

A CONCEPTUAL FRAMEWORK FOR ANALYZING THE FINANCIAL SYSTEM*

Robert C. Merton and Zvi Bodie

ABSTRACT

This paper develops a conceptual framework for analyzing fundamental institutional changes in the global financial system. The framework's objectives are to improve our understanding of how and why financial institutions change, to make accurate predictions about how they are likely to evolve in the future, and to guide business strategy and public policy in this arena.

The key element in the framework is its reliance on functions rather than on institutions as the conceptual “anchor.” Hence, it is called the *functional perspective*. It rests on two basic premises:

1. Financial functions are more stable than financial institutions — that is, functions change less over time and vary less across borders.
2. Institutional form follows function — that is, innovation and competition among institutions ultimately result in greater efficiency in the performance of financial system functions.

This functional perspective is used to explore some of the key public-policy issues facing the global financial system. The issues addressed include: risk accounting, regulation of OTC derivatives, deposit insurance reform, pension reform and privatization, international harmonization of regulatory policies, and innovations in macro-stabilization policy.

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Financial markets and intermediaries today are globally linked through a vast international telecommunications network, so that the trading of securities and the transfer of payments go on more or less continuously around the clock. The financial markets include the foreign exchange, fixed-income, and equity markets, as well as the new and growing markets for “derivative” securities such as futures, options, and swaps. Capital market functions are also performed by financial intermediaries such as banks and insurance companies, which provide customized products and services -- the kind that do not lend themselves to the standardization necessary to support a liquid market.

For a variety of reasons --including differences in size, complexity, and available technology, as well as differences in political, cultural, and historical backgrounds -- financial institutions generally differ across borders. They also change over time. Even when the names of institutions are the same, the functions they perform often differ dramatically. For example, banks in the United States today are very different from what they were in 1925 or in 1955, and banks in the United States today are very different from the institutions called banks in Germany or the United Kingdom today.

In this paper we try our hand at setting forth a unifying conceptual framework for understanding how and why the institutional structure of the financial system changes and how it is likely to evolve in the future.² The key element in the framework is its focus on functions rather than on institutions as the conceptual “anchor.” Hence, we call it the functional perspective. It rests on two basic premises: Financial functions are more stable than financial institutions -- that is, functions change less over time and vary less across borders.

Institutional form follows function -- that is, innovation and competition among institutions ultimately result in greater efficiency in the performance of financial system functions.³

The paper develops the functional perspective and gives an overview of its range of application. Applicability of the functional perspective ranges widely, from analysis of the entire financial system to individual business strategy decisions and specific public policy choices. We distinguish four levels of analysis: system-level, institution-level, activity-level, and product-level.

The evolution of the financial system is described as an innovation spiral, in which organized markets and intermediaries compete with each other in a static sense and complement each other in a dynamic sense. The functional perspective views financial innovation as driving the financial system

1. The conceptual framework set forth in this chapter is a synthesis and extension of work presented by the authors in Merton (1989; 1990; 1992a; 1992b, Ch.14; 1994; 1995), Bodie and Merton (1992;1993), and Merton and Bodie (1992a; 1992b; 1993).

2. In the economics literature, the closest analogue is the work of Schumpeter (1911), North (1994), and Williamson (1985). Their focus, however, is on the economic system as a whole, whereas ours is on the financial system only.

3. The functional perspective adopted here is similar in spirit to the functional approach in sociology pioneered by Robert K. Merton (1957). There are a number of others whose work fits comfortably within this framework. In the area of financial innovation, see Black and Scholes (1974), Benston and Smith (1976), Ross (1989), and Scholes (1994). In the intermediation literature, the analytical approaches of Black, Miller, and Posner (1978), Black (1985), Brennan (1993), Gorton and Pennacchi (1992), and Pierce (1991, 1993) are aligned with the functional perspective. In the case of finance practitioners, the perspective is perhaps best exemplified in Sanford (1993).

toward the goal of greater economic efficiency.⁴ Technological advances that have already resulted in dramatically reduced transaction costs and advances in the theory and practice of finance that rely on low transactions costs, are likely to produce wide-ranging institutional changes in the future. We sketch the broad outlines of some of those changes.

From the most aggregated level of the single primary function of resource allocation, we distinguish six basic or core functions performed by the financial system:

To provide ways of clearing and settling payments to facilitate trade.

To provide a mechanism for the pooling of resources and for the subdividing of shares in various enterprises.

To provide ways to transfer economic resources through time, across borders, and among industries.

To provide ways of managing risk.

To provide price information to help coordinate decentralized decision-making in various sectors of the economy.

To provide ways of dealing with the incentive problems created when one party to a transaction has information that the other party does not or when one party acts as agent for another.

The six chapters to follow offer in-depth descriptions, analyses, and illustrations of each of the core functions of the financial system. A final chapter discusses the evolving infrastructure and regulation of the global financial system in the future.

Change and Diversity in the Global Financial System

We know that people have engaged in financial transactions since the dawn of recorded history. Sumerian documents reveal the systematic use of credit for agricultural and other purposes in Mesopotamia around 3,000 BC. Barley and silver served as a medium of exchange -- i.e., money. Even regulation of financial contracts existed in ancient times. Hammurabi's Code contains many sections relating to the regulation of credit in Babylon around 1,800 BC.⁵

Banking institutions arose in the city-state of Genoa in the 12th Century AD, and flourished there and in Florence and Venice for several centuries. These banks took demand deposits and made loans to merchants, princes, and towns. Security issues similar to their modern form also originated in the Italian city states in the late Middle Ages. Long-term loans floated by the Republic of Venice, called the *prestiti*, were a popular form of investment in the 13th and 14th Centuries, and their market price was a matter of public record. Even organized exchanges for trading financial futures contracts and other financial derivatives, which some see as an innovation of the 1980s, are not entirely new. Similar contracts were widely traded on the Amsterdam securities exchange in the 1600s.⁶

As this little bit of history makes clear, some things have not changed. Financial activities, such as borrowing, investing in securities, and other forms of financial contracting are very old indeed. The

4. Theories of financial innovation that are consistent with this view are: Allen and Gale (1988, 1990, 1994), Barnea, Haugen, and Senbet (1985), Benston and Smith (1976), Diamond (1984), Diamond and Verrecchia (1982), Duffie and Jackson (1989), Fama (1980), Fama and Jensen (1985), Merton (1989, 1992b, Ch. 14), Milgrom and Roberts (1992), Ross (1973, 1976, 1989), Strong and Walker (1987), Townsend (1990), and Williamson (1986).

5. See Homer (1977).

6. See de la Vega (1688).

ways in which these activities are carried out, however, have changed quite a bit through the ages.

In the past few decades, in particular, the pace of financial innovation has greatly accelerated.⁷ Think of round-the-clock-trading in Tokyo-London-New York, financial futures, swaps, mortgage-backed securities, exchange-traded options, “junk” bonds, shelf registration, electronic funds transfer and security trading, automated teller machines, asset-based financing, LBO, MBO, and all the other acronymic approaches to corporate restructuring. And this is but a small sampling.

While it may be hard to believe that the pace of general financial innovation during the past few decades can sustain itself into the future, there are reasons to believe it can because it is rooted in fundamental economic factors.⁸ Technological advances in telecommunications, data processing, and computation, which began in the 1960s, have resulted in dramatically reduced transaction costs for the financial services industry. In addition to lower transactions costs due to technological advances, there is also the learning curve: When one has created nine new markets, the tenth one becomes a lot easier. The decision to implement an innovation involves a trade-off between its benefit and its cost. With secularly lower transactions costs, the threshold benefit to warrant implementing financial innovations declines. If we see the same pace of change in the underlying fundamentals as in the past, the implementation of financial innovation is likely to remain rapid, as the threshold for change is lower.

With much lower costs of change, it becomes profitable not only to introduce new products and create new markets, but also to change entire institutional arrangements (including geographical and political locations) in response to much smaller shifts in customer tastes or operating costs than in the past. Thus, technological advances, lower costs, and the prospect of greater global competition in financial services all form the basis for predicting substantial increases in both the frequency and the magnitude of institutional changes for private sector and government financial intermediaries and for regulatory bodies alike.⁹

To illustrate both the change and the diversity in institutional structures around the world, consider the financing of retirement income for older people. For much of the world's population, the extended family is the main institution to perform this function. Elderly family members live and work with younger members of the agrarian family, and all draw a common livelihood from it. But in much of the industrialized world, urbanization and other fundamental economic and social changes have led to new institutional structures for the care and support of the elderly.

An often-used metaphor for describing a country's retirement income system is the “three-legged stool.” The first leg is government-provided pension and welfare programs (such as Social Security in the United States); the second is employer- or labor union-provided pensions; and the third is direct individual saving. There is substantial variation across countries in the mix of the three sources of retirement income.

Table 1-1 illustrates these national differences. The first column shows Social Security replacement rates of final salary for 12 different countries in 1992. The replacement rate is given for two levels of final salary — \$20,000 (low income) and \$50,000 (middle income).

7. See Finnerty (1992).

8. See Remolona (1992) for evidence on the rate of growth of financial derivatives markets.

9. This is also the conclusion drawn by Hayes (1993).

Table 1-1. International Social Security Replacement Rates and Pension Coverage in 1992

Country	Social Security Retirement Benefit as a Percentage of Final Earnings (based on final salary of \$20,000 and \$50,000)	Proportion of Labor Force Covered by a Private Pension Plan
United States	65%-40%	46%
United Kingdom	50%-26%	50%
Germany	70%-59%	42%
Japan	54%	50%
Canada	34%	41%
Netherlands	66%-26%	83%
Sweden	69%-49%	90%
Denmark	83%-33%	50%
Switzerland	82%-47%	90% (compulsory)
Australia	28%-11%	92% (compulsory)
France	67%-45%	100% (compulsory)
Italy	77%-73%	5%

Notes:

1. The social security replacement rates in column 2 are given for two different levels of final salary — \$20,000 and \$50,000. For example, in the US the replacement rate is 65% for someone with a final salary of \$20,000 and 40% for someone with a final salary of \$50,000. Where only a single replacement rate is given (e.g., Japan), the rate is the same for both salary levels.
2. The pension plan coverage rates in column 3 only include pensions provided by employers or labor unions. They do not include voluntary retirement savings accounts for individuals such as IRAs in the United States.

Source: Davis (1994).

Table 1-1 also shows the proportion of the labor force that is covered by a private pension plan. At one extreme is Italy, where the government-run social security system provides a replacement rate greater than 70% for both low- and middle-income workers. It is therefore not surprising to see that in Italy only 5% of the labor force is covered by an employer pension plan. At the other extreme is Australia, where the social security replacement rate is quite low, but 92% of workers are covered by a compulsory employer-based pension plan.

Table 1-1 is a snap-shot at a point in time. It therefore fails to convey the dramatic changes that have occurred in national retirement income systems and the changes that are bound to come in the decades ahead.¹⁰

For example, the high proportion of Australian workers covered by a private pension plan shown in

10. See, for example, the study sponsored by the World Bank (1994).

the last column of Table 1-1 is a very recent phenomenon. In July 1992 the Australian government implemented a major pension reform that introduced a system of mandatory employer-based pensions similar to those in Chile and Switzerland.¹¹

Pension reform is currently a high priority issue in several European countries (e.g., Italy, Germany, France) that have relied heavily on pay-as-you-go systems of retirement income provision in the past. As the proportion of the elderly in their population increases in the next few decades, these systems will come under tremendous strains that are likely to lead to institutional change. And in the developing nations of Asia and Africa, some of which have had no formal pension system at all, institutional reforms are being considered to supplement the informal systems of family provision of old-age income.

The example of retirement finance clearly demonstrates that the financial system encompasses a broader set of institutions than just financial markets and intermediaries. The family and government play an important role everywhere. In many countries—even those with fully developed financial markets and intermediaries—the family is still an important institutional mechanism for financing education, housing, care of the elderly, and even start-ups of new businesses.¹²

Government's role in supporting the infrastructure of the financial system is fundamental. It includes establishing and enforcing property rights and other laws affecting contracts as well as regulating financial markets and intermediaries. Governmental bodies often substitute for or supplement private sector intermediaries, providing cash loans, subsidized interest rates, and loan guarantees.

The roles of family, government, and private-sector markets and intermediaries, and the regulatory structures governing them, vary considerably from country to country and from financing activity to activity. The relations among all of these institutions are typically both competitive and complementary. This applies to both the relations between financial intermediaries and markets and the relations between those private sector institutions and the family and government.

Why a Functional Perspective?

As illustrated by the example of systems for providing retirement income, institutional change in the financing of economic activity is today a dominant theme around the world in both the private and the public sector. Among other policy issues of current concern are the following:

What regulatory or other institutional arrangements are most efficient for dealing with over-the-counter markets for derivatives such as forward contracts, options, and swaps?¹³

Is there a way to improve the institutional mechanisms that support investment in business innovation?¹⁴

To tackle such questions, one requires a tool of analysis that explicitly deals with the dynamics of institutional change. The neoclassical economics perspective addresses the dynamics of prices and

11. See Bateman and Piggott (1993).

12. We use the term “family” in a technical sense to mean any group of people with strongly interdependent utility functions. It is thus not necessarily the same as a household. If within a household such interdependent utility is not present, then the legal or biological family does not function as “family.”

13. For example, a recent report by the United States General Accounting Office (1994) has recommended that “Congress require federal regulation of the safety and soundness of all major U.S. OTC derivatives dealers.”

14. Porter (1994), for example, believes that the institutional structure of the United States financial system tends to create a problem of insufficient investment in business innovation.

quantities, but is largely an “institution-free” perspective in which only functions “matter.” It thus has nothing to say directly about the institutions that perform these functions and how they change over time.¹⁵

At the other extreme, there is a static institutional perspective which assumes that institutions not only matter but takes them as the conceptual “anchor.” It views the objective of public policy to be to help the institutions currently in place to survive and flourish. Framed in terms of *the* banks or *the* insurance companies, managerial objectives are similarly defined in terms of what can be done to make those institutions perform their particular financial services more efficiently and profitably.

Because this institutional perspective is static in focus, it cannot explain the dynamics of institutional change. Moreover, from this perspective, financial innovation sometimes appears to threaten the stability of the system by providing the means to circumvent institutionally-based regulations at low cost.

Drawing on both the neoclassical and institutional perspectives, the functional perspective adopted here takes as a given the economic functions performed by financial institutions and then seeks to discover the best institutional structure for performing those functions at a given time and a given place. It does not assume that existing institutions, whether private sector or governmental, operating or regulatory, will be preserved. Thus functions rather than institutions serve as the conceptual anchor. Because institutions “matter” but are not the anchors, institutional changes can be explained within this perspective.¹⁶

To illustrate the differences among the neoclassical economics perspective, the static institutional perspective, and the functional perspective, consider how many ways there are today to take a levered position in the Standard & Poor's 500 stocks:¹⁷

1. You can buy each stock individually on margin in the cash stock market.
2. You can invest in an S&P 500 Index fund and borrow from a bank to finance it.
3. You can go long a future contracts on the S&P 500.
4. You can go long an OTC forward contract on the S&P 500.
5. You can enter into a swap contract to receive the total return on the S&P 500 and pay LIBOR or some other standard interest rate.
6. You can go long exchange-traded calls and short puts on the S&P 500.
7. You can go long OTC calls and short puts.
8. You can purchase an equity-linked note that pays based on the S&P 500 and finance it by a repurchase agreement.
9. You can purchase from a bank a certificate of deposit with its payments linked to the return on the S&P 500.
10. You can either buy on margin or purchase the capital appreciation component of a unit investment trust (examples are Super Shares or SPDRs) that holds the S&P 500.
11. You can borrow to buy a variable-rate annuity contract that has its return linked to the S&P 500.

From a neoclassical economics perspective, all 11 of these are equivalent ways of achieving a desired exposure to the S&P 500. Indeed, the modern theory of asset pricing (based on the law of one

15. This feature of the neoclassical perspective has been stressed by North (1994).

16. The functional perspective on the financial system falls within the research tradition of what Williamson (1985, p. 16) calls the New Institutional Economics.

17. This example is taken from Merton (1995).

price) relies on this equivalence to infer information from the market prices of these products. But these 11 different forms for investing in the S&P 500 are not simply cosmetic product differentiations among competing issuer institutions. The neoclassical perspective offers little guidance in understanding the managerial or regulatory implications of the differences.

The static institutional perspective, on the other hand, tends to lead one to view the 11 different ways of taking a levered position in the S&P 500 with alarm. If regulators want to maintain the safety and soundness of financial institutions currently in place, the development of alternative ways of achieving an economically equivalent result poses a danger. A natural regulatory response is to try to slow down financial innovation or ban it altogether. The important question from a public policy perspective, however, is whether the institutions currently in place ought to be preserved.

The functional perspective offers an alternative view with very different policy implications. It is precisely the development of a multiplicity of institutional forms illustrated in our example that has facilitated the globalization of the financial system in the 1980s and 1990s. Given the diversity of the national currency, financial-cultural, and regulatory regimes that have become linked together, it seems remarkable in retrospect that the process of globalization has been so smooth. Financial innovation has made it possible to hook up these diverse national financial systems to a single global network.

Indeed, one can think of today's financial system as a global network (similar to the Internet) that can be freely accessed by any government or firm that has the standardized hardware, software, and trained personnel necessary to "hook up" to it. An important implication is that governments in countries with less well-developed domestic financial systems may not have to follow the same historical path as the United States or Germany and develop a complete set of organized financial markets and intermediaries. Instead of erecting local securities exchanges and the regulatory apparatus to oversee them, they can concentrate their limited resources on developing the financial and technological expertise needed to access the global financial network.¹⁸

Functions of the Financial System

As stated at the outset, the primary function of any financial system is to facilitate the allocation and deployment of economic resources, both across borders and across time, in an uncertain environment. From the most aggregated level of the single primary function of resource allocation, we can further distinguish six basic functions performed by the financial system:¹⁹

Function 1: Clearing and Settling Payments

A financial system provides ways of clearing and settling payments to facilitate the exchange of goods, services, and assets.

There are alternative ways of clearing and settling payments. Collectively, the set of institutional arrangements for accomplishing this task is called the payments system. Depository financial

18. The World Bank (1990) reports that in 1989 it launched the Financial Technical Assistance on Asset and Liability Management Project to help selected groups in the public and private sectors gain expertise in the use of modern techniques of financial risk management.

19. Other functional classification schemes have been suggested in the finance literature. An appendix to this chapter briefly discusses several of them.

intermediaries such as banks serve this function with wire transfers, checking accounts, and credit/cash cards. Other intermediaries such as money market mutual funds offer transaction-draft accounts, and firms whose principal business is not financial, such as AT&T, General Electric, and General Motors, offer general credit cards.

Mechanisms for clearing and settling securities transactions are designed to deal with the costs and the risks associated with the process. Costs arise in the form of processing fees, transfer taxes, and the maintenance of collateral. Risk arises because one of the parties to a transaction may not fulfill its terms. For example, the buyer may not be able to arrange financing, or the seller fails to deliver. The key elements for managing these costs and risks include netting arrangements, efficient use of collateral, delivery-versus-payment, immobilization of securities, and extension of credit.

Chapter 2 examines these basic mechanisms. It takes a broad view of the payment system, to include not just systems for clearing and settlement, but also derivative instruments, traditionally not viewed as integral to the payment system, except with respect to their own clearing and settlement. The chapter establishes that derivative instruments serve as an important extension of the payment system because they substitute in a variety of ways for trading in cash-market instruments.

The chapter compares the payment system demands of cash-market security trading strategies with those of derivatives-based strategies. It shows how the derivatives-based strategies typically transform a small number of large payments into a large number of small payments spread over time. By reducing the occurrence of relatively large funds transfers, the use of the derivatives alternative can significantly lower the risk of a major disruption caused by a single default.

Chapter 2 concludes by focusing on the foreign-exchange market and examining alternatives for dealing with credit risk induced by different time zones (“Herstatt risk”). It illustrates how these alternative approaches to the reduction of this risk, including netting and the use of derivatives, can serve as functional substitutes with very different implications for institutional change.

Function 2: Pooling Resources and Subdividing Shares

A financial system provides a mechanism for the pooling of funds to undertake large-scale indivisible enterprise or for the subdividing of shares in enterprises to facilitate diversification.

In modern economies, the minimum investment required to run a business is often beyond the means of an individual or even several individuals. From the perspective of firms raising capital, the financial system provides a variety of mechanisms (such as security markets and financial intermediaries) through which individual households can pool (or aggregate) their wealth into larger amounts of capital for use by business firms. From the perspective of individual savers, the financial system provides opportunities for households to participate in large indivisible investments.

Mutual funds that hold stocks and bonds are examples of financial intermediaries that provide virtually full divisibility in subdividing the individual unit size of the traded securities they hold. Chapter 3 explores the role of mutual funds in detail. It also identifies the process of securitization as one key to future gains in the efficiency of pooling. Securitization is essentially the removal of (non-traded) assets from a financial intermediary's balance sheet by packaging them in a convenient form for outside investors and selling the packaged securities in a financial market.

Function 3: Transferring Resources Across Time and Space

A financial system provides ways to transfer economic resources through time, across geographic regions, and among industries.

A well-developed, smooth-functioning financial system facilitates the efficient life-cycle allocations of household consumption and the efficient allocation of physical capital to its most productive use in the business sector. A well-developed, smooth-functioning capital market also makes possible the efficient separation of ownership from management of the firm. This in turn makes feasible efficient specialization in production according to the principle of comparative advantage.

Intermediaries that serve this function include banks and thrifts in financing corporate investments and housing, insurance companies and pension funds in financing corporate investments and paying retirement annuities, and mutual funds that invest in virtually all sectors.

Chapter 4 explores this function in depth. In particular, it identifies the incentive problems of adverse selection and moral hazard as the main barriers to greater efficiency in the transfer of capital resources around the world. As in the chapter on the pooling function, collateralization, credit enhancement, and securitization are seen as the key to future improvements in the performance of the resource transfer function.

Function 4: Managing Risk

A financial system provides ways to manage uncertainty and control risk.

A well-functioning financial system facilitates the efficient allocation of risk-bearing. Through often elaborate financial securities and through private sector and government intermediaries (including the system of social insurance), the financial system provides risk-pooling and risk-sharing opportunities for both households and business firms. It facilitates efficient life-cycle risk-bearing by households, and it allows for the separation of the providers of working capital for real investments (i.e., in personnel, plant, and equipment) from the providers of risk capital who bear the financial risk of those 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. Insurance companies are the classic example of a financial intermediary offering risk protection. They sell protection against loss in value of human capital (e.g., death and disability), physical property (e.g., fire and theft), and financial assets (e.g., contract guarantees including bond-default insurance). Mutual funds help control risk by providing diversification.

Chapter 5 explores the risk management function in detail, including the three basic ways to manage risk: hedging, diversifying, and insuring. The recent pace of financial innovation in risk management is likely to continue into the future. Chapter 5 identifies the emergence of derivative securities as the most important innovation, because like the purchase of insurance contracts, derivatives allow for the separation of risk management from the transfer of resources. The chapter also discusses the impact of these developments on the stability of the financial system and the possible need for regulation of derivatives trading.

Function 5: Providing Information

A financial system provides price information that helps coordinate decentralized decision-making in various sectors of the economy.

The manifest function of financial markets is to allow individuals and businesses to trade financial assets.

An additional latent function of the capital market is to provide information useful for decision-making. Interest rates and security prices are information used by households or their agents in making their consumption-saving decisions and in choosing the portfolio allocations of their wealth. These same prices provide important signals to managers of firms in their selection of investment projects and financings.

As the diversity of financial markets has increased during the past two decades, so too have the opportunities to extract useful information from the prices of financial instruments. Chapter 6 illustrates how information about the future volatility of changes in security, currency and commodity prices can be extracted from options and option-like securities. Volatility is a critical input for virtually all decisions relating to risk management and strategic financial planning.

The introduction of exchange-traded options in 1973 and the concurrent development of the theory of contingent-claims pricing have made it possible to infer beliefs about future volatility of an asset directly from the prices of options and other derivatives whose payoffs depend in a non-linear way on the asset's price. The estimate extracted in this way is called implied volatility.

An important, if unintended, consequence of the proliferation of derivatives will be a richer information set that can facilitate more efficient resource allocation decisions.

Function 6: Dealing with Incentive Problems

A financial system provides ways to deal with the incentive problems when one party to a financial transaction has information that the other party does not, or when one party is an agent for another. A well-functioning financial system reduces the incentive problems that make financial contracting difficult and costly. These problems arise because parties to contracts cannot easily observe or control one another, and because contractual enforcement mechanisms are not costless to invoke. These contractual “frictions” take a variety of forms: moral hazard, adverse selection, and information asymmetries.²⁰

Chapter 7 focuses on the impact of incentive problems on the contractual relationships between a firm's managers and its capital providers. In short, incentive problems make it more costly for companies to raise external capital than to use internal capital. The nature and size of these additional costs affect, and are affected by three major aspects of corporate behavior: financing policies; investment and capital budgeting policies; and risk management policies.

Chapter 7 shows how the financial system can respond to overcome those incentive problems. It discusses recent security innovation and the use of derivatives within corporate risk management programs as examples of how innovation can reduce the scope and the costs of incentive problems.

The Functional Perspective at Four Levels of Analysis

20. For detailed development and a review of the literature of asymmetric information and agency theory in a financial market context, see Strong and Walker (1987). See also Barnea, Haugen, and Senbet (1985), Fama (1980), Fama and Jensen (1985), Grossman and Hart (1982), Jensen (1986), Jensen and Meckling (1976), Milgrom and Roberts (1992), Ross (1973), and Townsend (1990).

The functional perspective is useful at several levels of analysis: system-level, institution-level, activity-level, and product-level.

Level of the System

The functional perspective offers a useful frame of reference for analyzing a country's entire financial system. In the former Communist countries of Eastern Europe, changing the financial system is a major part of a general restructuring of the entire economic system, from one based on central planning and government ownership of business to one based on free markets and private ownership. A number of other countries with well-developed free markets for non-financial goods and services still have centralized government control of their financial systems.

With total control over both the banking and pension systems and restrictions on cross-border capital flows, these governments collect almost all the savings of the household sector and allocate most of the capital to the business sector. In at least some of these countries, reforms to privatize large parts of the financial system are under consideration. And even among countries like the United States, with highly developed private financial markets and institutions, important changes in the way government regulates the system are actively being debated. An example would be the system of financing retirement income.²¹

In general, such analyses begin with a description of the functions served by the pension system and a determination of how they are currently performed. From this base, the analysis then continues by examining alternative institutional arrangements used at other times and in other countries.

It is unlikely that solutions developed in one country or group of countries cannot be improved upon. Functional analysis seeks new institutional arrangements or new combinations of existing ones that might improve the performance of the functions, given the specific local economic, political, and cultural circumstances.

Level of an Institution

Application of the functional perspective is not limited to analyses at the level of the financial system. A functional perspective is also useful in the study of a particular institutional form. Examples are the savings and loans (S&Ls) in the United States during the 1970s and 1980s, or U.S. commercial banks during the 1990s.²²

Evolving as specialized institutions in the United States during the first half of this century, S&Ls or "thrifts" came to have two core economic functions: to provide long-term financing for residential home-owners at fixed interest rates and to provide a riskless, liquid, short-term savings vehicle for large numbers of small savers. These are separable functions that need not be performed by the same intermediary.

Nevertheless, the U.S. public policy response to the difficulties faced by thrifts during the 1970s and 1980s was to try to find ways of making them healthy again. The S&L problem was thus framed in terms of taking the existing institutions as a given (i.e., maintaining the institutional structure) and asking what changes could be made to improve the thrifts' competitive position. It is difficult to rationalize the public policy toward the thrifts during the 1980s unless preservation of existing financial institutions was

21. See, for example, Bodie and Merton (1992, 1993).

22. See Merton and Bodie (1992b) for a discussion of the S&Ls and Merton and Bodie (1993) for a discussion of commercial banks.

a primary objective of that policy.

Ironically, while the government was struggling at great cost to save the thrifts during the 1980s, both of the thrifts' principal economic functions were being taken over by other institutional mechanisms. The creation of securitized mortgage instruments, ostensibly to help the thrifts, led to the creation of a national mortgage market that allowed mutual funds and pension funds to become major funding alternatives to the thrifts. These funding markets also allowed entry by agent-like institutions such as investment banks and mortgage brokers to compete with the traditional principal-like thrifts for the origination and servicing fees on loans and mortgages.

Level of an Activity

To illustrate application of the functional perspective to a financial activity, consider lending. Lending is often treated as a homogeneous activity in both private sector and public sector decision-making. But from a functional perspective, lending in general is multi-functional, involving two of the six basic functions of the financial system.

Lending in its "purest" form is free of default risk, so it falls under a single basic functional category: the intertemporal transfer of resources. But, of course, with few exceptions, payments promised in loan agreements are subject to some degree of default risk. Lending therefore also involves a second basic functional category: risk management. When a loan is made, an implicit guarantee of that loan (a form of insurance) is involved.

To see this, consider the fundamental identity, which holds in both a functional and a valuation sense:

$$\text{Risky Loan} + \text{Loan Guarantee} = \text{Default-Free Loan}$$

$$\text{Risky Loan} - \text{Default-Free Loan} = \text{Loan Guarantee}$$

Thus, whenever lenders make dollar-denominated loans to anyone other than the United States government, they are implicitly also selling loan guarantees. The lending activity therefore consists of two functionally distinct activities: pure default-free lending (the intertemporal transfer function), and the sale of default risk insurance by the lender to the borrower (an example of the risk management function.)²³

The relative weighting of these two functions varies considerably across the various debt instruments. A high-grade bond (rated AAA) is almost all default-free loan with a very small guarantee component. A below-investment-grade or "junk" bond, on the other hand, typically has a large guarantee component.

Level of a Product

To see an application of the functional perspective at the level of an individual financial product, consider municipal bond insurance.²⁴ In the United States, there are specialized insurance companies that sell insurance contracts that guarantee interest and principal payments on municipal bonds against default by the issuer. The policies are typically sold to the issuer, which "attaches" them to the bonds to give them an AAA credit rating. To succeed as a guarantor, the insurance company itself must be seen as a very strong credit.

In evaluating the firm's competitive standing, a manager with an *institutional* perspective would

23. For analysis of the default insurance guarantee business, see Merton and Bodie (1992b).

24. This example is taken from Merton (1993, pp. 28-29).

focus on other insurance companies as competitors. A manager with a *functional* perspective would instead focus on the best institutional structure to perform the function, which may *not* be an insurance company.

Consider as one alternative an option exchange that creates a market for put options on municipal bonds. In such a market investors could achieve the same protection against loss by buying an uninsured municipal bond and a put option on that bond.²⁵ Note that both structures serve the same function for investors — protection against loss from default — but the institutions are entirely different: An options exchange is not an insurance company. Furthermore, the put option traded on the exchange is a different product from the insurance guarantee. Although the products and institutions that provide them are both quite different, the economic function they serve is the same.

In certain environments, it is surely possible that an options exchange with marked-to-market collateral and a clearing corporation could be a “better credit” than an insurance company and also thereby be a superior institutional structure to serve the guarantee function. In such environments, *the institutionally-oriented manager may miss recognizing the firm's prime competitor*. Regulatory bodies for financial services are almost exclusively organized along institutional lines, so they face similar problems. *Because options are not insurance products, and exchanges are not insurance companies, insurance regulators would have no control over the option exchange even though its product is a perfect substitute for an insurance product.*

The Financial Innovation Spiral

The evolution of the financial system can be viewed as an innovation spiral, in which organized markets and intermediaries compete with each other in a static sense and complement each other in a dynamic sense. That intermediaries and markets compete to be the providers of financial products is widely recognized. Improving technology and a decline in transactions costs has added to the intensity of that competition. Inspection of Finnerty's (1988, 1992) extensive histories of innovative financial products suggests a pattern in which products offered initially by intermediaries ultimately move to markets. For example:

The development of liquid markets for money instruments such as commercial paper allowed money-market mutual funds to compete with banks and thrifts for household savings.

The creation of “junk-bond” and medium-term note markets, which made it possible for mutual funds, pension funds, and individual investors to service those corporate issuers who had historically depended on banks as their source of debt financing.

The creation of a national mortgage market allowed mutual funds and pension funds to become major funding alternatives to thrift institutions for residential mortgages. Creation of these funding markets also made it possible for investment banks and mortgage brokers to compete with the thrift institutions for the origination and servicing fees on loans and mortgages.

Securitization of auto loans, credit-card receivables, and leases on consumer and producer durables, has intensified the competition between banks and finance companies as sources of funds for these

25. With a standard fixed exercise price, the put would actually provide more protection because it covers losses in the value of the bond for any reason, not just issuer default. The coverage could effectively be “narrowed” to only default risk by making the exercise price “float” to equal the current price of an AAA bond with comparable terms to those of the covered bond.

purposes.²⁶

This pattern may seem to imply that successful new products will migrate from intermediaries to markets. That is once they become familiar, and perhaps after some incentive problems are resolved, those products will trade in a market. Just as venture-capital firms that provide financing for start-up businesses expect to lose their successful customers to capital market sources of funding, so do the intermediaries that create new financial products.

However, exclusive focus on the time path of individual products can be misleading, not only with respect to the apparent secular decline in the importance of intermediation, but with respect to the general relations between financial markets and intermediaries. The evolution of the financial system can be viewed as an innovation spiral, in which organized markets and intermediaries compete with each other in a static sense and complement each other in a dynamic sense.

Financial markets tend to be efficient institutional alternatives to intermediaries when the products have standardized terms, can serve a large number of customers, and are well-enough understood for transactors to be comfortable in assessing their prices. Intermediaries are better suited for low-volume customized products. As products such as futures, options, swaps, and securitized loans become standardized and move from intermediaries to markets, the proliferation of new trading markets in those instruments makes feasible the creation of new custom-designed financial products that improve “market completeness”; to hedge their exposures on those products, the producers (typically, financial intermediaries) trade in these new markets and volume expands; increased volume reduces marginal transaction costs and thereby makes possible further implementation of more new products and trading strategies by intermediaries, which in turn leads to still more volume. Success of these trading markets and custom products encourages investment in creating additional markets and products, and so on it goes, spiralling toward the theoretically limiting case of zero marginal transactions costs and dynamically complete markets.

Consider, for example, the Eurodollar futures market that provides organized trading in standardized LIBOR (London Interbank Offered Rate) deposits at various dates in the future.²⁷ The opportunity to trade in this futures market provides financial intermediaries with a way to hedge more efficiently custom-contracted interest-rate swaps based on a floating rate linked to LIBOR. A LIBOR 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 to Treasury rates.

At the same time, the huge volume generated by intermediaries hedging their swaps has helped make the Eurodollar futures market a great financial success for its organizers.²⁸ Furthermore, swaps with relatively standardized terms have recently begun to move from being custom contracts to ones traded in markets. The trading of these so-called “pure vanilla” swaps in a market further expands the opportunity structure for intermediaries to hedge and thereby enables them to create more-customized swaps and related financial products more efficiently.

26. For a comprehensive discussion of the implementation of asset securitization, see Norton and Spellman (1991), Zweig (1989), and the entire Fall 1988 issue of *Journal of Applied Corporate Finance*.

27. This example is taken from Merton (1993).

28. See, for example, Antilla (1992) on the Chicago Mercantile Exchange.

Eurodollar futures appear to be a nearly perfect substitute for LIBOR-based fixed-to-floating-rate swaps. One might therefore think that non-financial firms would simply transact directly in the LIBOR futures market and bypass the financial intermediary altogether. However, the futures require a mark-to-market collateralization of positions, and OTC swaps need not. Thus, intermediaries that issue such swaps to corporations and hedge them in the futures market in effect perform the service of managing the collateralization process for these non-financial business customers.

As demonstrated in this example, intermediaries help markets grow by creating the products that form the basis for new markets and by adding to trading volume in existing ones. In turn, markets help intermediaries to innovate new more-customized products by lowering the cost of producing them. Thus, although markets and intermediaries are competitors, they also are complementary to each other.²⁹

The Future of the Global Financial System

Consider now a small sampling of the implications of the functional perspective for the future evolution of the global financial system. In our most likely scenario, aggregate trading volume expands secularly, and trading is increasingly dominated by institutions such as mutual funds and pension funds. As more financial institutions employ dynamic strategies to hedge their product liabilities, incentives rise for further expansion in round-the-clock trading to allow for more effective implementation of these strategies. Supported by powerful trading technologies for creating financial products, financial services firms will increasingly focus on providing individually tailored solutions to their clients' investment and financing problems. Sophisticated hedging and risk management will become an integrated part of the corporate capital budgeting and financial management process.

The Household Sector

Retail customers ("households") will 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 informational effects as described in Gammill and Perold (1989), will enhance liquidity in the basket/index securities, while individual stocks become relatively less liquid. With ever greater institutional ownership of individual securities, there is less 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.

The Non-Financial Business Sector

Just as there will be changes in the financial products and services offered to households, so too non-financial firms will face a very different set of opportunities.³⁰ As shown in Chapter 7, the development

29. A general development of this observation is presented in Merton (1993).

30. This section is based on Merton (1995).

of low-cost financial tools that enable firms to hedge particular risks has profound implications for their investment, financing, and risk management strategies. The management of risk has traditionally focussed on capital. Equity capital is the “cushion” for absorbing risks of the firm. Management does not have to predict the source of loss, because equity protects the firm against all forms of risk. But the very characteristic of the equity cushion that makes it attractive to managers is the characteristic that creates a moral hazard for the shareholders who provide that equity cushion. The resulting agency and tax costs are the main reasons equity financing can be expensive.³¹

The other fundamental means for controlling risk is through hedging. In contrast to equity capital which is all purpose, hedging is a form of risk control that is very targeted. Hedging can be very efficient, but it carries with it the requirement that its users have a deep quantitative understanding of their business. They must understand much more about their structures than in the case of all-purpose equity capital. Developing this deeper understanding of their business is going to require some retraining of the ways managers think about their businesses if they are to use hedging effectively.

Consider, for instance, the example of a “synthetic refinery.” Imagine a firm with extensive crude oil reserves and a chain of gasoline stations. Suppose that strategic analysis concludes that there are serious risk concerns about ensuring the firm's access to the production process that links those two activities together. The need to eliminate that risk in the past would have been satisfied by perhaps acquiring a refinery.

The alternative today, especially if the firm has no expertise in refining or managing a refinery, would be to enter into contracts in which the firm agrees to deliver so many barrels of crude oil and, perhaps with some time delay, receives in return a certain amount of high-grade gasoline. That contract functionally creates a synthetic refinery. It may not be appropriate for every such firm, but entering into a simple contract is perhaps a lot safer and a lot more efficient than acquiring the refinery itself. Thus, while creating a synthetic refinery may require the firm's management to increase its knowledge in one area (the use of financial tools), not having to build and manage an actual refinery also reduces their need for expertise in another area (building and managing a refinery).

As the skills needed to apply these kinds of risk management are acquired by institutions and their customers, one of the outcomes may be changes in the industrial organization and governance systems in parts of the non-financial sector of the economy. In particular, there is the choice between being a private firm (by that we mean a firm with a relatively small number of owners) or being a public firm with ownership held by public shareholders.³²

Consider some of the trade-offs that owner-managers weigh when making the choice between the firm being private and public. The advantages of being private are headed by reduced agency costs, lower costs of transferring information including external reporting, protection of key information from competitors, and greater flexibility to optimize with respect to taxes and regulation.

What are the benefits of going public? Most important are the risk-sharing benefits. If a small group of owners is bearing the full risks of the firm, then at some point if this risk becomes large enough, the shadow price placed by them on the firm is lower than the public market price would be because they cannot achieve the diversification that public shareholders have. Hence, private owners

31. See, for example, Grossman and Hart (1982), Jensen (1986), and Merton (1993).

32. This discussion ties into the work by Jensen (1989) on the corporate form of organization and Williamson (1985) on the boundaries of the firm. Williamson (1988) compares and contrasts his transaction-cost approach with Jensen's agency approach to the study of economic organization.

internalize parts of the firm's risks that are diversifiable with widespread ownership. The other key benefit has to do with capital expansion. The private firm runs into limits on debt as a function of the absolute variability of the business.

Consider such a firm with needs for funding and risk-sharing that believes it must move to the public ownership domain with all its costs (that reflect what the firm gives up by going public). If the firm were instead able to use efficient hedging to strip away the risks of the business that are not adding to value (e.g., commodity price risks, interest rate risks, or currency risks), it could reduce the total variation or riskiness of the business, without lowering its profitability. In so doing, it reduces the risk exposure to its private owners. The reduced risk will also allow the firm to expand its capacity to raise capital in the debt market without going public.

To the extent hedging becomes widespread, a macro shift back toward greater private ownership of firms could appear as these hedging tools are developed. This shift in institutional structure for firms marks one type of influence that financial innovation can have beyond the financial sector.

The Financial Sector

Whether the financial services industry becomes more concentrated or more diffuse in this scenario is ambiguous. The central functions of information and transactions processing would seem to favor economies of scale. Similarly, the greater opportunities for netting and diversifying risk exposures by an intermediary with a diverse set of products suggest both fewer required hedging transactions and less risk capital per dollar of product liability as size increases.³³

Increased demand for custom products and private contracting services would seem to forecast that more of the 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 serve the financial service functions.

These same factors also improve the prospects for expanding asset-based financing, and such expanded opportunities for securitization permit smaller, agent-type firms to compete with larger firms in traditionally principal-type activities. Continuing the scenario, 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. Traditional institutional identifications with specific types of products will continue to 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 this hypothetical path, the need to distribute a higher volume and more diverse set of products promises continued relative growth of the firm's sales activity.

Controlling actual and perceived default risk for its customer-held liabilities has always been a key requirement for success of any financial intermediary. Greater customer expectations 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-risk exposure.

As technology advances continue to drive down trading and custodial costs, the posting and careful

33. For a detailed discussion of the allocation of risk capital in financial firms, see Merton and Perold (1993).

monitoring of collateral is likely to be more widely adopted as the primary means for ensuring counterparty performance, especially among financial institutions. Implementation of this practice will in turn require enhanced trading skills for the firm. The trading activity is also likely to expand to meet the execution requirements for implementing more complex product technologies.

This framework for analysis underlies the next six chapters, which offer in-depth analyses and illustrations of each of the core functions of the financial system.

Infrastructure and Regulation

The financial infrastructure consists of the legal and accounting procedures, the organization of trading and clearing facilities, and the regulatory structures that govern the relations among the users of the financial system. From a long historical perspective of several centuries, the evolution of the infrastructure of the financial system has been identified as perhaps the key to understanding economic development.³⁴ In particular, the emergence of England as the first industrialized nation in the world during the 18th and 19th centuries has been attributed to the creation of the necessary financial infrastructure during the latter part of the 17th and early 18th centuries.³⁵

An important challenge for public policy is explicit recognition of the interdependence between product and infrastructure innovations and acknowledgment of the inevitable conflicts that arise between the two. To call up a simple analogy, consider the creation of a high-speed passenger train, surely a beneficial product innovation. Suppose, however, that the tracks of the rail system are inadequate to handle such high speeds. Without any rules, the innovator, whether through ignorance or a willingness to take risk, might choose to run the train at high speed anyway.

If the train crashes, it is, of course, true that the innovator and the passengers will pay dearly. But if in the process the track is also destroyed, those who use the system for a different purpose, such as freight operators, will also be harmed. Hence the need for policy to safeguard the system.

A simple policy that meets that objective is to mandate a safe, but low speed limit. Of course, this narrowly focussed policy has the unfortunate consequence that the benefits of innovation will never be realized. A better, if more complex, policy solution is to upgrade the track and in the meantime set temporary limits on speed, while there is a 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. Separate and discrete financial innovations in products and services can be implemented in an entrepreneurial way and rather quickly. Innovations in financial infrastructure, however, must be more coordinated; they therefore take longer to implement and will occur more gradually.

Successful public policy depends importantly on recognizing the limits of what government can do to improve efficiency and on recognizing when government inaction is the best choice. Government regulatory actions can do much to either mitigate or aggravate the dysfunctional aspects of financial innovations. By analogy, hurricanes are inevitable, but government policy can either reduce their devastation by encouraging early warning systems or it can aggravate the damage by encouraging the building of housing in locations that are especially vulnerable to such storms. Similarly, well-intentioned government policies aimed at reducing the systemic risks of a crisis in the global financial system may have the unintended and perverse consequence of actually increasing the risk of such a crisis.

34. See North (1994, pp. 258-260).

35. See North (1994, p. 263) and Dickson (1967).

Risk Accounting

A fundamental part of the infrastructure that will require significant changes to accommodate future financial innovation is the financial accounting system. Traditionally, accounting focusses on value allocations. For this purpose it is generally effective. We need not distinguish here between book or market valuation, because the point is that the accounting system basically looks only at value allocations. It is therefore an ineffective structure for identifying risk allocations.

To illustrate this point, suppose a hypothetical savings bank has fixed-rate mortgages as assets, floating-rate deposit liabilities, and equity. The accounting system indicates the value of assets (the fixed-rate mortgages) on the left-hand side, and on the right-hand side it tells us the value of deposits as well as the value of the bank's equity.

Suppose that this bank now enters into a swap in which it agrees to receive the floating interest rate and pay the fixed rate. What is the impact of this transaction? The objective, of course, is to match the risk of interest-rate exposure of its assets and liabilities by transforming floating-rate financing into fixed-rate financing, or equivalently in this case by transforming fixed-rate returns into floating-rate returns.

But where does that drastic change in the risk exposure of the equity appear in the balance sheet? The current financial accounting structure with its focus on valuation has no place for it. The reason is that the value of a swap is typically zero when the institution enters into it. It thus can neither be listed as a liability, nor can it be listed as an asset.

Much is written and said today about the large and varied exposures that are “off-the-balance-sheet” of banks and other financial institutions. It is even suggested that firms that use those swaps or other off-balance sheet contractual arrangements do so to hide information from outsiders. At times and for some firms, disguise may be a primary motive, but the more frequent and widespread reason that these “zero-value” contractals are off-balance sheet is simply that the accounting system does not have a place to put them.

Although contracts like interest-rate swaps and futures contracts have no initial value, they can have an immediate and significant impact on the risk exposure of the various assets and liabilities that are on the balance sheet. It is precisely in this sense that accounting can be said to do a good job at valuation but that it is totally inadequate to deal with risk allocation.

Major changes in accounting structure and methodology are required to address this inadequacy. In particular, financial accounting needs fundamental revisions to develop a specialized new branch called “risk accounting.” The prospect for such development is not just prospective and theoretical. Pressed by the reality of need, financial firms that deal extensively in complex securities have already developed risk accounting protocols as part of their internal management systems. With the benefits of real-world experience, these protocols could serve as prototypes for standardized risk accounting.³⁶

An Example: Regulation of OTC Derivatives

Chapters 1, 2, and 5, call attention to the extraordinary growth in the trading of derivatives since the mid-1980s. Driving this growth is the vast savings in transactions costs from their use. The most recent growth has been focussed in over-the-counter (OTC) derivatives. These contracts are transacted away from a central market, putting greater pressure on the intermediary issuing them to price them correctly and to manage their risk.

Much has been written on whether it is time for governments to take strong steps to protect against

36. For generic examples, see Hindy (1993) and Merton (1989, pp. 242-247; 1992b, pp. 450-457).

increases in systemic risk arising from the use of OTC derivatives.³⁷ Yet, as discussed in Chapters 1, 2, and 5, the use of OTC derivatives can just as well be framed as reducing systemic risks.³⁸ Resolving this issue therefore rests on the empirical evidence. A key question in the debate therefore becomes how to measure the risk exposure created by derivatives.

The contribution to systemic risk exposure from OTC derivatives must be measured relative to the risk exposure contribution of the financial structure that they replace, and not in some abstract, absolute terms as if there were no systemic risk exposure prior to their introduction. For example, the over-the-counter (OTC) options market for foreign exchange (forex) is in part a substitute for interbank forex market trades. The exposure to contract default on OTC options is related to the difference between the principal amount and the strike price. In the forex market, principal amounts are exchanged, so the default exposure is the total principal amount. Therefore, although the options surely have exposure to contract default, their use as a substitute for the standard forex transaction actually reduces the magnitude of systemic exposure.³⁹

Prior to the widespread development of swaps, parallel loans were used to achieve similar results. The systemic exposure of these loans included the principal and gross interest payments on each loan. The swap, by contrast, involves no principal amount exposure; it has exposure only to net interest payments. Yet public debate on the systemic risk of swaps and other derivatives is often clouded by the nearly universal practice of citing the notional principal amount of swaps outstanding and treating that number as if it were the amount at risk.

To facilitate measurement, financial accounting must undergo fundamental revisions in the long run. As discussed, central to those revisions is the creation of a specialized new branch dealing with risk accounting. Until a system of risk accounting is in place, truly effective regulation will be difficult to implement.

Functional Regulation

As discussed in Chapter 1, increasingly more sophisticated trading technologies, together with low transactions 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, distinctions between financial institutions are likely to become even less clear in the future.

For example, insurance companies now offer U.S. Treasury money market funds with check writing, while banks use options and futures markets transactions to provide stock-and-bond-value insurance that guarantees a minimum return on customer portfolios. Credit subsidiaries of major

37. Most recently, in the United States, the General Accounting Office 1994 report and the Global Derivatives Study Group (1993). See also Darby (1994), Freeman (1993), Miller (1994), and Paré (1994).

38. It is all the more perplexing because derivative securities have long been integral parts of the financial system. As discussed in Merton (1992a), options, forward contracts, and futures have been around since the 17th and 18th centuries in Europe, the United States, and Japan. Among the earliest derivative securities were bank currencies (money) which "derived" their value from their convertibility into the underlying gold held in depositories.

39. Chapter 2 makes the same point for the Rolling-Spot forex futures contract traded on the Chicago Mercantile Exchange with respect to the length of the settlement period.

manufacturing firms no longer serve only the single, specialized function of providing financing for customers of their parents; they now offer services ranging from merchant banking for takeovers and restructurings to equity-indexed mutual funds sold to retail investors. Electronics also makes the meaning of “the location of the vendor” of these products ambiguous. Therefore, whatever the change in the degree of regulation in the future, a major change in the format of regulation from *institutional* to *functional* seems inevitable.

The approach generally adopted by regulators is to treat the existing institutional structure as given, and to view the objective of public policy as helping the institutions currently in place to survive and flourish.⁴⁰ In contrast, the functional perspective takes as given the functions to be performed and asks what is the best institutional structure to perform those functions.

Functional regulation promises more consistent treatment for all providers of functionally-equivalent products or services and thereby reduces the 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 often required with an institutionally-based regulatory structure.⁴¹

The case of regulating OTC derivatives provides an illustration of a major advantage of functional regulation. To be effective and avoid unintended consequences, policy implementation must be comprehensive and include similar treatment of economically equivalent transactions. For example, a proposed regulation to force marked-to-market collateral requirements on OTC derivatives, but not on loans and other “traditional” investments, could actually cause a shift back toward structures (like parallel loans) that actually increase the systemic exposure of the system.

Implementation of comprehensive regulations, however, will be quite difficult. To underscore the point, we repeat the example from Chapter 1 of the varied ways to take a levered position in the Standard & Poor's 500 stocks:

1. You can buy each stock individually on margin in the cash stock market.
2. You can invest in an S&P 500 Index fund and borrow from a bank to finance it.
3. You can go long a futures contracts on the S&P 500.
4. You can go long an OTC forward contract on the S&P 500.
5. You can enter into a swap contract to receive the total return on the S&P 500 and pay LIBOR or some other standard interest rate.
6. You can go long exchange-traded calls and short puts on the S&P 500.
7. You can go long OTC calls and short puts.
8. You can purchase an equity-linked note that pays on the basis of the S&P 500 and finance it by a repurchase agreement.
9. You can purchase from a bank a certificate of deposit with its payments linked to the return on the S&P 500.
10. You can either buy on margin or purchase the capital appreciation component of a unit investment

40. The thrust of policymaker thinking is perhaps reflected in the titles given to government reports. For instance, the U.S. Treasury entitled its February 1991 detailed proposals for financial system reform, *Modernizing the Financial System: Recommendations for Safer, More Competitive Banks*.

41. See Chicago Mercantile Exchange (1993) for an example of a model for a more functionally-oriented regulatory structure. See also the National Commission on Financial Institution Reform, Recovery, and Enforcement (1993) and Pierce (1993).

trust (examples are Super Shares or SPDRs) that holds the S&P 500.

11. You can borrow to buy a variable-rate annuity contract with its return linked to the S&P 500.

In the U.S. alone, the types of institutions involved in these equivalent trades include brokers, mutual funds, investment banks, commercial banks, insurance companies, and exchanges. The regulatory authorities involved include the Securities and Exchange Commission, the Commodity Futures Trading Commission, the Board of Governors of the Federal Reserve System, the Comptroller of the Currency, and state insurance commissions. One need hardly mention that, in the real world, attempts to regulate just two or three of the eleven ways of doing an equivalent thing are not going to be effective.

Looking Ahead

As we look into the future, there are a number of areas where a functional perspective on regulation seems to offer the potential for improved policy options. Let us consider some of them.

Regulation of Banks

First, consider commercial banks in the United States.⁴² Since the 1930s they have performed traditionally two main economic activities: They make loans (including guarantees of loans) to businesses, households, and governments, and they take deposits from customers. The loans and guarantees made by banks are risky and tend to require careful monitoring. Thus, bank loans are relatively “opaque” assets.⁴³ On the other hand, bank deposits are expected by customers to be safe and liquid.

Government insurance through the Federal Deposit Insurance Corporation (FDIC) is the principal means to assure safety of customer deposits. It is the fundamental mismatch between bank demand-deposit liabilities insured by the government and the illiquid, risky and opaque loans collateralizing those insured deposits that gives rise to the deposit-insurance problem.⁴⁴

Even if historically there were efficiency gains from using insured deposits as the primary source to finance the commercial lending activities of banks, there is no evidence that such benefits exist today.⁴⁵

42. Merton and Bodie (1993) and Pierce (1993) present an explicitly functional approach to the subject of bank regulation in the U.S. While their analysis focuses specifically on the U.S. experience, it also applies to many other countries with a similar structure.

43. We use the term “opaque” here in the sense developed in depth by Ross (1989).

44. In discussions of deposit insurance, it is common practice to use the cost to the U.S. taxpayer of bailing out the depositors of failed depository institutions as the measure of the problem. The true cost to society, however, is the misallocation of investment and the unintended redistribution of income and wealth caused by the current system. The current deposit-insurance system, accounting rules, and regulatory procedures can encourage excessive risk-taking.

45. Gorton and Pennacchi (1991) present several “agency-cost” arguments for using very short-term debt to finance in large part those specialized institutions that make opaque and illiquid loans. They show, however, that there is no need for this short-term debt to take the form of insured demand deposits that are part of the payments system. Indeed, Merton and Bodie (1993) argue that financing with *insured* deposits would defeat the agency purpose of short-term debt because the holders of that debt would no longer have an incentive to monitor the firm in making their decision whether to “roll over” the debt and continue to finance the firm.

We argue elsewhere (1993) that by changing the institutional structure of commercial banking through separating banks' lending and loan-guarantee activities from their deposit-taking activities it is possible to achieve potentially large social benefits with no apparent offsetting costs. We are therefore led to agree with Black (1985), Kareken (1986), Litan (1987), Pierce (1991, 1993), and Tobin (1985, 1987), that deposit insurance can be effectively reformed by this separated structure. As discussed in Merton and Bodie (1993), this separation can be achieved by simply requiring that federally insured deposits be fully collateralized with the equivalent of U.S. Treasury bills.⁴⁶

This proposed solution to the structural problem of deposit insurance, however, does not require a “narrow-bank” structure that prohibits institutions which take transactions deposits from engaging in other financial activities, including risky lending. Indeed, under these collateral conditions, there is no danger to the safety of deposits from depository firms offering other financial services. Thus, this proposal does not eliminate any opportunities for economies of scope or scale from “one-stop shopping” for consumers of financial services.

Once the lending and loan-guarantee activities of banks are separated from insured deposits as the funding source, lending could be carried on with many fewer government restrictions and strict capital requirements designed to protect the FDIC. The financing of these lending activities would probably evolve to some combination of common and preferred stock, long-term and short-term debt, and convertible securities, as determined by competitive market forces. If, as some have suggested, government intervention is required in the area of commercial lending to overcome private-market failures, that intervention can surely be made more efficient if it is not complicated by the existence of government-insured demand deposits.

The proposed reform also readily permits other institutions, such as mutual funds, to compete with depository banks in offering insured deposits to their customers. As long as these other institutions maintain the required collateral and follow the same reporting procedures, a “level playing field” is created for all providers of safe and liquid transaction deposits.

In this new environment is there still a roll for deposit insurance? Reasons given for deposit insurance tend to fall into five categories:

To encourage and enhance a safe and convenient form of investment for small savers.

To ensure an adequate and stable supply of credit to worthy borrowers who would not otherwise

Benston and Kaufman (1988) argue that if the same institution that holds a customer's deposits also grants loans to that customer, economies of scale and scope can be achieved. Black (1975) and Fama (1985) appear to make similar claims, although Black (1985) later seems to reject such synergies. In these times, it is rare that either a business or an individual carries all its financial accounts including credit cards with a single bank. Moreover, we are unaware of any widespread practice to induce this behavior by offering significantly better loan terms to those who would do so. If, however, such potential efficiency gains are really there, the Merton and Bodie (1993) proposal for reform does not rule out lending and deposit-taking activities within the same company, provided that the loans do not serve as collateral for deposits.

In sum, we know of no study showing direct synergistic benefits from having risky loans serve as the collateral for insured demand deposits.

46. The idea of requiring interest-earning obligations of the U.S. government as 100% reserves against bank demand deposits was proposed by Friedman (1960). His proposal was, however, motivated by the objective of achieving more effective control of the money supply.

have access to the nation's supply of capital.

To facilitate the creation of liquidity.

To prevent a run on the banking system that might destabilize the macroeconomy.

To enhance the efficiency of the payments system.

In our opinion, only the last of the five actually requires deposit insurance for efficiency. The other four are better served by alternative means.

Deposit insurance enhances the efficiency of the payments system by eliminating unnecessary monitoring costs. If demand deposits are subject to default-risk on the part of the bank, then sellers of goods seeking to verify the ability of buyers to make good on their promises to pay would have to verify not only that the buyer has enough money in his account, but also that the bank in which the account is held is solvent. Similarly, buyers who want the convenience of writing default-free checks would have to monitor the solvency of the bank in which they have their account. Uncertainty about the ability of the bank to make good on its deposit liabilities thus creates "deadweight" losses. The system of collateralized demand deposits we advocate eliminates this deadweight loss for all parties at minimal cost. The role of the FDIC in this system is simply to confirm to the public that sufficient collateral is there and that if it is not, the FDIC will make good on the payment.

Regulatory Cooperation and Competition

The blurring of distinctions among financial intermediaries and markets 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 common policies chosen are suboptimal.⁴⁷

A related question is whether imposition of a single regulator for all providers of a particular financial function has the unintended consequence of actually inducing a new systemic risk component that did not exist before? Put differently: Do multiple types of institutions and regulators serving a particular financial function create multiple channels of service, which thereby serve to reduce systemic exposure?

As an analogy, consider an instance from transportation. The objective is to assure travel from England across the Channel to France. Suppose that only one institutional form of transportation across the Channel is available, flight by airplane. Assume further a single regulator for air transportation. In this structure, foggy weather, which is known to happen in England, becomes a systemic event that can shut down transportation.

Because nothing is going to fly, it does not matter how many different airlines there are. Moreover, if the single regulator decides that planes should not fly because it thinks that there is bad weather coming, and it happens to be wrong, then the single regulator actually induces the systemic event. Why not allow the Channel tunnel as another way of getting across? With a different regulator, it is in every dimension a different way to cross. Systemic risk is reduced by this diversification. But the tunnel too could block up. So why not a third way such as a hovercraft that can go across the surface? The likelihood that all three ways would fail simultaneously is probably quite small. Hence, the presence of multiple modes of transportation with different structures reduces the systemic risk of complete

47. White (1993) makes a similar point.

breakdown in being able to cross the Channel.

As with transportation, so with financial services. We acknowledge that regulating a particular financial function is more complicated when there are multiple channels of providers, because a regulator has to deal with many different kinds of institutions. But the end objective should not be what is easiest for regulators, but what is best for the end users of the financial system.

Pension Reform and Privatization

Financial innovation can facilitate the achievement of some non-financial goals of public policy. Pension reform and privatization of state-owned enterprises are examples. These two objectives are high on the list of many countries, including Argentina, Brazil, Chile, the Czech Republic, Hungary, Israel, and Italy.⁴⁸ The idea of linking the implementation of policies to simultaneously achieve both of these objectives provides an occasion to illustrate the application of the functional perspective to public policy regarding the financial system.

Privatization in its most general sense means transferring responsibility for performing some economic function from the government to the private sector. In the context of pension reform, privatization has come to mean less reliance on the government-run part of the pension system, which is typically a pay-as-you-go system, and greater reliance on employer-provided pensions and specially-designated private retirement accounts.

But, privatization also means the transfer of the ownership and control of state-owned enterprises to the private sector. In many countries, privatization in this sense is under consideration as a mechanism for improving the way business firms are managed and scarce capital resources are allocated among those firms. It is believed that by encouraging the creation of competitive securities markets and by finding structures that make managers more accountable to the owners of these securities, the most competent managers will rise to the top and resources will be allocated more efficiently.

Reform of a country's pension system and privatization of state-owned enterprises are quite separate financial matters. Nonetheless, under certain circumstances, combining the two may make it easier to resolve problems that arise in trying to implement each separately. For example, a major element in switching from a government-run pay-as-you-go retirement income system to a funded private pension system is providing financial instruments for pension funds to invest in and liquid markets in which to trade them. Similarly, privatization of industry is greatly facilitated by having an array of securities markets to absorb the stocks and bonds issued by newly privatized firms. Undertaking pension reform and privatization of industry at the same time permits a more balanced growth in securities markets by simultaneously developing the demand (by pension funds) and the supply (by privatized firms).

In implementing pension reform, financial managers in both the private and public sectors can exploit the global financial network discussed in Chapter 1 to avoid conflict with other policies. For example, swaps can be used to allow local firms and individuals to diversify internationally without exposing the country to the problem of "capital flight."⁴⁹ As an illustration, consider an international equity swap contract between a small-country pension fund and a foreign institution on a notional or

48. A recent World Bank study (1994) documents many of these efforts. In particular, Chile's experience since 1981 has been closely studied as a possible model for other countries. See Myers (1991, 1992) for details about the Chilean experience. See Bodie and Merton (1992) on Israel; Diamond (1992) on Poland, and Hanke (1991) on the former Communist countries of Eastern Europe.

49. Merton (1992a) develops this idea in detail.

principal amount of \$1 billion. In the proposed swap, the total return per dollar on the small-country's domestic stock market is exchanged annually for the total return per dollar on a market-value weighted-average of the major world stock markets. Trading and ownership of actual shares remain with small-country investors.

The swap agreement effectively transfers the risk of the small-country stock market to foreign investors and provides the domestic investors with the risk-return pattern of a well-diversified world portfolio. 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 flow.

Foreign investors benefit from the swap by avoiding the costs of trading in individual securities in the small country market and by avoiding some potential tax complications which often arise with cross-border investments. Furthermore, they 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 custodial-default risk or expropriation exposure of foreign investors is limited to the difference in returns instead of the total gross return plus principal.

The risks of default are further reduced when the small country party to the swap is a pension fund with its assets invested in the small country stock market as a hedge. The foreign counterparty to the swap could, of course, also be a pension fund with its assets invested in the world stock-market portfolio.

Equity-return swaps based on the returns of major stock markets are common today. Although we are unaware of their explicit application to stock markets in countries with capital controls, given the current rate of innovation, we would not be surprised to see such a development soon. More generally, customized private financial contracting is now available in world capital markets on a large enough scale to accommodate the needs of national governments. As illustrated by our hypothetical swap example, such contracting often makes possible low-cost elimination (or at least reduction) of unintended and undesirable side effects of public financial policies without interfering with the intended objectives of these policies.

Stabilization Policy

Chapter 1 briefly discusses the ways that financial innovation can affect central bank activities designed to stabilize the macroeconomy. Without taking a position on whether governments should pursue stabilization, we believe that if stabilization remains an objective of government policy in the future, central banks will almost surely use derivative instruments to help implement it.

For an example of how derivatives could be used in the future consider the case of the German government in 1990, which issued a sizable private placement of ten-year *Schuldscheine* bonds with put-option provisions.⁵⁰ They are just like standard ten-year government bonds, except they have the feature that the holders can put them back to the government for a fixed price.

By issuing those bonds, the German government in effect introduced a pre-programmed stabilization policy. How is that? Suppose it had issued a standard ten-year bond instead. Suppose further that afterward interest rates start to rise, and therefore, that bond prices fall. Normal ten-year bonds would fall in price in line with interest rate rises.

50. We are indebted to Peter Hancock and the J.P. Morgan Global Research Group for alerting us to the existence of the *Schuldscheine* bonds with put options.

But what happens to the bonds with the put option? The put bonds will not decline as much as the normal ten-year. Furthermore, the rate of decline in the put bonds becomes less and less, until they cease to decline at all. At that point, they will actually begin to behave just like a short-term money instrument. If interest rates were to fall and bond prices to rise, then the puts would become more out-of-the-money, and the effective outstanding bond exposure held by investors would increase, which is effectively the same as the government's issuing more bonds.

Note that the decrease or increase in the equivalent bond exposure takes place immediately as interest rates change, without requiring that the bonds actually be put back to the government. It is unlikely that stabilization was the original intent of the German government. Nevertheless, by issuing those put bonds it in effect put into place an automatic stabilizer to the extent that "stabilization" means to "lean" against market movements; that is, to buy bonds when bond prices go down, and sell bonds when they go up. The put bonds thus function as the equivalent of a dynamic, "open-market" trading operation without any need for actual transactions.⁵¹

The put bonds achieve more than that because their issue also in effect announces a prescribed open-market policy. If the market believes that issuance is a systematic part of policy, then by looking at the size and terms of government put issues, the market can figure out the implied stabilization policy. In comparison to traditional open-market activity, the put-option bond automatically "kicks in" as soon as events occur because it is built into the structure of the securities. Therefore they add value because on weekends, non-trading days, and during crashes, the central bank need not be on the scene to implement the open-market operations.

The stated interest rate to be paid by the government on these put bonds is lower than on a standard ten-year bond because the price of the bond includes the value of the put. This provides another difference between selling put bonds to the market and just doing the open market stabilization policy. The government in effect charges for the stabilization insurance because the private sector pays for the put option rather than receiving it for free.⁵²

To charge explicitly for stabilization may or may not be an objective that policymakers want to achieve. It is, however, now feasible to charge the private sector for interest rate insurance in an efficient way. By issuing the bonds, the government in effect gives the private sector a positive supply of interest rate insurance, which can then be distributed by the private sector.

As noted, none of this was likely to have been the conscious intent of the German government in the case of the *Schuldscheine* bonds. The action nonetheless provides an alternative to traditional stabilization policies, and thus it is an early instance of a class of new techniques for dealing with a low-friction, global financial system. It should be evident that this same approach to automatic stabilizers could also be applied to automatic intervention programs for currencies.

Summary and Conclusion

This book tries to make the case that the functions of the financial system are stable, but that the ways in which functions are performed are not. Accordingly, it introduces an analytical framework that

51. In the usual applications, the contingent-claim instrument is given, and a dynamic trading strategy is derived that replicates the payoffs to the claim. Here, we start with a trading strategy and derive the contingent claim that replicates the payoffs from the strategy. This reverse approach was used by Cox and Huang (1989) to solve the lifetime consumption problem. See also Merton (1992b, pp. 457-467).

52. Of course, it is not really "free" now, since taxpayers pay for it.

relies on functions rather than on institutions as its conceptual “anchor.” From a functional perspective on the financial system, institutional form follows its function.

From the most aggregated level of the single primary function of resource allocation, six core functions performed by the financial system are identified:

To provide ways of clearing and settling payments to facilitate trade.

To provide a mechanism for the pooling of resources and for the subdividing of shares in various enterprises.

To provide ways to transfer economic resources through time, across borders, and among industries.

To provide ways of managing risk.

To provide price information to help coordinate decentralized decision-making in various sectors of the economy.

To provide ways of dealing with the incentive problems created when one party to a transaction has information that the other party does not or when one party acts as agent for another.

The six chapters 2-7 correspond in application to these six functions. Each chapter connects financial innovation with major improvements in the performance of financial functions. Specific instances include:

Trading in derivative instruments has substituted in a variety of ways for trading in underlying securities, thereby providing an alternative mechanism for the clearing and settling of transactions.

Securitization has made it possible for institutions such as mutual funds to flourish, thereby facilitating the pooling of resources and the subdividing of shares.

Improved techniques for collateralization, credit enhancement, and financial contracting with derivatives have made it possible to overcome some traditional incentive problems, thereby enhancing the transfer of capital resources around the world and the global allocation of risks.

Expansion of the number and diversity of financial markets creates more opportunities to extract useful information from the prices of financial instruments.

The chapter here considered the changes in financial infrastructure and regulation necessary to support further improvements. Among these is the need to develop a new branch of accounting to measure the exposure of firms to the risk of unanticipated changes in the economic environment. Effective regulation is impossible without such an accounting system.

In the future, public-sector managers are likely to become increasingly familiar with financial engineering, derivatives, and the advanced financial technology and concepts currently used in the private sector. They must do so not only so they can understand the parts of the financial system they regulate, but also to execute their own functions more effectively. We harbor the hope that the functional perspective set forth in this volume can help with the efficient evolution of the system by providing a single framework of analysis shared by both public-sector and private-sector managers.

Appendix: Other Functional Classification Schemes

The essence of the functional perspective is its reliance on functions instead of institutional forms as the conceptual anchors for analyzing the financial system. Which functional classification scheme to use depends on its effectiveness in analysis. Table A shows how various authors view the functions that we have described.

Table A. *Functional Classification Schemes*

Function (1)	Hubbard (2)	Kohn (3)	Rose (4)	Sanford (5)
Clearing and settling	Providing liquidity	Providing liquidity	Providing liquidity	Transaction processing
Pooling	No	Yes	No	No
Transferring resources	Lending	Lending	Lending	Financing
Risk management	Yes	Yes	Yes	Yes
Information	Yes	No	No	Advising
Incentives	No	Yes	No	No

NOTE: Sanford also has a functional category “trading and positioning. In the scheme here, it would be included in the category of risk management.

SOURCES: Hubbard (1994), Kohn (1994), Rose (1994), and Sanford (1993).

As is evident from columns 2 through 4 of Table A, providing liquidity and lending are sometimes listed as core functions of the financial system. We note in the chapter that lending can be analyzed as a combination of the resource transfer and risk management functions. Here we analyze liquidity in terms of two of our core functions: clearing and settling (function 1), and dealing with the incentive problems arising from asymmetric information (function 6).

Liquidity is defined as the relative ease and speed with which an asset can be converted into the medium of exchange, money. In our view, the quantitative measure of an asset's liquidity is its bid-ask spread.⁵³ A perfectly liquid asset trades with a zero bid-ask spread.⁵⁴ Illiquidity can arise because of the costs and risks of trading an asset or because of incomplete and asymmetric information about the value of an asset.

Liquidity is sometimes confused with certainty of payment. But liquidity and price certainty are logically distinct properties of assets. Thus, shares of stock traded on securities exchanges can be highly liquid yet subject to considerable uncertainty about temporal changes in the transaction price. The converse is that an individual's claim to a government pension may be completely riskless, with no price uncertainty, yet totally illiquid.

It is sometimes claimed that a core function of commercial banks is to create liquidity.⁵⁵ In the

53. See Hooker and Kohn (1994) for an alternative measure of liquidity in terms of search cost.

54. In addition, the size of a transaction can affect the bid-ask spread. One should therefore measure an asset's liquidity by the bid-ask spread for a transaction of a given size.

55. Diamond and Dybvig (1986), for example, identify liquidity creation as one of the core functions performed by banks. Indeed, they oppose policy moves toward 100% reserve banking because it would prevent banks from fulfilling their primary function of creating liquidity (p. 57).

traditional bank arrangement, there is a mismatch between the liquidity of the deposits issued by the bank and the loans backing those deposits. Indeed, it is this mismatch in liquidity that is often cited as the root cause for banking panics.

The current environment of low and secularly declining transactions costs for securitization supports a hierarchical or incremental chaining approach as an efficient means for providing liquidity. Liquidity is enhanced whenever a collection of assets is “repackaged” and the resulting liabilities created have a smaller bid-ask spread than the original assets. Thus highly illiquid and opaque assets can be financed with instruments of different degrees of liquidity — stocks, bonds, and short-term debt instruments.⁵⁶ Portfolios of the more liquid of those securities, in turn, can be used as assets to back other securities that will have even greater liquidity, and so on.

Thus, at each link in the chain, the differential in liquidity is relatively small. Cumulatively, it is possible to create virtually perfectly liquid securities while minimizing the danger to the system of ever experiencing a “crisis” because of a mismatch between the liquidity of an intermediary’s assets and liabilities.

56. Ultimately, the economic uncertainties associated with illiquid assets are borne collectively by participants in the financial system. But the form in which they are borne can influence the degree of liquidity available.

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