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A FRAMEWORK FOR ANALYZING THE PROCESS OF FINANCIAL INNOVATION

by

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ABSTRACT

The following note presents a framework for analyzing financial management techniques and financial product innovation. The framework attempts to illustrate how characteristics of the economic system and its participants motivate financing needs and encourage innovations in financing techniques. New sets of financial contracts are the joint product of (1) changes in technology and in the international macro environment of asset prices; (2) the interplay of individual market participant's existing financial exposures; and (3) the presence of fruitful cross-market arbitrage opportunities based on differing national jurisdictions and structures. We use stylized examples to explore several different manifestations of this process and we offer general observations on how financial innovation may change the character of international money and credit markets. Finally, in thinking about official attitudes toward the process of innovation policies, it is necessary to form a view of the counterfactual world. How would the world economies have functioned without innovation?

A Framework for Analyzing the Process of Financial Innovation

by

Allen B. Frankel and Catherine L. Mann*

I. INTRODUCTION

The following note presents a framework for analyzing the process of financial product innovation. The framework attempts to illustrate how characteristics of an economic system and its participants motivate financing needs and encourage innovations in financing techniques. We use stylized examples to explore several different manifestations of this process and we offer general observations on how financial innovation may change the character of international money and credit markets. By taking an overview, we hope to focus the analysis on the economics of the process of financial innovation and not on the characteristics of individual financial instruments. In doing so, we hope to integrate the most recent innovations in banking instruments into the broader context of the changing structure of international financial relationships.

New sets of financial contracts are the joint product of (1) changes in technology and in the international macro environment of asset prices; (2) the interplay of individual market participant's existing financial exposures with their expectations for those prices;

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*International Finance Division, Federal Reserve Board. This paper represents the views of the authors and should not be interpreted as reflecting the views of Board of Governors of the Federal Reserve System or members of its staff.

and (3) the presence of fruitful cross-market arbitrage opportunities based on differing national jurisdictions and structures. Financial innovation results from individual market participants managing financial exposures derived from the interplay of changes in financial asset market prices and firms' expectations for those prices. Changes to the environment, both technological and macroeconomic, underlie this process.

For banks and other financial intermediaries, this process of financial innovation causes substantial changes in the profitability of whole categories of financial services thereby changing the basis of traditional customer relationships and traditional product offerings, which together form the foundation for market share rivalry. The introduction of new financial contracts and packages of contracts suggests that financial intermediaries are forging new customer relationships, are taking on new responsibilities, and are changing competitive rivalries in response to the opening of new global markets. But, the remarkable recasting by financial intermediaries of their product lines is not only in response to customer demands, but also to their own demands, for more effective protection against the uncertainty generated by unexpected movements in interest rates and exchange rates. This inference is buttressed by numerous observations of declines in fees for both traditional and innovative intermediation services charged by banks to their most creditworthy customers and the increasingly blurred line between the type of intermediation services provided by commercial banks, investment banks, insurance companies, and other financial firms.

The following parts of this paper (1) discuss the economic foundations of the process of financial innovation, (2) examine stylized examples drawn from public presentations by corporate officers, and then (3) offer several observations on how financial innovation changes the character of the international money and credit markets.[1]

II. ECONOMIC FOUNDATIONS

Environment. One of the most important results of the recent wave of financial innovation is the considerable expansion of available financing techniques for making investments and obtaining credit. At the same time, and potentially more important, market participants now have many more alternatives that implicitly or explicitly give them the choice of which financial exposures (risks) to cover or bear. The introduction of these new financial market capabilities is, in large part, in response to "events" that encouraged the development of internal financial risk management functions within firms' oranizational structures that more closely scrutinize financial exposures and alternative financing options.[2]

Among the notable events that encourage increased attention to the management of exposures are (1) the high volatility by historical

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[1]Readers interested in the macroprudential aspects of recent innovations should see the BIS (1986).

[2]A thorough discussion and description of one major banking firm's adaptations in offerings and organization may be found in Morgan (1986).

standards of financial asset prices and the persistence in the trend movements in these prices, (2) the change in quality of an unprecedented amount of both international and domestic banking credits already on banks' books with the resulting concern over bank capital, and (3) technological developments. This latter factor is associated with advances in computers, software, and telecommunications technology that increased the availability of information on financial opportunities and reduce the cost of assessing and analyzing that information. Technology also allows the ready adaptation of highly complex financing packages to specific circumstances; in particular, it makes possible the timely valuation (based on current market prices of standard financial contracts) of possible solutions to specific financing problems. For example, a firm may wish to convert floating rate New Zealand dollar exposure to fixed rate German mark exposure. While no direct (bilateral) swap market exists for this transaction, active markets for swaps of both currencies into U.S. dollars assure the "efficient pricing" of the cross transaction.[3]

The Framework. Chart 1 shows an overview of the economic foundations of the process of originating and evaluating financial products and packages. It shows how two sets of economic factors, those associated with firms and those associated with national structures,

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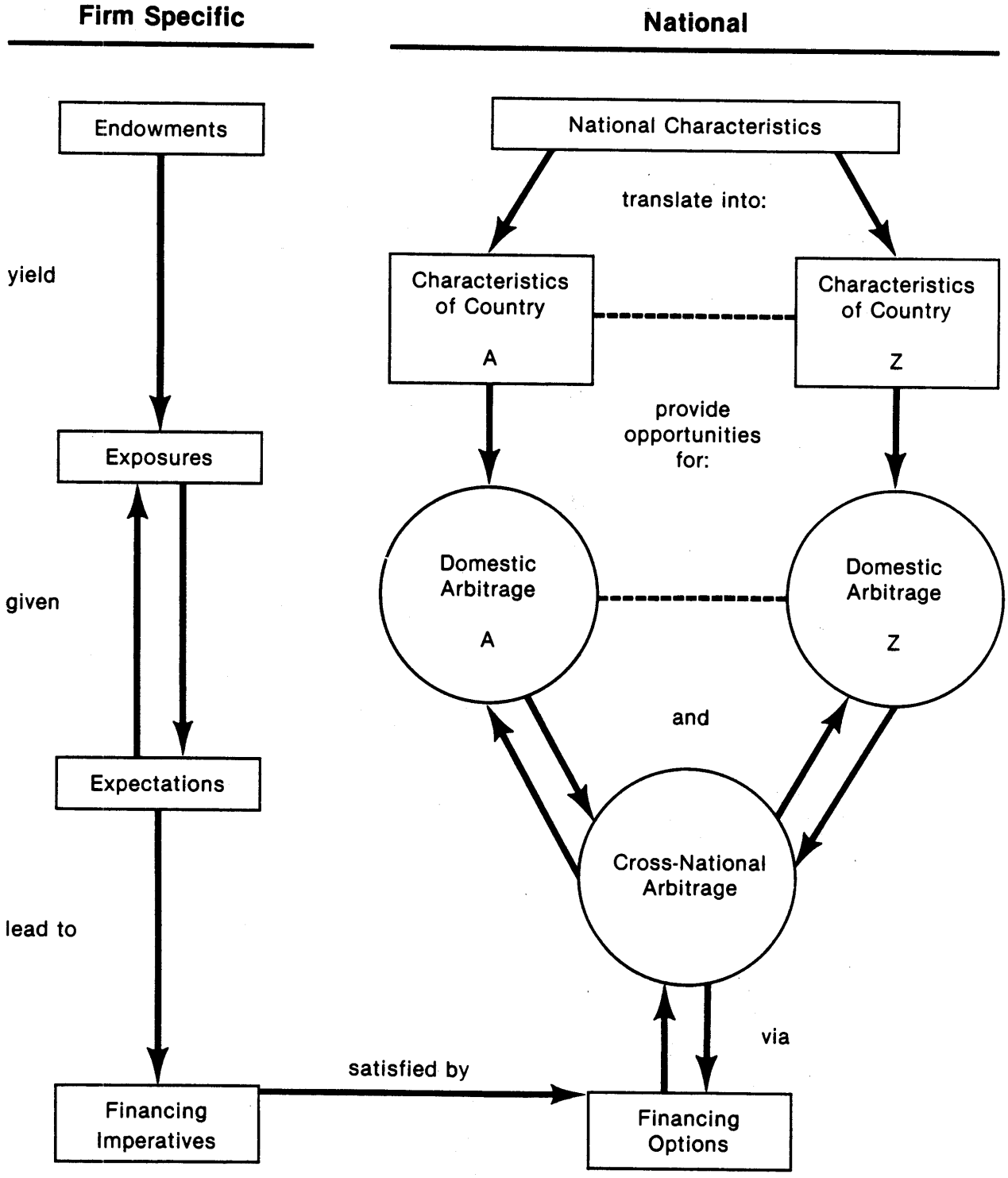
[3]A swap is a financial arrangement in which counterparties agree to exchange streams of payments over time according to a predetermined rule.

Chart 1

General Schematic: A Framework for Selecting and Generating Financing Options

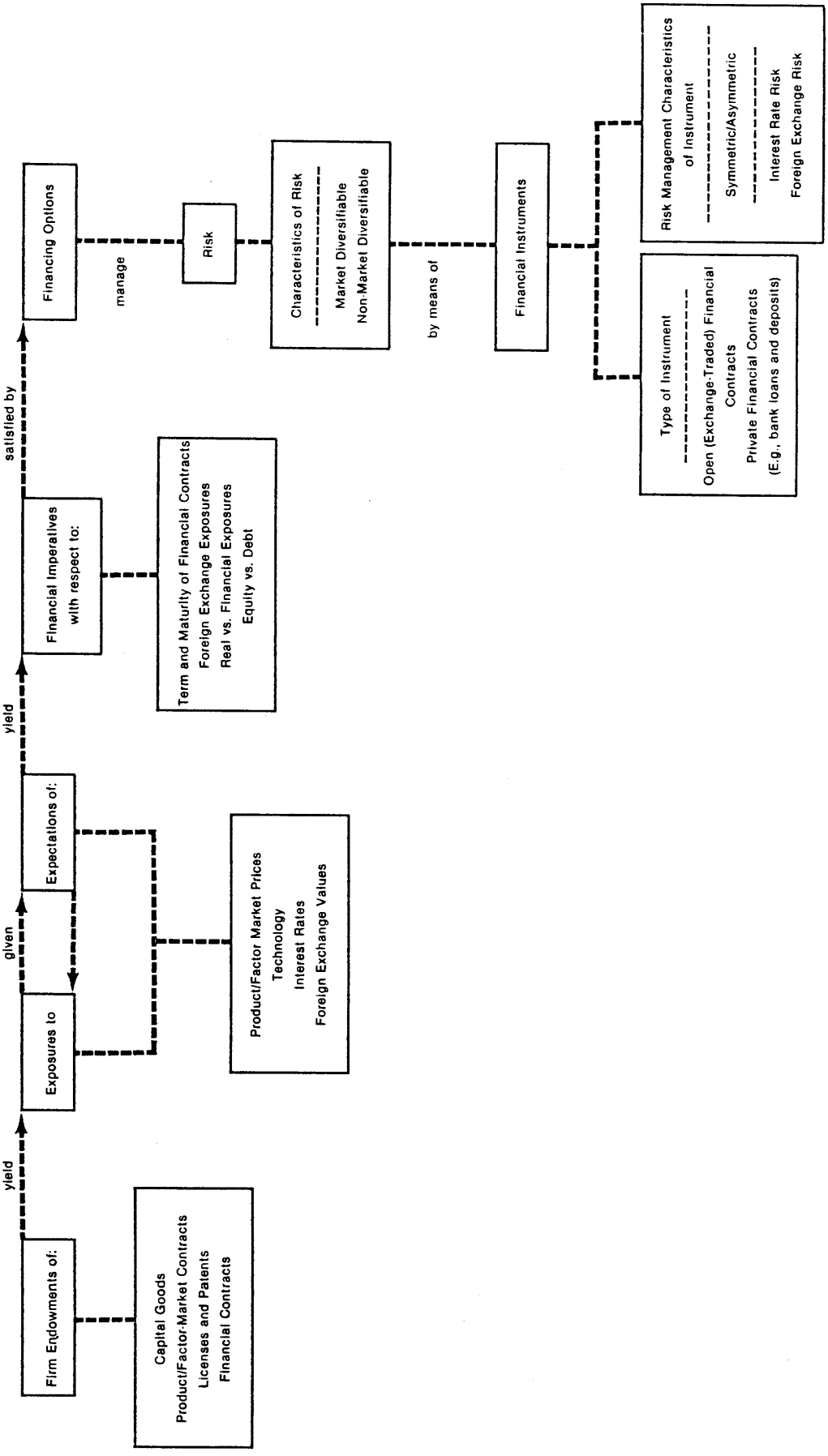


jointly create and differentiate financial product markets and influence financing choices. The first set of factors includes those involved in a firm's decision-making process, in which interest rate, price level, and exchange rate expectations interact with existing exposures (that are generated, broadly speaking, from the firms' business) to yield financial risk management problems that may be resolved by selecting among various financing techniques (existing or potential). The second set of factors, those associated with a nation's macro policy and micro regulatory environment, identifies the national characteristics that provide the basis for market opportunities that may be exploited by financial instruments. Fruitful market opportunities arise not just from firms' ability to arbitrage across different financial jurisdictions (thereby minimizing the cost associated with taxation and regulation), but more importantly, firms seek protection against asset price uncertainties generated by possible changes in different countries' monetary and fiscal policies.

Firm's Financial Imperatives. Broadly speaking, it is the nature of the firm's business that is the foundation for the financing imperative. As seen in Chart 2, such "endowments" as physical assets, production techniques, and financial contracts yield exposures to inflation, term structure, exchange rates, income volatility, and technological change. Given that the firm may be treated as an organization that is seeking to maximize the value of a specified objective function, these exposures lead to financing imperatives. Thus, given a knowledge of its exposures, its expectations for movements in asset prices, growth, and its objective function, the firm can rank

Chart 2

Breakdown of General Schematic: Firm Specific Model



alternative financial contracts. The most recent period has exhibited high and volatile asset prices and exchange rates; therefore, it should come as no surprise that new financial contracts appeared in the marketplace as floating-rate agreements, swaps, and interest rate caps, that specifically alter interest rate, term structure, and foreign currency risks.[4]

One outgrowth of such innovations, many of which take the form of off-balance-sheet transactions, is the growing inability to glean from financial statements what financing strategies are in fact being employed. Historically, firms' financial statements reflected business characteristics and could provide clues as to residual financial exposures. For example, firms in capital intensive industries often chose to finance capital spending with long-term fixed-rate debt so as to minimize the volatility of reported return on equity. Consequently, heavy reliance on floating-rate debt by such a firm traditionally would have been considered in a market evaluation as evidence of the firm's inability to obtain long-term debt and therefore would be a negative signal of its creditworthiness. However, off-balance sheet exposures transform on-balance sheet exposures; therefore, their use has reduced the information content of standard financial statements. For example, reported floating-rate financing by a capital-intensive firm might now reflect the involvement of that firm in a long-term interest rate swap contract.

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[4]An interest rate cap is an option under which a buyer pays a premium to receive compensation if a particular interest rate index rises above a certain level.

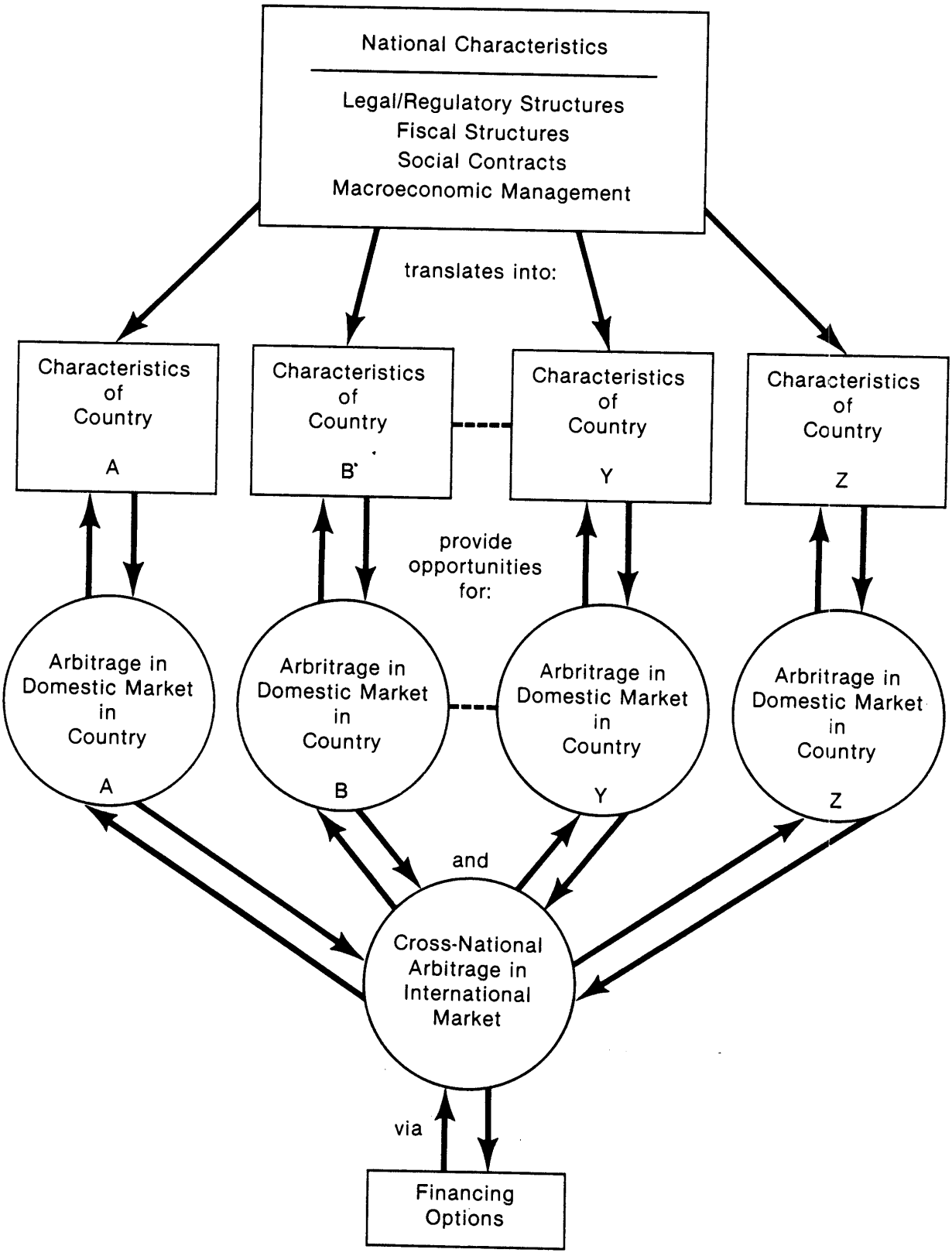
To some observers, the claimed persistence of such "profitable" opportunities to manage firms' financial imperatives suggest marketing efforts by intermediaries intent on building trading volumes. However, in an environment in flux that continually changes economic exposures, the presence and persistence of arbitrage should not be perplexing, especially when preferential access to some markets by some actors continues to be accepted and encouraged by national authorities.

National Financial Structures. Countries' national characteristics are embodied in their legal and regulatory systems, fiscal (tax) mechanisms, and macroeconomic management techniques and goals, as shown in Chart 3. These characteristics create arbitrage opportunities both within the domestic market and across domestic markets that are exploited by the existing financial instruments and generate financial innovations where no appropriate instrument exists. Heightened sensitivity to the differences among and inconsistencies across national structures has been fundamental to financial innovation and the resulting increasingly internationalized capital and money markets. Moreover, the recent surge in the development of cross-national financial arrangements has induced significant changes to purely domestic regulations. By contrast, in earlier periods, cross-national financial arrangements came as a byproduct of resolving inconsistencies within the domestic system.

Regulatory avoidance continues to be a major factor in financial innovation. A simple example will develop this argument. Consider a country which, for expressed reasons of macroprudential policy, has a ceiling on the interest rate that savings institutions may

Chart 3

Breakdown of General Schematic: National Model



pay on retail deposits; retail deposits are the most common form of household financial investment. It is understood by the national authorities that if this ceiling becomes binding, it must be supplemented by other regulations (including exchange controls) to discourage depository institutions from exploiting the low cost funds for their own benefit as opposed to the benefit of the officially designated beneficiaries. Such behavior might be the lending of funds raised in the domestic retail market to international borrowers at a higher open market interest rate. Even with strict capital controls, there are clear incentives to undertake financial transactions that are the economic, but not the regulatory, equivalent of prohibited diversions of credit. Historically, such activities might be booked as forward foreign exchange transactions because the thinness of long-dated foreign exchange markets made it difficult for financial regulators to detect and prove that specific transactions were violations of credit control regulations. Thus currency swap activities may, in some instances, be appropriately viewed as an updated means by which a bank would increase the covered return on its core deposits while avoiding regulatory limitations on their deployment. However, even with strict adherence to the spirit of regulations by financial firms, the plethora of national tax and accounting practices and the diversity of national market structures provide ample motivation for innovative cross-national financial arrangements.

There is a key endogeneity not captured by our charts. While unsatisfied financing imperatives and unexploited national arbitrage opportunities generate financial innovations that resolve the immediate

financing needs and span the open arbitrage, neither firms' endowments and expectations nor national characteristics are static. That is, the dynamics of the underlying economic processes lead to revisions of firms' financing imperatives that, as a result, open new arbitrage possibilities -- ongoing renewal of the forces generating financial innovation.

III. STYLIZED EXAMPLES

In the following section, we present five examples that are designed to show how the framework outlined above can capture a wide range of actual financing problems and financing decisions. In the part that follows, we link these decisions to general observations on the changing character of international money and credit markets.

To clarify the firm's decision-making framework, we have constructed two examples using stylized facts from public presentations by senior corporate financial officers of how their firm derived and satisfied its financial imperatives. In the first example, the firm's exposure management problem involves a long-dated foreign exchange risk and other concerns associated with the changing spread between long-term and short-term interest rates. In the second example, the firm's exposure derives primarily from differentials between short-term interest rates. The fact that there are several financial packages that resolve the financial imperative points to the conclusion that not only are initial exposures important for the firm's financing choice, but that expectations for asset price movements and appetite for risk are

also crucial. That is, the firm's managers operate as if they are charged with managing exposures because "shareholders" do not.

Example 1. Long-dated Foreign Exchange and Term Structure of Interest Rates

The initial exposure problems facing the firm are a long-term contract for periodic receipt of fixed payments in foreign currencies. A recent acquisition by the firm has, through its impact on the firm's debt to equity ratio, increased the cost of issuing long-term, fixed-rate debt in the public bond markets. However, the firm assures itself of long-term access to home-currency denominated, floating-rate financing by making payments to a bank syndicate for a line of credit.

One financing option available to the firm is to fund itself exclusively with its bank facility. However, in doing so, it is choosing to finance long-term foreign currency receivables with floating-rate, home currency debt. Therefore, it leaves uncovered risk associated with changes in the level of interest and foreign exchange rates. The firm's target return on equity may not be achieved if a higher than expected short-term domestic interest rate occurs, or if the home currency value of its foreign currency receivable falls. Therefore, choosing to leave these exposures unmanaged is consistent only with expectations of lower short-term interest rates and a weaker home currency than are currently reflected in the market's yield curve and forward exchange rates, or with significantly different expectations for the variance of those asset prices than are reflected in the market. If the firm's managers do not have these expectations for the movement

in interest rates and exchange rates (or are not responsible for forming them), alternative financing plans should be considered.[5]

The firm could entertain plans for two alternative arrangements. Package 1 might include an interest rate swap (into a fixed-rate obligation) and a long-dated foreign currency put option (although such options are not often available longer than three years). Package 2 contains only a cross currency swap that fixes the firm's net return on its anticipated receipts of foreign currency. It assures the home currency purchasing power of the foreign currency receivables and no exposure to interest rate changes remains. By contrast, the first package allows the firm to benefit from a weakening of its home currency while protecting it from an appreciation. Therefore, in choosing the first package, the firm only places a floor under its net return. A minimum return on its investment is not only assured, but any volatility serves only to increase the average return.

If the firm expects the home currency to weaken more than is reflected in the market's forward rate, it probably makes sense to purchase the first package. If the management of the firm or the stock market is very sensitive to volatility in the firm's earnings, the second package might be preferred. No one of the two alternatives is necessarily the best choice. The firm's actual financing choice will

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[5]We believe that it would be fruitful to extend our general analysis to take into account the agency costs of the new financing techniques. Such analysis would consider the conflicts arising from the financial restructuring among the interests of a firm's creditors, managers and shareholders. Jensen and Smith (1985) provide a possible framework for such an extension.

reflect its tolerance for volatility in return, the strength and direction of its expectations for interest rates and exchange rates, and transactions costs of purchasing the several instruments. Most importantly, while characteristics of the initial exposures are critical to this example, the choice of arrangement itself alters the firm's exposures, which then together with subsequent changes in the environment and expectations, make the problem of exposure management an on-going concern.

Example 2: Exposure to Short-term Interest Rate Differentials

The firm in the second example must purchase all eligible government-guaranteed floating-rate loans offered to it. The firm's gross return on assets equals the yield on short-term government debt plus a loan-service fee. Thus, even if it matched the maturity profile of its borrowings to that of its assets (the loans), the firm remains exposed to the risk that its funding costs could rise relative to those of the government.

A bank suggests a note issuance facility (NIF).[6] In effect, the bank proposes to organize a syndicate for the purpose of writing a conditional put option. Should the borrower be unable to fund itself at or below a given spread above the government rate, the syndicate assumes the burden of the higher funding cost so long as the firm meets the agreement's financial covenants (including material

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[6]Equivalent facilities have been referred to as revolving underwriting facilities (RUFs) and note purchase facilities.

adverse change in circumstances). The facility puts a cap on the firm's net intermediation cost and therefore puts a floor under the net return on its assets.

The firm's evaluation of the bank's proposal must take into account both the commitment fee and the firm's conditional expectation that it may need to draw on the facility. The greater the probability of a reduction in the firm's creditworthiness, or the likelihood of any other situation that might cause its funding costs to rise relative to that of the government, the greater the value of NIF. However, the bank's proposed pricing reflects not only its expectations for general money-market conditions and specific conditions affecting its own cost of funds, but also its views of the firm's prospects and on the expected value of requiring specific financial covenants of the firm.

Example 3: Financial Innovation, the Financial Intermediary, and Market Structure

In the following example, we discuss how changes in the market for the provision of financial intermediation services affect the behavior of the financial firm and change the kinds of risks it may decide to take on. The example further suggests that the interplay of the demand for new financial instruments with the role desired by the financial organization may lead to a change in market structure.

The firm underwrites securities. It established and maintains a deep distribution network so as to make a market and take positions in those securities through secondary market transactions. The

distribution network gives the firm the capacity to alter quickly its position in response to changes in asset prices, actual or expected.

The firm's initial involvement in the swap market was to broker swaps between members of its distribution network. However, such a limited involvement was short-lived as customers demanded the greater timeliness and flexibility that could be provided by an organization that acted as principal. What ensued was an internal assessment of the strategic value to the firm of full participation in the swap market.

The assessment focused on the need to evaluate and price credit risk appropriately, on the one hand, versus the opportunity to exploit a well-developed ability to manage price risk and to employ technology, on the other. Acting as principal in swap transactions requires the firm to make long-term unsecured credit extensions, something that it historically had not done. Therefore, resources would have to be expended to create and maintain a formal and on-going credit review and pricing apparatus. In addition, there was some concern about the cost to the firm of having its own credit standing affected by credit judgments on the quality of its portfolio of swaps.

The firms's decision to participate in the swap market was based on the view that such participation would allow it to exploit its existing capabilities in distribution, assessing asset price risk, and arranging financial packages. That is, the firm concluded that such capabilities needed to be leveraged to retain market presence as a securities underwriter.

Example 4: Use of Swaps by Banks with Claims on Developing Countries

In this example, we consider how a set of market participants (international banks) have used a certain type of innovative financial arrangement (the swap) to solve a global financial problem (the involuntary lengthening of maturities of developing-country debt). This example illustrates earlier observations about the changing character of the international money and credit markets, specifically their increasingly multi-currency and multi-country character. Note that new provisions in some multi-year rescheduling agreements that allow banks a one-time conversion of the debt into their own currency offer an alternative solution to this same problem.

The involuntary lengthening of the maturity of loan portfolios of banks with claims on troubled debtor countries has added considerable complexity to their problems of exposure management. This is particularly true for banks without dollar funding bases because of the dollar denomination of much of the original debt.

Consider a non-U.S. bank that has a large portfolio of short-term dollar-denominated loans to borrowers in troubled debtor countries. To minimize foreign exchange exposure, the bank funded these loans with wholesale dollar deposits obtained on international markets at floating-rates; the bank's primary funding source is fixed-rate, home-currency deposits. The lengthening of part of its portfolio limited the bank's option to reduce its interbank borrowing in dollars should its standing in the wholesale deposit market deteriorate, or should the cost of these funds rise for systemic macroeconomic reasons.

In other words, a stable spread between the floating-rate earnings and the wholesale deposit expense could not be approximated.

Given this typical set of circumstances for non-U.S. banks, they were attracted to the exposure management properties of the cross-currency swap contract. The bank could use its fixed-rate home-currency deposit base as the foundation for a swap into floating-rate dollars which would fix (over the duration of the swap) the net spread on the floating dollar loans.

While the involuntary lengthening of the developing-country debt is the centerpiece of this example, it is clear that a larger number of desired lending or funding strategies that take the bank out of its home currency and alter the interest-rate basis of its net exposure is now possible. The bank has the means to disengage financial decisions for the two sides of the balance sheet. Because such contracts as the swap are now available, it is clear that interest rate and exchange rate exposures can be more closely managed to desired ends. As noted earlier, these ends may or may not mesh with those desired by regulatory authorities.

From these examples, it would appear that the emergence of markets for new financial products should be attributed, in large part, to the heightened awareness, greater motivation, and increased ability of firms to manage their financial exposures, combined with aggressive exploitation of technological changes and historical comparative advantage by the financial intermediaries creating the products. However, an even greater source of incentives for financial innovation

may be the interaction of international markets and national financial structures.

Example 5: Internationalizing the Yen

Financing techniques often originate as responses to changes in regulatory or tax structures. In recent years, cross-national effects have been more prominent elements of altered patterns of financial behavior; this has been particularly true for changes in yen-based financing practices.

There has been a reorientation of the Japanese financial system in order to assure that it places greater reliance on market processes for the determination of interest rates. However, in an effort to bring about a smooth transition between regimes, the Japanese authorities chose to seek to control, through calculated liberalizations, the rate of integration of yen-based money and capital markets with international ones. These control efforts have, on occasion, been undercut as unanticipated arbitrage opportunities emerged and were exploited by market participants. The background facts, as they applied in late 1984, for one example are as follows:

(1) Qualifications for non-Japanese issuers of Euroyen bonds were liberalized in December 1984 to include corporate borrowers.

(2) A 20 percent withholding tax continued to be applicable to interest payments by Japanese, and not non-Japanese, issuers of Euroyen bonds.

(3) From April 1984 on, the Japanese authorities had permitted the swapping of foreign currency bond issues into yen.

(4) Large classes of Japanese institutional investors were effectively bound by limits on the amount of foreign credits in their portfolios. Such restrictions did not apply to their holdings of the foreign currency bonds of Japanese issuers.

The liberalization of qualifications in December was followed by several months of intense issuance activity. The inducement for this activity was undoubtedly the premia that constrained Japanese portfolio managers were willing to pay for the dollar bond offerings of Japanese issuers. In turn, such Japanese issuers were able to swap their dollar-denominated interest and principal payment obligations with non-Japanese issuers of Euroyen bonds. That is, the liberalization of qualification accommodated a bridging of the regulatory structure by expanding the pool of eligible counterparties for currency swaps but it did not provide the inducement. The April 1985 removal of the withholding on interest payments on Euroyen bonds of Japanese issuers to non-Japanese investors signaled the acquiescence of Japanese authorities to the freer access of Japanese borrowers to international capital markets.

IV. GENERAL OBSERVATIONS ON THE CHARACTERISTICS OF FINANCIAL MARKETS

Abstracting from individual market participants and generalizing across their actions, what are some of the aggregate impacts of financial innovation on international money and credit markets? Three seem to stand out. First, the ability of individual participants to disengage various decisions about their balance sheets

implies that the desired instruments for exposure management should be much more "targeted," that is, have a very specific interest rate, exchange rate, or other financial exposure characteristic. Second, a greater desire by multinational market participants to manage foreign exchange risk suggests a wider currency denomination of market instruments. Finally, the greater ability and return to piercing domestic regulatory structures point to an increasingly multi-country character to the market.

The evidence of the first concept, that of targeted exposure management, is considerable. One of the significant innovations in the new financial contracts is that many represent an "unbundling" of existing contractual structures. For example, a ten-year, fixed-rate, dollar loan contract "bundles" a specific maturity, interest payment stream, and currency, each of which represents a specific financial exposure. Over time, the borrower may come to want only one of these characteristics for its financial plan -- say the term. A financial swap contract might allow the borrower to rebalance currency and interest rate exposures without renegotiating the covenants of the original contract.

Another example of the targeted exposure management technique is the separate and simultaneous negotiations of a swap contract and a Eurobond issue. The contract to issue the Eurobond specifies the interest rate, currency, and maturity, which are presumably those desired by the lender, while the swap that is negotiated at the same time generates the desired exposure of the borrower. The existence of the swap makes it more advantageous for the market participant to enter

into the Eurobond contract; without the swap the cost of the Eurobond in terms of required exposure tradeoff might not have been acceptable. However, with the two parallel negotiations, the two components of the overall package are unbundled -- the extension of credit and the desired characteristics to the lender, and the tailoring of the attributes of the bond to the particular needs of the borrower. As a result of this unbundling, the market has become more efficient in the provision of credit.

The magnitude of swap activity on the market attests to the growing ability of participants to explicitly or implicitly unbundle financial contracts for targeted exposure management. Swaps and other innovative financial contracts are critically important for targeted exposure management for the individual market participants, on the one hand, and for weaving together market participants into a whole fabric that is the international money and credit markets, on the other.

While this deepening of the financial markets that results from financial innovation is undeniable, the question of whether the allocation of net exposure across participants in the financial system is more or less socially optimal or efficient cannot be easily answered. Financial intermediaries are often accorded a special role in financial systems; they have a somewhat different set of prudential regulations than those faced by non-financial firms; in addition, they may have implicit or explicit official support (including access to official credit facilities and favorable tax treatments). The interaction of the general motivations for financial innovation with this set of prudential regulations and official licenses makes it difficult to determine

whether financial intermediaries, as both providers of new contracts and market participants, and individually or in aggregate, might become more exposed to asset price fluctuations or act to redistribute risks throughout the international financial system.

Proper management of foreign exchange risk has become much more important since the floating rate period began. However, over the last five and one-half years, with the dollar's substantial appreciation and quick depreciation, the potential impact of foreign exchange gains and losses on participants' profit and loss statements has been much more significant. Firms increasingly seek financial contracts in a variety of currencies. We see evidence of this desire in the greater variety of publicized currency denominations for open-market financial contracts.

There is a growing pool of non-dollar denominated Eurobonds. There is a widening set of currencies in which foreign currency options contracts are quoted, and not all options are quoted with respect to the dollar. The European Currency Unit (ECU) is being used for loans, bond denomination, and options. Some European market participants are converting their entire financial statements to ECUs. Many of the innovative financial contracts make it easier to finance and pay in currencies other than the home currency of the market participant. But, the currency characteristics of other available contracts mean that firms need not remain exposed to "excess" foreign exchange risk.

The third general observation of the aggregate impact of innovative financial contracts on international money and credit markets is their increasingly multi-country character. While there is an

intimate relationship between the multi-currency and multi-country aspects of the market, the two can be separated because fundamentally a convertible currency is not bound by its national borders. The increasingly multi-country character of the market comes primarily from the increased ability of market participants to pierce domestic regulatory structures, in part through the use of the currency of that country and in part, because of the existence of new financial contracts that readily transform exposures.

The diversification of currency exposures potentially accommodated by financial innovation may affect the sensitivity of exchange rates to "news." A wider audience has emerged for capital market products denominated in what were up-to-now "exotic" currencies (such as the Australian dollar) among market participants whose needs for residual exposure management suggest advantages of assuming positions based on exposure to the movements in the exchange rates of such currencies. The potential for such deepening of the markets may imply a general reduction in exchange rate volatility and in the demand for certain vehicle currencies as news is more widely dispersed through the exchange markets by a wider variety of heterogeneous agents. Moreover, the growth of futures and options markets in a wide variety of currencies may further reduce the impact of news by dispersing its effects across the time dimension.

Instruments such as futures and swaps increasingly link domestic markets and individual participants across the time dimension. Deep markets in cross-currency and interest rate swaps link the term structure across countries, tightening the relationship between

countries' policy choices and accentuating the spillover of domestic events to the international markets. A greater recognition of these linkages by individual market actors must impact how aggregate expectations for asset prices are formed, resulting perhaps in a tightening distribution of expectations for future asset price movements.

V. SUMMARY

Using illustrative examples, we have analyzed the economic fundamentals of how an individual market participant chooses a financial arrangement. The firm must weigh the explicit transactions costs of purchasing an exposure management package against the implicit and expected costs of unmanaged exposures to interest rate and exchange rate trends and volatility.

It is the interaction of national financial structures that creates an environment in which firms increasingly are motivated to manage financial exposures. Simple arbitrage opportunities may originate and prompt response; but more importantly, differing and changing macroeconomic policies and goals lead to a world of greater financial uncertainty to which market actors are compelled to react.

Financial innovation is the endogenous result of these two forces acting together with technology. Technology not only reduces the cost of arranging existing types of financial contracts, but also importantly it reduces the cost of systematically pricing packages of various financial contracts.

Introducing forward-looking contracts in a variety of currencies, and contracts with asymmetric payoffs, will likely affect how expectations for asset prices are formed, how explicit policy choices and domestic spillovers affect other countries, and how both international and domestic markets react to exogenous events.

It appears that financial innovation increases the market's efficiency in the provision of credit. However, because there are differences in the roles, regulations, and official involvement with financial firms, as opposed to those of non-financial firms, the efficiency of the resulting allocation of risk is not clear. Finally, in thinking about official attitudes toward the process of innovation and in contemplating restraining policies, it is necessary to form a view of the counterfactual world. How would the world economies have functioned without innovation?

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