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(List continues on the inside back cover)
Risk Management in Developing Countries

Stijn Claessens

The World Bank
Washington, D.C.
# CONTENTS

1. WHAT IS RISK MANAGEMENT? 1

2. RISKY ECONOMIC ENVIRONMENT 5
   - Sources of Risks 5
   - Risk Management and External Shocks 9
   - Traditional Risk Management Tools 11
   - Why Market-Based Instruments? 14

3. THE THEORY OF RISK MANAGEMENT 17
   - General Concepts 17
   - Measuring Risk Exposure 18
   - Integrated Analysis 19
   - The Institutional Structure 22

4. MODERN TECHNIQUES AND TOOLS 27
   - Forward Contracts 27
   - Futures Contracts 33
   - Option Contracts 39
   - Currency and Interest-Rate Swaps 45
   - Commodity Swaps 48
   - Commodity-Linked loans 50
   - Commodity Bonds 55

5. OVERCOMING SOME OF THE BARRIERS 59

6. ACTION PLAN FOR DEVELOPING COUNTRIES 63
   - Identification and Analysis of Risks 63
   - Legal and Institutional 63
   - Policy Paper 64
   - Awareness 64
   - Training and Education 64
   - Mock Trading and Presentations 65
   - Policies, Accounting and Control 65
FOREWORD

This document is part a series of publications by the International Economics Department of the World Bank, which aims to provide developing country decision-makers with practical guidance and tools in the area of asset and liability management. It draws upon the analytical and operational experience of the World Bank, and of other agencies that are active in supporting developing country policy makers in this increasingly important area. These publications will also constitute the essential background of future training and technical assistance programs in asset and liability management, some of which are being carried out under the auspices of a joint program with UNDP.

This particular Handbook focuses on Risk Management -- the use of hedging devices, such as futures and options, in order to reduce uncertainties in a country’s foreign exchange revenues or expenditures. This document is not a teaching aid per se, but rather a survey of the tools that exist, of circumstances under which those tools could be usefully employed, of instances in which they have been successfully used by developing countries, an indication of how to approach hedging operations, and suggestions to further their usage through changes in domestic regulatory regimes governing financial transactions.

The document’s design reflects its multiple audiences and purposes. The layout will permit readers to select their own level of interest in a particular subject while bypassing others. The general text is for those looking for an in-depth introduction to risk management, the concepts used and instruments available. Marginal summaries appear of all key points made in the discussion, so that policy makers, who do not need to access the detail contained in the general text, can nevertheless benefit from the document’s content.

We are grateful for the financial support of the Interregional Programme of UNDP, and for the support from the Research Committee and the Development Economics and Regional Vice Presidents’ offices of the World Bank. Our gratitude for their cooperation is also extended to those people in government and in the private sector in the various countries which have participated in the World Bank technical assistance programs and on whose experience this Handbook draws.

This Handbook has been prepared by Stijn Claessens, a Senior Economist in the Debt and International Finance Division. It draws extensively on work by Toshiya Masuoka, and joint work with colleagues in the International Economics Department, particularly Ron Duncan and Panos Varangis.
The Handbook has also benefitted from the comments and suggestions of an external reviewer, Mr. Georges Corm, as well as a number of colleagues within the World Bank group, particularly Jean-Francois Rischard, Lester Seigel, Masood Ahmed, Ron Duncan, John Underwood, Ron Brigish, Ramasastry Ambarish and Tom Klein.

Many thanks go to Cheryl Martin for putting the book into its final shape, to Vince McCullough for broad-ranging editorial assistance, and Heinz Rudolph for graphics production assistance.

D. C. Rao  
Director  
International Economics Department
ABSTRACT

This document aims to provide developing country decision-makers with practical guidance and tools in the area of Risk Management -- the use of hedging devices, such as futures and options, in order to reduce uncertainties in a country's foreign exchange revenues or expenditures. The document surveys the risk management tools that exist, the circumstances under which those tools could be usefully employed, the instances in which they have been successfully used by developing countries, and provides indications of how to approach hedging operations and suggestions to further their usage through changes in domestic regulatory regimes governing financial transactions.
1. WHAT IS RISK MANAGEMENT?

Everybody engages in risk management -- the homeowner in Florida, who must decide whether to insure his house against hurricane damage or bear the risk himself; the multinational corporation which needs to weigh the potential losses from exchange-rate fluctuations; and countries, where violent fluctuations in, for example, export prices can play havoc with balance-of-payments earnings projections and, so, long-term economic management.

Risk management is simply a way of insuring against an upset in future plans -- more precisely, for companies and countries, identifying the risks, how they may affect future cash flow and long-term plans, and deciding how best to insure against them. The greater the volatility of the variables, the more pronounced is the effect on balance-of-payments, export earnings, or cash flows of whatever kind. Risk management seeks to bring some certainty into planning by ironing out these fluctuations.

Modern risk management techniques have developed over the past 20 years in response to increasingly volatile interest rates, exchange rates and commodity prices. The demand came, initially, from multinational corporations and financial institutions, such as pension funds, whose revenues (and expenses) see-sawed with those ups and downs. International financial markets responded by developing such tools as futures, options, and swap contracts in currencies and interest rates. Later, came similar commodity risk instruments. The number of corporations using risk management techniques is growing but each seldom uses only one instrument or technique. A company usually enters into a number of financial transactions, with the overall objective of minimizing unexpected variations in future profits (or net cash flows) from changes in interest rates, exchange rates and commodity prices.

Risk management is the management of assets and liabilities to minimize adverse changes in future cash flows from external shocks. Such hedging is not speculation. It is a form of insurance which brings some certainty to such things as balance-of-payments and export earnings.
The importance (and desirability) of risk management has been widely recognized in industrialized countries, but, in the developing world, its application has been limited. This is partly because there are barriers (which in some countries are formidable) to the introduction of risk management techniques. Yet, many corporations in developing countries face identical risks and could benefit from hedging them. So, too, could governments in their economic management and planning. Risk management can complement medium-term structural adjustment because it can, say, lock in future export prices at a fixed (and known) level and so reduce unanticipated deviations from initial projections of major economic variables.

Hedging, however, does not mean consistently lower debt service payments, higher interest receipts, higher export prices or lower import prices. Hedging is a trade-off of moderate and predictable current cost against future factor price movements which could produce windfalls or large losses. Whether the hedge has avoided losses or gains to the economy depends on the (ex post) trend in international factor prices, which cannot be anticipated.

Although better external risk management can help developing countries in their economic management, it can be done effectively only when some key conditions are fulfilled. The financial techniques are sophisticated and, if used inappropriately, can be costly. A country undertaking risk management should have sound overall economic management, including the ability to project, manage and record balance-of-payments and external financing flows.

Even so, the number of developing countries using modern risk management techniques is growing. For example, it is estimated that more than 25 percent of the funds raised in 1989 on international capital markets by 16 developing countries incorporated some form of risk management -- a more than twofold increase over 1988. And while participation by developing countries in futures exchanges has been small so far, on some U.S. exchanges such as livestock products and currencies, developing countries could benefit from risk management, but, if risk management tools are used inappropriately, they could be costly.
countries represent between 15 and 25 percent of total foreign participation. They included Eurodollar futures contracts (Chile), oil price hedging (Mexico), currency and interest rate swaps (India and Thailand), currency options (India, Indonesia, and Turkey), a loan with a copper swap (Mexico), and one with oil options (Algeria).  

1. See World Bank (1990), _Quarterly Review of Financial Flows to Developing Countries_, March.

2. Precise pricing information is not available for some of these transactions, partly because the complete terms were not made public.
2. RISKY ECONOMIC ENVIRONMENT

Sources of Risks

Developing countries are vulnerable to sudden changes in exchange rates, interest rates and commodity prices because many have large (nondollar) debts, much of it variable interest rate, and a dependence on (primary) commodity exports and imports. These prices will continue to influence many countries' balance-of-payments, debt indicators and macroeconomic performance and the economic performance of individual projects.

Although many developing countries would benefit from better risk management, it is a complex exercise. There are many different elements concerned with the management of currency, interest and commodity price risks on assets (reserves), liabilities, export earnings and import expenses. First, what are the sources of risk and nature of exposures in developing countries?

Currency risks. Exchange rate volatility, which had increased since the movement to floating exchange rates in the early 1970s, has not diminished in the 1980s (Figure 1).¹

Figure 1

Risk management involves the management of currency, interest rate and commodity price risk, all external prices which influence a country's balance-of-payments and macroeconomic performance, as well as debt indicators.
For developing countries, the aggregate share of nondollar debt has increased by roughly 13 percentage points since 1981, due partly to the decline of the dollar since 1985, and partly to the increased borrowings in nondollar currencies. So, with a large nondollar debt stock (about 55 percent of all developing countries' debt), debt service in dollar terms for some countries is highly sensitive to cross-currency exchange rates.

Interest rate risks. Part of developing countries' debt servicing problems in the 1980s can be traced back to the high (real) interest rates in the late 1970s and early 1980s (Figure 2). Then, much external debt (including short-term debt) was variable rate -- for example, 78 percent of Latin American and Caribbean debt in 1980. Sharp interest rate rises meant large increases in debt service. Exposures to interest rate changes have been reduced for some developing countries, in part due to less new commercial borrowing in the 1980s, and, more recently, because of Brady agreements, where commercial debt has been converted to fixed rates. However, for all developing countries variable rate debt as a fraction of total debt has increased by about 3.5 percentage points since 1980 (see Table 1).

Debt service in many developing countries has been, and remains, highly sensitive to changes in exchange rates and/or interest rates because much of the debt is variable rate serviced in dollars.

Figure 2

![Nominal Interest Rates, 1965-1992](image-url)

*Based on six month US dollar LIBOR*
Table 1

<table>
<thead>
<tr>
<th>Variable Rate PPG Debt as a Share of Total PPG Debt</th>
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<tr>
<td>World</td>
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<tr>
<td>Latin America</td>
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<td>Africa</td>
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<td>Asia</td>
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<td>EMENA</td>
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Note: PPG stands for Public and Publicly-Guaranteed Debt; EMENA stands for Europe, Middle East and North Africa.

For many countries the share of variable rate debt has been growing -- for example, for Indonesia by 15 percentage points since 1980. Also, in absolute terms, the interest exposure of developing countries remains large. A one percentage point change in international interest rates implies an absolute change in total debt service of about $6 billion, equivalent to about 10 percent of total aggregate resource flows in 1990 -- that is, debt, other portfolio flows, official development assistance and foreign direct investment flows combined. Moreover, this trend towards variable rate debt will continue as official debt (mostly fixed-rate) is reduced and countries rely more on commercial financings.

Commodity price risks. Just as volatile have been commodity prices (Figure 3). The behavior of real commodity prices, that is, deflated by the unit value of developing countries' imports, is similar.

Part of the volatility can be explained (ex post) by shifts in demand and supply factors, but the fluctuations resulted (ex ante) in large risks. Changes in individual commodity prices were even more marked (see Figure 4). Some commodity prices have fluctuated over the 1980s by between 50 percent and 170 percent of their average value.
Many developing countries are heavily exposed to commodity price fluctuations because of their dependence on commodities, imports as well exports. For 89 developing countries in 1984-88, nonfuel primary commodity exports were 51 percent of total exports — or 23 percent of gross domestic products (GDP). Including fuel, they were 28 percent of their GDP. Earnings and expenditure of developing countries, dependent on commodity exports and imports (especially oil) are vulnerable to commodity price fluctuations.
On the import side, crude oil and refined oil products are the most important commodities. In 1989, oil imports accounted for about 14 percent of total imports of non-oil producing countries (and in 1990 for as much as 25 percent). And for 56 of the same 89 developing countries, more than 10 percent of imports were fuels in 1984-88.

Although many developing countries have reduced their dependence on primary commodities over the past five years (by about 27 percentage points), absolute exposures remain large. For example, a $1 movement in the price of oil still implies a change in expenditures for oil-importing developing countries of about $2.5 billion.

Risk Management and External Shocks

Risk management is the management of a country's (or a project's) assets and liabilities to minimize adverse changes in future net cash flows arising from external shocks. Anything that generates inflows of cash is an asset, while anything resulting in outflows of cash is a liability. Thus, export earnings are dividends on assets, or revenues from the sale of assets. By the same token, imports are liabilities. Some assets and liabilities are tradable, e.g. foreign exchange reserves, while others, e.g. exports, are not.

The asset and liability structure can be altered directly by changing the amounts of assets or liabilities in the balance sheet, and indirectly through hedging instruments that change the characteristics of the returns on those assets and liabilities. For instance, a country can improve the risk characteristics of its assets and liabilities by holding adequate foreign exchange reserves or by borrowing in appropriate currencies. Or it can do it by transactions in futures and swap markets. How the asset and liability structure can be changed depends to a large extent on whether it concerns tradable or non tradable assets and liabilities.
Risk management is really about the sharing of risk -- that is, the transfer of risk to the international financial markets. This involves a protection against some or all downside risk in exchange for giving up some or all upside potential. Why is this transfer of risk (or hedging) attractive to a developing country?

Most developing economies are less diversified than developed ones. Consequently, an adverse external shock can affect a developing country relatively more and create more output loss than for a developed country. It is, therefore, sensible to transfer risk to developed countries since, at an appropriate price, both can gain. Moreover, developing countries are less able to profit from speculating on movements in international prices (interest rates, exchange rates, commodity prices) because of human resource limitations. They should therefore concentrate on hedging.

External shocks can mean balance-of-payments adjustments and, so, adverse repercussions, such as reduced creditworthiness in international financial markets, a reduction in domestic and external confidence, and the reallocation of factors of production. All make economic management more difficult. This can be aggravated by a tendency of governments and international financial markets to consider a positive terms-of-trade shock as permanent (which can result in a procyclical rather than a smoothing policy when the shock is, in fact, temporary) and a negative shock as temporary (which can result in an unsustainable policy when the shock is permanent). Therefore, temporary shocks can distort investment and resource allocation decisions.

Adverse external shocks can also affect the financial and economic viability of individual projects. They were often the cause of derailed projects and also programs (including those of the IMF and World Bank), as they weakened the ability of governments to manage the economy (see Box 1).
Even though many of the effects of external shocks are contemporaneous and initially limited to particular sectors of the economy, such shocks have significant effects on the broader domestic economy over time. Take the increase in real interest rates in the late 1970s. It was partly responsible for the debt crisis that hit many countries in the 1980s. Certainly lower GDP growth in the 1980s for developing countries partly stemmed from it.\(^5\)

Moreover, the Dutch (or "Nigerian") disease showed that even beneficial terms-of-trade movements had, over the long run, negative effects for other sectors of the economy, often led by an appreciation in the real exchange rate.\(^6\) For example, a terms-of-trade increase (which may prove to be temporary) could inhibit or halt diversification out of commodities into other sectors. Thus, managing windfall gains (even avoiding them) would assist macro-economic management.

**Traditional Risk Management Tools**

Why use modern risk management techniques and not traditional tools? In the past, developing countries have used other risk management mechanisms: borrowing, securing contingent (or compensatory) finance, building up reserves; stabilizing international prices of commodities; insulating the domestic economy, or sectors of it, through domestic price stabilization, export diversification, or other means. All have shortcomings.

**Borrowing and contingent finance**, which includes compensatory finance (the Compensatory and Contingency Financing Facility of the IMF and the STABEX system of the EC), will always be an integral part of a risk management. However, (contingent) finance is not a tool for *ex ante* risk management and, anyway, its availability is limited and uncertain. Access to international credit tends to move procyclically with a country’s general external economic situation, and so, little smoothing is obtained. In general, because of creditworthiness perceptions, financing is least likely to be available when needed most.\(^7\)
Box 1: IMF and World Bank Experience

Unforeseen external developments in 125 IMF standby and extended arrangements (approved in 1982-87) showed that the average adverse deviation was 3 percent of GDP and primarily due to weaker than expected export prices and volumes. The net shortfall in external position translated at times into a significant deterioration in the fiscal position. Since the scope for quick and full offsetting measures was limited, it was difficult to achieve original program objectives or to comply with the performance criteria of IMF arrangements. Many program interruptions were typically dealt with through waivers or modification.

The World Bank Adjustment Lending Report (1990) noted that external factors are the most common cause of lack of success of programs. An Operations Evaluation Department review (1986) was made of 36 Country Economic Memoranda (CEMs) and 74 Structural Adjustment Reports (SARs) for the agriculture, industry and energy sectors. Of the 36 CEMs, only 2 explored the sensitivity to commodity price fluctuations. Of the 74 SARs, only about 10 percent considered the impact of fluctuations in agriculture, power and energy prices. These findings resulted in an operational policy changes that recommended that "sensitivity analysis is essential both in project evaluation and macroeconomic projections when commodity prices play an important role". Project and program performance would likely have been better with more explicit risk management. The limited attention given in project appraisal to the assessment and management of risk is also verified by a recent International Finance Corporation (IFC) report on the poor performance of IFC agricultural lending.

Building up reserves in times of advantageous terms-of-trade has been used, for example, by the Mineral Resources Stabilization Fund in Papua New Guinea, the Copper Stabilization Fund in Chile (Box 2), and by Mexico and Venezuela in the wake of windfall oil gain following the Gulf crisis. But these are essentially self-insurance, and therefore costly for a country with limited access to foreign savings.
Box 2: Chilean copper stabilization fund

The Chilean Copper Stabilization Fund (CSF) was set up in 1985 as part of the Chilean Government’s structural adjustment program with the World Bank. The CSF aims to stabilize export revenues by using foreign exchange reserves to absorb cyclical variations in revenues, that is, it promotes the role of precautionary savings. Under the CSF agreement, the Chilean Government deposits surplus revenues from the parastatal copper producer with the Central Bank; it can withdraw these funds in case of a shortfall in export revenues. A price band is defined around a reference price and when the actual price is above the reference price band, the scheme mandates a deposit of a proportion of the excess revenues (and, correspondingly, when the actual price is below the reference band, a withdrawal can be made). Surplus funds are viewed as international reserves. As copper prices remained high in the late 1980s and surpluses grew, the accumulated reserves were used in 1989 to buy back part of Chile’s external debt and to deal with an unexpected fall in export earnings (the "poisoned grapes" crisis).

International commodity agreements, quasi-cartels which attempt to stabilize international prices, have proved to be unworkable or counterproductive. This is because intervention prices have not been set consistent with long-run supply and demand forces, and enforcement is difficult (evasion by signatories and "free-riding" by third parties). Currently, only one agreement (on natural rubber) is in effect.

Domestic price stabilization schemes, which aim to minimize the impact of international price fluctuations by stabilizing either domestic (local currency) prices or export revenues (or import expenditures), have often been used in developing countries. However, for many schemes, actual objectives have differed greatly from stated objectives and domestic prices have adjusted too slowly to international prices, increasing the costs of maintaining the schemes. Their success in providing price stability over long periods has been poor. Export diversification has the disadvantage that it takes a long time to achieve.
Why Market-Based Instruments?

Compared with traditional risk management, market-based instruments offer many advantages. They are able to hedge (or smooth) exposures without substantial resources (for example, subsidies, reserves, finance for stockpiling) or distortions. Some can provide hedging benefits over long periods. They rely on markets to determine their terms, specifically world market expectations of future prices, and thus reduce the need for subjective price forecasts. And, finally, they shift the risk from developing countries externally, to consumers, producers, or speculators in industrialized countries.

Because of the comparative advantage of developed countries in carrying risks, the insurance value of hedging can be obtained at low cost. The risk is borne by the party most able to do so, and these instruments may carry a lower cost than traditional, commercial financings because of the increase in creditworthiness from a better match between debt obligations and ability to service debt. Witness the financing for a Mexican copper mine linked with a hedging transaction (see page 52). However, the average price received will not necessarily be higher (or the price paid lower) than without hedging: that will depend on the (ex post) trend in prices, which cannot be anticipated.

Market-based instruments are cheaper and more effective than traditional risk-management tools and techniques....

...but they protect against downside risk only by foregoing some upside potential.
Risk management involves smoothing the impact of shocks, favorable as well as unfavorable. It can only protect against downside risk in exchange for some current costs or by giving up some upside potential. Risk management may thus be perceived to have a "cost", either an upfront cash outlay (when buying options) or a future opportunity loss (when the advantages of more favorable external circumstances will not materialize because prices are locked in). In the long run, modern risk management will not lead to higher or lower returns (although, if creditworthiness is enhanced, borrowing costs may be lower), and in some periods a country could have been better off not using it. Risk management is, however, a tool for better management, planning and budgeting, all of which can enhance a country's credit standing. As an official of the Mexican Finance Ministry said, regarding a decision to hedge oil exports: "It is extremely important for us that investors know that, no matter what happens to the price of oil, the economic program is on for 1991. Regardless of what happens, we have got US$17 a barrel ... and there's enough in the kitty."10

Because it means better economic management, planning, and budgeting, risk management can enhance a country's credit standing.

1. The weights used to create the index of effective exchange rates are the IMF weights. Exchange rate volatility is calculated as the Coefficient of Variation (CV) of the effective exchange rates over the preceding 24-month period.

2. The (nominal) interest rate is the London interbank offer rate (LIBOR) on six-month U.S. dollar deposits (period averages in percent per annum) on which much commercial bank debt is indexed. Interest rate volatility is measured as the Coefficient of Variation over the preceding 24 months.

3. The largest changes have occurred for Mexico and Venezuela: Brady agreements reduced the share of variable debt for Mexico from 78 percent to 51 percent and for Venezuela from 82 percent to 58 percent.

4. The figure plots the commodity price volatility as the coefficient of the variation of the IMF index of 34 nonfuel commodity prices in the preceding 24 months.


6. Also, especially when there are long lags in adjusting factors of production, such as in minerals and tree crops, uncertainty will tend to deter investment and production. Economies heavily dependent on a single commodity often have difficulty therefore in diversifying into other commodities as the uncertainty about the price of the predominant commodity tends to introduce exchange rate uncertainty, which deters investment.

8. Examples of price stabilization schemes include stabilization of wool prices in Australia and of agricultural prices (cocoa, coffee, cotton, copra) in Côte d'Ivoire, Nigeria and Papua New Guinea.

9. Other costs are lower too (see further Chapter 5).

3. THE THEORY OF RISK MANAGEMENT

General Concepts

In industrialized countries, techniques of modern risk management were initially used by financial institutions to control unexpected downturns in net interest income due to changes in interest rates. The notion was later expanded to include exchange rates and commodity prices, and was increasingly used by non-financial firms.

In developed and developing countries alike, any assets, enterprise, investment project or country is exposed to price risks, and investment planning always involves assumptions about price movements. Risk management analysis quantifies the sensitivity of an investment (or macroeconomic performance) to price changes, and suggests appropriate hedging actions to alter that level of sensitivity.

Risk management involves:

1. Identifying an objective function -- that is, a measure of performance;
2. Identifying and measuring risk exposure in relation to the objective function (or measuring the sensitivity of performance to unexpected changes in prices);
3. Deciding on an acceptable degree of risk exposure (or deciding on the degree of risk exposure to be hedged);
4. Choosing and executing hedging transactions.

For developing countries, risk management quantifies the sensitivity of performance to price changes and suggests appropriate hedging actions to alter the level of sensitivity.

The first steps in risk are to decide on a measure of a country's economic performance; identify and quantify risk in relation to that measure; decide how much of the risk should be hedged; and, finally, hedging it.

For a company an objective function may be net profit from operations. Net profit fluctuates over time due to various factors, including investment strategy, competition and international prices, including currency and interest rates, and commodity prices. The risk manager then divides the possible fluctuations into those related to movements in financial prices and those unrelated. The first are financial risks and can be hedged with financial instruments. The second cannot and remain part of the company's general commercial risk.
An objective function for a country is defined here in a simple way (but in practice, it will need to be more specific).\footnote{1} This simple approach uses targets, such as a country’s net foreign receipts and import costs, that need to be hedged. It is implicitly assumed that the country does not take a view on price movements of a particular asset or commodity, (that is, does not try to "beat the market" by speculating) and that it focuses on minimizing risk given the expected value of future cash flows. It is also assumed that the fraction of tradable assets and liabilities out of total assets and liabilities is small. Consequently, hedging the market values of tradables is much less important than hedging the cashflows of nontradables.\footnote{2}

**Measuring Risk Exposure**

Cash flows can be analyzed in terms of a country’s whole economy or by subsectors, such as the government budget, the central bank’s accounts, state enterprises, private firms or individual projects. Practically, cash flows to and from the country can be estimated by reclassifying items in the balance-of-payments data (for example, the composition of currencies and commodities) or by analyzing cash flows of individual entities or projects. Alternatively, cash flows can be looked at in two ways: external debt service requirements (cash required to service external debt on schedule), and the country’s ability to service that debt (export earnings and so on, net of import costs).

Two basic measurements can be used to obtain a country’s risk exposure: one based on historical data, and the other based on projections or simulations.

The first approach aims at drawing useful relationships between net cash flows and risk factors usually by means of (multivariate) regression, other econometric analyses or from historical patterns. If done econometrically, the risk exposure of each risk factor is then measured by the covariance between the cash flows and the risk factor, relative to variance of the cash flows (that is, the regression coefficient).\footnote{3} Put simply, the risk exposure is the change in cash flow for each unit change in financial prices. This approach does not, however, take...
into account future changes in the country's economic structure. The second approach (simulation) does, also projecting cash flows based on varying assumptions about future price movements. The statistical estimates of the variability of net cash flows then represent the exposures, but the quality of the analysis is largely dependent on the validity of assumptions about future events. In practice, both approaches are usually carried out and results are compared to check plausibility.

Integrated Analysis

In many cases, the exposure of individual enterprises is a straightforward calculation. For example, the exposure of an enterprise which exports commodities will be the physical amount of commodities expected to be exported in a given period. Or the exposure of an enterprise to interest rate risks may be equal to nominal floating-rate debt. However, where there are several risks, they cannot be tackled separately. Ideally, a country's overall external risk management strategy (covering currency and interest rate, and commodity exposures and new borrowings) should be integrated. Why? The price risks will often be correlated; common financial instruments are applicable to exposures from commodity prices, exchange rates, interest rates; and common conceptual problems arise in those exposures. Also, there may be an inverse relationship between export price and volume (for instance, in the event of crop failure by a large producer), which would make conventional hedging unwise.4

The need for an integrated analysis is clearest in the case of hedging the effects of currency and interest rate movements on a government's overall debt service. Start with interest rate risk. It is tempting to look at variable-rate debt (that is, debt, including short-term debt, indexed to LIBOR or another international rate) as a single risk, based on nominal debt only. Not so. If nominal interest rates rise because of a worldwide (expected) increase in inflation, and real interest rates are constant, then borrowing at a floating rate may provide a good match between (nominal and real) debt service and debt servicing capacity.
since nominal debt service capacity (broadly, export prices) will also rise in line with inflation. Borrowing at a fixed rate would not be wise, since the real rate would rise when inflation (and debt service capacity) falls, and vice-versa. However, if real interest rates fluctuate because nominal interest rates fluctuate (that is, expected inflation is not reflected one-to-one in interest rates), then with floating interest rates the borrower takes on some real interest rate risks, while with fixed interest rates the lender does.\textsuperscript{5}

This implies that LIBOR and export prices needs to be analyzed jointly. Since there is only a weak relationship between export price changes and LIBOR, there has been wider swings in real interest rates (that is, LIBOR minus the change in export unit value for non-oil exporting developing countries) than in nominal rates (Figure 4). Individual developing countries may, therefore, have had a (short-run) exposure to real interest rate movements.

Figure 4

But there is no market-based instrument to hedge real interest exposures.\textsuperscript{6} Would hedging nominal exposure be appropriate? Possibly, if there is little offset (or natural hedge) between LIBOR and commodity price movements. (In general, LIBOR and commodity prices and earnings have a low or negative correlation.)

In practice, hedging nominal interest exposures is equivalent to hedging real interest exposure.
Then, nominal interest rate changes translate one-to-one to real interest rate changes. So, in practice, hedging nominal interest exposures is equivalent to hedging real interest exposure.

Integrated analysis is also required in currency risks. For many countries, the composition of debt appears to be imbalanced, with a large share of nondollar debt. In fact, whether it is or not depends on the composition of net foreign inflows available to service the debt. Many developing countries' inflows are from commodity exports and are often denominated and received in dollars (oil, for example), or are dollar-linked in the short run. Cash outflows for imports are likely more diversified. When the currency composition of net trade (exports minus imports) is greatly different from the currency composition of debt, then the country may have an imbalance and so an exposure to exchange-rate risks.

Another comparison for assessing currency risks could be based on trade direction -- that is, export destination and import origin. There will be less exchange-rate risk where a developing country matches exports to creditor nations with the currency composition of debt -- because it is, essentially, matching debt service obligations and capacity to pay.

Demand factors can also influence the relationship between prices and exchange rates. These are most relevant for primary commodities, prices of which (almost always quoted and paid in U.S. dollars) are negatively related to the value of the U.S. dollar -- demand from nondollar sources falls as the dollar rises, and rises when the dollar falls. This implies that non-U.S. dollar borrowings provide some hedging potential for a primary commodity exporting developing country, because, as commodity prices fall, so do nondollar exchange rates, and vice versa.

These considerations, particularly the possible relationships between exchange rates and terms of trade...
(commodity prices), make the determination of the desired currency composition more difficult. Often an integrated analysis (including econometric estimation) is required. This has been done for some countries (Papua New Guinea, Colombia, Mexico, Brazil, Indonesia, Turkey) and they show that there are some relationships between exchange rates and prices. These, however, may be weak and unstable over time.

In practice, accounting for all possible interrelations and working out a comprehensive risk management strategy for a country may not be feasible. Useful progress can be made, however, by encouraging private businesses and public-sector enterprises to adopt available instruments. Then it will be necessary to look at how risks are allocated within the economy.

**The Institutional Structure**

In developing a risk management strategy, it is necessary to analyze domestic institutional structures, for example, the one governing a commodity's production, marketing and export, the one determining foreign exchange allocation and conversion, or the one governing the allocation of external debt receipts and payments. This is important because it determines how the impact of international price changes is distributed among various parties in the domestic economy -- financial institutions, state enterprises, exporting or importing firms, final producers or users (either directly or indirectly through changes in support prices), government tax revenues, marketing boards' profits (for example, if the domestic local currency price is guaranteed), other intermediaries, and the government.

The mechanisms determining the distribution (of the impact of price changes) include the foreign exchange system, the structure of the domestic financial system, (government's) internal budgeting procedures, taxes, tariffs, subsidies, quotas, price stabilization schemes, and the market structure of competition. This implies that measurement of exposures of individual entities may, in practice, be complicated. Also, the needs and capabilities of the various parties have to be taken into account in
devising risk management programs. Let’s look at the coffee sector in Costa Rica, with the interplay of exporters, millers and producers (see Box 3).

The institutional structure determines not only the distribution of coffee price risks, but also foreign-exchange risk, legal and regulatory constraints, taxation, political constituencies, and so on. It was found that an appropriate strategy for risk management for Costa Rica should include not only use of financial instruments by the exporters and millers, but also institutional changes.

Indeed, analysis of the domestic institutional structure is important for understanding the effects of market failures and policy-induced distortions on risk management. Where private-sector access to international financial markets is limited (for example, by exchange controls) domestic hedging instruments may develop. In Brazil, for example, the domestic marketing structure and regulations make the use of international financial instruments difficult. As a result, commercial banks have issued short-term certificates of deposit linked to domestic commodity prices, which serve as hedging devices. This does not, however, insulate the economy from external commodity price shocks.

Hedging by one entity (or enterprise) usually has implications for the design of risk management by others, among whom the risk is distributed. For example, a large domestic exporter hedging commodity price risks by selling futures may render it unnecessary for the government to hedge its corresponding (profits or export) tax revenues. Here, the domestic exporter is the (so-called) preferred party, performing the risk management activities for their own and others’ benefit.

The preferred operator of a risk management scheme will depend on the institutional set-up, the sophistication of domestic financial markets, private-sector access to foreign finance, and domestic market failures or policy-induced distortions. In many cases, risk managed by the private sector will lead to a stabilization of government tax revenues and the overall economy, especially when distor-
tions are minimal. Where government is the risk manager, a careful analysis of market failures will be needed.

Box 3: Distribution of commodity price risks in Costa Rica's coffee sector

Who would benefit from risk management in Costa Rica's coffee sector? Almost everyone. The three most important players, however, are the producer, the miller and the exporter.

The exporter faces price risk between buying from the miller and selling to a foreign buyer (either of which, buying or selling, may occur first). During this time, which averages 30-45 days, the exporter absorbs all price movements, whether favorable or unfavorable. Because exporters work on low margins (typically, 1.5-2.5 percent), their profits can disappear even with small adverse movements in international prices.

The miller pays the producer an advance (about 60 percent of value, based on current prices) when the crop is delivered to the mill. At the end of the crop season, the miller receives payment at the final local currency price (the "precio rieles") from the exporter, subtracts the allowed margins, costs, and production tax, and pays the remainder to the producer. The miller is exposed to price risk on two counts. First, the profit depends on the level of the "precio rieles". Second, the legal system in Costa Rica prevents millers from recovering advances to the producer. With a high advance, the millers may not be able recover advances at the end of the crop year, if prices drop sharply; and with a low advance, a miller may lose business to competitors.

The producer bears most of the price risk -- about 70 percent over the marketing year. Only at the end of the crop year does the producer know the final price realized, although an insurance (of sorts) is the initial advance.

However, two other parties are exposed -- the government, through export taxes and profit taxes on millers, and the coffee sector regulatory body which derives its revenues from a 1 percent export tax.

A strategy for risk management could, therefore, include not only financial instruments for exporters and millers (the parties best able to use these tools), but also institutional changes -- for example, deepening domestic markets by introducing fixed price contracts -- that allow the benefits of risk management to reach the producer.
Even if the ideal in risk management is years away for a developing country, there are still huge benefits to be had from moving towards that ideal. Most countries undertake risk hedging incrementally. Often, the hedging instruments needed are not available to developing countries. Even if they are available, the market may not be active or accessible to the extent desired (because of, say, creditworthiness concerns). In this case, the aim should be to move toward the best possible situation and the risk analysis should identify the major contributing factors to risk. This will enable decision makers to carry out the most useful incremental hedging transactions. It is, thus, important to analyze the constraints on hedging transactions to reveal the best risk structure attainable under the circumstances.

Flexibility is also needed. Because there is no perfect model to measure risk exposure, estimates may turn out to be wrong and hedging activities already in place may become obsolete or even harmful. Modern techniques, using such instruments as futures and swaps, are more flexible than conventional techniques. Indeed, adjustments to the currency composition and maturity structure of external debt can be changed almost daily.

Whether the risk management schemes are run by the private or public sector will depend on a country's institutional set-up, the sophistication of domestic financial markets, private access to foreign finance, and domestic market failures or policy-induced distortions. Risk management by the private sector often will lead to steady tax revenues and a stable economy, especially when distortions are minimal. Even if the ideal in risk management is years away, there are still huge benefits from moving towards that goal.

1. A country's objective function may be defined generally, for instance, in terms of a social objective function (such as a utility function defined with respect to the country's consumption) which the country will seek to maximize. For some papers which use a more general objective function see Provolos and Duncan (1991) and Claessens and Duncan (1993).

2. For companies in developed countries, especially financial intermediaries, hedging market values is much more important than hedging cashflows as a much larger fraction of assets is tradable. In case of developing countries, foreign exchange reserves are generally the only tradable asset. Liabilities can, in general, only be changed at great difficulty.


4. External shocks may affect quantities as well as prices. Asset and liability management, however, cannot eliminate quantity risks such as an export shortfall, but can adjust price management for the interaction between price and volume.

5. In addition, the long-run effect of interest movements can be different from the short-run effect. A nominal interest increase that is matched by an inflation increase can still create a liquidity problem (and possibly debt servicing difficulties), especially for a country that is credit constrained. Consider the case where the nominal interest rate goes up from 8 percent to 10 percent because of a rise in general, long-run inflation of 2 percentage points (real interest rates remain thus constant). Assume that the debt-to-export ratio is 100 percent and that all debt is on a variable
interest basis. The rise in interest rates will not cause net real wealth of the borrower—the NPV of export earnings minus the NPV of debt service—to change, since the real interest rate and real exports earnings will remain constant. It will cause, however, the nominal interest bill to rise by 25 percent. Initially, nominal exports will increase little (by only 2 percent in the first year) and the interest-to-export ratio will thus rise from 8 percent to 9.8 percent (10/1.02), a significant increase in the short-run cash flow burden. Over time, the debt service capacity will go up by the rate of inflation, and since the real interest rate has not changed, there will be no increase in the long-run debt servicing burden.

6. Part of the real interest rate exposure can be hedged by hedging commodity price risks.

7. The correlation between developing countries' terms of trade and interest rates has been found to be empirically insignificantly different from zero or slightly negative.

8. The elasticity has been estimated to be between 0.75 and 1.00. This is, however, a long-run relationship and may not manifest itself in the short run. This relationship does not exist for the oil price.
4. MODERN TECHNIQUES AND TOOLS

What are the characteristics and mechanisms of financial instruments for risk management, particularly the more recently developed financial instruments? Here, forward and futures contracts, options and swaps are described (see Table 2), and examples given of simple risk hedging using these instruments. There is also a more detailed look at instruments for hedging commodity price risk, especially commodity swaps and commodity-linked financing. Also presented are examples of their use.

**Forward Contracts**

A forward contract is an agreement to buy (or sell) an asset at a preset price on a future date. At maturity, if the actual price (spot price) is higher than the contracted price, the forward buyer makes a profit. If the price is lower, the buyer suffers a loss. The payoff to the seller is the opposite to that of the buyer.

Forward contracts are often used to hedge the risk of holding a certain asset (or liability). This so-called "forward cover" allows the owner to fix the revenue from the future sale of the asset at the time the contract is made, "locking-in" the price. For example, assume that an exporter's major market is in Germany, export revenues are denominated in deutsche marks (DM) and the current exchange rate is 2 DM to the dollar. The exporter has taken out a US$1 million loan from a U.S. bank to be repaid in six months when the exporter will receive DM 2 million from the sale of delivered goods. If the DM depreciates in the meantime (say, to 2.2 DM to the dollar), the exporter faces repayments on the loan that are larger than his receipts. He can hedge the exchange-rate risk with a forward contract. The current DM/$ forward rate for the six-month contract is DM 2.0/$. The exporter purchases a forward contract to sell the DM 2 million for US$1 million at the end of the six months, thus locking-in the amount of the export revenue at today's forward exchange rate.
<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Financial Instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward</td>
<td>An agreement to purchase or sell a given asset at a future date at a preset price.</td>
<td>No cash transfer is needed at the beginning. Cash transfer occurs only at maturity.</td>
</tr>
<tr>
<td></td>
<td>Transactions are made mostly through brokers by telephone and telex.</td>
<td>Credit risk is involved.</td>
</tr>
<tr>
<td></td>
<td>A typical use is for locking-in a future price.</td>
<td>Tailor-made contracts are available for specific hedging needs.</td>
</tr>
<tr>
<td>Futures</td>
<td>An agreement to purchase or sell a given asset at a future date at a preset price.</td>
<td>Contracts are available primarily for short-term maturities (up to one year).</td>
</tr>
<tr>
<td></td>
<td>Transactions are made in formal exchanges through clearinghouse systems.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contract terms (amounts, grades, delivery dates, etc.) are highly standardized.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Profits and losses are settled daily, requiring daily cash flows.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Margin (collateral) money is required at the beginning.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A typical use is for locking-in a future price.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>An original position can be closed or reversed easily and quickly.</td>
</tr>
</tbody>
</table>
Table 2 (cont.)

Financial instruments used in hedging

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Financial Instruments (cont.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>- The right to purchase or sell a certain asset at a preset price on (or before) a specified date.</td>
<td>- A buyer or an option contract can limit the maximum loss, but keep open the opportunity to take advantage of favorable price movements.</td>
</tr>
<tr>
<td></td>
<td>- Transactions are made both through brokers by telephone and telex and in formal exchanges.</td>
<td>- A buyer has to pay a premium (cost of option) up-front.</td>
</tr>
<tr>
<td></td>
<td>- A typical use is for setting a ceiling or floor for prices.</td>
<td>- A buyer faces a seller's credit risk. (A buyer has the right; a seller has the obligation.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tailor-made contracts are available for specific hedging needs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Contracts are available primarily for short-term maturities.</td>
</tr>
<tr>
<td>Swap</td>
<td>- An agreement to exchange specified cash flows at fixed intervals.</td>
<td>- No cash transfer is needed at the beginning.</td>
</tr>
<tr>
<td></td>
<td>- A series of forward contracts lined up on a schedule.</td>
<td>- Credit risk is involved.</td>
</tr>
<tr>
<td></td>
<td>- Transactions are made through brokers by telephone and telex.</td>
<td>- Tailor-made contracts are available for specific hedging needs.</td>
</tr>
<tr>
<td></td>
<td>- A typical use is for locking-in future prices for a long period.</td>
<td>- Contracts are available for medium- and long-term maturities (one to ten years).</td>
</tr>
</tbody>
</table>
### Table 2 (cont.)

**Financial instruments used in hedging**

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ii) Commodity-Linked Instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commodity Swap</td>
<td>A swap contract on a certain commodity. An agreement to pay a pre-fixed amount of cash in exchange for a variable amount of cash at fixed intervals, or vice versa. A variable amount of cash is determined by the market for a set quantity of a commodity. A fixed amount is based on a fixed price for the same quantity of the commodity.</td>
<td>No deliveries of physical commodities are involved. Transactions are purely financial, as the other swap contracts (see the swap section above for characteristics of swap contracts in general). The markets are not very active, except for energy and minerals.</td>
</tr>
<tr>
<td></td>
<td>- Contracts are provided by international banks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- A typical use is for locking-in a price of a commodity for medium- and long-term.</td>
<td></td>
</tr>
<tr>
<td>Commodity-Linked Loan</td>
<td>A loan in which interest and/or repayment amount are linked to the market price of a certain commodity.</td>
<td>A loan can be regarded as effectively denominated in a commodity.</td>
</tr>
<tr>
<td></td>
<td>- A loan can be viewed as a combination of a conventional fixed-rate loan and a commodity swap contract.</td>
<td>Credit risk of the loan is lower than that of a conventional loan, if used by a commodity producer. A producer can repay the loan even if the price of the commodity falls significantly.</td>
</tr>
<tr>
<td></td>
<td>- These loans are provided by international banks.</td>
<td></td>
</tr>
<tr>
<td>Commodity-Linked Bond</td>
<td>(Forward-type) A bond in which coupons and/or principal are linked to the market price of a certain commodity.</td>
<td>(Forward-type) Characteristics are similar to commodity-linked loans.</td>
</tr>
<tr>
<td></td>
<td>- (Option-type) A bond to which the right to buy or sell a certain commodity at a preset price is attached.</td>
<td>(Option-type) This type is often useful for commodity producers to reduce the cost of financing.</td>
</tr>
<tr>
<td></td>
<td>- These bonds are underwritten by international banks.</td>
<td>The bonds have been issued primarily on gold and oil. Some are available for silver, copper, and nickel.</td>
</tr>
</tbody>
</table>
This example shows two important characteristics of the forward contract. First, no cash transfer occurs up-front. The exporter is obligated to deliver the DM at maturity, but pays no money except for transaction fees. Second, forward contracts involve a credit risk. What if the counterparty to the forward transaction fails to deliver the U.S. dollars at maturity? Although the exporter can then buy U.S. dollars for DM in the spot market, the whole purpose of hedging fails. Since a forward contract is an agreement between two parties, credit (or default) risk has to be considered.

Forward markets for major currencies are liquid and efficient for transactions up to a maturity of one year (see Table 3). There are few formal exchanges for these forward markets (none for interest rate markets). Transactions, through brokers and dealers, are mostly completed by telephone and telex.

Forward contracts for international interest rates are known as forward rate agreements (FRAs), and are liquid up to a year. FRAs are similar to currency forward contracts. Two parties agree to pay (or receive) a specified interest rate on a fixed amount of money for the future period. Dealers use shorthand for agreements -- for example, a "3 x 6" FRA on US$1 million at 6 percent. This simply means that two parties agree to receive (or pay) US$15,000 (US$1,000,000 x 6% x 3/12) in interest for a period of three months starting three months from now.

Forward markets for commodities are less liquid than currency and interest rate markets. The London Metal Exchange is one of the largest forward markets for commodities: aluminum, copper, lead, nickel, and zinc are traded on three-month maturities. Transactions are also done by telephone and telex. For some time now, developing countries have been able to hedge using short-dated (that is, roughly one-year maturity) commodity forwards. For instance, Ghana and Côte d’Ivoire have consistently sold forward a large chunk of the next year’s cocoa exports at a fixed price.
### Table 3

**Liquidity of Markets**

<table>
<thead>
<tr>
<th></th>
<th>Currency</th>
<th>Interest Rate</th>
<th>Commodity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forwards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-Term</td>
<td>A</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Long-Term</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td><strong>Futures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-Term</td>
<td>B</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Long-Term</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td><strong>Options</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-Term</td>
<td>B</td>
<td>A</td>
<td>C</td>
</tr>
<tr>
<td>Long-Term</td>
<td>C</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td><strong>Swaps</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-Term</td>
<td>C</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Long-Term</td>
<td>B</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

**Notes:**
- A -- Highly Liquid
- B -- Moderately Liquid
- C -- Not Liquid

Here, a "liquid" market means a market where a counterparty of a transaction can be found easily and the transaction can be made quickly without changing the price of the instrument considerably. In a highly liquid market, a large transaction can be completed in a matter of minutes.
Futures Contracts

Futures contracts are similar to forward contracts: the buyer of a futures contract agrees to purchase a specified asset at a specified price on a specified date. There are, however, four big differences.

First, contract terms (amounts, grades, delivery dates, and so on) are standardized in futures contracts, which also improves the market’s liquidity (see Table 4). Second, transactions are handled only by organized exchanges through clearing houses. Third, profits and losses in trades are settled daily. Fourth, futures contracts require depositing "margin" money (or collateral) with the exchange or broker, usually around 10 percent of the value of the contract, in case of commodity contracts, and around 5 percent for interest and currency futures. These arrangements significantly reduce the credit or default risk of forward transactions.

Futures contracts cover the same hedging as forward contracts. Let's again look at that exporter who wants to hedge his DM exchange risk. He can sell DM futures contracts instead of purchasing the dollars for the DM through a forward contract. This assures a known exchange rate (say $0.50/DM) for six months. The size of a DM futures contract traded in the Chicago Mercantile Exchange is DM 125,000. So, to hedge the DM 2 million revenue, the exporter needs 16 futures contracts (DM 125,000 x 16 = DM 2 million), which mature in 6 months. The price of the futures contract is quoted as $0.50/DM (currency futures prices are quoted in dollars against another currency). Six months later, the gain or loss in the DM export revenue from changes in the exchange rate is offset by the cumulative loss or gain in the futures contracts. Chile used them to hedge its floating rate debt and Mexico used futures as an oil export hedge (Box 4).

To reduce the uncertainty of its variable interest rate debt with commercial banks, in 1988 and 1989 Chile’s Central Bank carried out short-term hedging operations.
### Table 4a

**Eurodollar Futures (The Chicago Mercantile Exchange)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract size:</strong></td>
<td>US$1 million</td>
</tr>
<tr>
<td><strong>Price quotation:</strong></td>
<td>Quoted in terms of a price index (100 minus rate of interest)²</td>
</tr>
<tr>
<td><strong>Settlement:</strong></td>
<td>Settlement is in cash. The final settlement price at maturity is determined according to the London Interbank Offered Rate (LIBOR) on three-month eurodollar time deposits prevailing on the last day of trading.</td>
</tr>
<tr>
<td><strong>Delivery month:</strong></td>
<td>March, June, September and December³</td>
</tr>
<tr>
<td><strong>Last day of trading:</strong></td>
<td>Second London business day prior to the third Wednesday of the delivery month.</td>
</tr>
<tr>
<td><strong>Minimum price change:</strong></td>
<td>1/100 of one percentage point⁴</td>
</tr>
<tr>
<td><strong>Daily price limit:</strong></td>
<td>No limit</td>
</tr>
</tbody>
</table>

**Notes:**

1. Eurodollar futures contracts are also traded on the Singapore International Monetary Exchange (SIMEX), the London International Financial Futures Exchange (LIFFE), and the Tokyo International Financial Futures Exchange (TIFFE). Similar contract specification is applied.
2. For example, the price index is quoted as 91.25 for an 8.75 percent interest rate.
3. The contracts maturing in each of these months are available up to 35 months out.
4. This means that the minimum price change in the price index is 0.01.
### Table 4b

**Gold Futures (The Commodity Exchange, New York)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract size:</strong></td>
<td>100 troy ounces</td>
</tr>
<tr>
<td><strong>Price quotation:</strong></td>
<td>Quoted in dollars per troy ounce¹</td>
</tr>
<tr>
<td><strong>Settlement:</strong></td>
<td>Settlement is in physical delivery</td>
</tr>
<tr>
<td><strong>Deliverable grade:</strong></td>
<td>Refined gold, not less than 995 fineness, cast either in one bar, or in three one-kilogram bars and bearing a serial number and stamp of a refiner approved and listed by the Commodity Exchange, New York</td>
</tr>
<tr>
<td><strong>Delivery month:</strong></td>
<td>The current month, the next two months, and February, April, June, August, October and December²</td>
</tr>
<tr>
<td><strong>Last day of trading:</strong></td>
<td>Third to the last business day of delivery month</td>
</tr>
<tr>
<td><strong>Minimum price change:</strong></td>
<td>Price changes are registered in multiples of ten cents per troy ounce¹</td>
</tr>
<tr>
<td><strong>Daily price limit:</strong></td>
<td>Ten dollars per troy ounce above or below the closing price of the preceding business day. Price limits do not apply to prices for the current delivery month</td>
</tr>
</tbody>
</table>

**Notes:**
1. For example, the price is quoted as 400.00 for $400, then, 400.10, 400.20, 400.30, and so on.
2. The contracts maturing in each of these months are available up to 23 months out.
Box 4: Mexico’s oil hedging

In late 1990 and during the first half of 1991, Mexico used financial risk management to protect its earnings from crude oil exports (roughly 1.3 million barrels a day) against a price drop. The three-part strategy covered a significant part of its export earnings over this period. Mexico bought put options at different exercise prices, engaged in selling of oil futures, and used short-dated (up to one year maturity) oil swaps to hedge its oil price risk. Buying put options guarantees a minimum price; and oil futures contracts and swaps guarantee the seller—and the buyer—a specified price at some future date. By using these contracts, Mexico effectively insured a minimum price of a part of its main exports over the near future. In addition, Mexico established a special contingency fund to protect against a trend decline in oil prices.

Mexico’s overall strategy ensured that it received at least $17 a barrel, the price used as the basis for its 1991 budget. Participation in the futures markets reassured investors that regardless of oil price movements, the economic program and the budget would be sustained. The strategy was successful for Mexico; oil prices fell significantly in early 1991. Not only did Mexico achieve more certainty ex ante about its oil earnings, but also it profited ex post as the gains (from a minimum price) exceeded the initial costs of buying the put options.

with Eurodollar futures contracts on the Chicago Mercantile Exchange (CME).  

Chile’s external debt carried considerable U.S. dollar interest rate risk. As of December 1987, about 83 percent of its total US$18 billion medium- and long-term debt was variable-rate loans, mostly tied to six-month LIBOR. Of this, US$13.8 billion was owed to commercial banks. About 90 percent of all medium- and long-term debt was denominated in U.S. dollars. As part of the 1987 debt restructuring and financing package reached with a consortium of foreign banks, roughly US$9 billion of debt was converted from loans tied to the six-month LIBOR to those tied to one-year LIBOR. Interest rates were to be reset at various dates in February, March, and April, 1988.

The Central Bank hedged about US$1.5 billion of this US$9 billion debt. For the February and March reset dates, the Bank sold March 1988 Eurodollar futures contracts; for April 1988 it sold June 1988 futures contracts. The size of a Eurodollar futures contract is US$1 million
and the contracts are traded for three-month interest rates. To hedge against the one-year interest rate on the US$1.5 billion debt, 6,000 contracts (that is, US$6 billion’s worth of three-month Eurodollar futures contracts) were necessary.

The sale of futures contracts was spread over more than three weeks. The Central Bank closed the position by buying back the contracts within a week of each interest reset date, for an effective LIBOR of 7.3 percent. The LIBOR would have been as high as 7.8 percent without the hedging.

An initial margin of US$1,500 per contract was required by the exchange -- a total of US$9 million, in cash and U.S. Treasury bills. The brokerage fee was US$30 per contract (round trip), or US$180,000 (0.012 percent of US$1.5 billion). The Central Bank is said to have carried out similar hedging operations in 1990.

For commodity hedging, let’s take the simulation of a long-term oil hedging strategy by a state oil-importing company (SOC). In January and July of each year, the SOC wants to lock in import prices over its six-month planning period. Assuming the volume of imports does not vary month-to-month, it buys six nearby (that is, monthly) futures contracts in equally spread out amounts. (If there is a seasonable pattern in imports, the SOC would adjust the amount of futures bought for each month.) Since the nearest futures contract is not the most liquidly traded (because physical delivery is required), it is assumed that the SOC buys the second nearest contract through to the seventh nearest contract. For example, in July of each year, the SOC buys equal amounts of the September, October (and so on) futures contracts up to the February of the following year futures contract. As the contracts approach their maturity month, the SOC reverses the contract by selling in the month before expiration an identical contract; for example, in August of each year, it sells the September contract of that year. It is also assumed that the SOC buys and sells all contracts gradually through the months so that it pays or obtains the average prices for the contracts in each month. This is to assure

In commodity hedging, a simulation shows how futures can iron out fluctuations in oil import costs.
comparability with SOC’s cash transactions which also take place gradually throughout the month.

The simulation involved eight six-month hedges, the first in July 1986 and the last in January 1990. The crude oil hedged is assumed to be Mexican Istmo. Figure 6 shows the gains and losses on a cash flow basis between July 1986 and January 1990, which takes in five months of the Gulf crisis. It shows, on a six-month cycle, the gain/loss on the futures (in Figure 5, Futures), the actual gain or loss on the import bill (Cash), and the net gain or loss (Net). It also shows the gain and loss of unwinding futures on a monthly basis. As can clearly be seen, the Net is much less volatile than the Cash figure since the Futures offsets the Cash. Also, month by month, there is more stability in cash flows.

Figure 5: Six-month Istmo hedges (July and January)
Using an oil price hedge beginning in July 1990 before the Gulf crisis, the SOC would have avoided increases in price volatility. The average cash loss over the period was $1.475 a barrel; the futures gain is $1.88, resulting in a net gain of $0.405 per barrel. Because the hedge eliminates much of the effect of higher prices in the second half of 1990, the SOC gains from hedging. In general, this gain is not to be expected: using futures will not lead to lower prices for imports, but to more stable prices and thus less risk. As a result, the relative risk reduction is high: 80 percent of the variability in the spot prices is eliminated by using futures.

Short-term hedging instruments have been around since the 19th century. Today, futures (as well as options) contracts with short maturities (that is, up to one year, or, exceptionally, two) are actively traded on exchanges, mainly in the United States. Contracts are available for Australian dollars, British pounds, Canadian dollars, DM, French francs, Japanese yen, Swiss francs and ECU, all against the U.S. dollar. Major interest-rate futures include U.S. Treasury bills, Treasury notes and bonds, mortgage-backed securities, British gilts, German Schultschein, and Eurodollar, Euromark, Eurosterling and Euroyen deposits. The commodities futures traded comprise agricultural commodities (for example, soybeans, wheat, sugar, cotton, coffee, cocoa), energy products (such as crude oil, heating oil), and metals such as gold, silver, copper, platinum (see Table 5). Energy futures are the most active. The volume of crude-oil futures traded on the New York Mercantile Exchange has, in recent years, exceeded world output.

**Option Contracts**

An option is the right to purchase or sell a certain asset at a preset price on (or before) a specified date. A buyer of the option owns the right to buy (or sell) and a seller (or "writer") of the option gives the right to the buyer. As in most markets, there are many technical terms involved in options transactions (see Box 5).
<table>
<thead>
<tr>
<th>Commodity</th>
<th>Exchange</th>
<th>Contract Size</th>
<th>Open Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocoa</td>
<td>CSCE</td>
<td>10 metric tons</td>
<td>50,297</td>
</tr>
<tr>
<td>Coffee</td>
<td>CSCE</td>
<td>37,500 lbs.</td>
<td>39,532</td>
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<tr>
<td>Copper</td>
<td>COMEX</td>
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<td>Corn</td>
<td>CBT</td>
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<tr>
<td>Cotton</td>
<td>NYCE</td>
<td>50,000 lbs.</td>
<td>38,671</td>
</tr>
<tr>
<td>Crude Oil</td>
<td>NYMEX</td>
<td>1,000 bbls.</td>
<td>268,488</td>
</tr>
<tr>
<td>Gold</td>
<td>COMEX</td>
<td>100 troy oz.</td>
<td>124,968</td>
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<tr>
<td>Silver</td>
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<td>5,000 troy oz.</td>
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<tr>
<td>Soybeans</td>
<td>CBT</td>
<td>5,000 bus.</td>
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<tr>
<td>Sugar</td>
<td>CSCE</td>
<td>112,000 lbs.</td>
<td>151,367</td>
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<tr>
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<td>KCBT</td>
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<tr>
<td></td>
<td>MGE</td>
<td>5,000 bus.</td>
<td>9,617</td>
</tr>
</tbody>
</table>

Notes:
1. Relatively liquid futures contracts traded in the U.S. exchanges which may be relevant to developing countries.
2. Exchange Abbreviations:
   - CBT: Chicago Board of Trade
   - COMEX: Commodity Exchange, New York
   - CSCE: Coffee, Sugar, and Cocoa Exchange, New York
   - NYCE: New York Cotton Exchange
   - KCBT: Kansas City Board of Trade
   - MGE: Minneapolis Grain Exchange
   - NYMEX: New York Mercantile Exchange
3. The number of contracts outstanding as of September 30, 1990.
4. Wheat futures contracts on the CBT, the KCBT and the MGE differ in terms of deliverable grades of wheat.
How would our earlier example (the exporter) hedge in the options market? He could buy a call option on U.S. dollars against DM (or buy a put option on DM), instead of using forward or futures contracts. Suppose the exporter purchases a European put option on DM 2 million with a strike price of DM 2.0/$ and a maturity of six months. The premium is quoted at 1 percent of the contracted amount -- or DM 20,000, which is $10,000 at the spot rate of DM 2.0/$. If the DM depreciates to DM 3.0/$, the exporter will exercise this option to sell the DM 2 million at DM 2.0/$ and receive US$1 million. If the DM appreciates to DM 1.0/$, the exporter will instead sell the DM 2 million in the spot market for US$2 million, making a profit of US$1 million. If the DM is unchanged, the exporter will sell the DM 2 million for US$1 million by either exercising the option or trading in the spot market.

Box 5: Option jargon

An option that gives the right to buy is a "call" option: if it gives the right to sell, it is a "put" option;

The asset on which the option is written is the "underlying" asset;

If the right to buy (or sell) is taken up by the buyer, the option is "exercised";

The price at which a buyer of the option can buy (or sell) the underlying asset is the "strike" or "exercise" price;

The date on (or before) which the buyer can buy (or sell) the underlying asset is the "maturity" or "expiration";

An option that can be exercised only on the expiration date is a "European" option. One that can be exercised either on or before the expiration date is an "American" option;
Unlike forward or futures contracts in which the future price is locked-in, options contracts limit the maximum loss (equal to the premium paid up-front), but leave an opportunity to take advantage of favorable price movements. However, since the buyer has to pay the premium up front, this often requires a significant amount of cash to buy options. Moreover, while the buyer of an option faces a credit or default risk by the counterparty, the seller does not.

There are liquid markets for options on currencies with short-term maturities. These options are traded both in formal exchanges, as with futures, and informally, as with forwards. Options on currency futures are also available on some exchanges (for instance, the Chicago Mercantile Exchange and the Singapore International Monetary Exchange). Long-term options on currencies are not actively traded, but are often attached to loans, such as dual-currency loans, or bonds.

**Dual currency loans** are those with a currency option on all or part the principal. There are three types. In the first, a loan is made in one currency, but the lender has the right to choose, at maturity, whether to accept the principal repayment in the original or in another currency at a prespecified exchange rate. For the lender, this loan is a combination of a conventional loan and the purchase from the borrower of a currency option written on the principal payment. For the borrower, the advantage is that the interest on the loan is lower -- maybe as much as one-to-two percentage points. The second type is a conventional loan with the sale of a currency option by the lender: the borrower has the right to choose the repayment currency at a prespecified exchange rate. In the third type, the borrower has the right to choose the currency of the loan at the time of drawing, and has to repay in that currency.

Where the lender chooses the repayment currency, the risk to the borrower tends to increase rather than decline: the borrower’s cost may be less because of the sale of the currency option, but the borrower is open to loss if the lender exercises the option. For example, a US$100 million dual currency (U.S. dollar/DM) loan requires the
borrower to repay in DM if the currency appreciates above a fixed level. Unless the borrower can reasonably expect DM revenues that exceed the amount required to repay at maturity, the borrower is exposed to the risk added by the loan. This type of loan does not provide downside protection against DM depreciation. Nonetheless, many developing countries use such dual-currency loans, because of the interest cost reduction from the sale of the option. India, Indonesia, and Turkey have all used such loans.15

The Central Bank of Turkey frequently uses DM/U.S. dollar loans because it expects ample DM revenues in Turkish workers' remittances from Germany. It agreed to a US$100 million dual-currency syndicated loan in March 1988. The loan had a three-year maturity, with a DM option written on the US$100 million principal. The premium from the sale of the DM option was used to reduce the cost of funding. As a result, the loan carried a floating interest rate of 0.015 percent over LIBOR without any front-end fee. If it had been a conventional loan, the Central Bank would have paid about 1.25 percent over LIBOR. The Central Bank did, of course, incur the (potentially unbounded) risk of an adverse change in the DM/$ exchange rate. It could have mitigated this risk by putting a cap on the possible DM/$ exposure (in exchange for which it would, of course, not have received as low a spread).

Air India and the Industrial Finance Corporation of India have also used this type of loan. A two-year DM option on US$50 million was attached to a syndicated loan of US$150 million for Air India. The option had a strike price of about DM 1.70 to the U.S. dollar and the option premium was used to pay the front-end fee. The loan carried a floating interest rate of 0.1875 percent over LIBOR for the first two years and 0.25 percent over LIBOR thereafter. The Industrial Finance Corporation used the same scheme, with the Swiss franc as the second currency.

Indonesia used the another type of dual currency loan (in which the borrower chooses the currency of drawing). In October, 1988, Indonesia contracted a 40

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**Turkey and India use dual currency loans....**

**.....as does Indonesia.**
billion yen Euroyen revolving credit facility for three years. Once the loan was fully drawn down, it would become a conventional (yen or dollar) loan, with an eight-year maturity and a five-year grace period, with a floating interest rate of 0.5 percent over LIBOR for the first three years and 0.625 percent over LIBOR thereafter. The front-end fee was 0.5 percent of the principal and the commitment fee was 0.25 percent. The total cost was slightly higher than for conventional loans, due to the option feature chosen by Indonesia. It gave Indonesia the right to choose the currency denomination of the debt over three years. This allowed Indonesia to better manage its external debt.

**Interest-rate options** also have liquid markets. There are two forms: options on interest-rate-bearing securities (such as U.S. Treasury bonds) and options on interest rates themselves. The latter are known as "caps" (call options) and "floors" (put options) and are, in effect, a series of options maturing on different dates. These interest risk management tools can be combined to create "collars", where the interest rate effectively paid falls in a band.

**Commodity options.** For commodities, options on physical commodities and options on commodity futures are only available for short-term maturities. The most actively traded contracts are on gold, silver, and oil. Long-term options are traded over the counter, mainly on gold, silver and oil, but the markets are not very liquid. But commodity options, like long-term options on currencies, can be linked to loans. Algeria's state-owned oil company, Sonatrach, entered into a loan agreement with a syndicate of international banks in November, 1989. The loan, coordinated by Chase Investment Bank, London, consisted of a US$100 million conventional floating-rate loan (with a seven-year maturity and a four-year grace period) and a series of oil option transactions. The proceeds of the loan were used to replace expensive (4 percent above LIBOR) short-term loans, reducing Sonatrach's cost of interest service. With this scheme, Algeria reentered the medium-term syndicated loan market at a much reduced cost. Sonatrach will pay an interest rate of 1 percent above
LIBOR over the life of the loan. Without the scheme, the cost would have been 3-4 percent above LIBOR.

Two special features were added to the loan. First, Sonatrach sold Chase four call options written on oil, so reducing the cost of funding (just as Turkey did in its dual-currency loan). Under this arrangement, Sonatrach will have to pay Chase a certain amount of cash if the price of oil rises above a prespecified ceiling (for instance, US$23 per barrel). This may not significantly increase Sonatrach’s risk, since its revenue will also increase. But, by selling the oil options, Sonatrach traded some upside potential in its oil export revenues for an immediate reduction in cost of funding.

The second feature was designed by Chase to bring other banks into the syndicate. Chase provided members of the syndicate with an opportunity for additional profits from oil price movements. Chase will pay the syndicate an additional interest margin above LIBOR, if the oil price rises above or falls below a prespecified price range -- in effect, 0.125 percent for a one dollar move in the price of oil, if the price moves substantially. This does not affect Sonatrach’s payments. The extra margins are to be provided by Chase. This could have increased Chase’s oil price risk, but the risk was eliminated by complicated transactions in options market (see Figure 6).

Currency and Interest-Rate Swaps

A swap contract is an agreement to exchange, or swap, specified cash flows at fixed intervals. So, a swap is really a series of forward contracts lined up on a schedule. For example, one party delivers a specified amount of a currency in exchange for another currency on every date specified in the currency swap. Once more, let’s return to the exporter and the DM.

Assume that the exporter and the German company agree a long-term export contract, in which the company pays DM 2 million for the exporter’s goods every six months over the next five years. Assume also that the exporter wants to lock-in the dollar value of these revenues
**Sonatrach/Chase Transactions**

- **Sonatrach**
  - Sale of 4 Calls

- Chase
  - Option Market
  - Option Premium
    - Purchase of 14 Puts and 14 Calls
    - Option Premium

- **Sale of 14 Puts and 14 Calls** (Implicit Options Attached to the Loan)

- **Loan Syndicate**
  - $100 million loan
now. The exporter now enters into a currency swap with a U.S. bank. The U.S. bank agrees to pay US$1 million (DM 2 million) every six months for the next five years to the exporter: the exporter agrees to pay DM 2 million on the same dates that the bank pays the dollars. Thus, the currency swap contract is, in effect, a series of ten forward contracts lined up over the next five years. In interest-rate swaps, two parties similarly agree to exchange floating-interest and fixed-interest payments.

Swap contracts, therefore, are similar to forward contracts: no cash is required at the beginning but there is a credit risk. Swap contracts, however, are available for longer maturities (three to ten years). Markets for both currency and interest rate swaps have good liquidity and maturities can generally be extended up to 10 years. Transactions are done through traders and brokers, the so-called "over-the-counter" market which has nonstandard contracts, tailored to customer requirements.

Currency and interest-rate swaps are typically used in two ways: to hedge an existing risk or to obtain a desirable liability structure by contracting new debt and a swap at the same time. For example, a country may arrange a swap in such a way that the timing of cash flows in a swap matches the payment dates on the existing asset or liability. Or a country may borrow in one currency and enter into a swap transaction in which repayment cash flows are exchanged for another currency. For instance, swaps often accompany new bond issues on loans in Euro-markets.

Thailand has used both types of swaps. The Ministry of Finance arranged with U.S. and Japanese banks to exchange floating-interest payments for fixed-interest payments (or fixed-interest for floating-interest payments). In March, 1988, Thai officials invited several U.S. commercial banks to bid for two (seven-year) U.S. dollar fixed-floating-interest swaps of about US$70 million.

Thailand also uses swaps with new borrowings. It wanted to tap the DM and Swiss franc bond market, but preferred to repay part of the debt in another currency. In

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Currency and interest-rate swaps are used to hedge an existing risk or to obtain a desired liability structure by contracting new debt and a swap simultaneously.

Thailand and India frequently use swaps.
mid-1988, it issued the first public Euro-Deutsche mark bond for DM 200 million and the first public Euro-Swiss franc bond for SFr 200 million. The DM bond, managed by Commerzbank and Deutsche Bank, had a maturity of five years, with 5.75 percent annual coupon payments; the Swiss franc bond had a seven-year maturity with a 4.625 percent coupon. The DM and Swiss franc cash flows to service these bonds were partly swapped to achieve repayments effectively denominated in another currency (U.S. dollars). In another 1988 deal, the Industrial Bank of Japan provided 13 billion yen for the Electricity Generating Authority and the Petroleum Authority of Thailand. Eight billion yen of this was swapped for U.S. dollars and so, effectively, denominated in dollars.

Many Indian agencies and public-sector firms, such as the Industrial Development Bank of India, the Export-Import Bank of India, the Industrial Credit and Investment Corporation of India, and Air India, have used swap transactions -- maybe up to US$1 billion of swaps in 1991-92. These include yen fixed interest into yen floating interest, yen fixed interest into dollar fixed, and sterling fixed interest into dollar floating interest. Most have (reportedly) applied only to the interest portion of liabilities.

**Commodity Swaps**

Commodity swap contracts are the most recent development. Although not yet very active, they have been growing. In recent years, the depth of over-the-counter and bond markets has improved for metal- (gold, silver and copper) and oil-linked instruments. Aluminum, nickel, zinc and jet fuel can also be swapped, but the markets are thinner (that is, an inability to enter into swaps in large volumes at prices close to current quoted prices). Swaps and other ways of extending the maturity of financial instruments is inherently more difficult for perishable crops, such as coffee, cocoa and cotton, partly because of seasonal production and the high cost of storage. Some transactions have taken place for these commodities, but the development of markets for these long-dated instruments will take time.

*The market in commodity swaps is not very mature. Transactions are purely financial, involving no deliveries of physical commodities.*
Commodity swaps are basically the same as currency and interest rate swaps but are not exactly a series of commodity forward contracts because they do not involve deliveries of physical commodities (see Box 5). Transactions are purely financial.

Let's look at an oil producer who wants to lock-in the price of its oil exports for the next five years, and will export 1 million barrels a year. The producer arranges the following commodity swap with a commercial bank:

Box 5: Oil swap simplified

The diagram above shows a simplified case of a commodity swap, in which the bank executes offsetting swaps with oil producer and consumer, thus intermediating the credit risk. The producer agrees to exchange cash flows with the bank. Semiannually over the period of the swap contract, (say, five years) and on a notional 10 million barrels of oil a year (that is, 5 million barrels at each semi-annual payment date), the producer pays the future market price and receives a fixed market price, say, $21. Thus if the future market price were $25 per barrel, the producer would make a net payment to the bank of $20 million; if the future price were $18 per barrel, the producer would receive a net payment from the bank of $15 million. The consumer executes an exactly opposite contract with the bank, undertaking to pay at a fixed price and receive at a future market price. When the producer sells 5 million barrels of oil semiannually to the consumer at the future market price, both producer and consumer have in effect locked-in a fixed price of $21 through a series of forward contracts.

1 The chart depicts a simplified case in which the following features are omitted: presence of a syndicate of banks; presence of an off-shore escrow account; and presence of multiple consumers.
2 The cash flows passing through the intermediating bank would not quite offset each other exactly, thus allowing the bank to make a return for bearing the credit risk.
Commodity: Oil

Amount: The U.S. dollar equivalent of 1 million barrels of oil every year

Fixed-price payer: Commercial bank

Floating-price payer: Oil producer

Tenor: Five years, with annual payments

Fixed price: US$17.00 per barrel

Floating price: The average daily closing spot price of North Sea Brent oil over the year preceding each payment date

Settlement: Netting-out

In this example, the oil producer sells oil to the third party from time to time at the spot price, but the revenues for the next five years are effectively fixed at a US$17.00 price (see Table 6).

The oil producer has hedged cash flows from oil sales. Even if the price of oil declines to, say, US$8.00, the total revenues stay the same. This may improve the producer's credit rating and lower the cost of financing or provide access to new lenders.

Commodity-Linked Loans

In these loans, interest and/or principal repayment are linked to the price of a certain commodity or to an index of commodity price(s). In one type of commodity-linked loan, interest and principal are paid in equal installments and linked to the cash equivalent of a certain quantity of a commodity. In another type, only interest payments are linked to a commodity price. In both cases, a conventional bank loan is combined with a commodity swap -- and both yield the same financial results.¹⁹
Imagine that a copper producer requires a US$1 million capital investment to increase production capacity. But the success of the project depends on future copper prices. Assume copper is currently US$1 per pound. If the expansion is financed by a bank loan, and copper prices fall, the producer's ability to repay the loan will be jeopardized. So, the producer takes out the following copper-linked loan with a commercial bank:

Table 6

<table>
<thead>
<tr>
<th>Period</th>
<th>Oil Price</th>
<th>Export Revenue</th>
<th>Commodity Swap&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Settlements by &quot;Netting-Out&quot;&lt;sup&gt;4&lt;/sup&gt;</th>
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<tbody>
<tr>
<td></td>
<td>(Floating)</td>
<td>(Fixed)</td>
<td>OP == &gt; CB</td>
<td>OP's Payoff</td>
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<td>$18 mil</td>
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<td>Year 5</td>
<td>8.00</td>
<td>$8 mil</td>
<td>$8 mil</td>
<td>$17 mil</td>
</tr>
</tbody>
</table>

Notes:
1. Hypothetical spot oil prices per barrel for the next five years.
2. Producer's revenues from the exports of 1 million barrels of oil at spot prices.
3. A floating payment amount is calculated by multiplying the 1 million barrels by a floating oil price. A fixed payment is based on a fixed price of $17.00 per barrel.
4. Cash flows of the oil swap if "netting-out" is used for settlements.
### Lender: Bank
### Borrower: Copper producer
### Commodity: Copper
### Principal amount: US$1 million (equivalent to the value of 1 million pounds of copper at the current price)
### Tenor: Five years, with semiannual installments
### Repayment schedule: Ten semiannual payments of the U.S. dollar equivalent of 130,000 pounds of copper (multiplied by the reference price)
### Reference price: The average daily closing cash copper price in the London Metal Exchange over the six months preceding each repayment date

The loan can be repaid regardless of the copper price over the next five years since it is effectively denominated in copper.

The same result can be achieved with a conventional bank loan and a copper swap. The producer borrows US$1 million from a U.S. commercial bank, to be repaid in 10 semi-annual installments of US$130,000 over the next five years. A parallel copper swap for 130,000 pounds with, say, a French bank fixes the effective copper price received at $1 per pound -- or US$130,000, equal to the debt service. A floating amount is paid semi-annually to the French bank in exchange for the fixed payment of US$130,000. The financial result is the same as with the copper-linked loan.

Now, let's take a look at a real-life example of a loan combined with a commodity swap -- a US$210 million financing package developed in 1989 by the New York branch of Banque Paribas (Paribas) for Mexicana de Cobre, S.A. de C.V. (MdC), a copper mining subsidiary of Grupo Mexico. The proceeds were used to refinance the debt assumed when MdC went public and was acquired by Grupo Mexico in November, 1988.
The syndicated loan, managed by Paribas, has a term of 38 months and a fixed-interest rate of 3 percent above three-year LIBOR (as determined by Paribas). The 12 equal quarterly payments started in December, 1989. To eliminate MdC’s copper price risk, a copper swap was attached to the loan, establishing a fixed price over the life of the loan for a portion of MdC’s copper production.

Because of the Mexican company’s high credit risk, Paribas had to reduce the copper-price risk and the payment risk. The copper price directly affects MdC’s earnings, which must be available for repayments over the life of loan. To deal with the copper price risk, Paribas entered into a copper swap with MdC through its London branch. MdC agreed to pay Paribas an amount based on the floating copper price it receives for its exported copper (based on the daily prices for copper on the London Metal Exchange) and Paribas agreed to pay MdC an amount based on a fixed price for the 38-month term of the loan. Paribas’ fixed payment under the swap was matched with the amount necessary for the periodic loan repayments. Thus, the copper swap enabled MdC to have funds sufficient to repay the loan, regardless of how the copper price moved over the next three years.

To mitigate the payment risk, a long-term contract with a copper user and an escrow account were established. SOGEM S.A., a Société Générale de Belgique subsidiary, agreed to monthly purchases of 4,000 metric tons of copper anodes from MdC for the period of the loan. The amount contracted was one third of MdC’s production. SOGEM promised to pay an amount based on the average price for copper on the London Metal Exchange into an escrow account established by Paribas. Paribas then pays the fixed payment into the escrow account each quarter and draws the floating payment under the copper swap agreement. Finally, the quarterly repayments to members of the loan syndicate are made from the escrow account (see Figure 7).
This scheme, together with MdC's history of excellent operating performance and Mexico's favorable economic reform policy, made possible the first voluntary lending to Mexico's private sector in hard currency since 1982.

Figure 7

MdC/Paribas Scheme: Cash Flows and Loan Repayments

* Paribas acts as lead-manager.
Commodity Bonds

Commodity bonds can be either a forward type or an option type. In the former, principal and/or coupons are linked to commodity price or to an index of commodity price(s). Such bonds have been issued mainly for gold and oil, although there have been some for silver, copper and nickel.

If only the principal payment (redemption value) is linked to a commodity price, the bond is, in effect, a security in which a conventional bond and a commodity forward contract are combined. If the coupon payments also are linked, the bond is a combination of a conventional bond and a commodity swap. These forward-type bonds are often issued by commodity producers for risk hedging.

The option-type bond combines a conventional bond with commodity options. In this case, a holder of the bond owns the right to buy (or sell) a commodity at an exercise price, in addition to his conventional bond. The option-type bonds are often used to lower the cost of financing (lower coupons) by attaching long-term options written on a commodity.

Consider an example where a gold-producing developing country issues forward-type bonds linked to the gold price in the Eurobond market to raise US$50 million. Assume the current price of gold is US$400 per troy ounce.

Issuer: Gold producing country

Face value of bond: US$1,000

Amount: US$50 million (US$1,000 x 50,000 bonds)

Issue price: US$1,000 per bond

Maturity: 10 years
Coupon payment: Annual payments of the dollar equivalent of 0.25 troy ounces of gold (multiplied by the reference price) per bond

Reference price: The average daily London morning fixing price of gold over the last year preceding each coupon payment date

Redemption: The dollar equivalent of 2.5 troy ounces of gold (multiplied by the reference price)

The 50,000 gold bonds, with a US$1,000 face value each, are issued. Thus, 12,500 troy ounces (0.25 troy oz. x 50,000) of gold are necessary for the annual coupon payment, and 125,000 troy ounces (2.5 troy oz. x 50,000) are required for redemption. Based on the current gold price, the bond's coupon is 10 percent (US$400 x 0.25 troy oz. = US$100, or 10 percent of the face value). The country can service the debt from gold exports, regardless of the gold price over the 10 years. Annual gold exports of 12,500 troy ounces, or roughly 390 kg are necessary for coupon payments; 3.9 tons are needed for redemption.

1. Modern and traditional instruments may complement each other. For example, the short- and medium-term use of financial instruments may complement export diversification that has a long time horizon.

2. The spot and forward rates are assumed to be the same for convenience and simplicity. Pricing theories are not discussed here. There are numerous publications on these issues. Cox and Rubinstein (1985), Grabbe (1986) and Figlewski (1986) contain a good description with respect to both theory and practice.

3. The expression “3 x 6” (stated as “three against six”) means the period starting three months from now and ending six months from now.

4. This is a simplified case. In practice, two parties pay or receive the amount which is the difference between a FRA rate (six percent) and a reference rate (LIBOR) at the beginning of the agreed period (three months from now), discounted by a three-month interest rate to reflect present value. Nonetheless, the financial effects are the same.

5. A futures contract is "marked to market" every day, using the closing price of the day ("settlement price"). Profit or loss is calculated by using the settlement price, and the profit or loss is settled with clearinghouses daily. This prohibits the carry over of large unrealized losses over a long period and thus reduces the risk of default.

6. The exact margin required by the broker per futures contract will depend, among other things, on the volatility of the asset in question, the minimum required by the exchange, the overall position (possible offsetting futures contracts and other deposits with the broker may lower margin requirements), the ability to transfer funds quickly (for example, the time difference and foreign exchange constraints may play a role), the volume of transactions anticipated, and the creditworthiness of the customer (previous credit history and history of meeting margin calls, and net worth). Furthermore, margin requirements are often less for hedged versus speculative accounts. Note that one can use U.S. Treasury bonds for a margin account instead of cash. If a customer deposits cash to satisfy his margin requirements, the broker may keep the interest on the deposit unless the customer negotiates to receive the interest payments. Most institutional and sovereign investors do not deposit cash for their margin requirements. Instead, institutional and sovereign investors deposit U.S. Treasury bills, U.S. securities with (generally) maturities less than one year, equities,
7. Delivery dates of a futures contract are standardized in the contract specification to fall on a given day in several months of the year. Here, for simplicity the delivery date is assumed to coincide with the timing of the export revenue.

8. The Treasurer's Office of the World Bank provided Financial Technical Assistance for these operations. Also see IMF (1989). Chile has continued these type of operations.


10. "Round trip" means that the brokerage fee is charged when the sold (bought) contracts are bought (sold) back to close out the position, or when the contracts expire.

11. US$30 x 6,000 contracts = US$180,000.

12. We choose this six-month hedging strategy since the nearby futures contracts are the most liquidly traded and a six-month horizon should allow the SOC and the country sufficient lead time in adjusting domestic prices.

13. A July 1990 hedge would have to be a five-month hedge since daily January 1991 futures and cash prices were not available at the time of the study.

14. A call option on U.S. dollars (the right to buy U.S. dollars for DMs) is a put option on DMs (the right to sell DMs for U.S. dollars). They are equivalent, except for the currency that is the underlying asset.


16. The maturities of the four options are 6, 12, 18 and 24 months.

17. Some designs of currency swaps involve exchanges of cash at the beginning and/or at the end of a contract life to accommodate specific needs of users. However, this does not alter the essential nature of swaps mentioned in the text, since these designs can be regarded as a combination of a plain swap and cash flow transactions at the beginning and/or at the end.

18. However, it should be noted that the economic consequences are approximately equal to those of a series of forward contracts.

19. Legal implications of the two are, of course, different.

20. This means that the loan bears a fixed interest rate of approximately 10.42 percent per annum.

21. "News from Paribas" (July, 1989) and other sources.

22. An interest swap was also included in the package to achieve floating rate funds for the syndicate of banks and fixed rate borrowings for Mdc.

23. The true yield to maturity on this bond should be calculated by using the forward rates of the gold.
5. OVERCOMING SOME OF THE BARRIERS

Although risk management can be attractive for developing countries, only a few have actually used such techniques and (especially longer-term) instruments. Why? Because developing countries face barriers, sometimes formidable ones.

Creditworthiness is a big hurdle. Because some countries have low credit standings, commercial banks and bond market investors have shied away from dealing with developing countries’ governments and private enterprises. Forward, swap, and option (if sold by the country) contracts involve considering creditworthiness. The longer the length of the contract and the greater the volatility of the underlying price, the higher the credit risk. As long as many developing countries have low credit standing, their access to long-dated risk management instruments will be limited. Short-dated, exchange-traded futures and options, which are subject to margin requirements, can help overcome credit risk, but those margins may themselves be a problem. Escrow arrangements, similar to the one used in the Mexicana de Cobre deal (page 52) can also help overcome creditworthiness constraints.

Premiums (that is, the upfront costs or margins of some risk management instruments) can be a deterrent for countries that already have difficulties raising foreign funds. In purchases of options, caps, and floors (that is, a series of options), those costs can be a significant portion of the value of the underlying (hedged) asset.

Domestic barriers can be a hindrance for state, as well as private enterprises, and quasi-public outfits, such as marketing boards. Legal, regulatory, and institutional constraints can affect (in particular) the private sector’s ability to hedge abroad. For example, exchange controls can prevent the purchase of collateral required for futures; or other laws prohibit access to international markets, as, at one time, in Colombia. Only when the Colombian
government changed the law was the private sector able to hedge interest rate, commodity, and currency risks.

**Policy barriers.** Because of market failures or (government) policy-induced distortions, often risks are either absorbed by the general budget or fall on small producers and consumers -- those least able to afford it because they do not have the expertise or access to international financial markets to hedge on or to allocate risk internally. Take, for example, Costa Rica, where coffee price risk is incurred in a complex manner by exporters, intermediaries and final producers (Box 3). The producer, who is least able to engage in risk management, incurs most price risk and the exporter (most able) has the least incentives to do so. In Colombia, because export contracts are not "opened" by the export institution for more than three months, private exporters have no incentive to hedge for long periods. So, even though there is an international hedging market beyond three months, exporters do not use it. In some other developing countries, state enterprises, including banks, may not face a hard budget constraint or be operating on a purely profit-motive. Thus, few incentives arise to manage, say, exchange rate and interest rate risks.

**Government intervention** in some developing countries, may greatly diminish the risk of the private sector and, so, reduce its incentives to manage risk. This may happen through explicit or implicit guarantee schemes, such as price stabilization, deposit insurance of banks, and guaranteed exchange rates coverage. In some countries, the government may provide insurance to financial institutions against major risks. Many such institutions have been bailed out after large losses on exchange-rate or interest-rate movements. The tax system too, may deter hedging; net profits may be less exposed than gross profits to external price risks.

**Know-how** is essential to effective risk management activities -- knowledge of instruments and an appropriate institutional framework. Understanding is needed of the risk structure of the economy, identifying appropriate risk management instruments, and making or supervising trans-
actions. Many developing countries lack such expertise. Moreover, an institutional framework may be necessary for adequate reporting, recording, monitoring, and evaluating transactions, and regulation to avoid (and protect against) speculation.¹

Awareness (or rather lack of it) is another important barrier. This includes not only lack of familiarity with the market instruments and their strategic use, but also misunderstandings of hedging and a likening of it to speculation. Many developing countries think risk management means consistently higher profits, lower debt service payments, and higher export prices (or, conversely, lower import prices). However, risk management is a tradeoff between moderate and predictable current cost and future external price movements, which could produce windfalls or large losses. Whether risk management has avoided losses or gains depends on the (ex-post) trend in prices, which cannot be anticipated. Policy makers are often unaware that risk management may entail "costs" (foregone higher revenue or lower expenses), which can make even successful hedging programs seem to be failures.

Fundamental barriers (or basis risk) is really that element of risk which cannot be hedged because international markets for risk management are incomplete.² There is often no perfectly matching hedging tool for a particular currency, interest rate, or commodity (for example, tropical fruits), or there is mismatch (in, say, maturity) between the characteristics of the variable to be hedged and those of the hedging tool. Maturities in futures and options, especially in commodity markets, are generally limited to one or two years. Using these instruments may reduce near-term exposure, but hedging for longer periods will be far from perfect. Long-dated over-the-counter or bond-market instruments are often unavailable for the risk in question.³ Basis risk does not imply that risk management is meaningless. But it does require an analysis of the cause, nature and magnitude of the mismatch.

Technical barriers. Critical preconditions needed for effective risk management may not be in place in

Many officials tend (erroneously) to equate hedging with speculation.

Some risks cannot be hedged.

Technical factors, such as weak communications networks, can inhibit hedging.
developing countries. In the real world, technical factors such as transport, storage, time differences, data processing and, especially, communications bottlenecks can be barriers.

1. This is most needed for publicly owned entities, but also private entities may require this.

2. Basis risk is the risk that cannot be hedged expressed as a fraction of the overall risk of the spot price. It can be measured as one minus the correlation coefficient between spot and futures prices. It increases if there is a mismatch between the final maturity of the instrument and the date the exposure occurs.

3. While a short-dated hedge might in principle be "rolled over" (that is, renewed at maturity), so as to duplicate a long-dated hedge, in practice the protection offered by a rollover will be considerably less than that of a long-dated instrument because of basis risk arising from changes in the relation between spot and futures prices. Whether (in the absence of basis risk) there is exact equivalence between a rollover and a long-dated instrument will depend upon the price process applicable: full equivalence would hold if, for example, the price behaved like a so-called random walk over time. But few prices appear to conform to this pattern exactly.
6. ACTION PLAN FOR DEVELOPING COUNTRIES

What is a feasible strategy for risk management? The first step is taking an inventory of exposures and analyze risk; then, look at the domestic regulatory and legal framework covering the use of instruments; setting up or changing the institutional framework to allow the (private) sector access to risk management instruments (subject to supervision); making relevant parties aware of their exposures; introducing officials, policy makers and the private sector to the available risk management instruments and dispelling misconceptions; and finally, education and training.

Identification and Analysis of Risks

Since risks are, typically, allocated in a complex manner, this is often not simple. However, this first step determines how the impact of international price changes are distributed among various parties in the domestic economy -- financial intermediaries, exporting or importing firms, final producers or users, other intermediaries, and the government. The mechanisms determining the distribution include domestic regulations, accounting practices, taxes, tariffs, subsidies, quotas, domestic price stabilization schemes, and the market structure of competition. The most important step is to quantify the exposure of the different parties, for which data on exposure and price movement will have to be collected.

Legal and Institutional

This aims to find impediments to the use of risk management instruments. Legal hurdles (including regulatory and taxes) should be the most immediate focus, but the analysis should not be limited to features affecting external transactions only. The absence or presence of legally binding domestic fixed-price contracts (often a practical means of hedging) will also need to be investigated. Then, recommendations can be made to set up (or change) the institutional framework. A suitable accounting framework for hedging will also be needed. Any changes, including measures to assure a liberalized domestic finan-

Determining how the impact of price changes are distributed among parties in the domestic economy.

Pinpointing legal and institutional impediments to risk management.
cial and marketing system, should be such that the use of risk-management instruments (by the private sector) can expand. Generally, the risk management strategy should be developed from the "bottom up", that is, determining first what the private sector can accomplish in risk management for the benefit of the country (once impediments are removed) and only then analyzing the role of government.

Policy Paper

At this point, the government or enterprise, using, maybe, outside consultants, should prepare a policy paper. This should present an overview of the external risks faced by the country (enterprise), of the institutional structure governing the impact of external risks (on fiscal and export revenues or fiscal and import expenditures, profits, etc.), of the resulting exposures of the different entities, and the necessary steps to remove these barriers or change the institutional framework (see Annex 1). The paper should indicate what the objectives of risk management are; where, if necessary, a unit can be established for risk management (either in a private enterprise or in the public sector, for example, the ministry of finance or energy, central bank, state enterprise or cooperative). The paper could lead to task forces to alter legal, accounting and institutional frameworks, organize technical training and education seminars, provide technical assistance, and to launch a pilot risk-management program.

Awareness

A general awareness strategy may involve, first, a seminar to alert policy makers to the risks from external exposures and to introduce them to financial instruments. The action program (as outlined in the policy paper) then needs to be presented to the government (including the central bank) officials or the board directors of state enterprises.

Training and Education

Through courses for the private and public sector (local seminars as well as seminars abroad), the necessary

Preparing a policy paper to establish locus and operational modalities of a risk management unit and, if necessary, alter legal, accounting and institutional frameworks.

Making government officials, policy makers and state enterprises aware of benefits of risk management.
skills can be acquired. The courses should be taught by academic and business consultants. That may be followed by internships (at, say, commercial banks, private-sector financial institutions, and commodity trading organizations) to acquire practical experience in hedging and in regulation and supervision.

Mock Trading and Presentations

Units involved in risk management may want to perform "mock" trading and risk management exercises. Such trades will allow specific skills to be acquired and presentations can then be made to boards of directors or other policy makers on the outcomes.

Policies, Accounting and Control

Many institutional and policy decisions within organizations will be necessary. First, the appropriate hedging strategies need to be determined and policy and guidelines need to be established. Second, monitoring and evaluation need to be developed. Third, internal accounting will need to link financial consequences of the hedging and other transactions. And fourth, further education of staff may be necessary. Many decisions will involve the board of directors or other policy makers, and their final authorization may be necessary.

In all cases, it is important that risk management be within authorized guidelines, properly supervised, integrated with other risk management and external borrowing, and the government budget. Since risk management is new to many developing countries, new accounting standards may be needed or old ones changed at the national level. Then, a small pilot risk management program could be undertaken. This would be limited in scope. Full risk management can be implemented as the final step.
1. If, for example, the absence of domestic fixed-price contracts arises from incomplete linkage to international markets, a first step in hedging strategy might be to encourage an intermediary to hedge externally in the international markets.

2. In most cases the private sector will be the preferred location for risk management because it will be guided by strong incentives to use these instruments effectively. The public sector should only be the location for a risk management unit when there is, for instance, a need to coordinate overall management of external exposures and borrowing, or the presence of a large state enterprise such as a state oil company.
Annex

The questions that the policy paper will need to address, are, among others, the following:

(a) What is the exposure of the country to various external price fluctuations?
(b) Who bears the risk from external price fluctuation?
(c) What risk management tools are currently used?
(d) Ideally, which entities should undertake risk management?
(e) What are the potential benefits from risk management?
(f) Is there any local legislation or regulations which impedes or does not facilitate hedging and other risk management?
(g) What is the level of understanding of price exposure and the benefits and means of hedging in the private sector and in the Government?
(h) What are the major obstacles to risk management in terms of communication facilities, and other physical barriers?
(i) What are the implications of price uncertainty for the general budget, i.e., what is the Government exposure?
(j) What objective would the Government like to achieve by the different sectors using risk management instruments?
(k) Is there any conflict between the Government needs and private sector needs regarding risk management? If the private sector were to adopt risk management instruments what would be the implications for the Government?
(l) What is the current role of the Central Bank in risk management and what changes may be necessary for the implementation of a risk management program?
(m) To what extent should regulatory requirements be amended to accommodate the implementation of a risk management program?
(n) What are the technical assistance and training needs in the private sector and in the Government to enable both of them to manage their price risk, and what is a preliminary costing of the services to be provided?
Glossary

**American option**
An **Option** contract that may be exercised at any time prior to expiration. This differs from a **European option** which may only be exercised on the expiration date.

**Asset and liability management**
Another term for risk management: adjustment of the structure of a country's assets and liabilities to minimize adverse impacts on future net cash flows from changes in external prices. See also HEDGING.

**Balance of payments**
Net value of all economic transactions, including trade in goods and services, transfer payments, loans, and investments, between residents of the same country and with other countries.

**Basis risk**
The price risk that results from the differences of quality, location and other characteristics between a **HEDGING** instrument, such as a futures contract, and the underlying asset itself, or from the differences in **maturity**.

**Call option**
A type of **Option** that gives the user the right to buy a currency, interest rate or commodity at a given price in the future. (See **Option** and **Put**.)

**Cap**
A SWAP transaction in which a buyer seeks a maximum price level for supplies. A similar price hedge may sometimes also be achieved by using futures or **options**.

**Clearinghouse**
A financial intermediary that matches buyer and seller in a market, for example, a formal futures exchange.

**Collar**
A type of **Hedge** in which a price range between a floor price and ceiling price is established instead of a fixed price. This allows the user to benefit from some market fluctuation.

**Commercial risk**
The risk of nonpayment by a non-sovereign or private-sector borrower arising from default, insolvency, or failure to perform on a contract.

**Commodity-indexed loan**
A loan by a bank or other financial institution in which the repayment is tied to commodity prices.

**Commodity-indexed security**
A special equity, bond or other debt instrument, with the return linked (in part) to the price of the commodity over a period of years.

**Contingent finance**
The provision of credits contingent upon certain pre-specified exogenous events. The best example is the Compensatory and Contingency Financing Facility (CCFF) of the IMF, which provides for the possibility of finance in the event of TERMS OF TRADE shocks.

**Currency of denomination**
The unit of account in which indebtedness or assets are expressed.

**Currency of reporting**
The unit of account used in reporting to agencies.

**Currency of transaction**
The medium of exchange in which a transfer occurs. The medium of exchange of one transaction (for example, disbursement) does not necessarily determine the medium of exchange of another (for example, repayment).

**Currency swap**
An agreement to swap the debt-servicing LIABILITY of a loan or bond with repayments due in one currency with that of a loan or bond with repayments due in a different currency. Similarly, for assets. This can be useful to debtors having assets or income in a currency different to that required for debt servicing; the mechanism provides protection against exchange-rate fluctuations.
**derivative products**
SWAPS, FUTURES, FORWARDS and OPTIONS and other specialized risk-management instruments that are synthetically created to hedge specific risks.

**dollar equivalent**
The unit of valuation for transfers occurring or balances existing in currencies other than dollars.

**European option**
An OPTION which may be exercised only on its expiration date. (See also AMERICAN OPTION)

**exercise price**
The price at which an OPTION may be exercised. Also called STRIKE PRICE.

**fixed-for-floating**
A HEDGING arrangement in which a user is given a fixed price for a period of time in return passing on the price swings of the market to another party. This is done by means of two equal sized but opposite transactions between the hedger and the company that is taking on the price risk, with one at a fixed price and the other at a floating-market price. Only the difference between the two transactions is exchanged between the parties, assuring the hedger of the fixed price whether floating-market prices are above or below the fixed level.

**fixed interest rate**
A rate of interest that is defined in absolute terms at the time of the loan agreement, for example, 8.5 percent. Compare VARIABLE INTEREST RATE.

**floor**
A SWAP transaction in which a seller seeks to set a minimum fixed price for sales. This can also be accomplished through the use of FUTURES and OPTIONS.

**foreign direct investment (FDI)**
The acquisition abroad of physical assets such as plant and equipment, with operating control residing in the parent corporation in the home country.

**forward market**
An informal market that trades in the future delivery of specific types of currency, interest rate or commodity. Unlike a FUTURES MARKET, regulation is much less strict and there is no CLEARINGHOUSE or MARGIN payments. These conditions tend to restrict trading to large financial entities.

**forward rate arrangements (FRAs)**
Forward contracts for international interest rates are known as FRAs. Two parties agree to pay or receive a specified interest rate on a certain amount of money for a certain future period -- for example, agree to pay or receive fixed interest for a period of three months starting three months from now.

**futures market**
A formal exchange that trades contracts for the delivery of a specific type of currency, interest rate or commodity in future months. Only a very small volume results in physical delivery, and in some markets, there is only cash settlement. The presence of a CLEARINGHOUSE and regular daily MARGIN payments on all positions ensures the financial integrity of operations. The market is open to all.

**hedging**
The process of controlling the risk of adverse effects of external price fluctuations. It is not aimed at improving relative prices, rather at limiting the impact of drastic change. The three external type of change that can cause adverse conditions are: exchange-rate fluctuations, interest-rate changes, and commodity-price fluctuations. HEDGING techniques involve the use of futures and OPTIONS trading, and CURRENCY SWAPS and INTEREST-RATE SWAPS.

**hybrid instruments**
Risk-management mechanisms and other specialized financial tools, such as oil-indexed loans and securities, that utilize futures, forward and OPTIONS markets as well as SWAPS to create individualized financial services linked to commodity prices.

**IFC**
See World Bank Group
Risk Management in Developing Countries

IMF
See International Monetary Fund

interest-rate swap
An agreement to swap the debt-servicing LIABILITY of a loan with a FIXED-INTEREST RATE with that of a loan with a VARIABLE-INTEREST RATE. For example, a government of a developing country may be able to borrow at comparatively better terms at variable rates than fixed rates, while for an enterprise in an industrialized country the opposite is true. Each may prefer its liabilities in the other form. They therefore borrow and arrange a SWAP.

International Finance Corporation (IFC)
See WORLD BANK GROUP

International Monetary Fund (IMF)
A specialized agency of the United Nations, the International Monetary Fund encourages monetary cooperation, establishes international standards for exchange policy, promotes stable exchange rates among its member nations and makes short-term advances and standby credits to members in temporary payments difficulties. Its resources come mainly from the subscriptions of its members. Headquarters: Washington, D.C., U.S.A.

liability
An amount owed by an individual or entity for items or services received, expenses incurred, assets acquired, services performed, and amounts received but not yet earned.

LIBOR
See LONDON INTERBANK OFFERED RATE

liquidity
This refers to the volume of trading activity and diversity of participants in a market. Greater liquidity allows trades to be executed quickly and easily at a uniform price; lack of liquidity tends to prevent some participants from finding a buyer or seller at a given time. High-volume FUTURES markets are the most liquid.

London Interbank Offered Rate (LIBOR)
The London Interbank Offered Rate for deposits, such as the six-month dollar LIBOR or six-month Deutschemark LIBOR. This rate is commonly the base on which banks' lending MARGINS are fixed. Thus, an original loan agreement or a rescheduling agreement may stipulate the interest rate to the borrower at LIBOR dollar six-month plus 1.5 percent, adjusted semi-annually for changes in the LIBOR-rate. See also VARIABLE-INTEREST RATE.

long-dated forward market
The market in forwards that extends years into the future. Most futures and forward transactions go no more than a year ahead.

margin
Funds deposited during the trading life of a futures contract to guarantee fulfillment of obligations. Margins are also required on short OPTIONS positions.

mark-to-market
The practice of covering any markets losses from a trading position on a regular basis (usually daily in FUTURES MARKETS). Informal FORWARDS MARKETS and SWAPS do not usually require this.

maturity
The debt service to be paid on a particular date. Final maturity date is the date of the last payment due on the loan. Maturity period is sometimes used to denote the entire period over which principal repayments are being made for the loan.

net flows
Loan disbursements minus principal repayments during any period. See also NET TRANSFERS.

net transfers
Loan disbursements minus repayments of principal and service payments during a period. See also NET FLOWS.
official development assistance (ODA)
Flows to developing countries and to multilateral institutions provided by official agencies, including state and local governments, or by their executive agencies. Each transaction must meet the following tests: a) it is administered with the promotion of the economic development and welfare of the developing countries as its main objective, and b) it is concessional in character and contains a grant element of at least 25 percent.

options
Purchase of the right to buy or the sell a currency, interest rate or commodity at a given price (STRIKE PRICE) sometime in the future. The buyer then can choose whether or not to exercise the option depending on market conditions and investment strategy.

over-the-counter market
A market made by commercial and investment banks (and brokers) in financial transactions. The market is characterized by relatively little regulation, and contracts are often non-standard and tailored to customer requirements.

participation
In a SWAP, this refers to a type of arrangement in which the provider grants the customer a share in some of the gains from market movements that favor the customer. For example, an oil seller with a SWAP that sets a fixed price of $20 might also receive the right to a percentage share of any gains from a increase in oil prices above, say, $25. Such a condition allows the oil seller to benefit from some of the uplift in oil prices while also maintaining a fixed minimum price.

premium
The price of an OPTION determined by buyers and sellers in open, competitive trading on the exchange trading floor.

private nonguaranteed debt
The external obligation of a private debtor that is not guaranteed for repayment by a public entity.

public debt
The external obligation of a public debtor, including the national government, a political subdivision (or an agency of either), and autonomous public bodies.

publicly-guaranteed debt
The external obligation of a private debtor that is guaranteed by a public entity.

put option
A type of OPTION that gives the user the right to sell a commodity at a given price in the future. (See OPTIONS and CALL.)

secondary market
The market where creditors sell ownership of loans. The loans are at times sold at a discount, the level of which is determined by the creditworthiness of the debtor.

short-term debt
Debt that has an original MATURITY of one year or less.

spot market
A market for immediately available single cargoes or other small lots of physical crude oil or refined petroleum products.

spread (or margin)
A percentage to be added to some defined base interest rate, such as LIBOR, to determine the rate of interest to be used for a loan.

strike price
The price at which an OPTION may be exercised. Also called an EXERCISE PRICE.

swap
A financial risk-management tool in which two parties exchange differing market risk exposures in order for one of the parties be assured of a fixed or predictable price, usually for an extended period of years. May also involve short-term instruments in which the risk is managed by the swaps provider rather than absorbed by a counterpart.
terms of trade
An index of export prices divided by import prices.

underlying asset
The payoff on an option contract is specified with respect to the movements of a price. The asset to which this price relates is the underlying asset. Note that this may not be a physical asset, but could be an index, e.g., the Standard and Poor's 500 stock market index.

variable-interest rate
A rate of interest that is computed by adding a spread to a predetermined base rate. For example, 1.25% over LIBOR. Compare fixed-interest rate.

warehousing risk
An alternative technique for a swaps provider to lay off the risk taken on. Instead of finding a market participant that needs to hedge an opposite market position, the swaps provider sets aside the risk by using futures and options or some other market or mechanism.

warrant
An investment instrument offered to the public that is similar to an option and allows the buyer to benefit from fluctuations in stock or commodity prices. A warrant to sell oil at, say, $25 a barrel at some point in the future would pay the investor cent-for-cent for any rise in prices above that level.

World Bank Group
An intergovernmental financial institution with the status of a specialized agency of the United Nations. The World Bank Group consists of four agencies:

International Bank for Reconstruction and Development (IBRD) was set up as an intergovernmental financial institution in 1946 as a result of the Bretton Woods agreements. It is the original agency of the World Bank Group, and is still commonly referred to as the World Bank. International Finance Corporation (IFC) was established in 1956 for the purpose of promoting the industrial development of its less-developed member countries by means of investments to productive private sector enterprises. International Development Association (IDA) was established in 1960 and supplements the activities of the IBRD. IDA provides the less-developed countries with long-term loans at very concessional terms: typically a ten year grace period, a forty year repayment period and only a small servicing charge.

The Multilateral Investment Guarantee Agency (MIGA) commenced operations in April 1988. MIGA was formed to promote private investment for economic development in its member countries by:

* insuring investments made by foreign investors against losses caused by political risks, and
* providing promotional and advisory services to assist member countries in creating a responsive investment climate to attract private foreign direct investment (FDI).

The World Bank Group assists economic development by lending to public and private entities in any of its member countries. Its funds are obtained from three sources: 1) payment made by members on account of their capital subscriptions; 2) borrowing in the various capital markets of the world; and 3) net earnings. Loans are usually restricted to maturities of not more than 20 years and carry an interest rate based on that at which the World Bank Group itself can borrow. Headquarters: Washington, D.C., U.S.A.
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Bibliography and Additional Reading


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