted to a global perspective on the financial system. By persisting in their present, narrowly defined “institutional” approach, regulators only ensure greater involvement of institutions in wasteful “regulatory arbitrage.” The rigidity of institutionally-based regulatory structures will cause the industries they regulate to fall farther behind—while innovative, less rigidly regulated competitors spring up all around them.

FINANCIAL INNOVATION

To make the case that financial innovation over the past 20 years has led to revolutionary changes in the international financial system, I need hardly do more than mention round-the-clock trading Tokyo-London-New York, financial futures, swaps, mortgage-backed bonds, exchange-traded options, “junk” bonds, shelf registration, electronic funds transfer and security trading, automated teller machines, NOW accounts, asset-based financing, and LBO,

MBO, and all the other acronymic approaches to corporate restructuring. And these are but a small sampling.

Of course, financial innovation has been going on for a considerable time. Indeed, many of the innovations of the last two decades, although heralded as novel, were not entirely new. Important examples are exchange-traded options, forwards, and futures contracts. The Dojima rice market in Osaka was a forward market in the 17th century and a fully organized futures market by the 18th century.² Organized futures exchanges were created in Frankfurt in 1867 and in London in 1877. The Chicago Board of Trade was founded in 1848 and the New York Cotton Exchange was incorporated in 1872. Options on commodity futures were traded on the Chicago Board of Trade in the 1920s. In the 17th century, options and contracts resembling futures accounted for the bulk of transactions on the Amsterdam stock exchange, which at the time was the financial center of the Western world. Moreover, from the accounts given by one 17th-century observer, it appears that the regulatory concerns raised about those contracts in Amsterdam—notably, insider trading, manipulation, excessive speculation and price volatility, and default risk—are much the same as those expressed about options and futures trading today.³ I suppose some things just never change.

While options and futures may not be entirely new, the proliferation of organized trading markets in both equity and fixed-income derivative securities during the past 15 years is unprecedented. Development of these standardized markets was absolutely essential for the subsequent creation of a wide range of financial products, many custom-designed to meet selected needs of investors and corporate issuers. One need go no further than any edition of the weekly trade journal, *International Financing Review*, to verify the profound impact that derivative securities have had on the mainline global financing of both businesses and sovereigns. At the same time, mainstream financial institutions and pension-fund-plan sponsors have increasingly adopted quantitative techniques, including computerized trading strategies, to help manage their investment portfolio.

2. See Ulrike Schaefer, “Forwards and Futures in Tokugawa-Period Japan: A New Perspective on the Dojima Rice Market,” unpublished paper (May 1988), Universitaet Marburg, Marburg, Germany.

3. Joseph de la Vega, *Confusion de Confusions* (1688). English translation by H. Kallenbenz, No. 13, The Kress Library Series of Publications, (Harvard

University, 1957). In Chapter 11 of *Capital Ideas: The Improbable Origins of Modern Wall Street* (Free Press, 1992), Peter Bernstein reports that Aristotle's anecdote about Thales in Book 1 of *Politics* is the first recorded mention of a financial option.

lios. The composition of both their equity and fixed-income portfolios has become more global. As with issuers, these investor-side changes could not have been implemented without well-functioning derivative security markets.

Such changes have been accompanied, moreover, by an explosion of trading volume in just about every sector of the financial markets. All this everyone knows. The question is, What has this wave of innovation done for economic performance?

THE SOCIAL VALUE OF FINANCIAL INNOVATION

There are some in the academic, financial, and regulatory communities who see all this innovation as nothing more than a giant fad, driven by institutional investors and corporate issuers with wholly unrealistic expectations of greater expected returns with less risk, and fueled by financial-services firms and organized exchanges that see huge profits from this vast activity. From this viewpoint, opportunists develop innovations that have no function other than to differentiate their products superficially. As the story goes, beyond the direct waste of resources in this activity, the feeding of unrealistic expectations among investors and issuers can impose additional, potentially much larger, social costs in the form of *ex ante* distortions of investment capital allocations and *ex post* excessive volatility in capital market prices, as faulty expectations are not realized. Perhaps. Any virtue can readily become a vice if taken to excess, and just so with innovations. There have surely been instances of financial products and trading strategies that have not delivered the performance promised.

But such examples notwithstanding, there are other recent innovations that have had significant economic benefits. Prime among them in the U.S. is the creation of a national mortgage market that, by means of a wide array of innovative mortgage-backed securities, transformed residential housing finance from fragmented, local-based sources to a free-flowing, international base of capital. As another instructive case, take the development of well-functioning international markets for financial futures, swaps, and option contracts. The dramatic re-

ductions in transactions costs achieved by such markets have made it possible for business firms to hedge against the uncertainties of currency exchange rates, interest rates, and basic commodity prices far more quickly and cheaply than was possible before. For households, among the most important innovations developed during the past two decades are a number of different kinds of mutual funds—money-market, fixed-income, international, real-estate, and equity-indexed—as well as a variety of pension, life insurance, and annuity products. Taken together, these innovations have greatly improved the opportunities for households to construct portfolios with more efficient risk-return tradeoffs and payoffs tailored more closely to changing needs throughout an individual's life-cycle.

We could continue with a listing of past innovations and their benefits as part of an inductive process of refuting capital market skeptics. But I will instead examine in greater detail a single innovation that has not yet been introduced (although it could be, using current technology). In keeping with our global focus, the problem that this product addresses is international diversification under capital controls.

AN ILLUSTRATIVE CASE: INTERNATIONAL STOCK-RETURNS SWAPS

Numerous empirical studies of stock market returns have documented the gains in diversification from investing internationally.⁴ By diversifying across the world stock markets, investors can achieve a significant improvement in the "efficient frontier" trade-off of higher expected returns against higher risks.⁵ As we know, the last decade has seen widespread adoption of international diversification strategies by investors in the large developed countries with the major stock markets—notably, the U.S., U.K., Germany, and Japan. But international diversification of investment portfolios has not yet evolved in many smaller, developed countries—countries where, unfortunately, it is likely to be even more valuable.

A major barrier to foreign stock market investment by citizens of some of these countries is capital controls, imposed by their governments to prevent

4. See Robert Grauer and Nils Hakansson, "Gains from International Diversification: 1968-85 Returns on Portfolios of Stocks and Bonds," *Journal of Finance*, 42 (July 1987), pp. 721-738; and André F. Perold and Evan Schulman, "The Free Lunch in Currency Hedging: Implications for Investment Policy and Performance Standards," *Financial Analysts Journal*, 44 (May/June 1988), pp. 45-50.

5. An investment portfolio is said to be on the efficient frontier if it yields the highest expected rate of return for a given level of risk, where risk is usually measured by the standard deviation of the return on the portfolio.

The dramatic reductions in transactions costs achieved by [financial futures, swaps, and options] markets have made it possible for business firms to hedge against the uncertainties of currency exchange rates, interest rates, and basic commodity prices far more quickly and cheaply than was possible before.

flight of domestic capital. A common rationale for such restrictions is that they reduce the risk that the local economy will have inadequate domestic investment to promote growth.⁶ Another important barrier is that the transaction cost paid by large foreign investors when they buy shares directly in these domestic stock markets can be so large that it offsets the benefits of diversification.

The cost in lost welfare from less-efficient diversification affects both large-country and small-country citizens. But the *per capita* cost is much larger for the small countries, simply because the domestic economies of such countries are by necessity less diversified.⁷

Of course, one (and perhaps the best) solution is simply to eliminate capital flow restrictions. But, taking the capital controls as given, the "constrained" solution involves separating the capital flow effects of investment from its risk-sharing aspects. Suppose that small-country domestic investors (perhaps through domestic mutual funds or financial intermediaries) who already own the domestic equity were to enter into "swap" agreements with large foreign investors.⁸ In the proposed swap, the total return per dollar on the small-country's domestic stock market would be exchanged annually for the total return per dollar on a market-value weighted-average of the major world stock markets. This exchange of returns could be in a common currency, such as dollars (as described here), or adjusted to different currencies along lines similar to currency-swap agreements. The amounts of the dollar exchanges are determined by the "notional" or principal amount of the swap to which per dollar return differences apply. As is usually the case with swaps, there is no initial payment by either party to the other for entering the agreement.

Without pursuing too many details of implementation, we see that the swap agreement effectively transfers the risk of the small-country stock market to foreign investors and provides the domes-

tic investors with the risk-return pattern of a well-diversified world portfolio.⁹ Since there are no initial payments between parties, there are no initial capital flows in or out of the country. Subsequent payments, which may be either inflows or outflows, involve only the difference between the returns on the two stock market indices, and no "principal" amounts are exchanged.

For example, assume the notional or principal amount of the proposed swap is \$1 billion. If it turns out that the world stock market earns 10% and the small-country market earns 12%, there would be only a flow of $(.12 - .10) \times \$1$ billion, or \$20 million, out of the country. Note further that the small-country investors make net payments out precisely when they can "best" afford it: namely, when their local market has outperformed the world markets. In those years in which the domestic market underperforms the world stock markets, the swap generates net cash flows into the country to its domestic investors. For example, if the small-country market instead earns 8% and the world stock market earns 11%, then domestic investors *receive* a net cash inflow of \$30 million (or $(.11 - .08) \times \$1$ billion). Moreover, with this swap arrangement, the trading and ownership of actual shares remain with domestic investors.¹⁰

Foreign investors also benefit from the swap by avoiding the costs of trading in individual securities in the local markets and by avoiding some tax complications (such as local dividend-withholding taxes) that often arise with cross-border investments. They also avoid the problems of corporate governance issues that arise when foreigners acquire large ownership positions in domestic companies. Unlike standard cash investments in equities, debt, or real property, the default or expropriation exposure of foreign investors is limited to the *difference* in returns instead of the total gross return plus principal (in our example, \$20 million versus \$1.12 billion in exposure). The risks of default could be further reduced

6. See James Tobin, "A Proposal for International Monetary Reform," *Eastern Economic Journal*, 4 (July/August 1978), pp. 153-159 on using controls to avoid the hardships caused by large movements of capital in and out of a country.

7. Part of the cost of capital controls may also be overly diversified domestic physical investment; that is, the domestic economies of such countries may compensate for their citizens' inability to diversify through overseas investment by overdiversifying local investment activities.

8. For discussion, analysis and references on swap contracts, see Clifford Smith, Jr., Charles Smithson, and Lee Wakeman, "The Evolving Market for Swaps," *Midland Corporate Finance Journal*, 4 (Winter 1986), pp. 20-32 and "The Market for Interest Rate Swaps," *Financial Management*, 17 (Winter 1988), pp. 34-44 and John Hull, *Options, Futures, and Other Derivative Securities*, (Prentice-Hall 1989).

9. Shares are assumed to be freely traded on the domestic exchange, and they are therefore priced to earn a competitive rate of return to the marginal investor. If the marginal investor is a domestic investor with no access to world stock markets, then the welfare loss is a higher cost of capital for domestic shares (and lower stock prices) than with an open economy because some of the risk perceived as systematic by constrained domestic investors would be diversifiable from a world-investor perspective. If the marginal investor is a world investor, then the welfare loss is the uncompensated excess volatility from inefficient diversification borne by domestic investors. The transfer of risk by the swap addresses both cases.

10. For incentive reasons, owners of domestic shares should have an economic interest in the firms. Hence, a significant amount but not all of the domestic risk can be swapped to non-voting foreign investors.

if the domestic party to the swap were a closed-end mutual fund with its assets invested in the domestic equity market as a hedge and its shares held entirely by local investors. The foreign counterparty to the swap could, of course, also be a closed-end fund with its assets invested in the world stock market portfolio.

Another advantage of the swap over actual foreign ownership of local stocks is that the potential exposure of foreign investors to manipulation by local investors is probably less for the swap than for direct transactions in individual stocks. It is more difficult to manipulate a broad market index than the price of a single stock. Even if settlement intervals for swaps are standardized at six months or one year, the calendar settlement dates will differ for each swap, depending upon the date of its initiation. Hence, with some swaps being settled every day, manipulators would have to keep the prices of shares permanently low to succeed. Furthermore, with the settlement terms of swaps based on the per period rate of return, an artificially low price (and low rate of return) for settlement this year will induce an artificially high rate of return for settlement next year. Thus, gains from manipulation in the first period are given back in the second, unless the price can be kept low over the entire life of the swap. Since typical swap contract maturities might range from two to ten years (with semi-annual or annual settlements), this would be difficult to achieve.

Note that this swap innovation is not designed to circumvent the stated objective of the capital-control regulation, the prevention of domestic capital flight. Instead, it is designed to eliminate, or at least reduce, the unintended and undesirable "side effects" of this policy on efficient risk-bearing and diversification. Although equity-return swaps based on the returns of major stock markets are common today, I am not aware of their application to stock markets in countries with capital controls. With the

current rate of innovation, however, it would not be surprising to see such a development soon. Whether or not this proposed solution turns out to be an effective one in practice is not the central point of the exercise here. Rather, it is to demonstrate how a simple but finely-tuned financial innovation of trivial intrinsic cost could help reduce the social cost of "blunt" policy tools that affect a number of countries around the world.

THE MOTIVES FOR FINANCIAL INNOVATION: REAL EFFICIENCIES OR ONLY REGULATORY AVOIDANCE?

Our swap example also serves to clarify another issue surrounding the relation between financial innovation and economic performance over the last two decades. One widely accepted theory is that cost reduction or otherwise lessening the constraints of regulation including taxes and accounting conventions is a driving force behind financial innovations. Indeed, a strong proponent of that theory, Merton Miller, claims that frequent and unanticipated changes in regulatory and tax codes have provided perhaps the primary impetus for financial innovation during the past 25 years.^{11,12} Many economists, moreover, believe that activities whose sole purpose is to circumvent regulations or avoid taxes are zero- or negative-sum games—that is, wealth transfers that only increase the total cost of achieving the intended objectives of the regulations. Viewed in this light, financial innovation is nothing more than opportunism having no social value.¹³

However, as our swap example illustrates, it is possible to have an innovation motivated entirely by regulation that nevertheless reduces the social cost of achieving the intended objectives of the regulation. And this is the case, whether or not those intended objectives of the regulation are socially optimal.

11. At least that is the thrust of Miller's 1986 article, "Financial Innovation: The Last Twenty Years and the Next," *Journal of Financial and Quantitative Analysis*, 21 (December 1986), pp. 459-471. More recent writings (see, for example, the article in this issue) suggest that he sees real efficiency gains as an important motive and outcome of the process.

12. Consistent with Miller's view are Edward Kane's theory of dynamic regulation and William Silber's view that financial innovation arises from attempts to reduce the cost of various constraints on corporations. See William Silber, "The Process of Financial Innovation," *American Economic Review*, 73 (May 1983), pp. 89-95; and Edward Kane, "Good Intentions and Unintended Evil: The Case Against Selective Credit Allocation," *Journal of Money, Credit and Banking*, 9 (February 1977), pp. 55-69; "Technological and Regulatory Forces in the Developing Fusion of Financial-Services Competition," *Journal of Finance*, 39 (July 1984), pp. 759-

772; and "How Market Forces Influence the Structure of Financial Regulation," in William Haraf and Rose Kushmeider, eds., *Restructuring Banking and Financial Services in America* (American Enterprise Institute for Public Policy Research, 1988). See also David Folkerts-Landau and Donald Mathieson, "Innovation, Institutional Changes, and Regulatory Response in International Financial Markets," in William Haraf and Rose Kushmeider, *ibidem* and John Finnerty, "Financial Engineering in Corporate Finance: An Overview," *Financial Management*, 17 (Winter 1988), pp. 14-33.

13. No credit is given to innovations that improve welfare by thwarting regulations that would otherwise impose more cost than benefit on society, because such welfare losses can, at least in principle, be eliminated more efficiently by simply changing the offending regulations.

Real Efficiency Gains: The Case of Stock Index Futures and Options

In general, innovations in financial products and services can improve economic performance in three basic ways:

- by meeting investor or issuer demands to “complete the markets” with new securities or products that offer expanded opportunities for risk-sharing, risk-pooling, hedging, and intertemporal or spatial transfers of resources;
- by lowering transactions costs or increasing liquidity; and
- by reducing “agency costs” that arise from either “information asymmetries” between trading parties or principals’ incomplete monitoring of their agents’ performance.

All three of these driving forces behind financial innovation are consistent with its working to improve economic efficiency.¹⁴

Consider the case of exchange-traded futures and options contracts on stock indexes such as the Standard & Poor’s 500 or the Nikkei. As noted at the outset of the paper, one of the major functions of capital markets is to provide a way of managing economic uncertainty and controlling risk. The main role of futures and options within the financial system is the risk management function. Index options and futures provide investors a low-cost means of controlling general market risk.

All risk management activities can be represented as combinations of three basic methods of managing risk.¹⁵

Reducing Risk by Selling the Source of It. In general, reducing a portfolio’s risk by moving from risky assets to a riskless asset can be accomplished either in the spot cash market or in a futures or forward market. Futures and swaps usually allow such broad risk adjustments to be effected at lower cost than with cash market alternatives. For example, the alternative to using derivative securities on an

index is to transact simultaneously in many individual stocks (say, five hundred stocks as in the case of the S&P 500).

Reducing Risk by Diversification. Diversification consists of simultaneously pooling and subdividing risks. While it does not eliminate risk in the aggregate, it redistributes it to reduce the risk faced by each individual. Broad diversification across large numbers of different securities has the drawback that adjustments in risk exposure can require a large number of relatively small transactions in the various securities. Moreover, bounds on the subdivision of the units of individual securities limit the number of securities that can be held for a given level of wealth. The use of basket cash-market securities and futures contracts on stock and bond-market indexes both reduces the cost and increases the speed with which diversification strategies can be executed. They also permit broader diversification by allowing arbitrarily small ownership of the individual components of the various indexes.

Reducing Risk by Buying Insurance Against Losses. Insurance permits the owner of an asset to retain the economic benefits of ownership, while eliminating the uncertainty of possible losses. Of course, this retention of the “upside” while removing the “downside” of asset ownership is not free. The fee or premium paid for insurance substitutes a sure loss for the possibility of a larger loss.

In general, the owner of any asset can eliminate the downside risk of loss and retain the upside benefit of ownership by the purchase of a put option.¹⁶ Furthermore, owning an asset and insuring its value against loss by purchasing a put option is economically equivalent to purchasing a call option on the asset.¹⁷ In this sense, an option, whether a put or a call, is a fundamental security that serves the central risk management function of insurance.¹⁸ In particular, options on aggregate portfolios of securities (such as index options) are a far more efficient means of insuring an investor’s asset holdings than

14. See Fischer Black and Myron Scholes, “From Theory to New Financial Product,” *Journal of Finance*, 41 (July 1986), pp. 645-655; George Benston and Clifford Smith, Jr., “A Transaction Cost Approach to the Theory of Financial Intermediation,” *Journal of Finance*, 31 (May 1976), pp. 215-231; Stephen Ross, “Institutional Markets, Financial Marketing, and Financial Innovation,” *Journal of Finance*, 44 (July 1989), pp. 541-556.

15. The idea that all such activities can be decomposed into three “dimensions of risk management” is developed in my article with Zvi Bodie (1991), cited in footnote 1.

16. During the term of the put, its owner has the right to sell the underlying asset at a fixed (“exercise”) price. Thus, any losses on the asset are truncated at this level.

17. The functional and value identity is that a call option combined with a holding of the riskless asset is equivalent to holding the asset together with a put option on the asset. See Merton, *Continuous-Time Finance*, pp. 277-278, cited in Footnote 1 for a formal derivation of this put-call parity theorem.

18. The classic portfolio-selection theory of Harry Markowitz and James Tobin holds that the investor should control his risk exposure first by forming a well-diversified portfolio of all the risky assets and, then, if necessary to adjust the risk further, by allocating his total wealth between this risky portfolio and the riskless asset. Hence, their theory covers the first two dimensions of risk management. It does not, however, explicitly take account of the opportunity structure provided by insurance.

a portfolio of options on each of the individual assets.¹⁹

Note that the reference to "insurance" here is to a class of contracts that performs a common function, as distinguished from the class of institutions called "insurance" companies. The insurance function is often served by a variety of institutions that are not classified as insurance companies. The traded-option exchanges just mentioned are a prime example.²⁰ Insurance companies, on the other hand, often provide products that do not serve an insurance function. For example, insurance companies in the U.S. offer money-market accounts, equity mutual funds, and guaranteed investment contracts, none of which performs an insurance function.

In sum, index futures and options increase economic efficiency in at least two of the three ways cited earlier: They serve to "complete the markets" by providing investors with a previously unavailable means of limiting their exposure to broad market declines—one that substantially reduces the transactions costs of quickly rebalancing a large portfolio. Furthermore, by allowing investors to avoid trading in individual stocks, index derivative securities may also address the potential "market impact" problem arising from information "asymmetries."

The problem, in this case, is as follows: An investor may be buying or selling a stock simply to adjust his risk exposure or to reflect his revised assessment of expected returns on the general stock market. But, he may instead be motivated by explicit private information about the company such as an unannounced earnings report or a litigation decision. The possibility of being "picked off" by information-advantaged traders should make otherwise uninformed counterparties "rationally" reluctant to trade. This reluctance in turn manifests itself in larger bid-ask spreads. The increased spread is a deadweight loss to the investor who does not have information about the individual stock. The structural opportunity to trade in market aggregates provided by indexed futures and options resolves this "market impact" problem because such investors can adjust

their broad asset-class allocations without having to trade in individual stocks.²¹

FINANCIAL SPIRAL EFFECT

As the case of index options and futures is meant to suggest, the dramatic changes over the past two decades are consistent with development toward a more efficient financial market and intermediation system. Indeed, such changes can be seen as part of a financial innovation "spiral" that proceeds as follows: The proliferation of new trading markets in standardized securities such as futures makes possible the creation of new custom-designed financial products that improve "market completeness." Next, volume in the new markets further expands as the producers themselves—typically, financial intermediaries—trade simply to hedge their own exposures. Such increased volume in turn reduces marginal transaction costs and thereby makes possible further implementation of new products and trading strategies—which in turn leads to still more volume. Success of these trading markets then encourages investment in creating additional markets, and so on it goes, spiralling toward the theoretically limiting case of zero marginal transactions costs and dynamically complete markets.

As one example, consider the Eurodollar futures market that provides organized trading in standardized LIBOR (London Interbank Offer Rate) deposits at dates in the future. The opportunity to trade in this futures market provides financial intermediaries with a more efficient way of hedging custom-contracted interest-rate swaps based on a floating rate linked to LIBOR. A LIBOR-based swap rather than a U.S. Treasury rate-based swap is better suited to the needs of many intermediaries' customers because their cash-market borrowing rate is typically linked to LIBOR and not Treasury rates. During the last few years, basic swaps have changed from being "one-off" customized transactions to standardized contracts traded in organized markets. Market trading of such "pure vanilla" swaps ex-

19. Beyond simply the additional costs of multiple transactions, there is a fundamental difference in both the pattern of returns and the cost of an option on a portfolio of assets and a portfolio of options on those assets. See Robert C. Merton, Myron Scholes, and Mathew Gladstein, "The Returns and Risk of Alternative Call Option Portfolio Investment Strategies," *Journal of Business*, 51 (April 1978) and "The Returns and Risks of Alternative Put Option Portfolio Investment Strategies," *Journal of Business*, 55 (January 1982), pp. 1-55.

20. Thus, the prime potential competitor to an insurance company offering investors default insurance on municipal bonds may not be another insurance

company but instead an options exchange that can create a market for put options on those bonds. The put options serve the same down-side-protection function for the investors as the insurance company product. This example also illustrates the difference between the institutional and functional approaches as applied to corporate competitive strategy analysis.

21. For a fuller development of this issue, see James Gammill and André F. Perold, "The Changing Character of Stock Market Liquidity," *Journal of Portfolio Management*, 13 (Spring 1989), pp. 13-17.

panded the opportunity for intermediaries to hedge, thereby allowing them to create customized swaps and related financial products more efficiently.

More generally, standardized traded-securities markets are used by financial-services firms to execute dynamic trading strategies designed to replicate the payoffs to more complex securities—securities that some of them help design and originate.²² The synthesizing of custom financial contracts and securities is for financial services what the assembly-line production process is for the manufacturing sector. Options, futures, and other exchange-traded securities are the raw “inputs” applied in prescribed combinations over time to create portfolios that hedge the various customer liabilities of financial intermediaries.

IMPLICATIONS

Having touched on the economic role of financial innovation in the past, what economic benefits and costs does financial innovation hold out for the future? Rather than lay out a long list of alternative assumptions (and then hedge each of my forecasts according to the accuracy of those assumptions), I will instead offer just one vision of how the future evolution of the system might proceed.²³

In this scenario, aggregate trading volume expands secularly, and trading is increasingly dominated by institutions. As more financial institutions employ dynamic strategies to hedge their product liabilities, incentives rise for further expansion in round-the-clock trading, which in turn permits ever more effective execution of these strategies. Supported by powerful trading technologies for creating financial products, financial-services firms increasingly focus on providing individually tailored solutions to their clients’ investment and financing problems. Sophisticated hedging and risk management become an integral part of the corporate capital budgeting and financial management process.

Retail customers (“households”), meanwhile, continue to move away from direct, individual financial market participation such as trading in

individual stocks or bonds, where they have the greatest and growing comparative disadvantage. Better diversification, lower trading costs, and less informational disadvantage will continue to move their trading and investing activities toward aggregate bundles of securities, such as mutual funds, basket-type, and index securities, and custom-designed products issued by intermediaries. This secular shift, together with the informational advantage of basket/index securities described earlier, will cause liquidity to deepen in those securities while individual stocks become relatively less liquid.

With ever greater institutional ownership, moreover, there is *less, not more*, need for the traditional regulatory protections and other subsidies of the costs of retail investors trading in stocks and bonds. The emphasis on disclosure and regulations to protect those investors will tend to shift up the “security-aggregation chain” to the interface between investors and investment companies, asset allocators, and insurance and pension products.

Whether the financial-services industry becomes more concentrated or more diffuse in this scenario is not clear. The central functions of information and transactions processing would seem to favor economies of scale. Similarly, as size increases, the resulting greater opportunities for netting and diversifying risk exposures by an intermediary with a diverse set of products suggests both fewer required hedging transactions and less risk-capital per dollar of product liability. Increased demand for custom products and private contracting services would seem to forecast that more financial-service business will be conducted as principal instead of agent, which again favors size.

On the other hand, expansion in the types of organized trading markets, reductions in transactions costs, and continued improvements in information-processing and telecommunications technologies will all make it easier for a greater variety of firms to perform the financial-service functions. Those same factors also improve the prospects for expanding asset-based financing, and such expanded opportunities for “securitization” permit smaller,

22. For example, see Charles Smithson’s account in this issue of the complex oil-linked debt issue by Sonatrach, the Algerian oil company. In that example, Chase used the oil futures and options market to hedge its own exposure resulting from the security’s highly unusual payoff structure.

For a more general discussion of this point, see Sections 14.3-14.5 in Merton (1990), cited in Footnote 1.

23. The influence of regulation on innovation is not considered in this “simulation” of the future. As Miller (1986) notes, it is unanticipated regulatory

changes that have the major impact. Moreover, regulation both shapes and is shaped by the time path of financial innovation. Exogenous changes in regulation are surely possible in the short run. But such changes trigger more financial innovations, which in turn provoke new regulation. As a result, the long-run role of regulatory change as an exogenous force for financial innovation is limited.

agent-type firms to compete with larger firms in traditionally principal-type activities. At the same time, however, the locational and regulatory advantages currently available to some financial institutions will be reduced because more firms will be capable of offering a broader range of financial products and servicing a wider geographic area; and traditional institutional identifications with specific types of products will become increasingly blurred.

As in other innovating industries, competition to create new products and services, and to find new ways to produce established ones at lower costs, could make the research-and-development activity the lifeblood of the financial-services firm. Along the projected path of development, the need to distribute more diverse and higher-volume products promises continued relative growth of the firm's activities.

Another key requirement for the success of any financial intermediary is its ability to control both the actual and perceived default risk of its customer-held liabilities. Greater customer demand for service and greater complexity of products will intensify the attention given to this issue in the future. The finance function of financial-services firms will be significantly expanded to cover not only increased working capital needs of the firm, but also the management of its counterparty credit exposure. As technology advances continue to drive down trading and custodial costs, the posting and careful monitoring of collateral is likely to be more widely adopted as the primary means for ensuring counterparty performance.²⁴ Using collateral to manage credit risk will in turn require such companies to increase their trading presence and skills. Trading activity will also likely expand to meet the requirements for designing, marketing, and hedging more complex products.

Having projected the above set of trends—some of which are well underway at present—I now use those projections as a point of departure for speculating about the future course of financial market regulation and, more specifically, of public policy toward financial innovation.

FINANCIAL INNOVATION AND REGULATION

The standard mode of analysis for financial regulatory policy is the institutional approach. In evaluating policy alternatives, this approach takes as

given the type of institutions that provide particular financial services and then analyzes what can be done to help these institutions to perform those services more effectively. Framed in terms of *the* thrifts, *the* banks, or *the* insurance companies, policy issues are posed in terms of what can be done to make these institutions safe and sound.

The perspective taken here is different. I start by taking as given the financial services or functions to be performed and then attempt to determine the institutional structure that will allow those functions to be performed in the most efficient way for a particular place and at a particular time. An important advantage of this functional approach is that the array of financial functions required in an economy is stable across time and place. In contrast, the most efficient institutional arrangements for fulfilling those functions will generally change over time and differ across countries.²⁵ Even when the names of institutions are the same, the functions they perform often differ dramatically. For example, banks in the U.S. today are very different from what they were in 1925 or 1955, and they are also quite different from the institutions called banks in Germany or the U.K. today.

Promoting competition, ensuring market integrity (including macro credit risk protections), and managing "public-good"-type externalities cover the broad potential roles for regulation and other government activities in improving economic performance of the financial system. Government action can affect financial markets in a number of different ways. First, in funding its own activities and in open-market operations, the Federal government (or its agencies) functions as a market participant following the same rules as other private-sector transactors. Second, government sometimes functions as an industry competitor and innovator by directly creating (or supporting development of) new financial products or markets such as securitized mortgages, index-linked bonds or all-savers accounts. Third, it serves as legislator and enforcer, setting and enforcing rules and restrictions on market participants, financial products, and markets such as up-tick rules, margin requirements, circuit breakers, and patents on products. Fourth, it serves as a negotiator when representing its domestic constituents in dealings with other sovereigns that involve financial markets.

24. For a discussion and analysis of the importance and techniques of default-risk management, see Merton and Bodie (1991) cited in Footnote 1.

25. See Merton and Bodie (1991) cited in Footnote 1 for a comparison of these two approaches in the context of the savings and loan crisis.

Such benefits notwithstanding, government activities also often have unintended and unfortunate effects on financial innovation and the efficiency of the financial-services industry. The potential costs of such activities can be grouped into four categories: (1) direct costs to participants, such as fees for using the markets or filing costs; (2) distortions of prices and resource allocations; (3) transfers of wealth among private party participants in the financial markets; and (4) transfers of wealth from taxpayers to market participants.

Coordinating Product and Infrastructure Innovations

I began this article by describing financial innovation as the engine driving the financial system on its journey toward greater economic efficiency. In elaborating this theme, however, I have largely ignored the concurrent changes in the financial “infrastructure”—that is, the institutions, regulatory practices, organization of trading facilities, and MIS systems—necessary to support this journey. But, I now extend the metaphor by considering perhaps the single most important public policy issue with respect to innovation: the interdependence between product innovations and innovations in infrastructure, and the inevitable conflict between them.

As an analogy of supreme simplicity, consider the creation of a high-speed passenger train, surely a beneficial innovation. Suppose, however, that the tracks of the current rail system are inadequate to handle such high speeds. In the absence of policy rules, the innovator, either through ignorance or a willingness to take risk, could choose to run the train at high speed. If the train subsequently crashes, it is of course true that the innovator and his passenger-clients will pay a dear price. But, if in the process the track is also destroyed, then those others such as freight operators who use the system for a different purpose will also be greatly damaged.

Hence the need for policy to safeguard the system. A simple policy that fulfills that objective is to permanently fix a safe, but low speed limit. But, of course, this narrowly focused policy has the unfortunate consequence that the benefits of inno-

vation will never be realized. An obviously better, if more complex, policy solution is to upgrade the track while at the same time maintaining speed limits for as long as there is this “technological imbalance” between the product and its infrastructure.

As in this hypothetical rail system, the financial system is used by many for a variety of purposes. When treated atomistically, financial innovations in products and services can be implemented unilaterally and rather quickly by entrepreneurs. Innovations in financial infrastructure, by contrast, must be more coordinated and, therefore, take longer to implement. As we have seen in the case of recent U.S. thrift and banking legislation, major changes—which could conceivably include outright elimination of obsolete institutions and their surrounding regulatory structure—take place exceedingly slowly.

It is thus wholly unrealistic to expect financial innovation to proceed along a balanced path of development for all elements in the system. Indeed, the imbalance between product innovation and infrastructure could at times become great enough to jeopardize the functioning of the system. Hence, the need for policy to protect against such breakdown. But, as we have also seen, a single-minded policy focused exclusively on this concern could derail the engine of innovation and halt the financial system's progress toward greater efficiency.

A related policy issue is whether government should itself be a financial innovator. If so, should such innovative financial instruments be issued if, and only if, they reduce the direct cost of government financing? Are there other social benefits? Would, for example, the national mortgage market have evolved without government-guaranteed mortgages?

The dramatic increases over the last decade in the size and complexity of transactions together with the global linking of financial markets have raised concerns about macro credit risk and the possibility of broad financial market “breakdown.” The 1987 crash in world stock markets still casts a shadow that heightens those concerns. The changes in practice projected by our scenario of innovation imply, *ipso facto*, further increases in the interdependence among institutions and markets in the international financial system.²⁶ This greater interdependence, in turn,

26. As I have discussed here and elsewhere (Merton 1990, Merton and Bodie 1991, cited in Footnote 1), controlling default risk for customer-held liabilities of financial intermediaries is a key element in the theory of efficient intermediation and economic performance. Furthermore, much the same point applies for the

integrity of markets that trade standardized instruments, such as options, futures, and swaps. Thus, in this specific sense, the theory supports the belief that credit risk is a major macro issue for the international financial markets.

promises renewed intensity of the policy debate on how to ensure market integrity and where to draw the line on government guarantees (both explicit obligations set by contract and implicit ones set by public expectations).

But if such heightened concern about macro credit risk would suggest an increasing role for regulation, there are also a number of factors that are pushing the other way. Continuing improvements in telecommunications, information processing, and electronic transactions technologies will make the monitoring of security prices and transfer of securities for collateral considerably less costly. Such technologies, for example, may eventually make practicable the creation of "narrow" depository banks, perhaps run along the lines of money market funds, but with additional marked-to-market collateral and a federal deposit-insurance "wraparound." This less comprehensive deposit insurance, lower-cost monitoring, and lower-cost collateralization all promise to reduce the need for regulation.²⁷

Whatever may be the change in the *quantity* of regulation in the future, a major change in the format of regulation from "institutional" to "functional" seems inevitable. As already noted, increasingly more sophisticated trading technologies, together with low-transaction-cost markets to implement them, tend to blur the lines among financial products and services. The existence of these technologies and markets also implies easier entry into the financial services. As a result, the lines between financial institutions are likely to become less distinct. Indeed, insurance companies now offer U.S. Treasury money-market funds with check writing, while banks use option and futures markets transactions to provide stock-and-bond-value insurance that guarantees a minimum return on customer portfolios. Credit subsidiaries of major manufacturing firms, which once performed the single, specialized function of providing financing for customers of their parents, have become multiple-function financial institutions with services ranging from merchant banking for takeovers and restructurings to equity-indexed mutual

funds sold to retail investors. Electronics has made problematic the meaning of "the location of the vendor" of these products. In contrast, a financial product's function from the perspective of the user is relatively well defined.

Most financial regulation involves products and services for household customers and, hence, the user's location is often better defined than the vendor's. Over time, functional uses of products are typically more stable than the institutional forms of their vendors. In keeping with the trend toward greater user access to international financial markets, product and service functions appear to be more uniform across national borders than are the institutions that provide them. Functional regulation also reduces the opportunities for institutions to engage in "regulatory arbitrage," which wastes real resources and can undermine the intent of the regulation. Functional regulation thus promises more consistent treatment for all providers of functionally-equivalent products or services, thereby reducing opportunities for "rent-seeking" and "regulatory capture." Furthermore, functional regulation can facilitate necessary changes in institutional structures by not requiring a simultaneous revision of the regulations, or the regulatory bodies surrounding them, as is required with the current institutionally-based regulatory structure.

The perceived benefits from a move to functional regulation might seem to support a broader case for widespread coordination, and even standardization, of financial regulations, both domestically and across national borders. However, such extrapolation is valid only if the coordinated regulatory policies chosen are socially optimal. The reduction in "regulatory diversification" that by necessity occurs with more effective coordination will accentuate the social losses if the selected common policies are suboptimal. The international issue of the trade-off between the benefits of regulatory cooperation and the benefits of regulatory competition could well be the most important financial regulatory issue of the 1990s.

27. See Merton and Bodie (1991) cited in Footnote 1 for an analysis of the costs and benefits of government participation in deposit and loan guarantees.

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