

Commodity Risk Management and Development

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Many developing countries that are dependent on commodity prices have found previous approaches to price instability unsatisfactory. Increasingly, they are relying on market-based instruments to deal with price uncertainty.



Summary findings

In 1995, 57 countries depended on three commodities for more than half their exports, reports UNCTAD. And commodities, fuels, grains, and oilseeds are important imports for several countries. The notorious volatility of commodity prices is a major source of instability and uncertainty in commodity-dependent countries, affecting governments, producers (farmers), traders, processors, and financial institutions. Further, commodity price instability has a negative impact on economic growth, income distribution, and poverty alleviation.

Early attempts to deal with commodity price volatility relied on buffer stocks, buffer funds, government intervention in commodity markets, and international commodity agreements to stabilize prices. These were largely unsuccessful — sometimes spectacularly so. Buffer funds went bankrupt, commodity agreements were suspended, buffer stocks proved ineffective, and government intervention was both costly and ineffective.

As the poor performance of such stabilization schemes became more evident, academics and policymakers began distinguishing between programs that tried to alter price distribution (domestically or internationally) and

programs that used market-based approaches for dealing with market uncertainty.

This change in approach coincided with a significant rise in the use of market-based commodity risk management instruments — aided by the liberalization of markets, the lowering of trade and capital control barriers, and the globalization of commodity markets.

By the mid-1990s, several governments, state companies, and private sector participants began using commodity derivatives markets to hedge their commodity price risks. Participation in those markets is growing, but important barriers to access remain, including counterparty risk, problems small groups (such as farmers) have aggregating risks, basis risk (no correlation of local and international prices), no local reference prices, low liquidity, no derivatives markets for certain products, and low levels of knowhow.

International institutions, local governments, and the private sector could facilitate developing countries' access to derivatives markets and the use of risk management tools to solve public sector problems.

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COMMODITY RISK MANAGEMENT AND DEVELOPMENT

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Development Research Group

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Summary Findings

Many developing countries depend to a large extent on commodities for their exports and government revenues. According to statistics from UNCTAD, in 1995 fifty-seven developing countries depended for over 50% of their exports on three commodities. Commodities, fuels, grains and oilseeds, are also very important imports for several developing countries. Commodity prices are notoriously volatile which is a major source of instability and uncertainty for commodity-dependent developing countries. Commodity price volatility affects governments, producers (farmers), traders, processors, and local financial institutions financing commodities in these countries. Studies have also found that commodity price instability has a negative impact on economic growth, income distribution and poverty alleviation.

In the past, there have been several attempts to deal with commodity price volatility. A number and variety of international and national institutions and programs were designed for this purpose. Most of the earlier attempts concentrated in trying to stabilize prices through the use mainly of buffer stocks, buffer funds, government intervention in commodity markets, and international commodity agreements. These schemes have not proven satisfactory in dealing with commodity price instability. Experiences have shown that buffer funds have gone bankrupt, international commodity agreements have been suspended, buffer funds have proven ineffective, and government intervention has been too costly and overall ineffective. As the poor performance of stabilization schemes became more evident, academics and policy makers began to emphasize the distinction between programs that attempted to alter the price distribution, either domestically or internationally, with programs that deal with market uncertainty using market-based solutions.

The rise in market-based commodity risk management instruments has been significant the last ten to fifteen years. The proliferation of these instruments is aided by the globalization of commodity markets, market liberalization, and lower trade and capital control barriers. During the 1990s, several private sector participants, state-owned companies and governments in developing countries have started using commodity derivatives markets to hedge their commodity price risks. While the participation of these countries in commodity derivatives market is growing, there are still certain important barriers in accessing these markets. Among the most frequently cited barriers are: low levels of know-how, counterparty risk, problems related to aggregation of risks from smaller entities (such as farmers), basis risk (or lack of correlation of local to international prices), lack of local reference prices, and low liquidity or absence of derivatives markets for certain commodities. International institutions, local governments, and the private sector could facilitate the access of developing countries to derivatives markets.

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I. INTRODUCTION

Commodities provide food and livelihood for many families and communities, provide export earnings and income for many governments, and provide raw materials for processors. Often, commodities are at the heart of local economies and sometimes national economies. Commodity markets are also volatile. It is probably safe to say that all countries have engaged in some type of public effort to manage commodity price risks. Moreover, many economies are highly dependent on commodities and that dependence, coupled with volatile prices, can present an obstacle to development. In this paper we review the development of international efforts to tame commodity markets and the economic thought behind those efforts. We also draw distinctions among the several categories of risk faced by producers, consumers and governments in developing countries and suggest appropriate roles for governments and the international community. Finally we argue that the rapid development of commodity price risk markets over the last decade offers promising market-based policy alternatives.

The paper is structured as follows. Section II discusses the nature of price volatility and presents several measures. We present evidence that generally price volatility dominates output fluctuations and that there are no significant portfolio effects between commodities. In other words, price fluctuations between commodities do not offset each other. Section III reviews the literature on commodity price stabilization concluding that the traditional approaches have not been satisfactory. Consequently economists and policy makers have turned their attention to at market-based commodity risk management instruments, such as commodity derivatives (forwards, futures, options, swaps), as means to reducing price uncertainty. Section IV categorizes the types of problems policy makers face as a consequence of price volatility. Section V presents evidence that derivatives markets for risk management have been growing rapidly due to commodity marketing and trade liberalization. The growth in commodity derivatives markets presents opportunities for developing countries and economies in transition to hedge their commodity related risks. Section VI documents steps governments and donor groups have taken to encourage private markets for risk instruments. Section VII presents case studies in the use of commodity derivatives markets by developing countries. The first case study deals with the issues of price protection for agricultural producers and the second deals with hedging the exposure of government revenues to commodity prices. Section VIII concludes.

II. COMMODITY MARKETS AND VOLATILITY

Commodity prices are notoriously volatile. Prices change day to day, and indeed on active exchanges change minute to minute. Prices change between the time of purchase and the time of export and between planting and harvest time. Prices change year to year and they change relative to other prices. These characteristics are not unique to commodity markets, but they have generated and continue to generate a special set of

issues and problems for market participants and policy makers because many communities and countries remain dependent on commodities. Price volatility and income volatility are also development issues, since many primary commodity producers are also poor.

Characteristics of price and income volatility

Figure 1 charts monthly indices of petroleum, food and metals prices on international markets from 1983 to 1998. Figure 2 shows the same indices relative to the price of manufactured goods from developed countries. The indices are trade-weighted to provide an overall measure of developing countries' terms of trade. The terms-of-trade indices are designed to measure a commodity-exporting country's ability to pay for capital goods manufactured in developed countries. Since the 1950s, many economists and policy makers have argued that volatile income and declining purchasing power have been an impediment to development. Both figures are characterized by peaks and valleys. And while the hypothesis of declining terms of trade appears to hold up over the long run, it is easy to find exceptional commodities and exceptional periods.¹ Indeed, many commodity markets experience short sharp price spikes followed by extended periods of considerably lower prices. Consequently, commodity-dependent economies are often characterized by boom-bust cycles.

Questions concerning what constitutes commodity price volatility and how it should be measured have generated considerable debate. Beginning with Massell (1970), most empirical studies attempt to measure unanticipated price movements. In practice, various de-trending schemes are employed, sometimes leading to contradictory results. See, for example, Glezakos (1973), Knudsen and Parnes (1975), Lam (1980), or Cuddy and Della Valle (1978), or MacBean and Nguyen (1980). Further, adjusting the terms-of-trade for quality improvements further complicates generalizations. Figure 3 provides the results of one measure, similar to the index used by MacBean and Nguyen.

Where option markets exist, implicit volatility measures can be inferred -- at least over the life of the option. Such measures are short-term in nature and are themselves usually based on assumed underlying distributions of random movements. Table 1 presents data from the Chicago Board of Trade daily volatility report which shows the disparity between commodity volatility and the volatility of some financial instruments. In addition, the term structure of future markets and inventory data can also be used to derive implicit measures of price volatility. (See Larson, 1994.)

Price effects dominate quantity effects.

¹ See Grilli and Yang, 1988 and Diakosavvas and Scandizzo, 1991.

Generally, governments, firms and individuals are more concerned with issues of income or revenue stability rather than price movements. For metals or energy commodities, production quantities are generally known, and volatile prices explain most revenue variability. However, agricultural commodities, especially field crops, are also subject to variable weather and pest conditions. Consequently, price-risk instruments address only a portion of the underlying problem. Still, for the most part, price effects tend to dominate quantity effects -- at least when measured globally.

In Table 2, the variance, in logs, of world export earnings for selected agricultural commodities is decomposed into three components: price effect, quantity effect and cross effect. As shown in the table, the price effect had been the most significant determinant of export earnings volatility for the all selected commodities except maize during 1970-95. The results confirm previous studies. For example, UNCTAD examined the volatility of major non-oil exports of developing countries from 1962 to 1981 and found that 101 out of the 174 cases had larger unit value volatility than quantity volatility (Maizels, 1992). Furthermore, of 73 cases that quantity volatility is larger than unit value volatility, value volatility exceeds volume volatility for 41 cases. Also, Yabuki and Akiyama (1996) examined export revenues of 12 major primary commodities in developing countries and found that of 8 out of 12 commodities show significantly higher price effect than quantity effect.

No significant natural portfolio effects.

Commodity prices are volatile, but farmers may choose to produce a portfolio of goods and countries may derive income from exporting more than one commodity. Consequently, the negative impact of price movements could be overstated if fluctuations between different commodity prices offset each other. For instance, when one country exports several commodities and if price movement of one commodity is negatively correlated to others, then this country's price risk on exported goods may be reduced. Likewise, if one country's price movement of exported goods is positively correlated to that of imported goods, then the net effects of price volatility may be reduced. If this is true, the price volatility has its main impact on the allocation of traded goods rather than on the aggregate level of the price volatility. This issue relates to portfolio management. Table 3 shows a simple correlation among price indices of selected commodity groups during 1970-95. It is observed that all nominal indices are related positively meaning that they have had a tendency to move together during the period. In real terms, several pairs show insignificant relations. It is noteworthy that prices do not demonstrate negatively significant relations with one exception (timber and petroleum).

More formally, Pindyck and Rotemberg (1990) examined the price movements of unrelated commodities and concluded that the prices tend to move together even after accounting for macroeconomic effects. This phenomenon is called excess comovement. They point out herd effect and liquidity constraints as two reasons for excess comovement. Herd effect occurs when traders across different commodities react in a

similar way to non-economic factors. Liquidity constraints arises when a fall in the price of one commodity lowers that of other commodities because it decreases the liquidity of speculators who are simultaneously “long” in several commodities.

However, recent studies have challenged the conclusions, finding only weak evidence of excess comovement. For example, Palaskas and Varangis (1991) found that excess comovement is an exception rather than the rule. More recently, Partha, Trivedi and Varangis (1996) using monthly time series data for nine commodities found only weak evidence of excess comovement. In addition, the empirical analyses of Leyborne, Lloyd and Reed (1993) suggested that excess comovement occurs only infrequently. Together, these studies imply that there is no strong natural portfolio effects among commodity prices.

Still, for countries who have exposure on both exports and imports there is some portfolio effect since commodity export prices may correlate positively with commodity import prices. For example, beverage prices are positively correlated with grain and oil prices. Thus, a coffee or cocoa exporter that imports wheat or oil has some natural hedge.²

Many developing countries depend on commodities

Diversification of income sources provides a natural hedge for many individuals, firms and economies. Still many developing countries, especially in Africa, remain as dependent on commodity exports for earnings as they were in the 1960s. (See, for example, Akiyama and Larson, 1992). Table 4 lists countries with export dependence on three leading commodities greater than 50 percent. For 1990-92, thirty-four African countries, 9 Asian countries and 14 Latin American countries fall into this category. Some countries depend almost exclusively on single non-oil primary commodities. For instance, cotton in Burkina Faso, copper in Zambia and uranium in Niger accounted for 99 percent of their exports during this period.

With exception of oil dependent countries, countries with high GDP per capita and high GDP growth appear less dependent on a limited number of commodities. Conversely, countries that are dependent on a limited number of commodities generally have a high external debt ratio as percent of GNP—for example, Congo (365.8 %), Zambia (191.3 %), Angola (274.9 %) and Guinea-Bissau (353.7 %). Furthermore, resources devoted to servicing the debt (debt service as a percent of exports of goods and services) among these countries is also high.

Whether commodity producing farming households are also commodity dependent is a more complicated issue. Limited empirical evidence suggests that in

² As discussed later, portfolio considerations distinguish the IMF’s CCF program single-commodity policy instruments.

many rural households, farmers may derive a small share of their household income from cash crops. Still, the commodity crop can represent a high proportion of cash income and may provide cash at an important time. For example, cash receipts for cotton in Uganda arrive when school tuitions are due. We return to this issue again in Section III.

III. ECONOMIC THOUGHT, INSTITUTIONS AND COMMODITY PRICE INSTABILITY

The number and variety of international and national institutions and programs designed over the past half century to address the disruptive and negative effects of commodity price instability reflect the many consequences of volatile commodity markets. These include macroeconomic effects on currencies, inflation and growth and microeconomic effects on producers, intermediaries, and consumers -- especially the poor.

Following the turbulent 1930s, the international community looked for mechanisms to tame economic cycles and currency volatility and ideas from economists and policy makers of that time shaped many present-day institutions. Short-term balance of payment problems caused by volatile commodity prices were viewed as an especially important trade-based component of macroeconomic instability. At Bretton Woods, Keynes (1943) proposed a world currency based on a price index of the thirty most-traded commodities.³ By linking currencies to the index, commodity prices and price-related swings in trade earnings would be largely stabilized in an automatic fashion. Keynes also proposed a commodity stabilization scheme that included buffer stocks and a central fund. While Keynes' ideas were not incorporated into the charters of the Bretton Woods institutions founded at that time, the ideas would resurface. A succession of proposed internationally backed compensatory financing schemes followed the Bretton Woods conference, including the 1953 Olano Proposal for a Mutual Insurance Scheme; the 1961 Development Insurance Fund; the 1962 Organization of American States Proposal; the Swedish and Brazilian Proposals at the Committee for International Commodity Trade meetings and the French Proposal for Market Organizations, all in 1963.

Also in 1963, the IMF began to offer compensatory financing to countries experiencing an unexpected temporary decline in export earnings. The on-going program is based on net export earnings, rather than a single set of commodities, thus taking advantage of any natural portfolio effect that might arise from diversified exports and imports. Hewitt (1993) states that the IMF's program functioned well early and was used by developed and developing countries alike, but became expensive and laden with conditionalities by the mid-1980s. Later, as part of Lome I in 1975, the EU offered its own compensatory financing scheme, STABEX, to ACP countries. Since then, the program has suffered from inadequate funding and a variety of implementation problems.

³ See Hewitt (1993) for a discussion of Keynes' proposal in the context of STABEX and compensatory financing.

Under current proposals, STABEX is likely to be drastically modified, if not eliminated as the current Lome agreement expires in 2000⁴ (European Commission, 1996).

In 1965, a World Bank study (World Bank, 1965; Hewitt, 1993) proposed a fund to supplement the IMF's program. In that document, Bank staff argued that shortfalls in export earnings not only lead to foreign exchange problems, but constrained economic growth. Consequently, unforeseen events could render development programs unaffordable. To counter this, the Bank should insure a mutually agreed upon development program against unanticipated shortfalls in export earnings that could not otherwise be covered. The program differed from earlier compensatory financing schemes in its emphasis on sustaining development programs through revenue shortfalls rather than stabilizing exchange rates. Although much discussed, the program was never adopted.

In 1950 Prebisch (1950) and Singer (1950) independently offered the hypothesis that, because of differing elasticities of income and demand, prices for primary commodity exports would fall relative to manufactured imports.⁵ Consequently, the net barter terms of trade for commodity producing developing countries would decline. This contradicted the long-standing notion of increasing scarcity put forward by Malthus and Ricardo. Soon thereafter, the two ideas were combined so that the "commodity dependency" problem was characterized by declining terms of trade and volatile export earnings. Generally economists argued that instability of export earnings limited development through adverse effects on income, inflation, savings and investment.

Using data from Malaysian rubber plantations, Caine (1954) challenged the negative link between revenue instability and investment. Caine argued that increased revenues during boom periods resulting in increased savings and investment. Later, MacBean (1966) also challenged the findings using cross-country data as did Knudsen and Parnes (1975). More recently, Deaton (1992) finds that for Africa overall, investment and ultimately GDP expand more to export price increases than contract in response to price falls. Conversely, Dawe (1996) calculates instability indices for a cross-section of countries by taking account of the share of exports in any given economy and finds that export instability is negatively associated with growth and investment. Hausman and Gavin (1996) find that volatility decreased economic growth and investment in Latin America. At the same time they found evidence that volatility adversely affects income distribution and raises poverty rates. In summary, the empirical

⁴ For example, Chapter VI of a much discussed European Commission Green Paper on the future of Lome concludes: "The evaluations also suggest that the Stabex and Sysmin systems need to be abolished or at least amended."

⁵ The usual Prebisch-Singer arguments concern the barter terms of trade -- that is, relative prices. Given the scope for productivity gains, for example, changes in the barter terms of trade may have little to say about welfare. See Diakosavvas and Scandizzo, 1991 for more complete discussions.

results of both cross-country and single country studies spanning four decades of research have been mixed. The same can be said for general-equilibrium studies.⁶

Beginning in the 1950s, many governments of commodity-producing countries took on the task of managing commodity markets through international agreements. Under United Nations auspices five international commodity agreements were signed by producing and consuming countries: the International Sugar Agreement (1954), Tin Agreement (1954), Coffee Agreement (1962), Cocoa Agreement (1972), and Natural Rubber Agreement (1980). Generally, the agreements were intended to address declining terms of trade through supply management, and price volatility through buffer stock operations. In 1968, UNCTAD put forward a proposal similar to Keynes' earlier proposal. Ultimately, the 1968 proposal resulted in a 1975 resolution passed at a special session of UNCTAD in Nairobi, calling for an Integrated Program for Commodities covering ten core commodities identified by UNCTAD as storable. Consistent with Keynes original proposal, a financial fund was to be established to provide liquidity to individual buffer stock. Ultimately, the proposal resulted in the creation of the Common Fund for Commodities.

These agreements, however, were unable to adapt to changes in the market, and by 1996 the economic clauses in them had all lapsed or failed (Gilbert 1987, 1996), victims of politics and economics.⁷ The Natural Rubber Agreement was resuscitated in 1997 and remains the only agreement with a functioning economic clause. Funds dedicated to buffer stock management at the Common Fund have never been used for that purpose.

Countries have also pursued stabilization goals unilaterally. The purposes and instruments of price stabilization are varied, but can be broadly classified. The goals of stabilization include: i) intra-seasonal stabilization where harvest prices are announced prior to the planting season so that farmers can better plan their allocation of resources⁸; ii) inter-annual smoothing of prices to stabilize producer incomes; iii) inter-annual smoothing of prices to limit inflation or smooth consumer budgets⁹; iv) smoothing of

⁶ See Behrman, (1987), Maizels, (1992) and Dawe (1996) for reviews of arguments and empirical studies on growth and export instability.

⁷ The Tin Agreement failed in a spectacular fashion, almost bringing down the London Metals Exchange.

⁸ Historic and present-day examples of government offerings of some minimum producer price are ubiquitous and include the three North American countries, the EU, the Mercosur countries, Japan, India, Indonesia and most African countries.

⁹ Many of the same countries that provide within-season price stabilization mechanisms -- such as a minimum producer price-- also provide price-smoothing across seasons. For example, minimum prices for domestic producers in many of the Mercosur countries are based on a moving average of world market prices (Quiroz and Valdes, 1993.) Other countries, intervene from public stockpiles to influence domestic markets. Examples include rice markets in the Philippines, South Korea, Bangladesh, India and Indonesia.

export earnings to stabilize government revenue or exchange rates¹⁰. Governments may also be motivated by self preservation motives as well, since food shortages and rapid increases in food prices can result in regime changes.¹¹ Knudsen and Nash (1990) group the instruments or institutional arrangements for price stabilization as follows: i) physical buffer stock schemes; ii) stabilization funds or variable tariff schemes; and 3) marketing boards.

While the links between price volatility, savings, investment and growth remain controversial, there is general agreement that some governments face difficulties managing their budgets and currencies as a consequence of trade instability stemming from commodity price volatility and that price volatility reduces producer welfare. However, most real-world examples of stabilization schemes are considered unsuccessful and often unnecessary. Early on, Bauer and Parish (1952) noted that the stabilization objectives of most marketing boards were ill defined and potentially a guise for taxation. Writing nearly forty years later, Knudsen and Nash would present further examples of confused and conflicting stabilization and income support objectives. Wright and Williams (1990) noted the wide-spread failure of domestic stabilization schemes of all sorts and linked the failure to the nature of commodity prices and underlying models of storage. Examining the time-series properties of commodity prices, Deaton (1992) argued that the series tended to be mean-reverting -- a condition for a successful stabilization fund -- but that the reversion took place over years. Consequently, successful stabilization funds needed impractically large lines of credit. Later, Larson and Coleman (1993) showed that, even with hedging, commodity price movements will eventually bankrupt stabilization schemes. Gilbert (1996) noted a variety of causes for the failure of international commodity agreements.

In 1954, Friedman stressed the importance of private savings rather than public stabilization schemes in solving the producer income problem. Later, in 1981, Newbery and Stiglitz argued that incomes and ultimately consumption rather than prices should be the focus of the farmer's risk-management problem. Given freedom of choice, the potential gains from reduced volatility were often not significant since farmers provide some measure of self-insurance by undertaking a portfolio of activities and by saving. Collier and Gunning (1996) offer similar arguments when advising against commodity export taxes during boom periods. In addition, Newbery and Stiglitz and later Williams and Wright (1991) argue that domestic public storage schemes aimed at stabilizing prices largely displace private storage rather than generate welfare gains.

¹⁰ Knudsen and Nash note that some countries such as Malaysia, Sri Lanka, Kenya and Colombia use progressive export tax rates to offset the price variability of exports. Others, such as Botswana (Hill, 1991) used international reserves, and fiscal measures to maintain stable exchange rates. See Hausman (1995) for a discussion of fiscal revenue risk in Latin America. A few countries, like Chile for copper, operate a formal stabilization fund that smooths export revenues (Arrau and Claessens, 1992.)

¹¹ For example, Deaton (1993) finds a correlation between commodity prices, economic growth and political survival in 44 African countries.

Household studies confirm that farmers in developing countries self-insure through a variety of formal and informal mechanisms including diversification of crops and labor, gift-giving, and income-and-responsibility sharing¹². (See Morduch, 1998 and Fafchamps, 1998 for reviews.) Using household data, Paxson (1992) confirms earlier observations by Cain and Friedman and shows that Thai rice farmers save most, if not all transitory income. However, self-insurance can prove expensive (Robertson, 1987) and unreliable (Alderman and Paxson, 1992). For example, returns to liquid savings can be negative (Deaton, 1991) or heavily taxed by inflation (Fafchamps, 1998.) Moreover, self-insurance schemes can fail when they are needed most, particularly in time of drought. (See, for example, Reardon, Matlon and Delgado 1988). In addition, even if self-insurance through savings and other mechanisms work, Timmer (1989) has argued that traditional analysis ignores the dynamic costs of adjusting and readjusting to volatile prices.

As the poor performance of stabilization schemes became more evident, writers began to emphasize the distinction between policies that attempted to change the distribution of prices internationally or domestically with policies of managing uncertainty using markets for price risk. McKinnon explored the use of futures markets as an alternative to buffer stocks in 1967. Later Gilbert (1985) demonstrated that hedging on forward markets could substitute for some of the welfare gains normally associated with buffer stocks. Gemmill (1985) argued that futures markets for cocoa, coffee, and sugar would provide an attractive mechanism for hedging export earnings risks and that forward contracts could be substantially cheaper than buffer stock operations. O'Hara (1984) looked at the use of commodity bonds to stabilize consumption. Rolfo (1980) investigated the use of futures for cocoa producing prices and calculates the optimal hedge ratio in the presence of both production (output) and price volatility.¹³ Overdahl (1987) demonstrated the benefits of oil futures markets for oil producing states. Kletzer, Newbery and Wright (1990) proposed financial instruments to smooth commodity export revenue and Claessens (1991) has pointed out that commodity bonds can be used to hedge debt management problems associated with volatile export earnings. Lapan, Moshini and Hanson (1990) discussed the microeconomic relationship between production and hedging.

Moreover, the theoretical findings have also become increasingly practical with the expansion of liquid futures and derivative markets. Sakong, Hayes and Hallam (1993) discuss the usefulness of hedging in the presence of production uncertainty. And Morgan, Rayner and Ennew (1994) conclude that futures markets for cocoa, coffee, sugar

¹² See Jean and Peter Lanjouw (1998) for a review of household surveys that measure sources of rural household income, including off-farm activities.

¹³ Rolfo shows that the ratio of optimal hedge to expected output should be below unity. Thus, limited usage of the futures market may be superior to a full short hedge of expected output when there is production variability.

and wheat -- key markets for developing countries' exports and food imports -- are efficient and therefore provide viable policy options for risk management. Recent country-specific studies include Claessens and Varangis (1994) for oil in Venezuela; Satyanarayan, et al. (1995) for cotton in Africa; Quattara, Schroeder and Sorenson (1990) for Cote d'Ivoire; Faruquee, Coleman and Scott (1997) for wheat in Pakistan.

While some writers stress the conditional cost advantages of risk-management over policies such as buffer-stock operations that attempt to alter price distributions (Gemmil, 1985; Hughes-Hallet and Ramanujam, 1991), other practical advantages exist as well. First and most importantly, risk management generally does not require collective action. Companies or individuals can frequently hedge independent of specific government programs and governments can pursue policies independent of international action. This is especially important given the propensity for international commodity agreements to fail. Further, there are often advantages relative to specific instruments. For example, buffer stocks are subject to large accumulations¹⁴ or stock-outs¹⁵; and compensatory financing schemes such as STABEX provide revenues ex-post drawing on limited donor resources. In contrast, risk-management instruments rely on private capital and payouts are automatic. Further the costs of managing risk, as with insurance, is known up-front although the ultimate value of the strategy is only known ex post.

IV. COUNTRY POLICY AND RISK MANAGEMENT

As the discussion above indicates, the consequences of commodity price volatility are varied. In this section we categorize the "problems" associated with commodity price volatility from a policy perspective. In dealing with private agents such as producers, traders and processors of commodities, we take as a starting point the merits of freedom of choice. For problems related to governments -- issues of budget, debt and trade instability, we emphasize the ex ante use of hedging techniques. As Bauer, Knudsen and Nash and other writers have noted, policies dealing with commodity price risk problems are frequently poorly defined and poorly targeted. Table 5 provides broad categories of price related risks intended to guide the discussion below. Although very general, the classification illustrates the point that the problems are varied and call for different and targeted policies.

At the most general level governments can be a source of price volatility through fiscal or monetary policy mismanagement or a failure to handle external financial shocks. Generally, changes in international commodity prices and changes in exchange rates are eventually reflected in domestic prices—even for policy-insulated agricultural prices (Mundlak and Larson, 1992.) Commodity-dependent countries have the added burden of

¹⁴ For example, the US CCC program in late 1980s.

¹⁵ For example, the International Natural Rubber Organization's buffer stock went from large accumulations (some of the rubber was actually frozen) to a stock-out in the mid 1990s.

handling the macroeconomic effects of commodity booms and busts (Varangis, Akiyama and Mitchell, 1995.) Consequently, sound economic management can reduce price and income volatilities. This is especially important when the poor rely on fragile self-insurance strategies.

Still, for any given level of volatility, market participants throughout the economy may lack access to international markets for risk management instruments. Some of the limits faced in markets for risk instruments are shared by all contracts (Posner, 1998); however, in many cases, markets for risk instruments face additional barriers. Governments sometimes prohibit outright the development of local markets for risk instruments because they potentially complicate currency and interest rate management policies, or because of restrictions on capital flows. In other cases, governments may fear the consequences of unregulated markets on poorly informed consumers, but may also lack the capacity to regulate.¹⁶ Moreover, international providers of risk instruments may choose not to participate in some markets due to perceived credit or sovereign risk. We return to this topic later in the paper.

Commodity price volatility problems can be categorized also by affected groups. Private sector participants are likely to be a diverse group with diverse needs. Given scope for choice, market participants will utilize a variety of risk-management techniques. Providing access to international price risk markets gives market participants greater scope for managing risks, and given opportunity, private traders and processors are likely to utilize risk markets directly. However, farmers generally do not, and rely on intermediaries such as grain elevators or warehouses to offer for example, short-term price guarantees. In turn, markets for delivering risk-management tools must have their basis in efficient domestic markets -- including markets for storage -- that can be linked to international commodity markets. Consequently, policies that promote efficient domestic markets through market liberalization, investments in infrastructure, and dissemination of market information also support markets for risk management instruments.

Ultimately, household are concerned about risk to income, or more broadly wealth, rather than price instability¹⁷. Rural households dependent on commodity production may hedge their income risks in many ways, including diversification and informal social arrangements in which family or friends assist in time of need. Where price-risk markets are available, farmers could also generate income by combining price-

¹⁶ For example, in Indonesia, a number of local brokers of futures and options were shut down in 1993. The industry lacked a regulatory framework in which to operate and were portrayed as "bucket shops." Traders and processors of cocoa, palm oil and other commodities had access to risk management markets, but did so through Singapore or other off-shore brokers.

¹⁷ See Bliss and Stern (1982) and Binswanger and Rosenzweig (1984) for discussions of smallholder labor decisions and risk.

insurance with crop, yield or weather insurance.¹⁸ Still, there are limits to the ability of very poor households to self-insure and governments often choose to intervene in markets to offer some minimal protection to producers or consumers.¹⁹ And despite the importance of production-related risks, most government programs intervene to influence price.²⁰ Generally, crop insurance programs, public and private, have not proven successful. (Hazell, 1992.) This is not to diminish the potential value of programs that might address catastrophic crop loss.

Governments are also concerned with food security and the ability of the government to provide a safety net in the case of extreme weather events. However, there are limits to the current markets to address such issues fully. Weather-related shortfalls in domestic production can not be fully addressed with price-based instruments and weather-event and other rare-event instruments are only now evolving.²¹ We return to these topics later.

Some developing countries do participate in risk markets through their parastatals, especially in the petroleum and metals markets. Government-owned companies such as PEMEX in Mexico and Codelco in Chile have a well established presence in the commodity risk markets. And as we discuss later, the direct presence of developing countries in some of these markets is growing rapidly. For these entities, "agent" problems and issues of oversight and transparency are especially relevant. Past mistakes at Codelco and in Orange County, California, highlight the potential consequences of poorly managed public participation in risk markets. Still, there are successful models of oversight. For example, the State of Texas empowers a Depository Board to oversee its hedge of oil royalties²². Southern California, a US public utility, separates strategy,

¹⁸ There are reasons why markets for commodity price and weather might evolve separately. While farmers worry about income, functioning storage markets will reduce the chance of stockouts for agricultural consumers -- although consumers will continue to worry about price. Disparate groups, including farmers, transporters, vacation businesses and energy producers may worry about the effects of weather.

¹⁹ For example, see Pinckney (1993) on food policies in southern Africa.

²⁰ Generally, crop insurance programs, public and private, have not proven successful. (Hazell, 1992.) This is not to diminish the potential value of programs that might address catastrophic crop loss. Indeed, innovations in the capital markets that take advantage of new risk instruments for catastrophic events such as hurricanes may foreshadow new methods for delivering weather-based insurance instruments.

²¹ See Miranda and Glauber (1997) for a discussion about systemic risk and crop insurance. An interesting recent development in financial derivatives is the catastrophe or "cat" bond. These instruments are to date relate primarily to earthquake or hurricane events and are designed to spread risk throughout the capital markets rather than keeping it on insurers' own books. According to the Economist magazine (Feb. 28, 1998), seven issues worth a total of \$1.1 billion were sold between 1994 and 1996.

²² The state has hedged oil-based revenues since 1992. The Depository Board comprises the State Comptroller, the State Bank Commissioner and Citizen member.

execution and reporting among a Hedge Committee, a Trader, brokerage firms, Treasury and Accounting.

While governments may intervene in domestic markets, justifiably or otherwise, to protect producers and consumers from volatile markets, they face risk-related problems in managing their own affairs as well. Broadly these fall into the central bank problems of managing reserves and managing debt, and the treasury problem of managing budget shortfalls. As noted earlier, economists have demonstrated the feasibility and potential benefits of using market-based instruments to address these issues. Cassard and Folkerts-Landau (1997) provide examples of how governments in Ireland, New Zealand, Sweden, Colombia and Hungary use instruments tied to exchange rate, interest rate, liquidity and sometimes commodity markets to manage their debt.²³ Practical experience, however is limited.²⁴ The same is true of current budgets where governments typically manage shortfalls by borrowing.²⁵ Similarly, new borrowing either from capital markets or from donor programs like the CCFE or STABEX has been the traditional solution for export earning shortfalls. However increased borrowing may not be an option for highly indebted countries, or countries where binding agreements limit new debt. Moreover, schemes such as compensatory financing programs have lacked timeliness. Donors as well as commodity-dependent countries are looking for alternatives.²⁶ Some current programs that use market based instruments to resolve public sector problems related to commodity price risk are illustrated in Sections VI and VII .

V. THE RISE OF COMMODITY RISK MARKETS

As discussed earlier, markets for risk management instruments allow agents to off-lay risks and are distinguished from market intervention schemes that seek to directly alter the distribution of prices by changing the terms of trade or reducing price volatility. The use of market-based hedging tools permits a Pareto efficient allocation of resources and risks, but in reality, a full set of contingent markets does not exist -- especially for time periods beyond several years. Further, market access can be of a problem for producers who lack financial and technical wherewithal and an appropriate institutional environment.

Ironically, policies designed to address perceived short-comings of markets for price risk or other development strategies often hampered the development of markets for

²³ Claessens, Kreuser, Seigel and Wets (1997) have proposed specific tools to assist other countries in developing similar management techniques.

²⁴ There are more numerous examples of ad hoc linking debt to commodity price performance. For example, the Confederate States of America issued bonds payable in bales of cotton in 1863 and the former Soviet Union took on oil-indexed debt from private Japanese Banks in 1979 (O'Hara, 1984).

²⁵ The US states of Alaska and Texas are exceptions.

²⁶ See a discussion of STABEX in European Commission (1996.)

price risk. For example, buffer stock schemes designed to provide multi-period price smoothing sometimes lead to larger-than-expected inventories²⁷. And while ultimately unsustainable, the schemes were in some cases successful in reducing volatility -- at least temporarily. In addition, domestic stabilization programs frequently decouple domestic prices from international markets. Futures and other risk management markets shrank or sometimes disappeared as a result. In a similar way, brokerage houses and associated regulatory laws and institutions were not needed in countries where marketing boards mandated farmgate prices country-wide. Consequently, the rise in global markets for risk management instruments is due in part to a changing approach to commodity problems by developed and developing countries.

Commodity markets and hedging.

Markets for commodities include spot, forward and futures. In spot or cash markets, prices set are for goods that will be delivered promptly. Thus, while spot markets provide price discovery, this is only for today (contemporaneous) prices. In other word, spot markets do not provide price information for goods to be delivered in a future date. This gap is addressed by forward and futures markets. Forward markets involve the delivery of a good at a specific time in the future. Forward and futures markets add the time dimension to spot markets. Thus, a seller or a buyer of goods can set a price for the good that they will trade in a future day. Futures markets are similar to forward markets but differ in four important areas. First, they are standardized in terms of contract terms and thus they are fungible. Second, they involve margins (collateral) to address the issue of counterparty risk. Third, they are traded in organized exchanges under rules and regulations. Four, while forward contracts usually involve physical delivery of goods at maturity, in futures markets users usually close their positions before maturity. However, the important element in both forward and futures markets is that users can hedge their price risk. They can lock-in today the price of the commodity they wish to purchase or sell at a futures date. In forward market, the physical purchase and hedging is in one transaction, while in futures market the physical purchase is often separate from hedging.

Forward and futures markets for commodities are not recent phenomena. Futures markets in commodities predate the now larger futures markets for other assets such as currencies, bonds, and equities. Agricultural commodities (grains) futures started trading at the Chicago Board of Trade (CBOT) in 1865. The London Metals Exchange (LME) started trading base metals in 1878 and precious metals started trading at COMEX in 1933. Meat and livestock futures contracts were introduced at the Chicago Mercantile Exchange in 1957. Some developing countries have also a long history in commodity futures trading. During the late 1800s the Buenos Aires Grain Exchange traded futures in

²⁷ Examples from the late 1980s include inventories associated with the US CCC program, the EU Common Agricultural Policy, and the ICCO's buffer stock.

grains. In India, futures trading was first introduced on the Bombay Cotton Exchange and the Bombay Oilseeds & Oils Exchange as early as 1921 and 1926 respectively.

The great depression of the 1930s, the onset of W.W.II and a change in economic thinking about economic development limited the use of commodity derivatives. The Prebisch-Singer view of ever-diminishing commodity terms of trade, the idea of a perfectly elastic supply of labor from the rural sector associated with Lewis' (1954) dual economy model, and Kuznets' (1955) theory that income inequality would diminish with industrialization all contributed toward a policy bias against agriculture and commodity sectors. With increased government intervention and more interventionist policies in commodity markets came a decline in the use of commodity risk management instruments, especially in developing countries. Trading ceased on the once thriving grain exchange in Argentina, the cotton/oilseeds exchanges in India, and the cotton exchange in Egypt. The disappearance of the Liverpool Cotton Exchange in the 1960s can be attributed to the commitment of the US government to purchase cotton at a fixed price. It was not until the 1980s when the failure of price stabilization schemes and the adoption of policies market liberalization policies improved opportunities for the development of markets for commodity risk management products. Indeed, most of the current futures exchanges in developing countries started after 1980. In addition, risk management products, such as commodity derivatives, increased in popularity due to: (i) trade and market liberalization that has resulted in increased linkages between world prices and domestic prices; (ii) improvements in technology (communications, software/hardware systems, etc.) and know-how; and (iii) a growth in the demand for commodity instruments from institutional investors²⁸.

As a result of the renewed interest in derivatives markets, trading volumes have increased considerably during the 1990s at both exchanges and the OTC (over-the-counter) market, providing more liquidity into derivatives markets and making them more appealing to both hedgers and speculators (see box below). For example, the trading volume at the New York Coffee, Sugar and Cocoa Exchange (CSCE) more than doubled between the early 1980s and mid-1990s (see also Figure 1). Similar growths have been registered for NYMEX's energy and CBOT's grain contracts, while the number of contracts traded at the Budapest Commodity Exchange increased more than threefold during the 1990s. Maturities have also improved allowing even longer-term hedges (more than 1-2 years) for certain commodities and for certain volume of transactions, particularly in the OTC market.²⁹ For example, a ten year hedge on oil price exposure and a five year hedge on copper, aluminum or gold are feasible for certain volumes. However, for most of agricultural commodities maturities are still very

²⁸ In recent years, bond portfolio managers have increasingly used commodity instruments as a hedge against inflation.

²⁹ The majority of OTC market transactions involve metals (precious and base) and petroleum with only a very low percentage going to agricultural commodities. Furthermore, more than 70% of the OTC transactions are within one year and only about 1% are for over five years.

limited. Most of the trading activity and open interest takes place in the first two to three nearby contracts (months). Somewhat higher maturities can be found in the OTC market for agricultural commodities.

Description of market liquidity and maturities for various risk management instruments.

Petroleum. Futures, options and OTC markets for crude oil are very liquid and liquidity is adequate even up to seven years or more (particularly in the OTC market). For heating oil and unleaded gas, there is enough liquidity in futures, options and OTC markets, albeit at somewhat shorter maturities compared to crude oil.

Precious Metals. For gold and silver, futures, options and OTC markets are quite liquid. Liquidity tends to be adequate even for longer maturities, i.e., ten years in the OTC market.

Base Metals. Futures, options and OTC markets are quite liquid for copper and aluminum with adequate liquidity to about three years. For other base metals, such as lead, tin, zinc and nickel, derivatives markets are less liquid and maturities tend to be shorter.

Agricultural Commodities. There is liquidity for several of major agricultural commodities traded at exchanges (coffee, cocoa, corn, soybean complex, wheat, cotton), but liquidity tends to concentrate within 9 to 12 months. OTC markets are less liquid, but maturities could be higher for certain transactions.

Implications for developing countries.

Wider and deeper markets now provide better opportunities for commodity producing developing countries to use risk management instruments. Capital and commodity market liberalization has also potentially improved access. Some countries already use these instruments. For example, Chilean and Peruvian copper producing companies have been using risk management instruments, as well as, several oil companies in Latin America, Asia, the FSU, and to some extent in Africa. In coffee and cocoa various private exporters in Latin America, Asia, and starting now in Africa, are users of futures and options contracts for hedging. According to some estimates, as much as 50% of the growth in sugar business in the last four years at the London and New York exchanges could be attributed to greater usage by producing countries. Other commodities for which there is an interest by developing countries include cotton, rubber, palm oil, soybeans, frozen orange juice, maize and wheat. However, with the possible exception of sugar, only a very small share of the open interest and trading volumes at agricultural commodity exchanges is attributed to developing countries.³⁰ In contrast, developing countries are making a greater usage of risk management instruments for metals and energy. Following the Gulf War, NYMEX reported a doubling of the open interest in crude oil futures attributed to developing countries. IPE's open interest attributed to developing countries and economies in transition also more than doubled

³⁰ According to industry estimates, the share of developing countries of the open interest in futures and options for most commodities is under 2%.

during the 1990s.³¹ In terms of the geographic distribution, Latin American users appear to have the largest share among developing countries and economies in transition. Smaller shares are attributed to users from Asia, Middle East/North Africa, the FSU/Eastern Europe, and lastly by users from Africa.

Why the significant interest from users in Latin America? First, Latin America has large markets for several commodities such as coffee (Brazil, Colombia, and Central America), grains (Argentina, Brazil, Mexico), oil--both exports (Colombia, Ecuador, Mexico, Venezuela) and imports (Brazil, Chile)--, and metals (Chile, Peru). Second, market deregulation, privatization, trade reforms, and reforms in commodity markets have been deeper and longer-lived resulting in reduced government intervention in commodity markets and increased private sector participation. Commodity price risks that were born by either the private or public sectors are now increasingly placed on external markets. Third, capital market reforms, the lifting of foreign exchange controls and greater macroeconomic stability had spill over effects on commodity markets contributing to the use of commodity risk management instruments.

For most part, the use of futures, options and OTC markets for commodities by developing countries is confined to relatively large organizations, either state or private, with very little participation on the part of producers or producer groups. With respect to exportable commodities such as coffee, cocoa, and sugar, foreign firms based in developing countries actually perform price hedging at the point of export, but, such hedging does not extend to local firms that sell the product to exporters or to farmers. With respect to OTC instruments, their use is limited in developing countries with the majority of the activity concentrated to petroleum and metals. Users of OTC instruments in developing countries are usually large entities, frequently government controlled, but also more recently large private entities.

Generally, commodity risk management instruments in developing countries are used to hedge price risks in specific transactions and thus covers relatively short horizons -- usually between few months and a year.³² However, there are few examples of companies that have employed longer-term strategic risk management strategies, particularly linked to financing. Examples include Mexicana de Cobre (a private Mexican copper producing company), Sonatrach (Algeria's oil company), and, Ashanti

³¹ At both IPE and NYMEX the open interest for oil attributed to developing countries and economies in transition is about 5-6% of the total.

³² Examples of such transactions related hedging are: a coffee exporter buys coffee upcountry and does not have a buyer. This exporter will sell futures contracts and buy them back as soon as he/she finds a buyer. This way, the exporter will protect his/her profit margins. In another example, an oil company sells crude oil but price of crude will be determined at the time of shipment, in a month or so time. At the moment of sale the oil company sells futures and buys them back at the time of shipment to lock-in a price for the crude at the time of sale. However, there are some longer term hedging strategies that link hedging to investment projects (the repayment of the loan is linked to commodity prices)

Goldfields Corporation (Ghana's gold producing company). Also, a few developing country governments have used commodity derivatives to provide price protection to farmers. Examples include the provision of options to coffee farmers in Guatemala, and cotton and maize farmers in Mexico. Finally, some governments that have used commodity derivative instruments strategically during extreme market situations. For example, during the Gulf War, the government of Mexico used commodity derivatives to protect itself against price declines when budgeting its oil related revenues. The governments of Ecuador also pursued a similar strategy, while the governments of El Salvador and Chile used options to hedge against increased import bills during the same period.

In general, risk management instruments in developing countries are more readily available for highly tradable commodities rather than commodities domestically produced and consumed. This is mainly because tradable commodities tend to have transparent prices linked to international markets prices (as a result of market liberalization and globalization) often determined at commodity exchanges (coffee, copper, cotton, cocoa, petroleum, and metals, in New York and London; grains in Chicago). On the other hand, commodities that are mainly domestically produced and consumed have a higher incidence of government intervention and domestic prices often are weakly linked to international prices. This tends to be the case for grains in a number of countries, where governments adopt pricing and trade policies to ensure self-sufficiency. There are also certain commodities for which markets tend to have a geographic segmentation mainly related to the feasibility and cost of transport. For example, livestock, and natural gas markets tend to be local markets. Even so, regional markets for risk management instruments often evolve. For example, metals and agricultural futures markets have evolved in China -- despite trade restrictions, and livestock derivatives have been developed in Argentina and Hungary.³³

VI. PUBLIC APPROACHES TO EMERGING RISK MARKETS

Much of the literature on commodity risk management centers on the sources and consequences of risk on farmers, traders, processors and governments. Also much discussed are the failures of policies designed to limit the perceived harm wrought by volatile commodity prices. Less discussed are the numerous efforts by governments and the development community to provide support for the development of private risk management markets and developments in the markets themselves. This section provides a very cursory review of such programs with the hope of encouraging other researchers to better document and analyze such efforts. Table 6 summarizes the main barriers to accessing risk management instruments in developing countries classified by commodity groups and puts into a perspective the areas where support and solutions are focusing.

³³ For a full discussion see Larson and Varangis (1996).

Programs to develop know-how

Technical skills associated with risk management is often lacking -- especially in newly liberalized markets. Of course, as with markets in physical commodities, markets for risk management instruments involve a number of actors with varying needs and levels of understanding. Several international organization offer programs designed to provide technical assistance to both policy makers and market participants. For example, UNCTAD, the International Trade Center, the Common Fund for Commodities, and the World Bank all offer broad-based technical assistance³⁴. In addition, there are several groups that offer quite specialized information. For example, The International Organization of Securities Commissions publishes a comparative review of international regulatory systems³⁵ and the IRIS Center at the University of Maryland offers a survey of collateral law.³⁶

At the other end of the spectrum, producers, traders and processors are most interested in the specifics of their commodity markets and the relevant international markets. Several in-country commodity associations have been especially effective in offering information and guidance to their membership. Examples include ASKINDO, the Indonesian Cocoa Association and ANACAFE in Guatemala. The private sector and government often work jointly on establishing local exchanges and technical information comes from private and public sources. For example, the Chicago Board of Trade, in exchange for equity, is currently working with local investors and the Government of Poland to establish a local futures exchange and the Chicago Mercantile Exchange is working with the public and private sector in Indonesia.

Addressing problems related to credit, collateral and counter-party risk

From interviews with providers of risk management instruments, the greater challenge for producers, traders and processors in many developing countries lies in overcoming their low credit rating and a lack of adequate collateral for hedging transactions. Providers of risk management instruments increasingly offer instruments to middle income countries in Latin America, Asia, Middle East and Eastern Europe. However, risk management services are more rarely offered in poorer countries, and where markets are newly emerging.

³⁴ For example, the ITC offers a useful set of commodity-specific handbooks that includes information on physical markets as well as markets for risk instruments (ITC, 1990). UNCTAD has been especially active in recent years on risk management research and has organized regional conferences on risk management experiences (for example, UNCTAD, 1997). Among other things, the World Bank has offered assistance to government treasuries on managing debt composition and to traders in emerging markets.

³⁵ This document is available for downloading at:
http://www.iosco.org/regulation_of_derivative_markets.html

³⁶ Visit <http://www.inform.umd.edu/IRIS/survey.html>.

Larger-scale and more sophisticated market participants can and do use off-shore accounts to meet margin requirements, or to directly purchase options, thereby avoiding local market constraints. Moreover, importers can frequently take advantage of guarantee programs when purchasing exports from developed countries. Exporters in developing countries however, must rely on indirect risk management techniques. Where financial institutions are weak, exporters often enter into pre-financing arrangements with importers to limit exchange-rate risks. (See Varangis and Larson, 1996.) However, pre-financing credit and risk-management arrangements tend to be very short-term and restrict marketing options as well.

Another approach is to use inventories to finance trade and sometimes bundle risk management services. Silos and warehouse operators function as intermediaries. Sometimes banks will enter into arrangements with traders or processors to provide a line of credit based on inventory levels. The value of the inventories is then hedged either directly, or by lending against only a portion of the inventory value. Unlike other collateral, the value of inventories match market price changes and capital needs. In Venezuela, for example, several coffee exporters have private arrangements with local banks. In other countries, for example Uganda, a private inventory management company such as ACE or SGS will monitor inventories on behalf of the lender. At a more sophisticated level, a standardized warehouse receipt is granted a special legal status and serves as a transferable instrument. In such cases, the role of the government is to provide the legal infrastructure for receipt-based trade, regulate and monitor warehouse operators and help with the establishment of standards. In some cases, for example several US states, a government agency manages an indemnity fund to insure receipt holders. Receipts are also used in spot and futures markets -- for example, the agricultural exchange in Zimbabwe³⁷. See also Glaessner, Reid and Todd (1992), Varangis and Larson (1996b), and Coulter and Shepherd (1995) for more on warehouse receipts.

Solutions for problems of scale and aggregation

Developing country producers of metals and energy face fewer hurdles in accessing risk markets because of the scale of the firms. In addition, multinational firms frequently have equity stakes and bring in-house risk management expertise. For agricultural commodities in developing countries, production and trade is usually fragmented and diffused. Providers of risk management instruments have to deal with smaller companies, often with short history in the business -- especially in emerging markets. Local banks, silos and warehouse companies can provide a distribution network, but often supporting financial sectors are weak. Consequently, a key issue in making available these instruments to small producers is building the necessary institutions that would allow the retailing of risk management instruments to small

³⁷ Trade in warehouse receipts predates trading in futures contracts in Chicago. (Williams, 1986.)

producers. In other words, the challenge is to build a system that would allow the aggregation of price risks from many small producers by a larger entity and this entity should hedge its assumed price exposure in international or local markets.

In some cases, the government or association puts in place directly an aggregating institution. Examples include the government agency ASERCA in Mexico which hedges cotton prices on behalf of producers (see section VII. below) and the National Coffee Association of Guatemala, ANACAFE, which provides similar services for smallholder coffee producers. More specifically, ANACAFE has trained local banks and many local exporters about hedging strategies and price risk management with the objective to guarantee loan repayment. ANACAFE facilitates the provision of credit lines to producers requiring that coffee is hedged to guarantee repayment of principal and interest of the loan.³⁸

Issues of basis risk and local markets

Basis risk arises because the design of futures contracts traded in developed countries reflects mostly local needs which may be quite different from needs in developing countries. High basis risk can result from a variety of factors such as the characteristics of the futures/options contract, local policies, grade or quality differences, transportation and local supply-demand characteristics. A high basis risk can make it impractical to utilize a particular futures/options contract for hedging purposes. Basis risk is more of an issue for agricultural commodities and much less so for metals and energy. Agricultural markets tend to be more localized, while energy and metals markets tend to be more global. Among agricultural markets, markets for exportable tropical commodities such as coffee and cocoa are considered global and basis risk tends to be relatively small. OTC markets could overcome some of the problems related to basis risk. However, OTC products, if at all available, in markets characterized with high basis risk would tend to be expensive, thus increasing the cost of hedging. In dealing with basis risk, some developing countries have established, and others are planning to establish, commodity futures/options markets. Argentina, Brazil, China, Hungary, India, Malaysia, the Philippines, Russia, South Africa, and Zimbabwe have functioning commodity derivatives exchanges, while Bulgaria, Indonesia, Poland, Romania, Thailand, and Turkey are in the process of establishing commodity derivatives exchanges.

In several instances, a source of basis risk is government policies. Countries that have reduced government intervention have established a greater linkage between

³⁸ A structure developed involved the provision of a two-year loan to coffee producers structured as prepayment financing through Cargill. Included in the loan was a coffee price risk management scheme in the form of a zero-cost collar (where producers are guaranteed a minimum price and paid for this price insurance by agreeing to a maximum sale price for their coffee). Principal and interest of the loan were paid through physical delivery of coffee to Cargill Guatemala.

domestic prices and international prices allowing the use of commodity derivatives instruments in existing international derivatives markets. Finally, on the policy front, many developing countries have been pursuing commodity market liberalization which has resulted in creating greater opportunities for using risk management instruments by providing for improved local price discovery and closer linkages of domestic prices to international prices. Examples of donor supported efforts to improve price discovery and information delivery systems in developing countries include an on-going World Bank project in Mexico and a USAID projects in Venezuela and Poland. In addition, improvements in communications and the development of the Internet has allowed increasing opportunities for computer-based trading and price discovery. For example, visit the Caribbean Commodity Exchange or the Continental Commodity Exchange.

Related to the issue of the basis risk is the fact that in several developing countries there are no reliable and consistent local prices that can be used as a benchmark in commodity risk management transactions. As commodity markets in many developing countries have recently undergone changes from a fixed pricing system to a market-based pricing system, there is little experience with respect to establishing a transparent, liquid, and reliable price reporting system. For agricultural commodities, grade and quality differentiation is important. Developing countries should put special emphasis to establish reliable, transparent and usable commodity price series and devise systems that would improve the dissemination of price information.

VII. EXAMPLES OF MARKET BASED ALTERNATIVES

Issues of intermediation: the case of agricultural smallholders

It is well established that most agricultural producers do not access commodity derivatives markets directly. This is mainly because of lack of know how, lack of collateral for margins, small scale of operations, and too cumbersome to execute, monitor and administer hedging transactions by small producers. Even at developed countries for larger farm units, producers make relatively little direct use of commodity derivatives markets. More so in developing countries where smallholders even less in the position to access commodity derivatives whether they are traded at their own country or somewhere else.

The key issue for producers in developing countries to access commodity derivatives to hedge their price risks is to set up a system to intermediate risk management instruments to farmers. In other words, there needs to be institutional arrangements so a large domestic entity can pool price risks from many small farmers and hedge them in the international market. The organization that can do that could be private or public entity. Below we present the case of ASERCA in Mexico as an intermediary to hedge price risks for cotton farmers.

Mexico's Cotton Price Support Scheme. Because of the recent liberalization of agricultural trade and internal marketing systems in Mexico, farm-level prices of several agricultural products are now determined mainly by international markets, and farmers have had to cope with price uncertainty between planting and harvest times to a degree unknown before. During 1993, for example, the international price of cotton fluctuated between 52 and 60 cents a pound.

The government has responded with a program designed to guarantee a minimum price to cotton growers. Through ASERCA, a government organization providing support services for agricultural commercialization, Mexican cotton producers are able to manage their price risks during the harvest period and are guaranteed a minimum price during the planting season. Although programs guaranteeing minimum prices are common, most programs simply transfer price risks from producers to the government budget through the floor price mechanism, and most programs fail—sometimes spectacularly—when sudden price changes overstrain the government budget. Necessity is the mother of invention, and ASERCA, lacking the budget to assume the price risk directly, designed a sustainable program to transfer the risks from growers to international markets.

During the planting season, ASERCA offers farmers the chance to participate in a program guaranteeing a minimum cotton price for a fixed fee. The minimum price is fixed using the New York cotton futures exchange. For a fee, ASERCA offers a guaranteed price (in US dollars) and hedges its own risk by using the fee to purchase a put option on the exchange for future delivery at harvest time. (The put option gives ASERCA the right to sell cotton on a specific future date at a prespecified price, known as the strike price.) Should prices subsequently fall, ASERCA pays farmers the difference between the New York price at harvest and the minimum price. This difference is exactly equal to the payoff value of the put option. If prices rise instead, ASERCA makes no payment to farmers. By paying a fee and participating in the program, a farmer in effect purchases insurance against a drop in prices below a certain level—in fact, the program refers to the fee as a “premium.” As with insurance, payouts do not always occur, so the program is not without costs. Private brokers could offer similar programs, although the private sector has had little experience in providing such services directly to growers. Since ASERCA's program is inexpensive to administer and demand driven, however, ASERCA can readily reduce its presence should a market for private brokers develop.

Hedging government revenues related to commodity prices: the case of oil

In several developing countries government revenues depend on commodity prices. The largest exposure that governments in developing countries have is mainly from oil related revenues and to a lesser extent from metal or agricultural exports related revenues. These revenues accrue as a result of ownership of the natural resource (mainly in the case of oil for most developing countries) or royalties and taxes from metal

producing companies (most of them privatized by now in most developing countries). Volatility in government revenues can be detrimental from a budgetary point of view. If revenues unexpectedly decline due to a fall in commodity prices the government needs to either cut expenditures or run a deficit and borrow in the international markets. Borrowing in this case could be difficult as financial markets may not be willing to lend or the cost of lending may be high if commodity prices stay low.

Why hedge revenue volatility? The simplest reason is so that government revenues are not a function of commodity prices. Governments can increase the probability that the expected revenues will actually be materialized. If government borrow, lenders will see a less volatile source of revenue and they will lend at more attractive rates. Another reason for hedging is that the effect of an extreme move in commodity prices can be such as to create significant financial and budgetary problems for the government. There are many examples of governments not putting some kind of limit on their commodity exposure and as a result running into problems.

One might consider the case of Mexico during 1998.³⁹ While oil accounts for about 10% of Mexico's exports, it accounts for about 40% of government revenues. Furthermore, it was calculated that a \$1 per bbl drop in the price of oil corresponds to \$800 million drop in government revenues. During the early 1997, crude oil was trading at about \$21 per bbl. The Government made a revenue plan based on the assumption that this would continue. This was not unrealistic since in early 1997 the market was forecasting a 2.7% probability that the price of crude oil a year later (in early 1998) would be under \$14 per bbl.⁴⁰ And for most of 1997 oil prices were around \$19-\$20 per bbl. But in fact, crude oil prices fell during the first quarter of 1998 by nearly one-third, or about \$4.4 per barrel, since December 1997. In addition, investor's were put-off by the low oil prices questioning the robustness of the economy. In this country's case, if the price in early 1998 had been close to the forward price one year ago, the government budget would have been safe. However, the price of crude oil moved to the low end of the expected range a year ago. In this case, the result is serious problems for the government budget. The Government could have easily averted this by buying an insurance against a catastrophic dip in crude oil prices. This insurance (effectively a put option) would have been inexpensive a year ago since the probability for a price decline below \$14 per bbl was only 2.7%.

In contrast, in 1991, petroleum prices fell with the end of Gulf War, but the Mexican government enjoyed the benefits of an oil-price insurance policy it obtained in the oil derivatives market. The Mexican government's overall strategy was to ensure at

³⁹ On March 30, 1998 Business Week ran an article entitled "Mexico Slips in an Oil Puddle: As crude prices plunge, investors worry about the economy"

⁴⁰ Probabilities were determined by analyzing option prices at that time (early 1997).

least a \$17 per barrel price for oil, the price used as the basis for its 1991 budget.⁴¹ Following the end of the Gulf War, crude oil prices dropped to the low teens compared to around \$25 during the crisis.

It is easy to come up with examples of hedges that would have been profitable. In this example, the hedge happens to be profitable. It would have been just as easy to find an example of an unprofitable hedge. The point of this example is to show that managing commodity price risks can decrease the chance of damaging financial situations like many oil exporting countries faced in early 1998.

The high dependency of government revenues on commodity prices applies to several developing countries. This tends to be the case for many oil exporting countries such as for example Congo, Gabon, Algeria, Venezuela, Malaysia, Cameroon, Mexico and Indonesia. Even in diversified economies such as Malaysia, Mexico and Indonesia a 10% change in oil prices would correspond to 5.3%, 3.5% and 2% change in government revenues respectively. Also, the revenues of several governments of agricultural exporting countries show high exposure to commodity prices. Examples are: Madagascar, Ethiopia and Uganda (coffee), Burkina Faso, Mali and Sudan (cotton), Cote d'Ivoire and Ghana (cocoa), and Guyana (sugar).

VIII. SUMMARY AND CONCLUSIONS

Commodity dependent developing countries are negatively affected by commodity price instability and previous efforts to deal with price volatility have not been satisfactory. Intervention in commodity markets with the objective to stabilize prices has been costly and overall ineffective, with large negative effects when the various price stabilization schemes collapse. Many governments and institutions are considering new approaches. The academic literature has shown benefits in using market-based risk management instruments to reduce commodity price uncertainty as opposed to stabilizing prices. While there has been a large proliferation in the use of these instruments the last ten years, developing countries face certain problems in accessing market-based risk management instruments.

Volatile commodity prices effect exchange rates, the cost of debt, government revenue, and private producers, processors, traders and consumers. These problems and their solutions differ. Very broadly, the problems associated with government entities center on the capacity and incentives to develop and execute risk management strategies. Further, markets for longer-term instruments are thin or missing. For private entities,

⁴¹ On March 11, 1991 the Wall Street Journal run an article entitled "Mexico's Moves to Lock In Oil Prices in Gulf Crisis Mean It Can Stay Calm Now as the Market Softens". According to the WSJ article a Finance Ministry official explained the reasoning behind the hedging strategy by saying: "It is extremely important for us that investors know that, no matter happens to the price of oil, the economic program is on for 1991. Regardless of what happens, we've got \$17 a barrel...and there's enough in the kitty."

there are a number of barriers that limit access to current markets. Chief among these are: a lack of knowledge and understanding, counterparty risk, and inadequate legal, regulatory and institutional environments. In addition, markets for some commodities and for weather-based instruments are missing or newly evolving.

Developing countries can take some actions that would improve their access to risk management instruments. These could include:

- Institution building in terms of intermediaries that would access smallholders and small to medium size domestic companies that lack the size and technology to access risk management markets directly. Institution building should involve the development of appropriate legal and regulatory infrastructures to address such issues as contract enforcement, for example.
- Technical assistance could focus in the design of innovative products that would be more acceptable in these countries and would cater to local conditions. These products need to address issues related to cost and counterparty risk exposure. There is also a need to design better ways to provide collateral that deals with the counter-party risk in hedging transactions.
- More analysis should be done on how to implement and regulate risk management programs and markets. These programs should be country and possibly commodity specific and involve several disciplines within the country (e.g., banks, insurance companies, legal departments, etc.).
- The development of information systems and dissemination of information is crucial. Furthermore, there is scope for increasing awareness in using existing information systems.
- Developing appropriate price indices that serve as reference for hedging instruments. Greater price transparency and dissemination of price signals plays an important role.

The international community can also play a role in assisting developing countries to access risk management instruments.

- Research should be funded on programs and policies that complement smallholder efforts to self-insure. Current research suggests that policies and programs that promote markets -- including financial markets -- promote self-insurance. Research into the limits of self-insurance is needed as well.
- The international community can also be more active in providing technical assistance and strategy advice regarding the broad design and implementation of risk management instruments. Advice on legal, regulatory, institutional and

policy reforms that would facilitate the use of risk management instruments is also important.

- Finally, international financing institutions should consider ways to extend limited markets. Such efforts might include combining risk management instruments with their lending products

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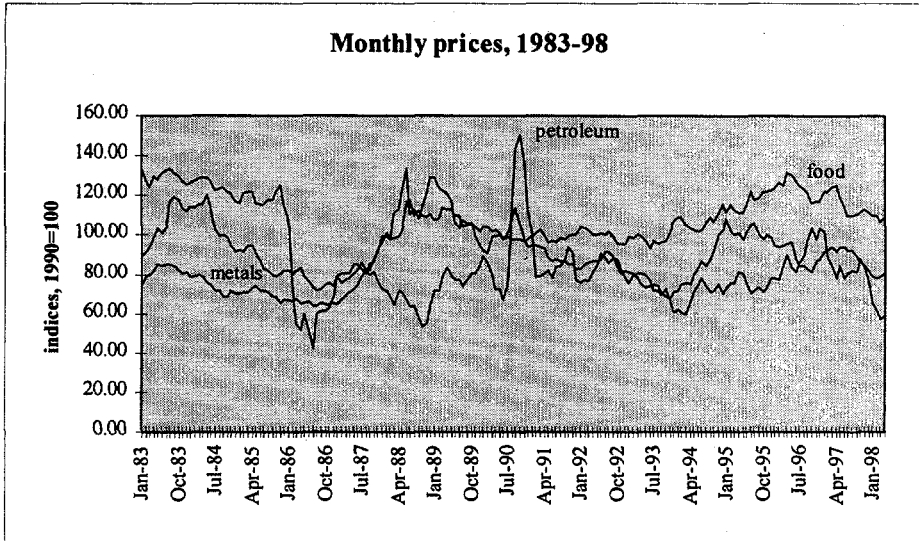
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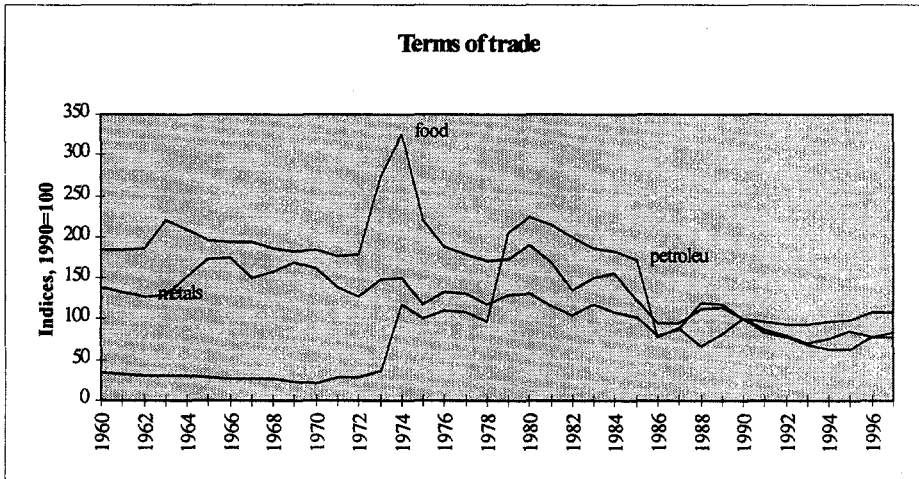
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Figure 1: Selected commodity price indices.



Source: The World Bank

Figure 2: Barter terms of trade indices.



Source: The World Bank

Figure 3: Instability measure for selected commodities.

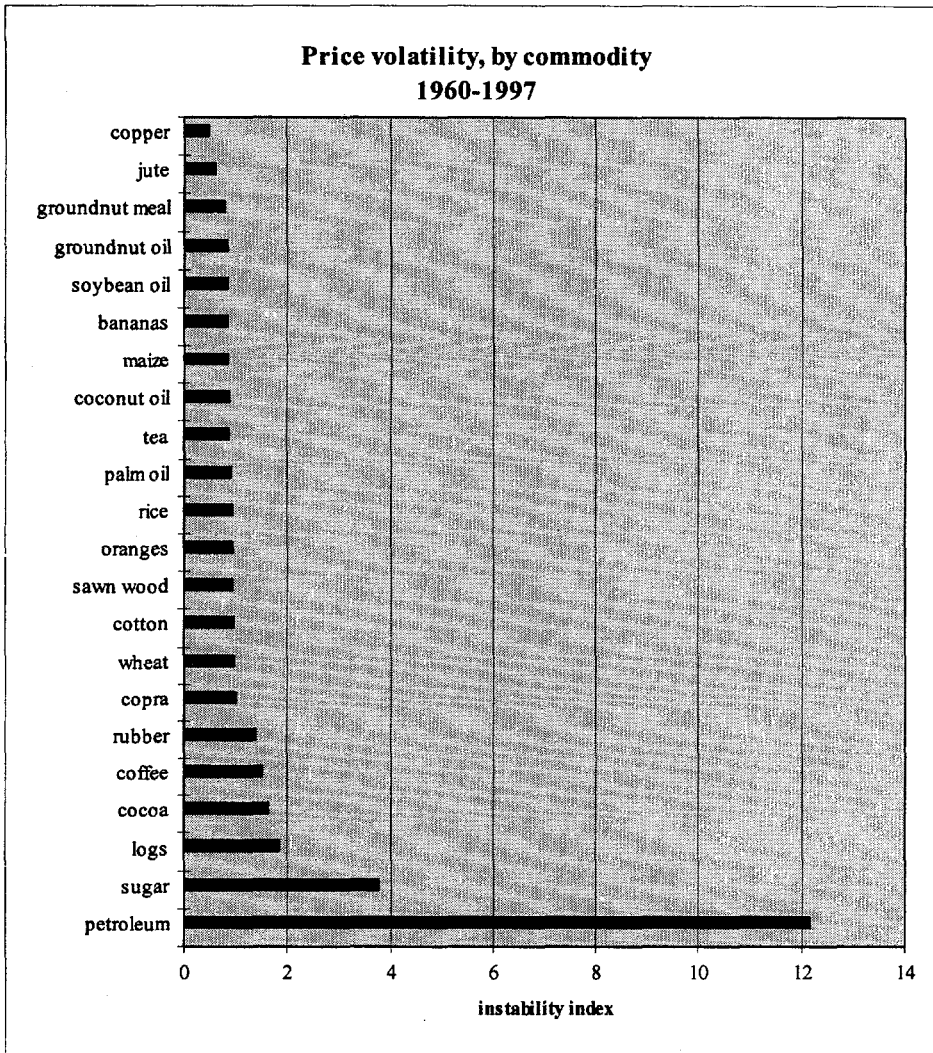


Table 1: Chicago Board of Trade Daily Volatility Report for June 11, 1998

Commodity	Contract	Volatility
1000 Ounce Silver	98Dec	31.26
Soybean Oil	98Jul	20.10
	98Aug	20.44
	98Sep	20.74
	98Oct	18.96
	98Dec	17.36
Corn	99Jan	18.15
	98Jul	23.41
	98Sep	30.02
	98Dec	24.94
5 Year Notes	99Mar	22.62
	98Jul	3.30
	98Sep	3.13
Oats	98Dec	3.29
	98Jul	33.35
	98Sep	39.92
Soybeans	98Dec	32.67
	99Mar	31.87
	98Jul	18.77
	98Aug	21.94
	98Sep	21.67
Soybean Meal	98Nov	20.97
	99Jan	20.73
	99Mar	20.66
	98Jul	33.28
	98Aug	27.69
	98Sep	27.80
2 Year Notes	98Oct	25.58
	98Dec	23.47
	99Jan	22.73
10 Year Notes	99Mar	20.24
	98Jul	2.69
	98Jul	5.03
U. S. Bonds	98Sep	4.67
	98Dec	4.74
	98Jul	7.37
	98Sep	7.92
Wheat	98Dec	7.90
	99Mar	7.82
	98Jul	21.11
	98Sep	23.05
	98Dec	22.57
	99Mar	22.12

Table 2: Decomposition of the variance of export revenue

	Revenue	Q	P	2Cov(P,Q)	
Cocoa		0.204	0.056	0.219	-0.071
Coffee		0.236	0.019	0.221	-0.004
Cotton		0.114	0.014	0.079	0.021
Maize		0.270	0.073	0.069	0.129
Rice		0.241	0.072	0.099	0.070
Sugar		0.217	0.019	0.149	0.049
Wheat		0.239	0.061	0.090	0.088

Table 3: Correlation between commodity index pairs

	Beverages	Fats & Oils	Fertilizers	Grain	Metals& Minerals	Non-energy	Petroleum	Timber
Beverages	1.0*							
Fats and Oils	0.78*	1.0*						
Fertilizers	0.52*	.80*	1.0*					
Grain	0.61*	.92*	0.92*	1.0*				
Metals&Minerals	0.65*	.80*	0.72*	0.79*	1.0*			
Non-energy Com.	0.83*	.93*	0.79*	0.88*	0.93*	1.0*		
Petroleum	0.71*	.77*	0.70*	0.77*	0.79*	0.85*	1.0*	
Timber	0.41	.61*	0.54*	0.61*	0.79*	0.76*	0.57*	1.0*

Note: Pearson Correlation Coefficients / Prob > $\frac{1}{2}R\frac{1}{2}$ under $H_0 : \text{Rho} = 0 / N = 38$

* significant at the 95% level

Source: Author's calculations based on the data from World Bank

Table 4: List of Countries with Export Dependence on Three Leading Commodities Greater than 50%

	Export dependence on 3 leading commodities	Leading Commodities	GDP per Capita		Poverty	External Debt as % of GNP	Debt Service as % of exports of goods and services
			US\$ in 1995	Avg. annual Growth 1985-95	% of people living on less than \$1 a day (PPP) 1981-95		
	1990-92					1995	1995
Africa (34)							
Congo	99.0	fuels, wood, sugar	680	(3.2)		365.8	14.4
Gabon	99.0	fuels, manganese ore, wood	3,490	(8.2)		121.6	15.8
Nigeria	99.0	fuels	260	1.2	28.9	140.5	12.3
Burkina Faso	99.0	cotton	230	(0.2)		55.0	11.1
Zambia	99.0	copper	400	(0.8)	84.6	191.3	174.4
Niger	95.7	uranium	220		61.5	91.2	19.8
Angola	94.5	fuels	410	(6.1)		274.9	12.5
Benin	93.8	cotton, fuels	370	(0.3)		81.8	8.4
Guinea-Bissau	92.0	nuts, fishery	250	2.0	87.0	353.7	66.9
Guinea	91.3	bauxite, aluminum	550	1.4	26.3	91.2	25.3
Malawi	88.8	tobacco, tea, sugar	170	(0.7)		166.8	25.9
Algeria	88.8	fuels	1,600	(2.4)	1.6	83.1	38.7
Burundi	87.9	coffee, tea	160	(1.3)		110.1	27.7
Mauritania	87.8	iron ore, fishery	460	0.5	31.4	243.3	21.5
Uganda	81.5	coffee, cotton	240	2.7	50.0	63.7	21.3
Zaire (Congo)	81.5	copper, fuels, coffee	120				
Equatorial Guinea	81.4	wood, cocoa, banana	380				
Cameroon	81.0	fuels, wood, coffee	650	(6.6)		124.4	20.1
Ethiopia	79.0	coffee	100	(0.3)	33.8	99.9	13.6
Cape Verde	78.9	fishery, banana	960				
Rwanda	78.8	coffee, tea, tin ore	180	(5.4)	45.7	89.1	
Mali	73.8	cotton	250	0.8		131.9	12.6
Comoros	70.5	vanilla	470	(1.4)			
Ghana	67.4	cocoa, aluminum, wood	390	1.4		95.1	23.1
Togo	63.3	phosphate rock, cotton, coffee	310	(2.7)		121.2	5.7
Chad	60.9	cotton	180	0.6		81.4	5.9
Mozambique	58.1	fishery, nuts, cotton	80	3.6		443.6	35.3
Somalia	57.8	live animals, fishery, banana					
Egypt	59.7	fuels, cotton, aluminum	790	1.1	7.6	73.3	14.6
Kenya	56.0	tea, coffee, fuels	280	0.1	50.2	97.7	25.7
Central African Republic	55.7	wood, live animals, cotton	340	(2.4)			6.8
Sudan	55.7	cotton, live animals, sesame seeds					
Cote d'Ivoire	55.0	cocoa, fuels, wood	660		17.7	251.7	23.1
Zimbabwe	53.0	tobacco, nickel, cotton	540	(0.6)	41.0	78.9	25.6
Asia (9)							
Yemen	90.2	fuels	260			155.2	3.2
Syria	61.4	fuels	1,120	0.9		134.8	4.6
Cambodia	99.0	wood, rubber, soybeans	270			73.5	0.6
Myanmar	99.0	wood, pulses, rice					
Afghanistan	78.5	fuels, grapes & raisins					
Maldives	73.5	fishery, olives	990	5.9			
Mongolia	68.4	copper ore, live animals, wool	310	(3.8)		61.5	9.1
Lao PDR	65.0	wood, live animals, coffee	350	2.7		124.9	5.8
Indonesia	53.1	fuels, wood, fishery	980	6.0	14.5	36.9	30.9
Latin America (14)							
Venezuela	88.1	fuel, aluminum, iron ore	3,020	0.5	11.8		
Ecuador	86.3	fuels, banana, fishery	1,390	0.8	30.4	84.1	26.7
St. Vincent & Grenadines	79.5	banana, fishery	2,280	3.8			
Guyana	77.5	sugar, bauxite	590	0.6			
Paraguay	69.8	cotton, soybeans	1,690	1.2		29.4	
Trinidad and Tobago	68.4	fuels, sugar	3,770	(1.7)		53.6	14.8
Jamaica	67.3	aluminum, bauxite, sugar	1,510	3.6	4.7	134.9	17.9
Dominican Republic	66.3	nickel, sugar, coffee	1,460	2.1	19.9	36.5	7.8
Honduras	60.3	banana, coffee, fishery	600	0.1	46.5	124.6	31.0
Dominica	58.0	banana	2,990	4.1			
Colombia	55.6	fuels, coffee, banana	1,910	2.6	7.4	28.2	25.2
Belize	53.8	sugar, juices, banana	2,630	3.9			
Chile	52.5	copper, fishery	4,160	6.1	15.0	13.3	25.7
Grenada	50.9	spices, banana, cocoa	2,980				

Sources: UNCTAD 1995 Commodity Yearbook, World Bank, 1997, World Development Report.

Table 5: Categories of commodity-risk management problems.

<i>Economy-wide risk management problems</i>		
<ol style="list-style-type: none"> 1. Macroeconomic mismanagement 2. Counter-party and sovereign risk 3. Severe limits on brokerage and supporting banking services 4. Lack of legal and regulatory infrastructure 5. Limited or non-existent markets for some types of financial instruments 		
<i>Policy instruments</i>		
<ol style="list-style-type: none"> 1. Policy advice and adjustment lending 2. Sovereign risk guarantees and improved contractual laws and enforcement 3. Technical assistance 4. Potential multi-lateral role in facilitating global markets for some instruments. 		
<i>Public and private sector problems related to commodity risk management</i>		
<i>Private Sector</i>	<i>Public Sector</i>	<i>Quasi-public Parastatals</i>
<ol style="list-style-type: none"> 1. Inefficient local commodity markets 2. Counter party risk 3. Small-scale activity 4. Basis risk 5. poor credit markets 	<ol style="list-style-type: none"> 1. Fluctuating Central Bank reserves 2. Fluctuating government budget revenues and expenses 3. Related short-term and long-term debt management problems 4. "Agent" problems related to objectives, management, reporting and corruption 	<ol style="list-style-type: none"> 1. Oversight and reporting of risk management activities. 2. Perverse incentives may preclude appropriate risk management.
<i>Long-term policy instruments and policy objectives</i>		
<ol style="list-style-type: none"> 1. Improve market access and market information for local commodity markets; 2. Improved financial and other supporting services 3. Delivery of risk management instruments through private intermediaries: brokers, warehouses, etc. 	<ol style="list-style-type: none"> 1. Improved regulatory, oversight, and enforcement capacity 2. Diversification through growth 3. Improve asset management capacity in Treasury and Central Bank. 	<ol style="list-style-type: none"> 1. Improved regulatory, oversight, and enforcement capacity 2. Privatization.
<i>Short-term policy instruments and objectives</i>		
<ol style="list-style-type: none"> 1. Remove policy-based impediments to underlying physical markets. 2. Technical assistance 3. Government or association-based transitional intermediary agency (for example, ASERCA in Mexico). 4. Government sponsored instruments (especially weather-related) and safety nets 	<ol style="list-style-type: none"> 1. Include commodity-based instruments in debt portfolio. 2. Hedge government budget against commodity price declines 3. Include commodity-based instruments in Central Bank operations. 4. Put in place independent and reporting, auditing and trading groups. 5. Access risk management services through intermediaries. 	<ol style="list-style-type: none"> 1. Out-source risk management functions 2. Develop administrative capacity and technical know-how to handle hedging 3. Put in place independent and reporting, auditing and trading groups.

Table 6: Barriers to commodity price risk management in developing countries by commodity group

	<i>Lack of Know how</i>	<i>Counter Party Risk</i>	<i>Intermediation issues</i>	<i>Basis Risk</i>	<i>Lack of Local Price Discovery</i>	<i>Low Liquidity</i>
<i>Petroleum</i>	Some cases	Maybe for some countries	No	No	No	No
<i>Precious Metals</i>	Some cases	Maybe for some countries	No	No	No	No
<i>Base Metals</i>	Some cases	Maybe for some countries	No	No (copper, alum.), possibly some basis risk with others	No	No (copper, alum.). Could be an issue for others
<i>Agriculture: Mainly Exports</i>	Moderate	Yes	Yes	For some (e.g. cotton) less for others (e.g. coffee, cocoa, sugar)	Moderate	moderate (less of an issue for coffee, cocoa, sugar)
<i>Agriculture: for Local Markets</i>	Yes	Yes	Yes	Yes	Yes	moderate (but not for grains and soybeans)

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