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September 26, 1988

To: Members of the Executive Board

From: The Acting Secretary

Subject: Managing Financial Risks in Indebted Developing Countries

Attached for consideration by the Executive Directors is a paper on managing financial risks in indebted developing countries, which is tentatively scheduled for discussion on Monday, October 24, 1988. A summary and issues for discussion appear on pages 32 and 33.

Mr. Mathieson (ext. 7662) or Mr. Folkerts-Landau (ext. 7665) is available to answer technical or factual questions relating to this paper prior to the Board discussion.

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INTERNATIONAL MONETARY FUND

Managing Financial Risks in Indebted Developing Countries

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(In consultation with other Departments)

September 23, 1988

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I. Introduction

A notable characteristic of the 1970s and 1980s has been the high variability of international interest rates, primary commodity prices, and major currency exchange rates. Quite apart from the effects on industrial countries, such international price variability presents a particular problem for indebted developing countries because it is essentially "beyond their control." This is not the same, however, as saying that measures cannot be taken to reduce the impact of such variability. Indeed, the uncertainties created by price and interest rate variability have spawned new official and private sector arrangements for dealing with the associated risks. In the Fund, for example, the creation of the Compensatory and Contingency Financing Facility (CCFF) reflected the desire to help maintain the momentum of adjustment in programs in the face of adverse external shocks. Meanwhile, the use of market-related hedging instruments has expanded strongly, encompassing both the introduction of new instruments (e.g., futures contracts on Eurodollar interest rates) and the growth of traditional futures and options markets.

This paper examines the types of market-related hedging instruments that could potentially be useful to indebted developing countries, as they seek to manage the financial risks created by external asset and commodity price variability. The remainder of this paper is divided into three sections. Section II reviews the variability in interest rates, in exchange rates, and in primary-commodity prices and then analyzes the effects of this variability on the domestic and external performance of indebted developing countries. Section III examines those market-related hedging instruments that are accessible to indebted developing countries. The discussion covers the characteristics of the hedging instruments, the cost of hedging operations, the depth of the markets for these instruments, and the design of hedging strategies. Some of the issues that would have to be addressed in determining if and how these hedging instruments could play a role in adjustment programs and in debt reschedulings are also discussed. Finally, Section IV presents a summary of key issues and several topics for discussion. A supplement provides more detailed information on the characteristics of hedging instruments, as well as a glossary of technical terms.

II. Financial and Commodity Price Risks Confronting Indebted Developing Countries

Throughout most of the 1970s and 1980s, fluctuations in world prices of primary commodities, in international interest rates, and in major currency-exchange rates affected the economies of the indebted developing countries through a variety of channels. Since the external bank debt of developing countries has typically carried an interest rate tied to the London Interbank Offer Rate (LIBOR), interest rate variability has at times made prospective debt-servicing payments highly uncertain. In the

case of exchange rate movements among the currencies of the major industrial countries, there were induced effects on developing countries' terms of trade, the value of their reserves, and on debt-service payments (the currency composition of net foreign liabilities have been less diversified than developing-countries' export receipts). Finally, commodity price variability has generated in some cases sharp fluctuations in export receipts and in the cost of imports.

Such goods and asset-price variability has not only made the formulation and implementation of adjustment programs more difficult but may also have discouraged some countries from opening up their economies more to international trade and capital flows. When real interest rates are highly variable, the scale of financing, for example, that should accompany an adjustment program becomes highly uncertain. Moreover, while greater participation in international trade and finance generally yields efficiency gains by allowing countries to focus production in the areas of their greatest comparative advantage, highly variable traded-goods prices and interest rates can also make the nature and sustainability of these gains very uncertain.

In what follows, a more precise picture is presented of the extent of variability in interest rates, in primary commodity prices, and in exchange rates. As will become apparent, there has been a tendency for this variability to extend across all major asset and commodity markets.

1. Interest rate variability

Changes in both nominal and real international interest rates have been historically large in the post-1972 period. Since a large portion of the international borrowing undertaken by developing countries has been denominated in the U.S. dollar and carries an interest rate indexed to LIBOR, fluctuations in nominal and real LIBOR interest rates provide a relevant measure of interest rate variability (Chart 1). The degree of interest rate volatility is represented in Chart 1 by the standard deviation of the monthly interest rates observed over the preceding two years. 1/ Real interest rates are approximated by adjusting the LIBOR interest rate by the percentage change in an index of developing country's

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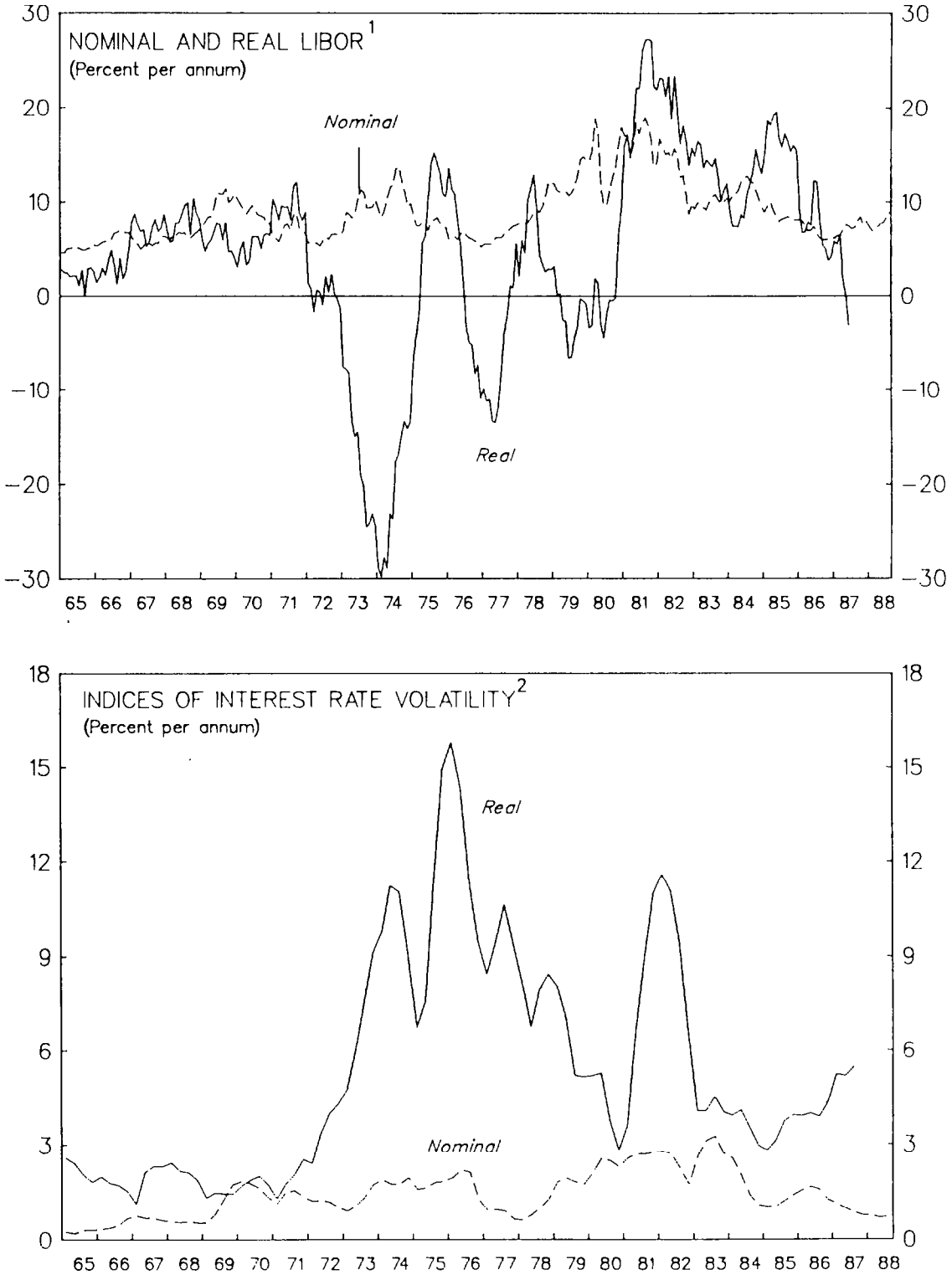
1/ The assumption embodied in the use of this index of unpredictability is that the interest rate expected in any month of the period is the average rate for the whole period. Two versions of interest rate fluctuations were initially calculated; one used data for the 24-month period preceding the quarter for which a measure is reported, and the other used data for the 12-month period. Since both versions give virtually the same results, only the 24-month period calculations are reported.

CHART 1

NOMINAL AND REAL INTERNATIONAL INTEREST RATES, 1965–88



[1] The nominal interest rate is measured as the London Interbank Offer rate on six–month U.S. dollar deposits (period averages in percent per annum). The real interest rate is the nominal interest rate minus the annual percentage change in non–oil developing countries' export unit values in dollars.
[2] Interest rate volatility is measured as the standard deviation of the levels in the preceding 24–month period of nominal and real LIBOR.

export prices over the preceding year. 1/ By any of these measures, fluctuations in international interest rates have at times been "large" during the 1970s and 1980s. Note also that there have been alternating intervals of tranquility and turbulence in interest rates during the period.

This volatility of international interest rates has had an increasingly important effect on the current account positions of developing countries. Prior to the mid-1970s, interest rate variability had a relatively limited impact on the debt-service payments of developing countries both because conditions in the international credit markets were relatively stable and because a large proportion of outstanding debt, particularly for the low-income countries, had been contracted from official sources at fixed rates and on concessionary terms. By the late 1970s, this picture changed sharply. Developing countries became much more dependent on private external financing as both the public sector and private residents borrowed heavily in world capital markets. There was a marked shift from nondebt creating flows--official transfers and private direct investment--to debt creating and interest sensitive borrowing in world capital markets. The contribution of bank borrowing to the financing required for the current account deficit of the capital importing developing countries rose from 54 percent in 1970 to 74 percent in 1981. As a result, the share of total external debt that was subject to floating interest rates increased from one quarter in 1973 to more than half in 1985. 2/

This rapid growth in external indebtedness, and the changes in the composition of that debt, greatly increased the sensitivity of developing countries to events in world financial markets. Countries with large floating-rate obligations faced complicated debt management problems, arising not only from the increase in the real cost of such obligations during 1979-82 but also from the high volatility of interest rates and the reduction in average maturities and grace periods. 3/ The cost of international bank lending for developing countries is particularly vulnerable to interest rate variability since the interest rate on such borrowing is typically based on a formula which ties the costs of funds to a market interest rate--(generally represented by the LIBOR or the U.S. prime interest rate)--plus a margin or spread. These spreads over LIBOR vary according to the perceived risks associated with lending to a particular country and with the degree of liquidity in international capital markets. Since a developing country is more likely to experience

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1/ There are naturally other price series that can be used to calculate real interest rates. While these will yield different estimates of variability for real interest rates, they generally show greater variability of real than nominal interest rates.

2/ By engaging in floating interest rate lending, bank creditors essentially transformed their own interest rate risks into credit risks.

3/ Maturities and grace periods on loans from private creditors are typically shorter than those from official creditors.

debt-service difficulties when interest rates are high and/or variable, spreads often rise during such periods. 1/

Developing countries have effectively taken on a relatively "open" (unhedged) position regarding interest rate variability. 2/ As a result, a rise in real international interest rates can have a significant effect on the interest payments ratio--defined as interest payments divided by exports of goods and services. Furthermore, the size of this effect varies considerably across different subgroups of developing countries, reflecting considerable differences in: the ratio of external debt to exports of goods and services, the share of external debt owed to private creditors, and the proportion of external debt with variable interest rates. For the capital-importing developing countries as a group, it is estimated that a 1 percentage point rise in interest rates would directly increase the interest payments ratio by about 1 percentage point. The middle-income countries are especially affected because they have borrowed proportionately more from private sources.

2. Exchange rate variability

Periods of increased variability in international interest rates have typically been associated with greater variability in key-currency exchange rates. Although some observers had anticipated in the early 1970s that short-term movements in key currency exchange rates would decline once the transition to more flexible exchange rate arrangements was completed, exchange rate variability has remained quite high. Indeed, the period since 1979 has featured some of the largest changes in exchange rates for major currencies since the early 1970s.

Measures of the volatility in nominal and real effective exchange rates of the U.S. dollar vis-a-vis other major currencies are presented in Chart 2. In brief, the chart suggests that since the move to generalized floating in 1973, exchange rates have displayed large fluctuations, and that these fluctuations have not declined in the 1980s. 3/

1/ These spreads can also be affected by a loss of confidence due to increased perceptions of risks concerning commercial bank lending and by the competition by banks for funds when public sector imbalances increase.

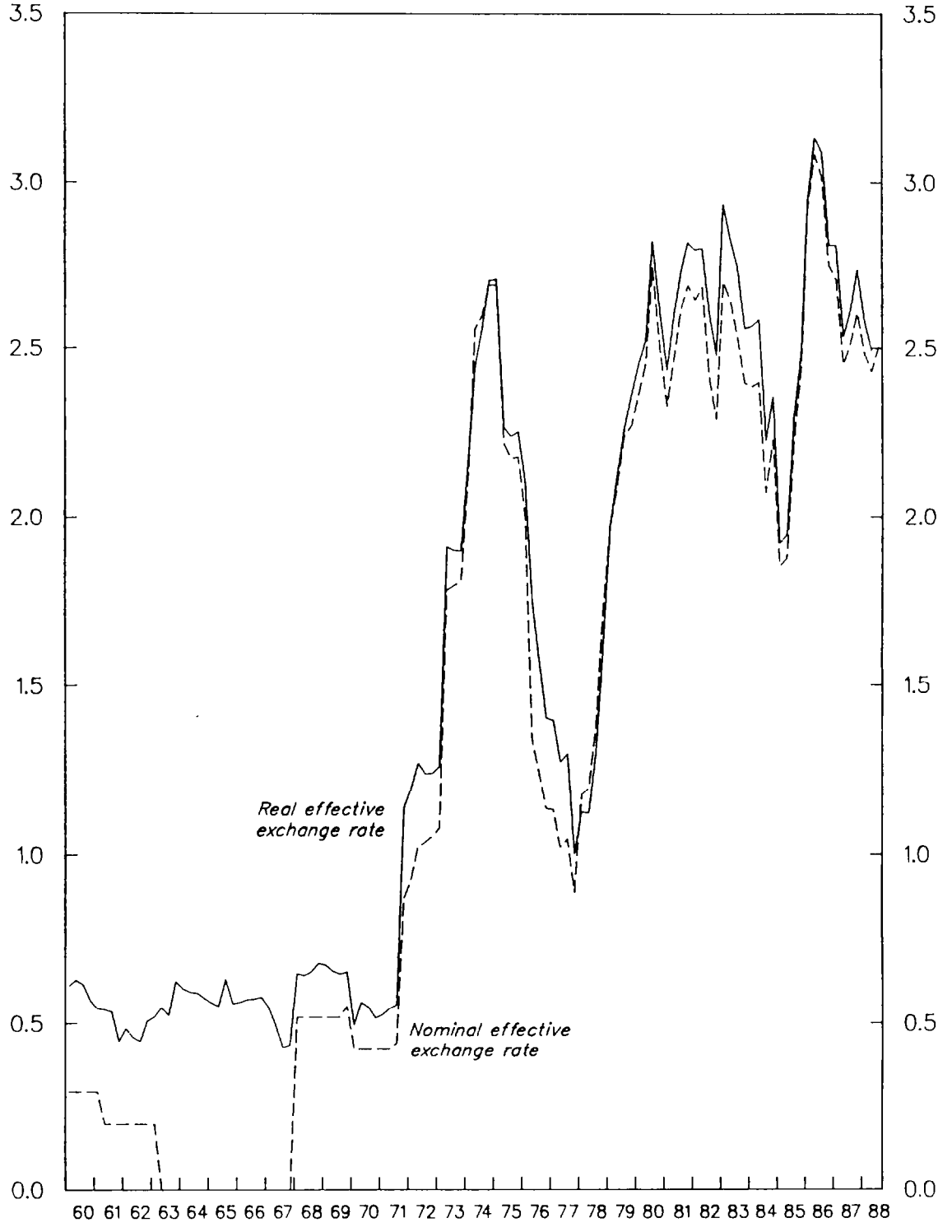
2/ This position could be implicitly hedged if these countries held assets (e.g., foreign exchange reserves) denominated in the same currencies and with similar maturities to their external liabilities. In most cases, however, the external assets of these countries are significantly smaller and may be of shorter maturity than their external liabilities.

3/ The volatility measure presented is the standard deviation of the monthly percentage change in the effective exchange rate calculated for the 24-month period preceding the quarter for which data is reported.

CHART 2

INDICES OF EXCHANGE RATE VOLATILITY, 1960–88[1]

(Percent per annum)



[1] Exchange rate volatility is measured as the standard deviation of the 24–month percentage change in the nominal and real effective exchange rates of the U.S. dollar vis–a–vis the Japanese yen, the Deutsche mark, the French franc, and the pound sterling.

The response of the terms of trade to movements in key currency exchange rates depends not only on the extent of exchange rate movements but also on initial trade balances and on the types of goods exported and imported. Recent analyses suggest that, other things being equal, a 1 percentage point depreciation of the U.S. dollar vis-a-vis the currencies of other industrial countries would result in similar percentage increases in the dollar prices of both nonfuel primary commodities and manufactures. But the effect of a dollar depreciation on relative prices of various traded goods could be considerably larger at a more disaggregated level, since the relative importance of the major industrial countries in world markets varies substantially across commodities and manufactured goods.

Given these linkages between movements in major currency exchange rates and developing-country terms of trade, exchange rate variability has the potential for creating considerable uncertainty regarding future export and import prices. In so doing, it necessarily makes trade projections less precise and complicates longer-term decisions regarding the allocation of resources to different sectors. 1/

3. Commodity price variability

The increasing importance of manufactures in developing-country total exports has partly mitigated the effects of unstable commodity export earnings. Also, there are important differences in the behavior and magnitude of swings between developing-country terms of trade and real commodity prices. It is no longer the case that developing countries are uniformly exporters of primary commodities and importers of manufactures; 2/ in addition, their terms of trade--(the ratio of export to import prices)--is not merely a reflection of the behavior of the real price of commodities in terms of manufactures. Nevertheless, these two series do display similar trends, and the primary sector continues to play a major role in the determination of GNP and in the generation of foreign exchange resources.

Prices of non-oil primary commodities have shown large short-term fluctuations over the last two decades in response to shifts in both demand and supply factors. Also, most prices have undergone at least brief periods of very rapid increases that later have been substantially reversed. This suggests that commodity prices, like exchange rates, may have a tendency to "overshoot" in response to unexpected developments. Because of large shifts in supply and demand for individual commodities, commodity prices have not always moved together, and in many cases these

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1/ Exchange rate variability can also influence investment income flows depending on the nature of the currency composition of the country's foreign assets and liabilities.

2/ The proportion of manufacturing exports in total developing country exports rose from 10 percent in 1973 to over 17 percent in 1985.

movements have run counter to general inflationary trends in the major industrial countries.

Chart 3 provides a snapshot of commodity price volatility in the period since the early 1960s. An overall commodity price index (which excludes oil and gold and uses developing-country exports as weights), indices for various subgroups of commodities, and a number of individual commodity-prices are shown. 1/ The aggregate index has moved sharply but, as one would expect, not as much as the prices of individual commodities; for example, prices for beverages have shown greater variability than the aggregate index. 2/ Moreover, commodity-price variability initially declined from that experienced in the early 1970s, this variability has increased in the 1980s. 3/

In addition to international interest rates and industrial country-exchange rates, non-oil commodity prices have also been affected on the demand side by the level of economic activity and rates of inflation in industrial countries, and on the supply side, by policies affecting levels of domestic production (particularly for agricultural commodities).

4. Adjustment policies and financial and commodity price risks

Since fluctuations in international asset and commodity prices can potentially have a strong impact on the economic performance of indebted developing countries, periods of increased international price variability have often created difficulties for the formulation and implementation of adjustment policies. 4/ Recent experience with Fund-supported adjustment programs suggests that such variability is more likely to have an impact on an adjustment program as the time horizon of adjustment programs is extended to the medium term. A recent review of the experience with unforeseen external developments in 125 stand-by and extended arrangements that were approved in 1982-87 was provided in a background paper on

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1/ The aggregate index has been available only since 1973.

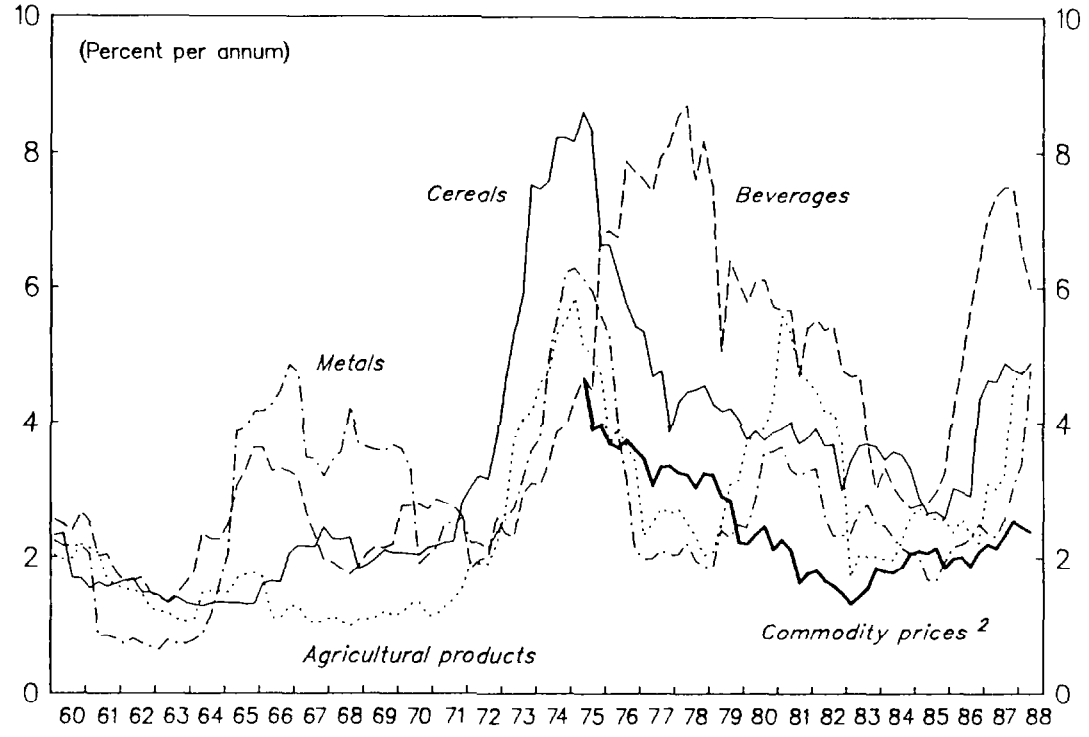
2/ In some cases, fluctuations in commodity prices have reflected changes in supply conditions, and the impact of price changes on export earnings has thus been dampened by variation in volume.

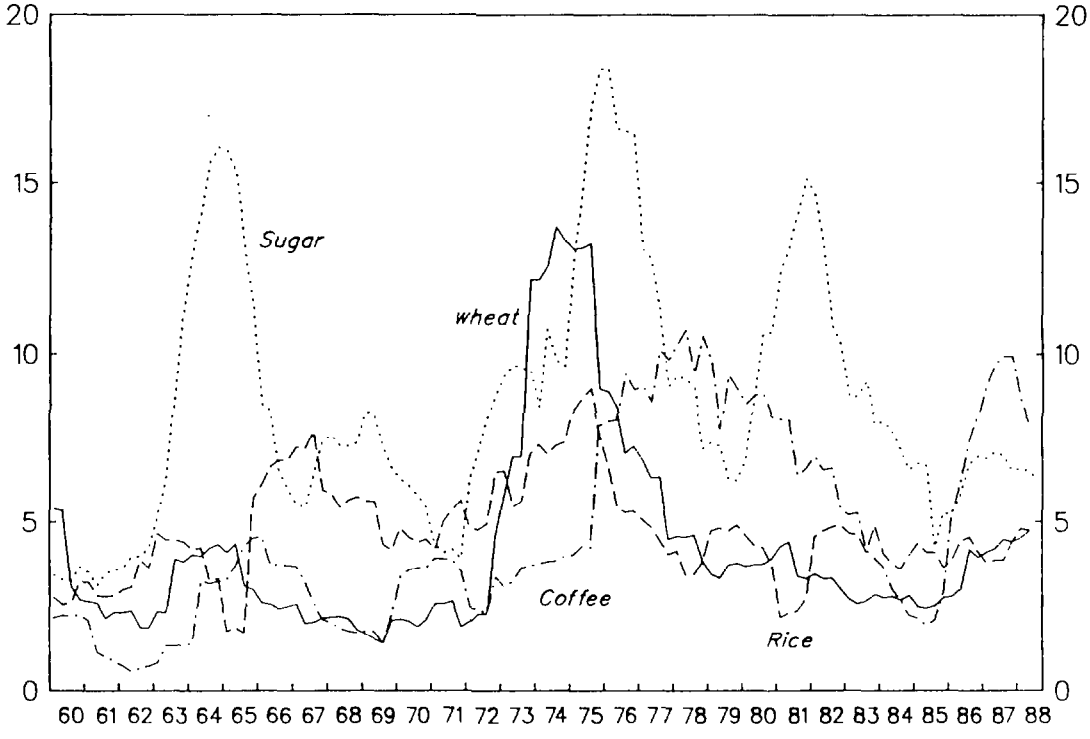
3/ Similar results were obtained when the indices of volatility were calculated in terms of real commodity prices rather than nominal commodity prices, where real commodity prices were defined as nominal commodity prices divided by developing county import unit values. A more detailed discussion of commodity price developments is available in "Commodity Price Baskets as Possible Indicators of Future Price Developments" (SM/87/291, 12/11/87).

4/ A key issue is how adjustment efforts are affected by the combined risks created by the interaction between interest rate, exchange rate, and commodity price variability. While the risks created by asset and commodity price variability could theoretically be offsetting, this has not been the general case in the 1970s and 1980s.

CHART 3

INDICES OF COMMODITY PRICE VOLATILITY, 1960–88[1]





[1] Commodity price volatility is measured as the standard deviation of the 24–month percentage change in commodity prices expressed in SDRs.

[2] Index of commodity prices excluding gold and petroleum and using developing country exports as weights.

contingency mechanisms. 1/ Over a six year period, exogenous external developments deviated substantially from those assumed at the onset of the program in 44 percent of the sample arrangements. In the other 56 percent of the arrangements, developments in individual external factors were at times quite large but mutually offsetting so that the overall effect on the program was limited. Deviations from program assumptions were reported to have occurred about evenly in adverse and favorable directions. As a broad order of magnitude, the average adverse deviation was 3 percent of GDP and 100 percent of quota. Weaker-than-expected export prices and developments were the principal sources of the shocks. When adverse external shocks had disruptive effects on adjustment programs, they typically gave rise to additional financing needs for the balance of payments and the budget. In particular, net shortfalls in the external account were at times translated through price and output effects into a significant deterioration in the fiscal position. Since the scope for quick and full offsetting measures was often limited, it proved difficult to achieve the original program objectives or to comply with the performance criteria established under Fund arrangements in the face of these adverse shocks. As a result, a large number of program interruptions were typically dealt with through understandings reached via the waiver or modification process.

5. Responses to external risks

All of this raises questions about the measures countries can take to reduce their exposure to these risks. Efforts to limit or offset the impact of external shocks have often focused on self-insurance, on official bilateral or multilateral agreements or assistance, and on market-based hedging instruments. With regards to self-insurance, developing countries have increasingly turned toward export diversification--and, in particular, toward diversification into manufactures--as a way of reducing the variability of export earnings. Producing and exporting a variety of products can offset the adverse domestic consequences of short-run exogenous changes in supply or demand for individual products. A recent study found that diversification into exports of manufactures contributes to reducing earning instability and also transfers the primary source of instability from supply to demand factors. 2/ Nevertheless, it is still true that manufactured goods exported by developing countries seem to exhibit greater variability than manufactures exported by industrial countries, and that export

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1/ See "External Contingency Mechanisms in Fund Arrangements--Preliminary Considerations" (EBS/88/30, 2/12/88) and Supplement 1, "Preliminary Considerations--Supplementary Information" (EBS/88/30, 2/26/88).

2/ Bond, M., and E. Milne "Export Diversification in Developing Countries: Recent Trends and Policy Import," in Staff Studies for the World Economic Outlook (Washington: International Monetary Fund), August 1987.

diversification takes a long time to achieve. It should not be viewed as a short-run measure to insure against external risks.

A second way in which some countries have sought to limit the impact of external risks is to impose limitations on external transactions. Exchange and trade restrictions are often motivated by considerations other than to reduce external risks (e.g., to protect sectors of the economy from foreign competition, to improve an unviable external position and to limit capital flight) but in many cases, restrictions have remained in effect even when they were no longer needed for those purposes or when their costs had reached prohibitive levels. Nonetheless, some proponents of inward-looking policies have attached considerable importance to the view that a restrictive exchange and trade system serves to insulate the economy from external disturbances.

Yet a third approach to self insurance is to improve the matching of the maturity and currency composition of foreign asset and liability structures. The potential importance of this factor was amply demonstrated during the early 1980s when countries had a large mismatch between the stream of returns on investment expenditures and the repayment structure of external loans. Moreover, the extensive accumulation of short-term debt became a major cause of difficulty, when the availability of short-term reserve assets dried up abruptly. To avoid a repetition of such problems, countries have sought to avoid excessive short-term debt accumulation and have a rebuilt their holdings of foreign exchange reserves. At the same time, the potential beneficial contribution that a better matching of foreign asset and liability structures can make is constrained by the substantial borrowing needs and large existing external debt of developing countries and by their still low reserve holdings. 1/

Official multilateral and bilateral agreements and assistance have also facilitated the efforts of indebted developing countries to limit the effects of external shocks on their domestic economies. For one thing, there has been a revival of interest in international commodity trading arrangements--and in buffer stocks in particular--that are designed to reduce short-term fluctuations in the prices of primary

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1/ These risk management efforts have also encompassed selecting an appropriate currency composition of external debt, establishing debt/equity swap programs, and purchasing crop-loss insurances on international markets. Moreover, some countries have negotiated linkages between the amount of funding made available under new money packages to changes in international interest rates or prices (e.g., the price of oil). It has also been proposed that some developing countries could issue commodity-linked bonds whose return would be tied to either export prices or a country's export receipts. Greater reliance on equity financing as opposed to external borrowing could also potentially reduce exposure to interest rate risks.

commodities exported by the developing countries. 1/ Five international commodity agreements with market-intervention provisions are currently in operation: the International Sugar Agreement (1977), the International Natural Rubber Agreement (1979), the Sixth International Tin Agreement (1981), the International Cocoa Agreement (1980), and the International Coffee Agreement (1983). 2/ During 1978-81, the five commodities covered by these agreements accounted for about 35 percent of the earnings of the non-oil developing countries from non-oil primary commodity exports. Three of these commodity agreements--namely, sugar, tin, and natural rubber--are also eligible for financing under the Fund's Buffer Stock Financing Facility.

Another important vehicle by which the Fund has helped members to reduce fluctuations in the availability of foreign exchange receipts is of course the Compensatory Financing Facility (CFF). This provided assistance to members experiencing temporary shortfalls in their export income which were caused by factors beyond their control. The cereal decision, which was established in 1981 for a period of four years and which was extended for a further four years ending in May 1989, has provided compensation to members for excesses in cereal import costs. 3/ More recently, agreement has been reached on a new Compensatory and Contingency Financing Facility (CCFF) which would preserve the essential features of the CFF, but would also provide contingent financing for a wider range of external shocks, including exports earnings, import prices, and interest rates. Other current account transactions (such as tourist receipts and migrant workers remittances) could also be covered where they are of particular importance. 4/

All of this brings us directly to the main subject of this paper, namely, recourse to market-related hedging instruments as additional means of shielding indebted developing countries from external price and

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1/ Some have expressed concerns about how effective these arrangements have been in actually limiting commodity price variability.

2/ An example of a regional stabilization program is the European Community's export earnings stabilization scheme (Stabex) which provides compensatory financing assistance to countries from Africa, the Caribbean, and the Pacific whose exports to the community have suffered a shortfall.

3/ The oil facilities of 1974 and 1975 assisted members in financing current account deficits resulting from the increase in oil prices.

4/ See "External Contingency Mechanisms in Fund Arrangements--Preliminary Considerations" (EBS/88/30, 2/12/88), and Supplement 1 (2/26/88); and "Modalities for the Compensatory and Contingency Financing Facility" (EBS/88/100, 5/29/88).

asset-market volatility. 1/ Suffice to say that to this point, there has been only relatively limited use of financial market hedging instruments by indebted developing countries. Some have argued that this is as it should be since: (1) these markets still lack a sufficient volume of activity, especially at maturities that would be most relevant for the hedging needs of indebted developing countries; (2) obtaining the required degree of protection against external price shocks would be too expensive; and (3) establishing the control and trading systems needed for effective operation in these markets would require the use of scarce technical and financial skills that could be better utilized for dealing with other foreign exchange reserves and debt management problems.

In the next section, hedging possibilities and benefits are subjected to close scrutiny by taking a comprehensive look at the potential role of market-related hedging instruments in managing the financial risks faced by indebted developing countries. Attention is focused on those instruments which are accessible by indebted developing countries and where market activity is sufficient to make feasible at least modest hedging operations. There is also an examination of the costs and cash-flow requirements associated with these hedging instruments. Finally, the role such instruments might have in adjustment programs and debt reschedulings is considered.

III. Market Based Interest Rate Hedging

1. The development of market-based hedging instruments

As suggested earlier, the pattern of price volatility experienced in the international economy during the 1970s stimulated the search for new instruments and techniques to transform and reallocate financial risks. This search was facilitated by the more general process of financial innovation and liberalization, 2/ the weakening or elimination of capital controls among the major industrial countries, and the emergence of the global trading of some of the more liquid financial assets. The growing importance and usefulness of hedging instruments, especially for institutional traders and portfolio managers, has been evidenced by the fact that for some cash instruments 3/ (e.g., the long-term U.S. Treasury

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1/ In the Managing Director's summing up of the Executive Board discussions on the Compensatory and Contingency Financing Facility (Buff 88/133), it was noted that "countries also would be encouraged to hedge a part of their foreign debt against unforseen rises in world interest rates, on the basis of the several instruments available in world financial markets."

2/ These developments are described in detail in International Capital Markets: Developments and Prospects, 1987 (Washington, International Monetary Fund), M. Watson, R. Kincaid, C. Atkinson, E. Kalter, and D. Folkerts-Landau.

3/ Cash instruments are the instruments whose price or interest rate variations are being hedged.

bond) trading activity in the futures markets is often larger than activity in the underlying cash markets.

Although there is now a very broad range of markets and instruments that can be used to hedge asset and commodity price risks (see the Supplement), the basic nature of the hedging instruments and strategies are generally quite similar across different markets. In view of these fundamental similarities, and because of the significance of floating interest rate debt in total liabilities of indebted developing countries, this section focuses principally on the use of interest rate hedging instruments. The focus on interest rate hedging instruments does not imply that they are necessarily more useful than commodity hedging instruments for a particular country. 1/ The Supplement discusses the use of commodity hedging instruments.

Even when the focus is on managing interest rate risks, the hedger faces an extensive variety of standardized and customized hedging instruments. In one sense, this extensive shopping list is deceiving because even the most complex contingent contracts 2/ are generally "built up" by combining two basic hedging instruments. One of these instruments involves the use of a contingent contract that "locks in" a given interest rate. By so doing, it allows the country to avoid the costs associated with a higher interest rate. But it also requires that the country forgo the benefits associated with a decline in interest rates. The oldest instrument of this type is a forward contract which obligates the owner to buy (or sell) a given asset on a specified date at a specified "exercise"

1/ Traders from developing countries have been involved to some degree in commodity futures markets for some time. However, data on the nationality of traders (as well as whether they are from the public or private sectors) are not generally published. A study by Powers and Tosini ("Commodity Futures Exchanges and the North-South Dialogue," American Journal of Agricultural Economics, Vol. 59, No. 5 (Dec. 1977), pp. 977-85), using confidential data from the Commodity Futures Trading Corporation (CFTC) for 1976-77 indicated that a significant percentage of open interest in a number of commodities traded on futures exchanges in the United States was held by traders from developing countries. For example, at one time during this period, 7 percent of the short interest in grains and soybean contracts was held by traders from Central and South America; this may well have reflected hedging by wheat and soybean exporters.

2/ The term contingent contracts refers to contractual arrangements entered into at a particular point in time for the sale or purchase of some asset or good at some point in the future contingent on a specified event taking place. This would encompass all existing market-related hedging instruments, e.g., futures, options, swaps, forward agreements, and interest rate caps.

price. 1/ The second instrument is a contingent contract that involves paying a premium to a counterparty for assuming the risk of higher interest rates. The hedger thereby retains the benefits associated with lower interest rates and still limits the risks associated with increases in interest rates. An option contract, which gives the owner the right but not the obligation to purchase (sell) an asset, potentially provides a means of placing a ceiling on interest rates for some period of time. 2/

Prior to the 1980s, most financial hedging instruments were provided by financial institutions on an "over-the-counter" (OTC) basis. In this way, the hedging instrument could be "customized" to the user's needs. Some OTC products, such as interest rate and currency swaps, interest rate caps, and forward foreign exchange contracts, have experienced rapid growth in recent years. 3/ For example, the total amount of outstanding interest rate and exchange rate swap agreements has grown to nearly a trillion U.S. dollars, while the amount of LIBOR interest rate caps currently outstanding is estimated to be near $250 billion.

During the 1980s, the use of exchange-traded futures and options contracts has expanded relative to the use of OTC instruments. Exchange-traded contracts have two basic advantages over OTC instruments. First, they often provide the most flexible means of implementing hedging or speculative strategies because of their relatively liquid secondary markets, which derive from the use of standardized contract terms. This allows hedgers and speculators to adjust their positions quickly as economic conditions change. Second, the credit risk associated with payment obligations is minimized by the use of performance bonds (i.e., margin requirements) 4/ that must be maintained on a daily basis, and by having the exchange interpose itself as counterparty in all contracts. When the clearing house is the principal (or counterparty) in every

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1/ As will be discussed, a futures contract provides a similar means of locking in an asset price or interest rate over some given period. A futures contract has often been viewed as "... a series of forward contracts. Each day, yesterday's contract is settled and today's contract is written" (Fischer Black, "The Pricing of Commodity Contracts," Journal of Financial Economics, Vol. 3 (1976), pp. 167-79). This reflects the daily marking to market of futures which will be discussed latter in this section. When their price is being determined, more complex instruments, such as interest rate swaps, are often viewed as similar to a series of forward contracts strung together over time.

2/ Although an option contract is viewed in this analysis as one of the fundamental building blocks for other more complex instruments, it has been argued by some that the hedging characteristics of such a contract can be replicated by combinations of forwards or futures contracts and holdings of risk-free securities.

3/ The glossary in the Supplement provides a technical description of these instruments.

4/ The nature of margin requirements will be discussed in more detail later in this section.

futures transactions and options, contract performance is guaranteed by the resources of the exchange rather than (as with OTC contracts) by any single individual trader. 1/

While exchange-traded commodity futures have a long history, the first financial futures exchange was the International Monetary Market (IMM), a subsidiary of the Chicago Mercantile Exchange (CME), which opened trading of foreign exchange futures in 1972. This was followed by the introduction of the first traded interest rate future by the Chicago Board of Trade (CBT) in 1975. Subsequently, significant financial futures markets for foreign exchange and government securities emerged in Australia, Canada, France, Japan, the Netherlands, Singapore, and the United Kingdom. The trading in some interest rate futures contracts, such as the U.S. Treasury bond and the Eurodollar contracts, have grown rapidly over the past two years (Table 1). 2/

The development of the financial futures markets has been paralleled by the growth of markets for financial option contracts. Financial options--that is, options on currencies, debt instruments, and stock indexes--were introduced in the early 1980s. Trading in currency options began in 1982 on the Philadelphia Stock Exchange, which has remained the most active exchange for currency options. Other exchanges, such as the Chicago Mercantile Exchange (CME), London International Financial Futures Exchange (LIFFE), and Montreal Exchange (ME) have also introduced trading in currency option contracts. Debt option contracts were introduced in 1982 on the CBT with a contract on a long-term U.S. Treasury bond. A debt option contract gives the owner the option to buy (sell) a cash instrument, such as a U.S. Government bond, or to buy (sell) a futures contract on such a cash instrument. 3/ Debt option contracts have also enjoyed a significant expansion in recent years (Table 1).

2. The use of market-based interest rate hedging instruments by indebted developing countries

In a broad way, the potential usefulness of market-based interest rate hedging instruments for indebted developing countries depends on the benefits associated with greater certainty about debt-servicing payments and on the costs and availability of hedges of different maturities. As demonstrated in the remainder of this section, factors such as the

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1/ In addition, only clearing members of the exchanges are able to clear trades through the clearing house, and other members of the exchange must transact through clearing members. Clearing members also impose margin requirements on their customers and are subject to net-worth requirements and other conditions designed to reduce credit risks.

2/ See the Supplement for details on history of contracts and exchanges.

3/ Such futures options therefore allow the holder of the option to acquire a futures contract when exercising the option, rather than the underlying asset.

Table 1. Trading Volume and Open Interest 1/ in Eurodollar Contracts

	Eurodollar Futures 2/				Eurodollar Futures Options 3/			
	Daily trading volume		Open interest (End of period)		Daily trading volume		Open interest (End of period)	
	CME 4/	LIFFE 5/	CME	LIFFE	CME	LIFFE	CME	LIFFE
	(Number of contracts--average)							
1981	948	--	1,461	--	--	--	--	--
1982	1,316	1,884	18,012	2,084	--	--	--	--
1983	3,608	1,822	45,602	8,565	--	--	--	--
1984	16,032	4,047	85,100	9,998	--	--	--	--
1985	35,320	5,076	121,537	17,740	2,949	235	43,077	3,991
1986	42,786	4,364	214,401	22,334	6,946	152	92,108	2,265
1987	79,665	6,859	253,004	26,666	10,158	--	69,792	--

1/ Open interest is the total number of contracts not offset by an opposite transaction nor fulfilled by delivery.

2/ Each contract has a face value of $1 million.

3/ Each contract is written on one Eurodollar futures.

4/ Chicago Mercantile Exchange (CME).

5/ London International Financial Futures Exchange (LIFFE).

structure of external debt, the ability to access the markets for particular instruments, the size and liquidity of the markets for each hedging contract, the cost of using particular hedging instruments, and the capacity to design and manage hedging programs--all count in the final benefit-cost calculus.

From the structure of a country's external debt, one can generally deduce the potential maximum size of interest rate hedging operations, the currency in which the hedging contracts would have to be denominated, the potential maturities of the possible hedges and the appropriate index interest rates. Since the external bank obligations of indebted developing countries are primarily medium-term floating interest rate instruments denominated in U.S. dollars and indexed to LIBOR with quarterly or semi-annual reset dates, there are a number of possible hedging operations that could be undertaken. The principal issues involved can be illustrated by considering both a short-term hedge of the LIBOR to be paid at the next interest rate reset date, and a medium-term hedge designed to limit the country's exposure to adverse interest rate movements over a three-year period. While these short- and medium-term hedging operations could potentially be carried out with a variety of different hedging instruments, 1/ creditworthiness considerations, position limits imposed by futures and options exchanges, market liquidity for individual instruments, and the cost of using a given instrument will limit the set of instruments that are relevant.

Creditworthiness considerations directly limit access to some hedging instruments. Creditworthy borrowers in industrial countries often use the interest rate swap 2/ market to convert their floating interest rate debt into the equivalent of fixed interest rate debt. However, since an interest rate swap involves an exchange of debt-servicing obligations (the fixed interest rate borrower agrees to service the obligations of floating interest rate borrower and vice versa), a swap is an effective hedging instrument only if each counterparty fulfills its debt-servicing obligations. Most borrowers, therefore, will engage in a swap only when credit risk is perceived as low. As a result, indebted developing countries with debt-servicing difficulties have not had access to this market. 3/

Certain other hedging instruments are not as directly restricted by creditworthiness considerations. The futures exchanges, for example, have

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1/ While the discussion of the short- and medium-term hedging operations will focus on the liability side of a country's external financial position, account would also normally be taken of a country holdings of foreign assets in designing the appropriate hedge.

2/ See the Supplement for a more detailed description of an interest rate swap.

3/ Techniques for dealing with credit risk in the swap markets, e.g., through collateralization or frequent marking-to-market of the contracts, are being considered.

sought to minimize credit risks by adopting margin calls. This involves both the posting of an initial performance bond (margin requirement) when a contract is either purchased or sold and the allocation to the margin account of the capital gains or losses on outstanding future contracts at the end of each business day. This practice limits credit risk by essentially reducing the scale of potential losses 1/ and by shortening the performance period to a single day. As long as a hedger can meet these margin requirements on a continuing basis, he can make use of the markets. 2/ Should the hedger be unable to meet any daily margin calls, his position is immediately closed out by the exchange. The exchange then returns the balance in the margin account after deducting any loss incurred on the hedger's position.

The state of market liquidity for a hedging contract is another potential limiting factor. Given the scale of the external debts of indebted developing countries, even modest hedging operations could potentially exceed those typically undertaken by individual private sector financial or nonfinancial firms. In addition, most futures and options exchanges establish position limits, on the holdings or sales of their contracts by any single trader. For bona fide hedging operations, these limits may be exceeded, subject to exchange approval which is based on an evaluation of the hedger's needs, his financial ability, and market liquidity. 3/ Thus, even if market liquidity is adequate for a given hedging operation, position limits could potentially constrain the scale of the operation.

The costs of using a market-related hedging instrument include not only the usual transaction costs, up-front premia, and the costs of meeting margin requirements, but also the personnel and equipment costs associated with monitoring and implementing a hedging program. The nature of these costs are discussed later on in this section.

1/ This is true to the extent that the potential range of price movements becomes larger as the length of the performance period is extended.

2/ Margin calls on hedging operations are discussed in more detail later in this section.

3/ In some exchanges, speculative position limits do not apply to traders who can establish that they are bona fide hedgers. This means establishing that a futures position offsets an existing cash exposure. The exchanges enforce the position limits, so they are also the judge of whether a particular position is justified as a bona fide hedge. However, regulators oversee the decisions made by the exchanges, and they often provide a nonexclusive list of hedging transactions. Any transactions not on the list can only be classified as a hedging transaction if the trader files certain statements with the exchange. Nonetheless, a foreign government could quality as a bona fide hedger if it satisfied the same rules applied to other traders.

3. A short-term hedging operation using the Eurodollar futures contract

The short-term interest rate hedging instruments that are most readily available to indebted developing countries are the futures contract on three-month U.S. Treasury bills, the futures contract on three-month Eurodollar funds, and short-term interest rate caps provided by financial institutions. The market for interest rate options does not yet appear to have the volume sufficient to accommodate even relatively modest hedging operations by indebted developing countries. The markets for the short-term U.S. Treasury bills and Eurodollar futures contracts, however, have much larger scales of activity.

Since much of the U.S. dollar-denominated floating interest rate debt of the indebted developing countries is indexed to LIBOR, the Eurodollar futures contract has certain characteristics that could potentially make it a useful short-term interest rate hedging instrument for indebted developing countries. The Eurodollar futures contract represents an obligation to buy or sell at a predetermined price on a specified future date a Eurodollar time deposit with a maturity of three months which is indexed to the three-month LIBOR. 1/ It has a face value of $1 million. The purchase (sale) of a futures contract results in a "long" ("short") position in Eurodollars. The purchaser's position is considered long because the contract implies that he will buy a Eurodollar time deposit at some point in the future. The seller's position is short because he has sold a Eurodollar time deposit, which he may not yet own, with delivery occurring at some future date.

Sales of Eurodollar futures contracts can be used to "lock-in" a particular level of LIBOR at some future date. As will be illustrated in this section, this lock-in of a particular level of LIBOR occurs because the effects of any increase in LIBOR on the hedger's actual interest payments would be offset by profits on the hedger's short position in Eurodollar futures. Conversely, any decline in interest payments resulting from a decline in interest rates will generate offsetting losses on the hedger's short futures position. Hence, the use of the Eurodollars futures hedge can turn floating-rate interest payments into the equivalent of a fixed interest rate payment.

a. Characteristics of the Eurodollar futures contract

Trading in Eurodollar futures contracts currently takes place on the Chicago Mercantile Exchange (CME), the London International Financial Futures Exchange (LIFFE), and the Singapore International Financial Futures Exchange (SIMEX). The CME and SIMEX have a linked clearing system making their respective contracts tradeable on each market. There are

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1/ The sale of a Eurodollar contract could therefore involve the promise to deliver 12 months from now a Eurodollar time deposit with three months maturity.

typically 12 Eurodollar futures contracts listed at any time with specified delivery dates ranging from three months for the nearest contract to three years for the farthest contract. 1/ Once a Eurodollar futures position is established, it can either be adjusted or eliminated prior to maturity of the contract through an off-setting trade. Alternatively, the contract can be allowed to mature with a cash settlement occurring at the end of the contract. Settlement of Eurodollar future contracts on the delivery date is made in cash rather than through physical delivery, since Eurodollar time deposits are nontransferable. Thus, futures contracts are used primarily as a means of reallocating the risks associated with movements in Eurodollar interest rates rather than as a means of transferring ownership of property.

The Eurodollar futures contract is priced on an index basis, i.e., the price is given as 100 less the three-month Eurodollar interest rate. Thus, for example, a future's interest rate of 8.25 percent translates into a price of 91.75 (Table 2). 2/ As a result of this pricing structure, the value of a short position in Eurodollar futures (i.e., the sale of a Eurodollar future) increases (falls) when Eurodollar interest rates rise (decline). This inverse relationship between the level of interest rates and the price of a contract explains why hedging against higher interest rates involves the sale of a Eurodollar futures contract (i.e., as interest rates rise, the higher interest payments are offset by profits on the short position).

Futures prices are determined on the floor of most futures exchanges through an open outcry auction system. The expectations of market participants about future developments in interest rates are reflected in the prices of futures contracts. 3/

1/ Further details of the Eurodollar futures contract are given in the Supplement.

2/ Each basis point change in the futures interest rate results in a basis point change in the price of a contract and is worth $25 = 0.01 percent (a basis point change) x $1,000,000 (the face value of the contract) x 3/12 (the maturity of a contract (three months) as a proportion of the year).

3/ The interest rate on Eurodollar time deposits with a three-month maturity but which are to be delivered six months from now, for instance, will tend to be near the interest rate for the three-month period beginning six months from now implied in the term structure of the cash market yield curve. The difference in futures interest rates and the current interest rate on the underlying cash instrument, i.e., the basis, reflects the shape of the cash market yield curve or the "cost of carry" associated with being long in the deliverable security until the contract delivery date. A positively sloped yield curve will produce positive basis, while a negatively sloped yield curve produces negative basis. The technical aspects of the relationship between future and cash market interest rates are discussed in the Supplement.

Table 2. Eurodollar Futures Contract Specification

Contract size	$1 million.
Price quotation	Quoted in terms of an index (100 minus rate of interest).
Settlement	Settlement is in cash according to the London Interbank Offered Rate for prime banks' three-month Eurodollar time deposit prevailing on the day of settlement.
Delivery month	March, June, September, and December.
Last day of trading	Second London business day before third Wednesday.
Minimum fluctuation in price	0.01 percentage point or $25.
Daily price limit	No limit.
Margin requirement	Initial margin $750; maintenance margin $500 per contract.

As noted earlier, the uses of futures contracts requires that margin requirements be satisfied on a daily basis. Both the purchasers and sellers of futures contracts are required to meet so-called initial and maintenance margin requirements. 1/ On the Chicago Mercantile Exchange (CME), for example, the initial margin for the Eurodollar futures contract is at least $750 or 0.075 percent of the nominal amount of the contract. 2/ In addition, the CME calls on members to replenish their margin deposits to the level of the initial margins when these fall below $500 per contract (the so-called maintenance margin).

Margin requirements can play an important role in determining both the cost and cash flow associated with using the futures market because the hedger may need readily available assets or lines of credit to meet margin requirements as market interest rates change. For example, the following table illustrates how changes in market interest rates could influence the margin account for a hedger with a short Eurodollar futures position of 1,000 March 1989 contracts (face value of $1 billion), which were originally sold at a price of 92 per contract.

	Price	Margin Account	Daily Resettlement Debit or Credit	Margin Call
Day 1	92.00	750,000	--	--
Day 2	92.05	625,000	-125,000	
Day 3	92.12	450,000	-175,000	300,000
Day 4	92.12	750,000	--	
Day 5	92.00	1,050,000	300,000	

When the contracts were sold on Day 1, the hedger had to make an initial margin deposit of $750,000 (the maintenance margin would be $500,000). 3/ On the following day, futures interest rates on three-month Eurodollar deposits are assumed to have decreased by 5 basis points; the price of the contract, therefore, increased by 5 basis points. In the view of the futures exchange, the hedger would have suffered a loss on his

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1/ The concepts of initial and maintenance margins are those used on the Chicago Mercantile Exchange. In contrast, there is only a single margin requirement that must be satisfied in the London International Financial Futures Exchange.

2/ These are the margins established by the exchange for contracts submitted to the exchange by clearing member firms. In turn, these firms establish initial margins for their individual customers that are typically higher than this amount. The size of the initial maintenance margins are related to the maximum price movement allowed for this contract on the exchange during the trading day or, if no such price limits do not exist, on the expected price volatility.

3/ Margin deposits earn money-market interest rates and can be made in negotiable money market securities.

short position in the sense that the contract that he has sold would be more costly to buy back. The margin account of the hedger with a short position would therefore be debited with the loss that he had incurred as a result of the rise in the price of the futures contract ($125,000). 1/ Since the margin account of the hedger would still have remained above the maintenance margin, no margin call would have been made. If the futures interest rates declined by a further 7 basis points on the next day, then the margin account of the holder of the short futures position would have been debited $175,000 at the end of that day. Since the balance in the margin account would have fallen below the maintenance margin, he would have been asked to replenish his account by $300,000 to the full initial margin of $750,000.

This cash-flow aspect of futures contracts may present a difficult operational hurdle for some potential users of the futures markets. A holder of a short or long position in futures contracts has to stand ready to pay the required funds into the clearing house at short notice or see his futures position immediately sold off. Hence, it is necessary to prearrange some form of financing or to have assets available to meet the potential cash flow requirements. Frequently this is done by establishing a line of credit at a commercial bank to be used specifically for this purpose.

In addition to meeting margin requirements, the user of Eurodollar futures contracts must incur a brokerage commission which is about $20 per contract per round trip. Hence, the transactions costs associated with the buy and sell cycle of 1,000 Eurodollar contracts (face value of $1 billion) would be approximately $20,000.

The type of hedge that can be constructed using Eurodollar futures is also influenced by the fact that most of the trading activity is concentrated in the three or four nearby contracts (i.e., those with maturities between 3 and 12 months). The Eurodollar market is thought to be sufficiently deep and liquid to absorb easily trades of 1,000 contracts ($1 billion face value) in a single session. 2/ Transactions of this size

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1/ As noted earlier, each basis point move in interest rates results in a $25 change in the value of the contract; and, in this case, the 5 basis point move results in a $125 change in the value of each of the 1,000 contracts. The margin account of a holder of a comparable long position would be credited with the same amount.

2/ Table 1 provides data on the recent average daily volume in Eurodollar futures contracts on the major exchanges for this type of contract. During 1987, for example, average daily volume on the CME was nearly 80,000 contracts and on the LIFFE was about 7,000 contracts. In early September 1988 on the Chicago Mercantile Exchange, total open interest on Eurodollar futures contracts amounted to about 550,000 contracts. This included open interest of approximately 170,000 contracts maturing in December 1988, 110,000 contracts maturing in March 1989, 40,000 contracts maturing in June 1989, and 25,000 contracts maturing in September 1989.

in contracts with maturities extending up to a year could reportedly be handled in the course of a normal business day. There is little trading in contracts extending beyond two years.

b. Design of a short-term Eurodollar interest rate hedge

Using Eurodollar futures contracts to hedge against an unanticipated change in LIBOR prior to the next date on which the interest rate on a country's external debt is to be reset would involve selling an appropriate number of Eurodollar futures contracts. In this way, any increase in interest rates that resulted in higher debt-servicing payments would also generate offsetting profits on the country's futures position. However, such a sale of Eurodollar futures contracts also means that any unanticipated decline in LIBOR, that would reduce debt servicing payments, would also generate losses on the country's future position. As a result, the lower interest rate cost would be offset by the losses on the futures contract thereby keeping the total cost of Eurodollar funds equal to the interest rate contracted for in the futures contract. A futures hedge therefore locks in a given cost of funds no matter which way interest rates move; that is, it is a symmetric hedging instrument.

To illustrate the effect of a futures hedge, consider a theoretical situation where in August 1988 the authorities wanted to fix the level of the interest payments that they would have to make in December 1988. Assume the country has $1 billion of external obligations and that the interest rate to be paid is the prevailing three month LIBOR plus 100 basis points. It is important to note that the authorities would only be able to lock in the three month LIBOR that the market anticipates would prevail in December. This rate would in general differ from the three-month LIBOR prevailing in August. For example, as indicated in Table 3, the three-month LIBOR in August 1988 was 8.75 percent per annum, whereas the authorities would only be able to lock in the higher rate of 9.2 percent for December 1988. The authorities might nonetheless choose to lock-in the higher currently expected rate if their concern was that interest rates might rise even further. If the interest rate reset date on the country's loan contract matched the maturity date on the futures contract, 1/ then a 9.2 percent LIBOR on $1 billion of external debt could have been locked in by selling 1,000 December 1988 Eurodollar futures contracts at a price of 90.8.

If LIBOR stayed at 8.75 percent until December 1988, then the higher futures rate (9.2 percent) that was locked-in during August would imply that the hedger's effective interest rate would be 10.2 percent, or 45 basis points above the actual interest rate prevailing in December (Table 3). This effective interest rate (10.2 percent) would reflect

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1/ The problems created when this is not the case will be discussed shortly. If transactions costs were included, the locked-in interest rate would be 9.21 percent.

Table 3. Illustration of Eurodollar Futures Hedge

(In millions of dollars)
(August 1988 three-month LIBOR rate: 8.75 percent)
(December 1988 three-months Eurodollar futures price 90.80 on August 18, 1988)

	Three-Month LIBOR in December 1988			
	Up 2 percent at 10.75 percent	Up 1 percent at 9.75 percent	Unchanged at 8.75 percent	Down 1 percent at 7.75 percent
A. Reset interest rate (LIBOR + 1 percent) for three-month period beginning Dec. 1988 (in percent)	11.75	10.75	9.75	8.75
B. Interest cost (in millions) for three months of $1 billion loan	29.38	26.88	24.38	21.88
C. December, 1988 futures contract settlement price (100 - LIBOR)	89.25	90.25	91.25	92.25
D. Profit (loss) per contract in basis points (90.80 - settlement price)	155	55	(45)	(145)
E. Brokerage cost 1/ (in millions)	0.02	0.02	0.02	0.02
F. Profit (loss) on futures hedge in dollar terms (in millions) (1,000 contracts x profit (loss) per contract in basis points x $25 per basis point) 2/	3.88	1.38	(1.13)	(3.63)
G. Effective interest cost (B+E-F) (in millions)	25.52	25.52	25.52	25.52
H. Effective interest rate (percent)	10.21	10.21	10.21	10.21

1/ Brokerage cost assumed to be $20 per contract (per round trip).
2/ One basis point of a single three-month $1 million contract is $25.

both the actual interest rate paid to the lender (9.75 percent) 1/ and the losses incurred on the futures contract (equivalent to 0.45 percent). 2/ On the other hand, if LIBOR increased by 2 percentage points to 10.75 percent, then the country would profit significantly from the hedge. Its effective interest cost would then still be 10.2 percent, and would be 155 basis points below the reset interest rate prevailing in December.

If the authorities wanted to hedge the LIBOR index for more than one quarterly interest rate reset date (e.g., December 1988, March and June 1989), then they could simultaneously sell 1,000 December 1988 futures contracts, 1,000 March 1988 contracts and 1,000 June 1989 contracts. 3/ While the interest rates locked in at each reset date would typically differ, such a "strip" hedge would allow the authorities to be certain of a scale of their interest payments over the next year. 4/

One issue associated with using such strip hedges is whether sufficient liquidity exists for contracts with longer maturities. The most active contracts in the Eurodollars futures markets are those with three, six, and nine months maturity. A strip hedge extending for more than a year, i.e., involving three-month Eurodollar contracts that mature one year from now, might therefore be difficult to manage or even to put in place. To extend the time frame of hedging operations, use is therefore often made of a "stack" hedge. For example, if the authorities desired to lock in the futures interest rate for its next three quarterly interest rate reset dates, then they could sell three times as many of the nearest term three-month futures contracts as are needed to hedge the first reset date. They could then close out one third of this position at the first reset date and rollover the remaining position to the next nearby three-month contract. 5/ This stack hedge procedure is repeated at

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1/ This would reflect the sum of the actual LIBOR (8.75 percent) and the 100 basis point spread to be paid the lender.

2/ Transaction costs would have only a marginal effect.

3/ This example is based on quarterly reset dates with the index rate being the three-month LIBOR. Although the hedges would be somewhat more complicated, it would be possible to use similar operations to hedge semi-annual reset dates with the six-month LIBOR or annual reset dates based on 12 month LIBOR.

4/ The decision concerning the length of the period over which interest rates are to be hedged would in part reflect the country's ability to alter policies to cope with interest rate increases. An ability to adjust quickly to changes in interest rates would presumably tend to reduce the need for long hedges.

5/ In terms of our example, this type of hedge strategy would involve selling 3,000 December 1988 Eurodollar futures contracts in August 1988. In December 1988, there would then be a simultaneous purchase of 3,000 December 1988 futures contracts and the sale of 2,000 March 1989 contracts. The purchase of the December contracts would represent the closing out of the hedge for the first quarterly reset date. The profits (or losses) that would arise as a result of the difference between the

each interest rate reset date until the entire position is closed out. But the stacking approach itself suffers from two shortcomings. First, the high frequency of selling and buying of future contracts increases the transactions costs of the hedge. Second, the prices for futures contracts that will be traded at the end of each quarter are uncertain. 1/ This means that it would not in general be possible to completely fix the interest rates that would prevail at each of the future reset dates.

If there are large differences between the interest rate and maturity features of the futures contract and those applicable to the underlying debt obligations, then hedging operations naturally becomes more complex. It may then be necessary to use some form of what is known as a "cross-hedge." As discussed in Appendix II of the Supplement, the construction of a cross-hedge involves consideration of such factors as the correlation between changes in the interest rates on the future contract and those on external debt and the relationship between the desired maturity of the hedge and the duration of the futures contracts. If appropriately designed, such cross hedges can provide substantial short-run protection against interest rate variability--and this occurs even if the characteristics of the futures contract and the debt obligation are quite different.

A recent example of the use of the financial futures to hedge an interest rate exposure arising from floating rate external U.S. dollar liabilities is the hedging program undertaken by Chile. About 87 percent of Chile's total medium and long-term foreign debt is denominated in U.S. dollars. Until early 1988, interest payments on most of these loans were tied to the six-month LIBOR. Negotiations between the Chilean authorities and a consortium of foreign banks resulted in approximately $9 billion of external debt being converted to an annual interest rate reset period starting in early 1988. The 12-month LIBOR became the index interest rate.

The 12-month LIBOR rates applicable to 1989 debt service payments were to be set at various dates in February, March, and April 1988. 2/ In order to eliminate some of the uncertainties about the LIBOR prevailing

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5/ (Cont'd from page 24) price at which the December 1988 contracts were initially sold in August 1988 and the purchase price in December 1988 would be used to offset any change in interest costs due to a move in market interest rates. In March 1989, the hedging operation would continue with the simultaneous purchase of 2,000 March 1989 futures contracts and the sale of 1,000 June 1989 contracts. Finally, in June 1989, the hedge would be closed through the purchase of 1,000 June 1989 contracts.

1/ This is a particular problem if the term structure of interest rates "twists" with short-term interest rates remaining relatively stable and medium- and long-term interest rates rising sharply.

2/ For example, the interest payments to be made in February 1989 would reflect the interest rate set in February 1988.

at the reset dates in February and March 1988, the authorities sold March 1988 futures contracts, while the reset dates in April 1988 were hedged through sales of June 1988 futures contracts. Since 3-month Eurodollar futures contracts were used to cross-hedge a 12-month interest rate, it was necessary to sell a total amount of futures contracts that equaled four times the underlying dollar amount of the loan, i.e., $6 billion of futures to hedge $1.5 billion of loans. 1/ The brokerage cost of the hedging operation was $30 per contract (round trip). The initial margin of $1,500 per contract was met by depositing U.S. Treasury bills. The sale of the futures contracts was spread over a period of more than three weeks. The authorities closed the futures position by buying back the futures contracts on the reset dates for which the hedge was intended. An effective rate of 7.3 percent was locked in by this operation, thereby eliminating interest rate uncertainty for that period.

The central bank is currently engaged in a new hedging operation aimed at reducing the uncertainty of the LIBOR rates prevailing at the 1989 reset dates. To this end, the authorities are now selling March and June 1989 contracts in order to hedge at least 50 percent of the debt of the central bank with reset dates occurring in January, February, March, and April. In addition, the Central Bank of Chile has authorized other public and private entities to hedge their floating rate liabilities. 2/

4. A medium-term hedging operation using interest rate caps

But what if a debtor country is interested in obtaining medium-term protection against a general upswing in interest rates? As already noted, borrowers that are perceived to be creditworthy have often achieved such medium-term protection by converting their floating interest rate debt into fixed interest rate debt over a three to ten year period through interest rate swaps. However, creditworthiness considerations would probably limit the access of indebted developing countries to this market. Moreover, activity in Eurodollar futures contracts drop off sharply for maturities greater than 18 months.

Another route to obtaining medium-term protection again higher interest rates is the purchase an over-the-counter interest rate cap. Interest rate caps are currently provided by several major commercial banks and securities houses. The purchaser of the cap pays a premium

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1/ The change in the price of a futures contract of cash instrument for a given change in its interest rate varies with the maturities of the instrument. For example, the price change of a 12-month instrument for a 1 percentage point change in interest rates will be about four times that of a three-month instrument. As a result, hedging against movements in the 12-month LIBOR using futures contracts indexed to the three-month LIBOR will require the use of four times as many three-month futures contracts as the face value of the underlying debt.

2/ The Chilean State Copper Company (CODELCO) has also engaged in hedging operations.

related to the level at which the interest rate is capped, the length of time over which the cap is in effect, and the expected volatility of the capped rate. If market interest rates exceed the cap, then the cap writer will reimburse the cap holder for the interest cost above the cap.

LIBOR caps were introduced in 1983, and it is estimated that $250 billion of such caps are outstanding. An important advantage offered by caps is that they can provide protection for up to ten years, though liquidity in the market for caps with a maturity of over five years is limited. The ability of this market to absorb large orders for caps with maturities up to five years--without simultaneously generating sharp changes in the cost of the cap--compares favorably with the ability of the Eurodollar futures market to absorb short-term hedging operations. Staff contacts with market participants suggest that caps on LIBOR for individual countries with a face value of $1-5 billion for five years could be provided without difficulty. As with traded options, the use of caps allows for some flexibility in limiting protection to a range of interest rate values. For example, an indebted country may seek interest rate protection only for interest rate values between 10 and 13 percent, and be willing to accept only partial protection when rates exceed 13 percent. The cost of interest rate caps increases with increases in the length of the coverage and with decreases in the exercise interest rate. For example, in August 1988, a <u>three year</u> cap on LIBOR at 10 percent (LIBOR was about 8.75 in August 1988) would have cost the equivalent of 1.25 percent of the face value of the principal to be hedged; by comparison, a five year cap at 10 percent would cost the equivalent 3.00 percent of the face value of the principal (Table 4).

The effects of the purchase of a cap on the hedger's effective interest rate, under various assumptions about the movement of LIBOR, are illustrated in Table 5. For example, if LIBOR remained unchanged at 8.75 percent, then the purchase of a three-year 10 percent cap would raise the hedger's effective annual interest rate by 45 basis points above the prevailing market rate of 9.75 percent (LIBOR plus 100 basis points). If, on the other hand, the market interest rate remained at 9.75 percent during the first year, while increasing to 11.75 percent during the last two years, then the hedger's effective average annual interest rate would be held at 11 percent--or 8 basis points <u>below</u> the average annual market interest rate. If interest rates were to rise to 11.75 percent and remain at that level for the life of the cap, then the hedger's effective average annual interest rate would be 11.42 percent; whereas the unhedged average interest rate would be 12.75 percent.

5. Some factors limiting the use of interest rate <u>hedging products by indebted developing countries</u>

While the above examples suggest that market-related hedging instruments might provide indebted developing countries with the ability to reduce their exposure to interest rate risks, it is clear that a number

Table 4. Premia for Interest Rate Caps on Three-Month LIBOR as of July 1988 1/

Maturity of Cap	Ceiling Interest Rate						
	7 percent	8 percent	9 percent	10 percent	11 percent	12 percent	13 percent
One year	1.22	0.64	0.27	0.15	0.08	0.06	0.05
Two years	3.20	1.95	1.08	0.56	0.28	0.15	0.12
Three years	5.27	3.45	2.12	1.25	0.75	0.44	0.26
Four years	7.36	5.02	3.28	2.11	1.36	0.87	0.57
Five years	9.42	6.64	4.52	3.06	2.08	1.41	0.97
Seven years	13.69	10.11	7.31	5.28	3.83	2.79	2.05
Ten years	18.78	14.35	10.83	8.20	6.24	4.78	3.70

1/ These premia are expressed as a percentage of the face value of the loan whose interest rate is being capped and are an average of premia quote by major banks and securities houses in New York in mid-July 1988. The three-month LIBOR averaged 8.3 percent during this period.

Table 5. Illustration of Interest Rate Cap Hedge

(August 1988 three-month LIBOR: 8.75 percent)

	Three-Month LIBOR During Period Sept. 1988-Sept. 1991				
First year	11.75	8.75	8.75	8.75	7.75
Second year	11.75	10.75	8.75	8.75	7.75
Third year	11.75	10.75	10.75	8.75	7.75
A. Cost (in millions) of $1 billion three year rate cap with a ceiling rate of 10 percent 1/	12.50	12.50	12.50	12.50	12.50
B. Loan interest rate (LIBOR + 1 percent)					
First year	12.75	9.75	9.75	9.75	8.75
Second year	12.75	11.75	9.75	9.75	8.75
Third year	12.75	11.75	11.75	9.75	8.75
Average annual loan rate	12.75	11.08	10.42	9.75	8.75
C. Interest cost for three years on ($1 billion loan) (in millions) 2/	382.50	332.50	312.50	292.50	262.50
D. Reimbursement payment from cap provider (in millions) 3/	52.50	15.00	7.50	--	--
E. Effective average interest cost (A+C-D) (in millions)	342.50	330.00	317.50	305.00	275.00
F. Effective annual interest rate (in millions)	11.42	11.00	10.58	10.17	9.17

1/ The cap premium is inclusive of all transactions costs.
2/ The interest cost is stated in current dollars.
3/ Payable at the end of the year.

of factors have worked to limit the use of such instruments. 1/ One consideration has been the cost of hedging. As already indicated, the use of products such as interest rate caps can require significant premia to be paid up front, which may be difficult in an environment of already heavy debt-service obligations. While the use of financial futures contracts does not entail up-front premia, it does expose the country to potentially large cash flow requirements arising from margin calls. Although such margin calls would occur only when market interest rates declined relative to the interest rates locked-in by the future contract, they still might require that the authorities raise the necessary funding very quickly to prevent the closing out of the futures position. 2/

A second consideration has been access to the markets on a continuous basis. In some cases, creditworthiness issues have limited the use of certain potential instruments (e.g., interest rate swaps). In addition, even for those instruments traded on organized exchanges, position limits which restrict the number of contracts that can be sold by a single hedger could limit the potential size of hedging operations. 3/

Another factor is the complexities involved in the management of hedging operations. Interest rate hedges generally require continuous monitoring and readjustment, especially if the duration of the hedge extends beyond the short term. Such activity requires skilled personnel capable of dealing in wholesale hedging markets on a continuous basis. While these hedging services can to some extent be purchased from various financial institutions, even the evaluation of the quality and cost of these services requires considerable knowledge of market instruments and techniques. 4/ A further problem arises in designing and implementing internal control mechanisms that effectively limit the activities of risk managers to legitimate hedging operations. Recent experience in some financial firms has shown that potentially large trading losses are possible if internal controls are not adequate.

1/ These factors are relevant for most developing countries, not only those with large external debts.

2/ For countries with limited access to international credit markets, any premium or cost that must be paid in the current period to alleviate future risk will imply more current adjustment to pay for less uncertainty about the magnitude of adjustment in the future.

3/ As discussed in footnote 3 on page 16, speculative position limits are applied flexibly for bona fide hedging operations where there is an underlying cash position that is being hedged. For example, although there is a 5,000 Eurodollar futures contract limit for speculators on the Chicago Mercantile Exchange, this did not constrain the hedging activities of the Chilean authorities.

4/ The staff of the World Bank's Financial Operations Department has provided technical assistance to a number of indebted developing countries on establishing the necessary institutional arrangements for the successful management of a hedging operations. It is expected that these efforts will be expanded.

6. Market-based hedging strategies and adjustment programs

As indicated earlier, external shocks can make the design and implementation of adjustment programs more difficult. In a medium-term framework, high variability of external interest rates and goods prices makes the financing gap less predictable. In addition, the prospect of such external shocks, which can also affect domestic spending and output, inevitably makes the specification of the time and scale of policy measures less precise. In such circumstances, obtaining some degree of insurance before the fact against certain types of external shocks through the use of market-related hedging instruments can make an important contribution to the continuity of the adjustment effort. Nonetheless, hedging operations must be seen as a complement to--not a substitute for--an appropriate set of adjustment policies.

The issue of which hedging operations would be potentially the most useful can only be specified on a case-by-case basis. Nonetheless, there are certain general considerations that are likely to bear on the use of hedging instruments in adjustment programs. One is that the value of a hedge depends directly on the benefits associated with being able to avoid sharp adjustments in policies, as well as on the cost of using and accessing the hedging instruments themselves. Even when the benefits of hedging operations are perceived to be significant, initial "start up" costs may point toward a modest scale of operations. As already noted, hedging operations require a highly trained technical staff. Establishing a hedging system would therefore involve certain personnel, training, and equipment expenditures.

A second consideration is that certain types of hedging operations would appear to be easier to incorporate into adjustment programs than others. For example, the recent operations undertaken by the Chilean authorities suggest that the Eurodollar futures market can be used to develop a short-term hedge against LIBOR exposure through near-term reset dates. Such hedging operations can help make short-term forecasts of financing gaps more precise. Since short-term commodity futures markets also have a high level of activity, similar commodity-hedging operations could make export prices or import costs more certain in the near term. However, given that the level of activity in futures contracts with a maturity beyond 12-18 months drops off quite sharply, it is likely to be difficult to extend any short-term hedges using futures contracts to a maturity comparable to the medium-term framework of the typical Fund programs. Some medium-term protection, at least against interest rate shocks, is potentially available through three or four year interest rate caps. But these require the payment of up-front premia that may be difficult to meet for countries that are experiencing external payments difficulties. The cost of such caps could be reduced by establishing a "corridor" which limits the maximum protection the country receives. For example, a country might purchase full protection against any increase in LIBOR to a range of between 10 and 12 percent, but, only partial protection for rates above 12 percent.

Some creditor banks have argued that the use of hedging instruments by indebted developing countries could potentially help forestall the need to reopen restructuring agreements in the event of unanticipated movements in the LIBOR index. 1/ Having bank creditors supply interest rate hedges in the form of LIBOR caps as part of restructuring agreements has also been seen by some as an attractive addition to the menu of techniques for resolving debt problems. Such a step could be part of a more general approach to structuring loan (or rescheduling) agreements to allow for more adequate hedging of financial risks.

Finally, while the use of financial hedging markets would not directly increase the scale of financing available to indebted developing countries, it would restore some access to international capital markets for debt management purposes. 2/ In particular, a country could regain some influence over the proportions of its external liabilities with either floating or fixed (or capped) interest rates.

IV. Summary and Issues for Discussion

Periods of high variability in international interest rates, in primary commodity prices, and in major-currency exchange rates have been a prominent feature of the economic landscape. This variability has in turn, adversely affected the economic performance and adjustment programs of indebted developing countries. The vulnerability of indebted developing countries to external shocks reflects their relatively open (unhedged) exposure to these risks. While export diversification, debt management, and reserve accumulation help limit their exposure, and, while official arrangements and facilities have been developed to provide some protection against external shocks, the question arises whether these countries could and should take better advantage of the same market-related hedging that have increasingly been utilized in industrial countries.

While access to some market-related hedging instruments by indebted developing countries would be limited by creditworthiness considerations, modest use of certain exchange traded futures contracts and of over-the-counter instruments would appear feasible. The potential usefulness of such hedging operations would have to be evaluated on a case-by-case basis and would involve consideration of the benefits and costs associated with

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1/ If such hedging operations were to be implemented through the use of futures contracts, it might be necessary to amend existing rescheduling agreements to allow for the issuance of collateralized debt, if secured bank credit lines were to be used for the management of the cash flows associated with margin calls. Such amendments have recently been negotiated between Chile and its commercial bank creditors.

2/ It is possible that countries whose exposure to interest rate risks is reduced through hedging operations might also be perceived as more creditworthy.

insuring against external shocks. The benefits are likely to take the form of reducing potentially sharp adjustment in policies or in financing requirements when external shocks occur, thereby enhancing the continuity of adjustment efforts. The cost of utilizing these markets include transactions costs, margin requirements, up-front premia, as well as the cost of establishing, maintaining, and supervising trading operations. Since indebted developing countries differ significantly in terms of their individual exposures to external shocks, and in their access to and degree of preparedness for, existing hedging instruments, it is to be expected that the techniques outlined in this paper will be more appealing to some countries than to others.

Among the issues that the Executive Directors may wish to consider in their interventions are the following:

1. Would use of market-related hedging instruments by indebted developing countries be a cost-effective means of maintaining adjustment momentum in the face of adverse unanticipated movements in international asset and commodity prices?

2. Do Directors view the use of hedging instruments as a potential useful addition to the market based menu approach to dealing with external debt problems?; and

3. If and how should the use of market-based hedging instruments be coordinated with other official hedging mechanisms? In particular, could the use of these instruments be a useful complement to contingency financing in the context of the Compensatory and Contingency Financing Facility?