$\mathcal{LPS} \ \mathcal{0749}$

Hedging
Commodity Price Risks
in Papua New Guinea

Stijn Claessens
and
Jonathan Coleman

With increasing awareness of commodity price risks and with technical assistance — strategic advice and assistance in institution building and skills training — developing countries such as Papua New Guinea can learn to use market-based commodity-linked financial instruments to improve their economic management.

WPS 749

This paper -- a joint product of the Debt and International Finance and International Trade Divisions, International Economics Department — is part of a larger effort in PRE to study the use of financial instruments to manage the external exposures of developing countries. Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Sarah Lipscomb, room S7-062, extension 33718 (31 pages, with figures and tables).

Papua New Guinea faces substantial exposure to price fluctuations for its major primary commodity exports: gold, copper, coffee, cocoa, logs, and palm oil. Its existing commodity risk management schemes -- its mineral stabilization fund and agricultural commodity funds --- are costly, provide only limited protection against the impact of fluctuations in commodity prices, and are unable to provide protection for long periods.

Claessens and Coleman show that market-based financial instruments are better suited to manage external price risk for a country that is a price taker in world commodity markets. This is especially the case for mineral and energy price risks where financial instruments (such as commodity swaps) exist for hedging export earnings over long periods. For agricultural export earnings, short-term hedging tools, such as options and futures, could be used effectively. Claessens and Coleman design specific financial strategies that Papua New Guinea could use, and demonstrate the gains to be made from active risk management.

The lessons learned are not unique. Many developing countries are heavily dependent on primary commodities for foreign exchange, and their economic development has suffered from the resulting risks and instabilities. With increasing awareness of these risks and with technical assistance — strategic advice and assistance in institution building and skills training — developing countries can learn to use financial instruments to improve their economic management.

Table of Contents

1. Introduction

Papua New Guinea (PNG) faces substantial exposure to price fluctuations of its major primary commodity exports. Existing commodity risk management schemes provide limited protection against the impact of commodity price fluctuations, have high cost, and are not able to provide protection over long time periods. (e.g., the agricultural stabilization funds are effectively exhausted).

This paper shows that financial instruments available in developed capital markets are better suited to manage the external risk of PNG than existing schemes, and are less costly. This is especially true for mineral and energy price risks where financial instruments exist for hedging over long maturities. This paper shows how these instruments could be used by PNG. For the agricultural stabilization funds, short-term hedging tools could be used effectively, and, for illustration, a simple hedging strategy is developed for the coffee fund.

The paper is organized as follows. In section 2, the importance of primary commodities to PNG is discussed, as well as its exposure to volatile international commodity prices. In section 3, existing commodity risk management mechanisms are discussed, and in section 4, the exposure of economic stability to past commodity price fluctuations is quantified. In section 5, a general overview of risk management schemes and their costs and benefits is presented, and section 6 discusses some specific financial instruments applicable to PNG for external risk management. Risk management strategies for the mineral and energy sectors are developed in section 7, and for the agricultural stabilization funds in section 8. Conclusions of the study are drawn in section 9.

2. Background: Importance of External Risk Management to the PNG Economy

This section describes why external risk management is of primary importance to the PNG economy. First, PNG is highly dependent on the exports of primary commodities for foreign exchange earnings, government revenues, and employment. Second, PNG is a price taker in the world markets of its major primary commodity exports. During the 1970s and 1980s period these markets have been highly volatile, with

large intra-year and inter-year fluctuations in prices, and thus a major source of instability in the PNG economy. Third, PNG's debt structure exposes it to both exchange rate and interest rate risks. Therefore, the use of commodity, interest rate, and currency risk management instruments would be of considerable value by reducing these exposures.

2.1. Importance of Primary Commodities to the PNG Economy

The performance of the PNG economy is determined largely by the strength of the export sector which is composed mainly of mineral and treecrop exports (see also Table 2.1). These are crucial to the economy in terms of foreign exchange earnings, government revenues, employment, and external debt servicing. However, agricultural production is the major source of employment in PNG. Within this sector, coffee and logs dominate, with the importance of cocoa, copra and coconut oil, and palm oil declining since the mid-1980s.

The importance of primary commodities in export earnings is illustrated in Table 2.1. In 1989, almost 70% of the total export earnings of PNG were obtained from the exports of gold and copper compared with less than 50% in 1985. It is projected that the mineral sector will continue to dominate in the early 1990s, contributing a little less than two-thirds of total export earnings in the 1990-1992 period. Outside the mineral sector, logs and coffee contribute the most to export earnings. In 1989, coffee and logs contributed 10.9% and 6.6%, respectively, with cocoa and palm oil at 3% to 4% and copra 1.4%. These proportions are forecast to remain fairly stable in the early 1990s period.

The minerals sector makes a large contribution to government revenues through corporation income taxes, dividend withholding taxes, and dividends from government equity in mineral projects. In addition, there are the import duties and payroll taxes paid by the mining corporations. In total the mineral sector provided 20% of government revenues in 1989, and by the end of the decade their share is forecast to rise to over 35%.

Table 2.1. Contribution of Major Primary Commodity Exports to Total Export Earnings, PNG, 1985-1992.

Commodity	1985	1986	1987	1988	1989	1990	1991	1992
				Percent				
Minerals	46.5	60.9	61.7	70.6	69.0	65.5	64.1	64.7
Gold	25.4	40.2	41.5	36.4	25.1	31.2	34.3	40.1
Copper	21.1	20.7	20.2	34.2	43.9	34.3	29.8	24.6
Nonminerals	53.5	39.1	38.3	29.4	31.0	34.5	35.9	35.3
Cocoa	7.5	6.3	5.3	3.5	3.8	3.2	2.6	2.6
Coffee	13.4	15.4	16.5	9.4	10.9	9.2	7.2	6.9
Copra	5.1	2.0	1.0	1.3	1.4	1.5	1.4	1.2
Logs	7.7	5.7	6.9	7.6	6.6	8.9	10.1	9.6
Palm Oil	7.5	3.9	2.8	1.7	3.1	4.3	5.4	5.6
Other	12.3	5.8	5.8	5.9	5.2	7.4	12.2	9.4

Source: Based on Table II in Annex VII of IMF, 1990.

Although less important than the mineral sector, the agricultural sector makes a significant contribution to government revenues though direct taxation of company income, taxes on agricultural exports, and profits from government equity in agricultural projects (e.g., oil palm estates). In addition, there are the indirect taxes imposed on imported agricultural inputs, as well as the taxes paid by individuals earning agricultural incomes, and the excise taxes levied on items such as fuel, beer, and cigarettes purchased with incomes generated from agriculture. It is estimated, for example that the contribution to total government revenues of the coffee sector alone is as much as 10% (see Brogan and Rewenyi (forthcoming)).

The mining sector generates few opportunities for employment in PNG. Most of the capital used in the mines is technologically advanced and is imported. The two major mines, BCL and OTML, together employ about only 6,000 people (many of whom are expatriates) which is about 0.3% of the labor force. The labor force in PNG (estimated to be 1.8 million in 1987) is primarily employed in agriculture. Within the formal sector, agriculture is the most important source of employment, taking about 20% of the labor force.

While the terms of trade have moved against the agricultural exports of PNG since the mid-1960s, real

consumption and investment have been maintained by overseas borrowing. As a result, external debt has

increased dramatically from less than $200 per capita in 1970 to more than $1,200 currently. The debt service

to exports ratio is currently at about 30%. In the 1988 government budget, and interest payments alone made

up almost 7% of total expenditures. External debt (servicing) has further been influenced by two external

factors: international interest rates and cross-currency exchange rates. The influence of movements in

international interest rates on PNG's debt service obligations has been relatively small compared to many other

developing countries, since a considerable part of PNG's long-term debt is of a fixed rate nature (approximately

45 percent). Still, a change of one percentage point in the interest rate alters debt service by about $13 million.

The influence of exchange rate movements on the level of debt measured in US dollars has been large since

a significant part of PNG's debt is in non-dollar currencies (approximately 60 percent). Over the period 1985

to 1989 the absolute value of the currency valuation effect on debt stock has, on average, been about $72 million

annually or about 3 percent of the debt stock (see also the Appendix).

2.2 Nature of Primary Commodity Value Fluctuations

The instability of export revenues of primary commodities is associated with fluctuations in both

quantities produced and prices. Indexes of the value, volume and unit value of the major primary commodities

of PNG between 1985 and 1989 and projections for 1990 to 1992 are reported in Table 2.2. Also reported in

Table 2.2 are the coefficients of variation (CV) (the ratio of standard deviation to the mean) which provide a

crude measure of instability.

The CV for the index of the value of mineral exports for the 1985-1992 period is almost 20%, indicating

that export value is quite unstable. The value of copper exports is especially variable with a CV of 36.5%, while

the CV of gold was 19.0%. Also, copper prices were highly unstable, recording a CV of 24.4%. The index of

the value of nonmineral exports was more stable than the mineral index, with a CV of 14.4%. The most

important commodities--logs and coffee--reported CVs of 20.6% and 34.5%, respectively, which are both lower

than the CVs for the other major commodity exports, except for gold.

Table 2.2. Papua New Guinea: Export Value, Volume, and Unit Value by Major Commodity, 1985-1992.

Commodity	1985	1986	1987	1988	1989	1990[1]	1991[1]	1992[1]	CV[2]
Value									
Minerals	68	95	86	131	128	100	96	111	19.3
Gold	78	132	122	141	98	100	108	145	19.0
Copper	59	62	54	121	156	100	85	80	36.5
Nonminerals	152	124	109	109	116	100	96	107	14.4
Cocoa	229	205	155	134	148	100	81	94	34.5
Coffee	139	169	164	123	144	100	77	84	26.3
Copra	327	133	67	104	117	100	91	91	59.9
Logs	83	65	71	116	90	100	111	121	20.6
Palm Oil	167	93	58	47	88	100	122	143	37.2
Volume									
Minerals	81	115	104	136	118	100	108	129	14.5
Gold	72	125	115	124	102	100	110	149	18.8
Copper	90	105	94	146	133	100	106	110	16.4
Nonminerals	82	83	86	91	92	100	100	106	8.9
Cocoa	83	82	80	78	115	100	92	103	13.1
Coffee	68	64	76	87	87	100	87	90	13.7
Copra	135	150	131	117	104	100	88	88	17.9
Logs	87	90	93	114	95	100	112	118	11.0
Palm Oil	70	78	72	48	76	100	118	129	29.3
Unit Value									
Minerals	84	83	83	96	108	100	89	86	9.5
Gold	108	106	106	114	96	100	98	97	5.6
Copper	66	59	57	83	117	100	80	73	24.4
Nonminerals	185	149	127	120	126	100	96	101	22.3
Cocoa	276	250	194	172	129	100	88	91	39.9
Coffee	204	264	216	141	166	100	89	93	38.1
Copra	242	89	51	89	113	100	103	103	47.7
Logs	95	72	76	102	95	100	99	103	11.9
Palm Oil	239	119	81	98	116	100	103	111	38.0

Source: Based on Table iii in Annex VII of IMF, 1990.

1/ Projections.
2/ Coefficient of Variation.

With the exception of gold and logs, the unit value variability of each export commodity in the table

is greater than its production variability. This reflects the high degree of instability of international agricultural commodities prices. Also of interest is the fact that the commodity unit values have declined over the period, especially for coffee and cocoa.

The dependence of PNG on primary commodities will be strengthened with expected developments in the energy sector. Oil export earnings could amount to as much as one-third of mineral export earnings by the year 2000, equivalent to 25% of total export earnings. With greater dependence on oil exports the economy of PNG will open itself to risks associated with fluctuating oil prices. Recent events have been a reminder that oil prices are highly unpredictable which suggests that risk management instruments to lower these risk will be of great importance in the future[1].

2.3 Problems Created by Commodity and Other Price Instability

The previous section clearly demonstrates that commodity price, exchange rate and interest rate instability has had and will continue to have major impacts on PNG's macroeconomy through its cash-flow effects on export earnings and the relative burden of debt service. The impact of volatile external prices does not, however, limit itself to its contemporaneous effect on cash-flows but also impacts on production and investment decisions. For PNG, the problems involved in developing the non-mining sector of the economy can, in part, be traced back to the large dependence on mineral exports and the volatility in mineral prices. In times of high mineral prices and high real exchange rates, the international competitiveness of the non-mining sector deteriorates and little investment occurs. However, in periods when mineral prices and the real exchange rate fall, the non-mining sector may still not develop, as investors realize the situation can easily reverse itself in the future, rendering investments in the non-mining sector possibly unprofitable.

---

[1] Historically, the CV of oil prices has been between 20% and 30%.

3. Existing Commodity Risk Management Mechanisms

In this section the linkages between the commodity sectors and other sectors of the economy are explored in greater detail and a description of the important institutions and mechanisms through which commodity prices affect the economy is provided. There are three main entities which bear the risks associated with fluctuating commodity prices. These are (i) the Government of PNG (GOPNG); (ii) the private corporations that operate in these sectors; and (iii) the agricultural marketing boards for coffee, cocoa, copra, and palm oil. We discuss the allocation of mineral and energy price risks first, followed by agricultural price risks, and the specific risk management schemes in place in each sector.

3.1. Mineral and Energy Price Risk

The GOPNG is affected by price changes in the form of tax revenues channeled through the Mineral Resource Stabilization Fund (MRSF), and through the Mineral Resource Development Corporation (MRDC) (through its equity stake in mines and energy projects and its responsibility for raising the necessary funds to finance the equity participation in new projects).

3.1.1. Taxation and MRSF

The structure of mineral resource taxation in PNG reflects the authorities' objective of providing adequate incentives to producers while ensuring that the government is able to secure most of any windfall profits (see further Coopers and Lybrand (1989)). The tax regime in place for both the mining and the petroleum projects places a heavy tax burden on the more profitable operations while minimizing tax requirements from marginal projects. Mining enterprises are subject to an effective tax rate of 46%. Highly profitable operations are subject to an additional profits tax (APT), which can result in marginal rates of almost 65%. The mining APT is payable when the project shows a return on investment above a specified rate. As a result of the APT, the government's revenues increases sharply in periods of high commodity prices.

Petroleum projects are subject a company tax rate of 50%. The APT for the petrc' :um industry is payable at a rate of 50% once the project has achieved a 27% nominal rate of return after income tax.

The Mineral Resource Stabilization Fund (MRSF) was established by an A.. of Parliament in 1974, with the objective of reducing the impact of fluctuations in mineral revenues on the government budget. Under this legislation, all dividends in state shareholdings, company income taxes, and dividend withholding taxes (identified above) from all designated mining operations must be paid into the MRSF. The assets of the MRSF are held by the Central Bank of PNG (BPNG) which invests them in securities abroad, primarily in the form of interest-bearing deposits and central bank securities. The surplus funds, managed BPNG, constitute the main source of reserves.

Drawdowns from the MRSF are determined on the basis of recommendations submitted to the Board of Management of the MRSF. The general rule for withdrawal is that the amount to be drawn down should ensure that the Fund is sustainable in terms of real purchasing power over the next five years (see also Guest (1987)). The Board of the MRSF is bound to make forecasts of future receipts for eight years ahead and (implicitly) for inflation forecasts for five years ahead. The commodity prices implicit in the forecasts should not vary more than 10 percent from the historical moving-average of commodity prices (20 years for copper prices, the preceding year for gold and silver).

In practice there has been considerable flexibility in the operation of the MRSF and a revision made to the MRSF Act in 1987 allows the government greater discretion than before. This, while providing greater flexibility in the use of mineral revenues, carries the risk of larger increases being allowed in drawdowns and expenditures in anticipation of future growth in these revenues. The contributions to and drawdowns from the MRSF have varied substantially over the past decade. The degree of stabilization the MRSF has provided can be quantified by comparing the Cv of its outflows over the period 1980-1988 (45%) with the CV of revenues (56%). This suggests that very little stabilization of the government's budget has taken place by placing MRSF

between tax receipts and inflows in the budget: only a relative reduction of about 20%[2]. The result is to be expected given the implicit use of the moving average price with short time periods (one year for gold and silver) as an indicator of the future price and the (recent) flexibility in the rules.

3.1.2. Mineral Resources Development Corporation (MRDC) Rules

The government has followed a policy of taking an equity share in all major mineral projects. Although these investments have been characterized by a high degree of risk, there has been popular support for the principle that the government should maintain a share in the ownership and control of projects involved in exploiting nonrenewable resources. The equity-participation in new mineral projects has taken place using the MRDC as a vehicle. In the case of mining projects, the government has reserved the right to take an equity share of up to 30%, although in most projects to date it has taken a 20% share. The expectation is that, in some form or another, the state, provinces and landowners will, through MRDC, retain an equity stake in the mining projects. For petroleum projects, the government reserves the right to take a 22.5% carried interest.

MRDC has financed its equity participation in the different projects in a variety of ways from deferred payback on future dividends--in which case the foreign investors effectively provides the financing--to loans obtained through external commercial borrowing (with a government guarantee)[3]. More recently, MRDC has relied on foreign financing. MRDC receives their dividends on its equity stake and pays any excess of dividends over financing costs to the DFP. Through its participation, MRDC is exposed to commodity price risk since its expenses (interest and principal payments on foreign loans) are not dependent on commodity prices whereas its revenues are. The substantial level of government equity in new mines envisaged over the next few years will

---

[2] This result is confirmed by the analysis of Guest, which derives the similar result that the MRSF has reduced the instability of mineral revenues by only 30 percent.

[3] Effectively, the Department of Finance and Planning (DFP) has arranged the financing under its name and then passed it on to MRDC.

require large amounts of new financing, (commercial external borrowings) which are estimated to amount to about $500 million in 1991 and 1992. This will greatly increase MRDC's exposure.

3.2. Private Corporations

Foreign companies operating mines in PNG are exposed to commodity price risks through the impact of price changes on the cash-flow derived from the mines (dividend remittances and other transfer payments to the parent company). Most foreign firms have put in place some risk management program to protect cash-flow streams to parents against commodity price swings. It appears, however, that the risk management is done at the parent, off-shore level, i.e. net profit remittances received by the parent from the subsidiary are hedged at the off-shore level, leaving export receipt and taxes exposed. This implies that much of the commodity price exposure remains at the subsidiary level and consequently that the PNG economy remains exposed to fluctuations in the price of its main exports.

3.3. Agricultural Commodity Boards

Given the importance of agricultural commodity exports to the economy and the volatility of international prices, stabilization schemes have been established in PNG since the 1940s for the important export crops in Papua New Guinea (PNG) -- namely cocoa, coffee, copra and palm oil. The four schemes are similar in design (see Figure 1). A threshold price is determined equal to a ten-year moving average of FOB prices, adjusted for inflation. Then a buffer zone is set at 5% above and below the threshold price in which no bounties or levies apply. When the current FOB price is more than 5% above the threshold price, levies are imposed on producers at 50% of the difference between the threshold price and the current FOB price. The levy revenues are paid into a commodity stabilization fund. When the current FOB price is more than 5% below the threshold price, bounties are paid to growers at 50% of the difference between the current FOB price and the threshold price. Bounties are paid out of the stabilization fund.

Figure 1

Until recently, the schemes were successful in stabilizing producer prices. However, in the mid- and late-1980s, commodity prices fell in real terms, so that current FOB prices were consistently below the threshold price. As a result, subsidy payments were made to growers over an extended period. This led to the eventual exhaustion of the cocoa, copra and palm oil funds, and the coffee fund is expected to run out early in 1991. To prolong price support, the funds were kept solvent through government financial contributions, commercial bank loans and STABEX transfers.

In response to these problems, in November 1989 the government decided to implement a number of interim measures which would provide support to the agricultural export sectors while a new approach to price stabilization was found. The objective of these new measures is to give price protection to growers while they adjust to lower international prices without the support of bounty payments from the stabilization funds. Instead of establishing a threshold price based on a long-run moving average, support during the adjustment period is based on the difference between the estimated costs of production and the international price. The level of price support will decline over an adjustment period of about three to five years depending on the commodity. By the end of this period producers will face international prices. The loans used to finance price support payments are to be repaid by the commodity boards from export revenues when the international price exceeds the support price.

The rationale for this policy is that without such a scheme agricultural incomes would decline substantially with a significant proportion of the estate sector going out of business. With support, as well as initiatives to improve productivity, such as extension and research, the sectors will be able to adjust to low prices and to gain international competitiveness, as well as being in a position to repay existing loans.

4. Impact of Commodity Price Fluctuations on Economic Stability in PNG

In this section we provide empirical estimates of the magnitude by which each institution is affected by commodity price risk. We identify the following parties: tax revenues, MRSF, MRDC, and the private sector.

4.1 Tax Revenues

Historically, PNG's total tax revenues have been very sensitive to variations in commodity prices. This can be estimated by running the regression:

(1)
$$TR_t = \alpha + \beta^* P_{t1} + \gamma^* P_{t2} + ... + error$$

where TR_t are percent changes in tax revenues in period t, and P_{ti} are percent changes in the prices of relevant commodities (e.g., copper and gold)[4]. From these regression equations, the elasticity of tax revenues with respect to the copper price (both expressed in percentage annual changes of dollar values) over the period 1976-1988 was about 0.25 (with a t-statistic of 3.3 and a R^2 of 0.56). The elasticity with respect to gold prices was about 0.18 over the same period, but not significant. A similar regression was done for export earnings. The elasticity of export earnings with respect to copper prices was about 0.18 (with a t-statistic of 1.37 and a R^2 of

---

[4] See further Gemmill (1985) and Kolb (1985) on how to estimate these sensitivities.

0.135). The elasticity with respect to gold prices was about 0.738 over the same period (t=2.84, R^2 = .45)[5].

These results suggest that the exposure of tax revenues to export prices is quite different from the relationship between export earnings and export prices in the case of the gold price, but similar in the case of the copper price. Since the average share of copper and gold in export earnings over the 1976-1988 period was about 25% and 30% respectively, these elasticities indicate also that movements in volumes exported have partly offset the effects of price movements in the case of copper exports and exacerbated those movements in the case of gold exports.

4.2 MRSF

Similar regressions were performed for the dividend stream on the government's share in the mining projects accruing to MRSF. The elasticity for gold was 1.22 (R^2 = 0.28, t = 2.06) and for copper 0.72 (R^2 = 0.05, t= 0.77). The regression coefficients for the annual levels of dollar dividends (in millions) on the level of prices for the period 1981-1988 were 0.076 for gold (R^2 = .43, t=2.14) and 0.005631 for copper (R^2 = .42, t=2.11). Since the last regression is in levels, the coefficients measure the exposure of the dividend stream to prices and can be interpreted as the quantity of physical commodities "received" by the government each year. These quantities are equal to 2.56 tons of gold (converting ounces to tons) and 5,631 tons of copper (or 8 percent of gold exports and 2.5 percent of copper exports).

Regarding future price sensitivities, the World Bank (1989) reports results for two scenarios: in scenario 1 the price of gold is 15% lower than in the base case and the price of oil stagnates in real terms; in scenario 2 the price of gold rises proportional to international inflation. The difference in the current account between these two scenarios is 7.5 percent of GDP and in the fiscal balance is 6.7 percent of GDP, indicating the large sensitivity of both aggregates to international commodity price movements.

---

[5]Over a longer period the elasticity of export earnings with respect to copper prices is 0.54 (with a t-statistic of 2.97), and the elasticity with respect to gold prices is 0.64 (with a t-statistic of 2.11).

4.3 MRDC and the Private Sector

Sensitivity scenarios regarding future prices can also be performed on the profitability and resulting tax

revenues in the case of an individual mining operation. This was done for a mine similar to the recently opened

Porgera mine, which largely produces gold. Based on production estimates, costs of production, and current

tax regulations profits, tax receipts and dividends paid abroad (the excess cash-flow after subtracting the

government's share) are calculated under different gold price assumptions.
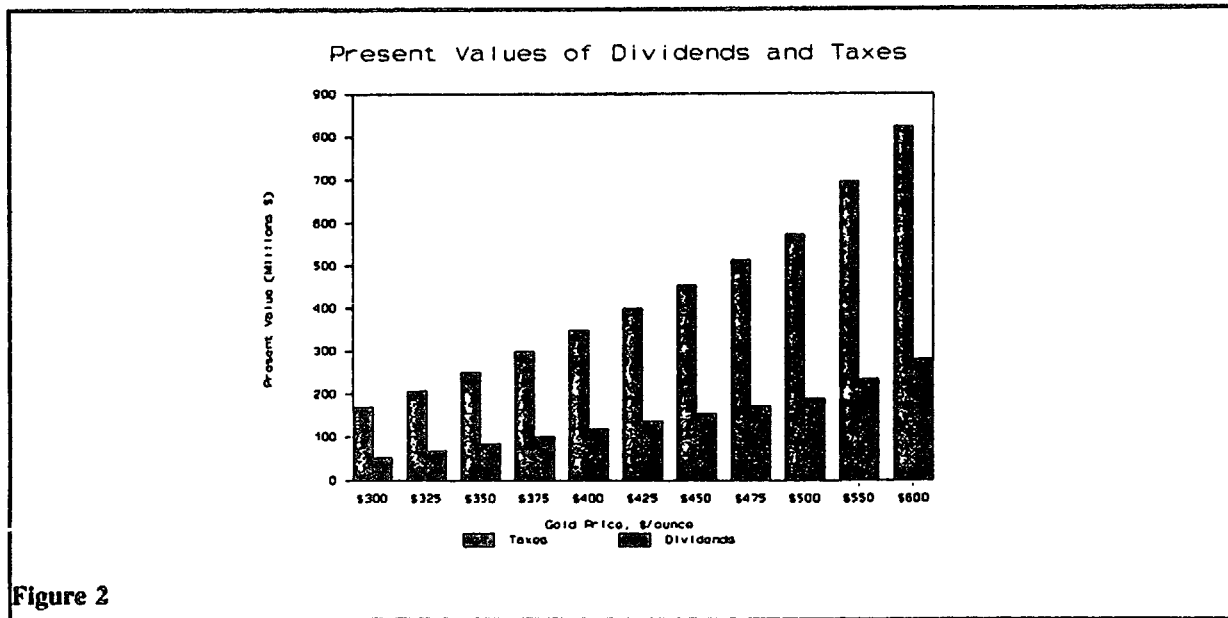

Figure 2

Figure 2 plots the results for the present value of dividends paid abroad and the present value of gross

receipts to MRSF (tax receipts, royalties and dividends) over the life time of the project. As one can observe,

the present value of MRSF receipts, PVT, is more sensitive with respect to the gold price than the present value

of dividends paid abroad, PVD. As the gold price increases, the APT comes into effect and raises the PVT

relatively more than the PVD. In regressing the PVT on the gold price, the slope is around two, while the

slope of a regression of the PVD on the gold price is only 0.75. Thus, the government is relatively (about three

times) more exposed to gold price risks than the foreign investors are, since they share less in the upside of

a price increase while the government shares more because of the APT[6].

5. Risk Management Schemes and Their Costs and Benefits

The above section indicated the need for risk management, especially commodity risk management. There are many different forms of commodity risk management that can be used by developing countries. We will discuss here the ones in use by PNG.

5.1 Stabilization Funds

The principle behind the agricultural product stabilization funds and MRSF in PNG is that in periods of decline in commodity-related tax revenues the government draws on its reserves to finance its normal expenditures. The experience with commodity stabilization funds in other countries has shown, however, that these funds are seldom sufficient to sustain expenditures in times of prolonged downturns in commodity prices and that consequently the funds only insure against short-lived and temporary declines in commodity prices (Gilbert (1990)). Evidence of this is provided by the agricultural stabilization schemes which are effectively depleted.

The PNG agricultural stabilization schemes were designed originally to stabilize price around the long-run average price. The non-stationarity of commodity prices means that use of the moving-average of past prices is unreliable as an estimate of the long-run price, and that the scheme is likely to fail. As reported above, the agricultural stabilization funds in PNG have indeed become exhausted following the persistently low prices of cocoa, coffee, copra and palm oil during the late 1980s. There are many similar examples from other countries (e.g., coffee and cocoa stabilization funds in Cote d'Ivoire and Cameroon). MRSF is the only stabilization fund in PNG that has so far performed successfully for a prolonged period. The recent closure of BCL has shown that even the MRSF can only provide very limited insurance against a major shortfall in

---

[6]In terms of levels, the coefficient for PVD is about $80,000 for the government's share.

government revenues and that additional support for PNG's balance of payments has been necessary.

Adjusting the rules of a scheme will not prevent the funds from exhaustion over the long-run, unless the effectiveness of the scheme in stabilizing prices is drastically reduced. For example, using historical data it can be shown that if the moving average period were to be shortened and the inflation adjustment were eliminated from the PNG agricultural schemes, the funds would not now be exhausted. However, while such changes would certainly reduce the frequency of depletion of the stabilization funds, the trade-off is that the price paid to producers would be less stabilized. Another modification to the design of the schemes which would slow the exhaustion of the funds would be to allow only 50% of the fund be paid out as bounties in any one year. In this case the fund would never become exhausted (although it could asymptotically decline to zero), but it would become progressively weaker in its ability to stabilize producer prices.

The agricultural schemes in PNG have failed largely because of the difficulty of determining the long-term price which in turn determines the level of withdrawals. Funds in other countries have failed for this reason but also because of lack of discipline in accumulating reserves in times of high commodity price. The increased flexibility with respect to drawdowns from the MRSF thus raises some concerns with respect to budgetary discipline.

5.2 Other Instruments

PNG has also benefitted of the international commodity agreements for cocoa and coffee. Most of the international price stabilization schemes have collapsed in recent years because of a breakdown in cooperation among its members or because of the exhaustion of support funds. PNG has also drawn funds from compensatory financing schemes (such as STABEX/SYSMIN facilities, and CCFF), which can serve as risk management schemes. However, they have the drawback of their limited and uncertain availability, as was shown following the recent closure of the Bougainville copper and gold mine (BCL).

6 Financial Instruments to Manage External Risk

The failure of the international commodity agreements to stabilize prices on a reliable basis and the possible drawbacks of compensatory agreements and domestic stabilization schemes point to the importance of financial market instruments for commodity price risk management purposes. The most important financial instruments from PNG's point of view are commodity futures, commodity options, commodity swaps and commodity-linked finance (loans and bonds) (Masuoka (1990)). More specifically, forward contracts, futures contracts and options could be used to eliminate price exposure over a short time period (e.g., one year) for the agricultural commodities. Swaps could be used in the mineral and energy sector for longer horizons. The nature and usage of these short- and long-term hedging instruments in the context of PNG is now further described.

6.1 Commodity Futures

As an example, the Cocoa Marketing Board in PNG may wish to set a guaranteed price to producers for the coming season without incurring significant financial losses if international prices change suddenly. Based on historical export patterns, the Cocoa Board could predict fairly accurately the quantities of cocoa available for export during different months throughout the year. Then it could sell futures contracts at the beginning of the season for each of the delivery months in the coming year in proportion to the volume available for export in each of those months. The guaranteed price at the beginning of the season to producers could be set as the weighted average of the futures prices (with weights given by the export volume). As exports are sold at international prices throughout the year, near-by futures contracts (i.e., those closest to expiration) could be purchased (thus offsetting the original short position) at prices close to the international price. Such a strategy would eliminate intra-year price risk for the Marketing Board.

6.2 Commodity Options

Commodity options (on futures contracts) could also be used by the commodity boards. For example, say the Coffee Marketing Board wished to hedge the future price of its coffee sales with options instead of using futures or forward contracts. Suppose the Board wished to sell 50,000 tons of coffee in six months time and wants to receive a price of at least $2,000 per ton. In this situation, the Board purchases put options giving it the right to sell coffee futures contracts at a price of $2,000 per ton. Say the premium quoted is $50 per ton so that $2.5 million is paid to cover the entire 50,000 tons. If after 6 months the price is greater than $2,000 per ton, say at $2,200 per ton, the Board would not exercise the options and receives $110 million in revenues. If, however, the price falls to $1,800 per ton, the Board will exercise its options, enabling it to sell futures contracts at $2,000 per ton. The futures contracts can then be bought back at $1,800 (since the spot and futures prices are always equal at the expiration of the contract) making a profit of $200 per ton. The Board then sells the coffee at the spot price of $1,800 per ton. Combining the $200 per ton gain on the futures contracts and $1,800 per ton on the physical commodity gives an overall price of $2,000 per ton and total revenues of $100 million. The coffee options provide price insurance to the Board, guaranteeing it at least $100 million in revenues in exchange for an insurance premium of $2.5 million.

6.3 Commodity Swaps

Assume that PNG and a big German company agree upon a long-term export contract in which the German company buys 2 million pounds of copper every six months over the next five years and pays the then current copper price at each six-month interval. Assume also that the PNG exporter wants to "lock-in" the dollar value of these revenues now. The exporter now enters into a commodity swap contract with a U.S. bank. Assume that the term for the swap is $1/lb. (indicative). The U.S. bank agrees to pay the exporter U.S. $2 million every six months for the next 5 years. The exporter agrees to pay the value at the spot price of 2 million pounds of copper on the same dates when the bank is due to make its payment--in effect a "difference"

check settles the transaction each 6 months. Thus, the commodity swap contract is, in effect, a series of 10 forward contracts lined up over the next 5 years and has locked the price at $1/lb.

PNG has sufficient access to private financial markets to be able to use any of these financial risk management techniques. Given the increase in exposure of the PNG economy to commodity price risk, the economy will increasingly depend on a handful of commodity exports for its growth and development. Therefore, commodity risk management should become an integral part of the GOPNG's economic strategy. We discuss in the next two sections some possible financial risk management techniques for the mineral and energy and agricultural stabilization funds respectively. However, PNG will need to establish first a proper institutional framework and overall strategy and acquire training. Only then specific risk management operations can be implemented.

Since PNG is not only exposed to commodity price risks, but also to other forms of external risks arising from its financial liabilities and assets (i.e., exchange rates and interest rates), it is furthermore important that the links between different exposures are taken into account. The interactions between the different forms of external risks which need to be taken into account are the following. First, movements in cross-currency exchanges rates may offset (or exacerbate) movements in primary commodity prices, implying that both commodity and exchange rate management may need to be modified. Second, there can be an inverse relationship between commodity prices and quantities traded. Depending on the elasticity of supply and demand, the effect of price changes on export revenues or import expenses can be offset by changes in the quantity of goods exported or imported. This may reduce the need for hedging price risks as a way to hedge revenue or expense risks (Coleman and Qian (1991)).

7. Mineral and Energy Price Risk Management Strategies

As discussed above, the MRDC does not insulate the government budget from the risks associated with commodity prices because MRDC's liabilities (loans) and assets (dividend streams) are not matched. This is

because its obligations on external loans (debt service payments) are independent of commodity prices while its dividends are highly dependent on commodity prices. A matching between assets and liabilities over the long-term can be made with either a commodity swap or commodity-linked finance.

An example is when MRDC has an equity stake in a copper mine. In that case, its revenues are sensitive to the copper price and a copper swap can be used to convert copper-price sensitive cash-flows into a certain cash-flow stream which can be used to service obligations on conventional loans. As mentioned by Masuoka (1990), this structure was successfully used in the case of the Mexicana de Cobre copper mining company.

The notional amount of copper swap would depend on the sensitivity of the dividend stream to the copper price. Based on our earlier analysis, the annual value of dividends (and thus MRDC's revenues) can be expressed as:

$$(2) \qquad\qquad D_t = \alpha + \beta^* P_t$$

where D is the value of dividends and P is the copper price. Graphically this is shown in figure 3.

In section 4, β was estimated to be about 5,631 tons. This implies that for every one dollar change in the price per ton of copper, MRDC's annual revenues change by approximately $5,631. This is equivalent to MRDC receiving (having a long position of) 5,631 tons of copper annually, since the value of owning 5,631 tons of copper would change by an equal amount as a result of a price change.

This long position of the MRDC in copper can now be hedged by a commodity swap. The swap would oblige PNG to pay annually the spot value of 5,631 tons ($\beta^* \$P_t$, which is about $15 million dollars at the current spot copper price) in exchange for a fixed payment received. The fixed payment would depend on conditions in the market for copper-swaps and on the futures prices for copper, but for illustrative purposes a fixed price of $2,500/ton can be used. The copper-price sensitive dividend stream will then be matched with

the copper-price sensitive obligation on the swap. The net result will be a cash-flow stream which is (largely) independent of copper price swings and which would thus, without any risk, be available to service conventional loans.

Commodity-linked loans can achieve the same result. Consider the case of the participation of MRDC in a gold-mine, (e.g. a mine similar to Porgera). Once the project comes on stream, the dividend payments received by MRDC will depend
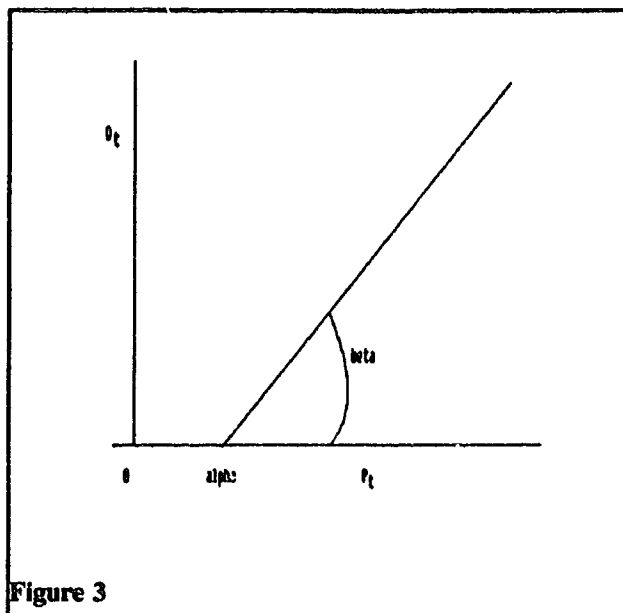

Figure 3

on the price of gold. It was shown above that for every dollar change in the price of gold, the present value of a dividend stream to MRDC coming from a project like Porgera changes by approximately $80,000, or, equivalently, the annual dividend stream changes by about $8,000[7]. In order to hedge this risk, the financing of the equity-participation by MRDC should consist of an obligation whose servicing also changes by $8,000 for each dollar change in the price of gold and for the remainder of a conventional loan. A gold-loan could constitute the price sensitive part. Gold-loans stipulate payments in terms of ounces of gold and the costs of servicing the gold loan would thus vary one-to-one with the price of gold. In every period, MRDC would want to owe 8,000 ounces of gold, since this obligation would vary in the same way as the dividend stream with gold price changes.

Currently, gold interest rates (gold fees) are between 2% and 3%, so that MRDC could borrow between 250,000 and 400,000 ounces of gold. At current gold prices, this means MRDC could obtain between $100 million and $150 million dollars in a gold loan. The remainder would have to be borrowed in a

---

[7]Notice that we measure here the sensitivity of the present value of dividend streams and not the annual dividend streams. The present value of all future dividends will be more sensitive to assumptions about the future the gold price than the annual streams. Approximately, the difference will be the factor 1/(discount rate).

conventional dollar loan[8]. The combination of the gold-denominated and the conventional loans would perfectly hedge MRDC.

Similar financial hedging techniques are possible for MRSF. The current investment policy for the reserves of the MRSF is that they are invested by the Central Bank in relatively low-yielding, safe assets. This policy does not seem to provide PNG with the best mix of return maximization and risk minimization. Even though using foreign exchange reserves provides a smoothing mechanism, it does not involve laying off risks to other parties and is an expensive self-insurance scheme, because the fund's asset returns are unrelated to commodity price movements and because it cannot sustain a prolonged decline in commodity prices. Further, the fund ties up a significant amount of foreign reserves.

A better reserve management policy would be to manage reserves through commodity loans, commodity swaps, or short-term commodity hedging tools. Commodity swaps are the most suitable. Based on projected revenues streams that depend on the price of a particular commodity, MRSF could enter a commodity swap with a foreign financial institution (altogether MRSF should eventually enter several swaps, i.e. separate ones for gold, copper, and oil).

As an example, consider MRSF's gold-dependent revenues. MRSF received K42.5 million in total revenues in 1988. Based on the production numbers of BCL and on prevailing gold and copper prices, it is estimated that revenues related to gold-mining amounted to about 30 % of total revenues or 12.4 million Kina (or $14 million) in 1988. This revenue stream depends on the gold price and is equivalent to MRSF holding a long position in physical quantities of gold. Using the 1988 gold price, this long position in tax revenues was equal to about 33,000 ounces of gold. Thus, for every dollar increase in gold price, annual tax revenues of the

---

[8]However, since the gold loan is likely to be in excess of MRDC's financing needs. the remainder could be invested in conventional securities.

MRSF change by about $33,000, or the change in the value of 33,000 ounces of gold[9].

MRSF could now enter a gold swap with a foreign financial intermediary with an interest payment of 33,000 ounces of gold (based on a spot price of 425 $/ounce with a notional interest payment of $14 million) in which it would effectively sell gold at a fixed price for, say, the next 10 years. The notional principal amount would depend on the current market gold fee; at a rate of 2% it would amount to about 1,650,000 ounces or about $700 million[10].

In this way, MRSF pays the third party at certain times the equivalent value of 33,000 ounces of gold at the then prevailing spot price--which exactly offsets the tax and dividend receipts it gets from the gold producer. In exchange, it receives from the third party (commercial bank) a fixed payment of $X times 33,000 at each date (where X depends on the gold fee, the current spot price of gold and the current interest rate), and MRSF's tax revenues for the next 10 years are effectively fixed at $X times 33,000.

Swap transactions will not result in a perfect hedge since MRSF revenues do not depend linearly on the underlying price of the commodity, but the revenues depend in a non-linear way on commodity prices and go up progressively when commodity prices rise. Considering the gold sector only, the dependence of the revenues paid into MRSF can be represented as:[11]

$$(3) \qquad R_t = \alpha + \beta Q^* max[P_t\text{-}F,0] + \lambda Q^* max[P_t\text{-}M,O]$$

where R_t is the revenue going to MRSF, β is the effective corporate tax (the combination of the regular

---

[9]The earlier analysis of the gold mine indicated that the regression coefficient of the net present value of taxes (NPT) on the gold price was about 2. This result is confirmed in a regression of the tax revenues paid into MRSF on gold prices which has a slope of about 0.23. Since NPT is the discounted value of all future taxes, it will be more sensitive to the gold price by approximately the factor 1/(discount rate), or about 10.

[10]Note that the notional principal amount is never exchanged between the two parties. Effectively only interest payment are settled on a netting out basis.

[11]This example concerns the revenues after depreciation allowances have expired and the project generates a positive profit.

corporate tax rate (currently 35%) and the withholding tax (17%), making for an effective tax of 46%), Q is the quantity exported, F is the fixed costs per unit for the producer (including depreciation allowances in the early years of the project), P_t is the gold price, and λ is the APT tax rate which comes into effect when profits exceed a benchmark, which is assumed to occur when prices P_t exceed the level M. ...

This exposure of revenues to gold prices can be hedged using swap transactions (as outlined above) combined with long-dated options. Once the company has largely depreciated its fixed costs, i.e. F = 0, the swap transaction would involve a (notional) amount of gold equal to β^*Q which would hedge revenues on account of the regular profit part. This would result in more stable streams to the general budget. In addition to the swap, MRSF could sell today a series of long-dated call-options to a third party with exercise prices of M, for amounts equal to λQ and with maturities on which tax receipts are due in future years. The sale of the call options would give PNG a premium income today. This premium could be invested in safe foreign obligations (e.g. commercial bank deposits or Treasury bills or bonds), from which an annuity could be passed on to the general government budget.

The gold swap would now hedge the normal corporate and dividend withholding tax revenues, and payments on the swap will be matched with tax receipts at each maturity date. The options would hedge the APT. At the maturity date of the option, the commodity price could either be below the level M (at which the APT is not in effect) or above it. When it is below, the call is also out-of-the-money and MRSF would not be required to make payments to the third party. When the call is in the money, the payment on the call will exactly be offset by the tax revenue to the MPSF from the APT. Again, the transaction would result in converting a risky tax revenue income stream into a certain yield on the invested premium. These transactions are shown in Figure 4. It is clear that the net payoff there is almost independent of the price of gold as it is horizontal for almost all price ranges.

The transactions result in MRSF largely locking in its revenues over a long period independent of the gold price. It also allows the MRSF to pass on a fixed stream of payments to the general budget, and not to

Hedging Taxes Using Swap and Option

Profit at $400, APT at $650

Figure 4
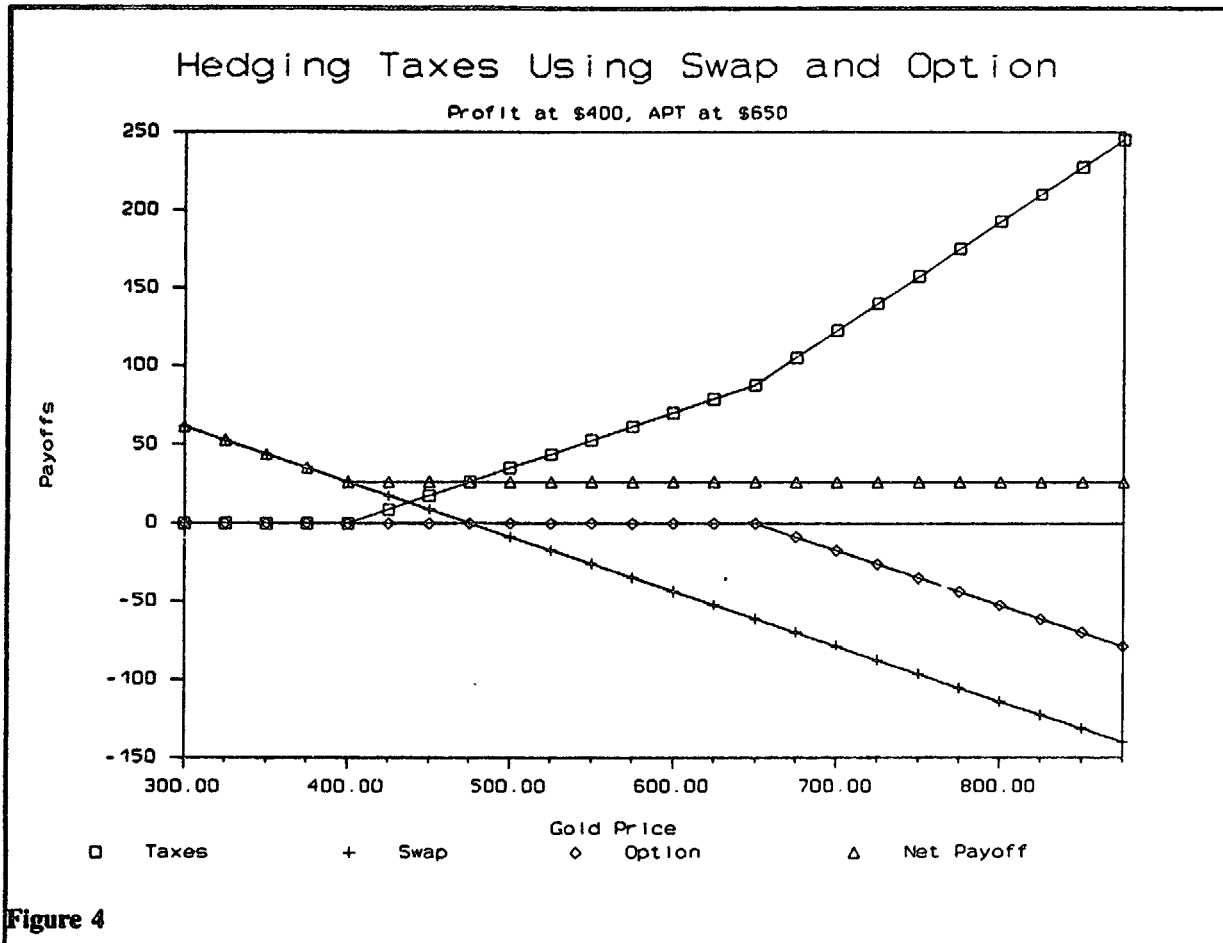
rely on formulas based on expected prices or ad-hoc decision making.

The use of short-term commodity hedging instruments would be similar to that of swaps. An example using commodity futures to hedge current year tax revenues against copper price risks would be the following. At the beginning of the fiscal year, PNG would sell copper futures contracts with maturities spread out over the year. The amount to be sold would depend on the sensitivity of the tax revenues to copper prices. The earlier analysis showed that this elasticity was about 0.25, implying that PNG would have to sell futures with a contractual face value equal to about 25% of anticipated tax revenues. This would effectively reduce as much as possible the combined effect of price and quantity uncertainty on next period tax revenue uncertainty.

8. Agricultural Stabilization Funds

In the description of the financial instruments by Masuoka (1990) it was indicated that for most agricultural commodities the longer term hedging instruments were not yet well developed. For these commodities, however, the short term hedging instruments are in general easily available. Since the four agricultural stabilization funds have very similar main features, we will develop below a hedging strategy for the Coffee Marketing Board using coffee futures traded in New York.

While the prime objective of the coffee fund is to reduce the effects of sharply changing prices over time, substantial problems can be associated with sudden price movements within the year. This was illustrated very recently with the breakdown in the International Coffee Agreement, leading to coffee prices declining from $3,356 per ton in January 1989 to $1,515 per ton in December. The largest monthly decline was between June and July, with price falling from $2,762 per ton to $1,942 per ton, a reduction of 30%.

Intra-year price risks can be hedged using futures contracts. A possible hedging strategy would work as follows. The Coffee Marketing Board offers producers a price for coffee which is fixed for the entire year. This price is set at the beginning of the year and is equal to the weighted sum of the prices of coffee futures contracts which will mature at various months throughout the coming year. The weights are determined by the quantities of coffee available for export in the months between each contract expiration.

For example, say in December 1988 the Coffee Board had wished to set a fixed price for the crop year 1989. There are five expiration months on coffee futures contracts (March, May, July, September and December) and in December 1988 each had a price for delivery in these months in 1989. Based on historical export trends the Board could have predicted fairly well the proportion of the total exports available before each of these delivery months (e.g., January, February and March 10%; April and May 20%; June and July, 30%; August and September 25%; October, November and December 15%). These proportions could have then been used to obtain a weighted price for the coming year.

This strategy was simulated using monthly data from 1980 to 1989 and the effect on intra-year variability

observed by comparing the CVs of various price series. The results are reported in Table 8.1. for the world price, the threshold price (ten-year moving average), the domestic price A (the threshold price adjusted for subsidies and levies calculated using the world price), the fixed price (the weighted futures price) and the domestic price B (the threshold price adjusted for subsidies and levies calculated using the fixed price, instead of the world price, and assuming that the price band followed the moving average).

Table 8.1 Intra-Year Price Variability 1981-89. (CVs)

Year	World Price	Threshold Price	Domestic Price A	Fixed Price	Domestic Price B
1980	16.8	2.9	8.9	0.0	1.1
1981	6.2	2.0	4.1	0.0	1.0
1982	4.2	2.0	1.6	0.0	0.0
1983	5.5	1.4	4.7	0.0	0.0
1984	2.7	1.6	1.9	0.0	0.0
1985	11.2	1.5	7.4	0.0	0.7
1986	16.7	1.2	9.7	0.0	0.6
1987	8.3	2.5	3.9	0.0	0.0
1988	2.9	0.5	2.5	0.0	0.2
1989	30.4	1.4	16.0	0.0	0.7
Mean	10.5	1.7	6.1	0.0	0.4

The inter-year CV of the world price is substantial, averaging 10.5% over the ten-year period. The instability in 1989 is clearly captured by the CV statistic, which reached 30.4% for that year. The domestic price A (based on the world price) also fluctuated throughout the period. The results showed that under the existing scheme the greater the intra-year variability of the world price, the greater it was for the domestic price for producers (e.g., in 1980, 1985, 1986 and 1989), even with subsidies and levies. In contrast, by using the futures contract to lock-in an external price, the inter-year fluctuations in the domestic price are removed almost altogether. On average, the CV of the adjusted domestic price is 0.4%, indicating that producers are almost entirely insulated from intra-year price instability. The impact of operating this hedging strategy on inter-year price variability is reported in Table 8.2.

28

Table 8.2 Average Prices for Stabilized Coffee Prices in PNG (US Dollars).

Year	World Price	Threshold Price	Domestic Price	Fund Size	Fixed Price	Domestic Price	Fund Size
1980	3466	2444	2955	68	4106	3275	73
1981	2869	2640	2749	82	2754	2697	95
1982	3088	2840	2964	87	2733	2733	96
1983	2911	3009	2898	89	2788	2788	96
1984	3189	3173	3157	91	3033	3033	97
1985	3231	3355	3203	91	2951	2985	96
1986	4295	3541	3897	104	3939	3740	100
1987	2505	3421	2792	101	2792	3278	105
1988	3013	3257	3019	90	2926	2930	105
1989	2387	3212	2684	85	2691	2791	101
Mean	3095	3089	3031	89	3120	3025	90
Std. Dev.	504.1	334.9	328.7	9.4	481.6	308.6	9.6
CV	16.2	10.8	10.8	10.6	15.4	10.2	8.9

The results show that the introduction of the hedging program has very little impact of inter-year variability compared to the stabilization fund. On average, the domestic price A (based on the world price) is $3,031 per ton, compared to $3,025 per ton for domestic price B (based on the fixed price). The stability of these prices was similar with coefficients of variation of 10.8% and 10.2%, respectively. The impact of the hedging strategy on the fund size is also shown in Table 8. 2. On average the mean of the fund with the hedging strategy is larger than that without it, while the variability of the fund is lower. This reflects the lower CV of the fixed price compared to the world price.

This analysis shows that with a simple hedging strategy using futures contracts the Coffee Board can fix the external price it faces for an entire year at a time. This stability can be translated into a very stable within-year domestic prices received by producers. The effect of implementing this strategy on inter-year variability is very small, however. Futures with longer maturities or rolling over futures may be used to manage this inter-year price risks.

9. Conclusions

This paper discussed some of the financial instruments available to PNG for managing its external risks and illustrated their potential benefits. Given the importance and benefits of risk management, PNG should consider undertaking a risk management program. This could involve establishing a national financing and risk management strategy (authorized perhaps by PNG's National Borrowing Advisory Committee). Furthermore, the MRDC needs to be strengthened by establishing rules regarding not only the size of its participation in new projects, but also the type of external financing it uses (e.g., more commodity indexing features) and its risk management strategy.

In the past, the MRSF has been well managed given the financial tools available. However, the MRSF should now take advantage of the recent innovations in international capital markets by using instruments such as commodity swaps to hedge its commodity price-sensitive tax revenues. This would allow stable cash-flows to be passed on to the general budget, independent of commodity price movements. Other commodity risk management techniques can also be introduced in managing the MRSF.

With the expected expansion of the mineral and energy sector, PNG should look for ways to reduce the variability of its economy through financial instruments, and, given its high international credit standing, is well placed to take advantage of longer-term commodity-linked instruments.

References

Coopers and Lybrand, (1989), Mining and Petroleum Taxation: A Guide for Operators and Contractors.

Brogan, B. and J. Rewenyi, (Ed.), (1987), Commodity Price Stabilization in PNG - A Work-in-Progress Seminar, Australian Centre for International Agricultural Research, January.

Coleman, J.R. and Y. Qian, (1991), "Managing Financial Risks in PNG: Optimal Debt Portfolio," In review for PRE Working Paper Series, World Bank.

Gemmill, G., (1985), "Optimal Hedging on Futures Markets for Commodity-Exporting Nations", European Economic Review, 27, pp. 243-61.

Gilbert, C.L., (1990), "Domestic Price Stabilization Schemes for LDCs," mimeo, IECIT, World Bank.

Guest, J., (1987), "Problems in Managing the MRSF", Bank of PNG Quarterly Economic Bulletin, June 1987.

International Monetary Fund, (1990), "Request for Stand-By Arrangement and Compensatory Financing of Export Fluctuations under the Compensatory and Contingency Financing Facility," March.

Kolb, R.W., (1985), Understanding Futures Markets, Scott, Foresman and Co. (London).

Masuoka, T., (1990), "Asset and Liability Management in the Developing Countries. Modern Financial Techniques. A Primer," PRE Working Paper No. 454, World Bank.

World Bank, (1989), Papua New Guinea Opportunities and Challenges for Accelerated Development, Report No. 7707-PNG, April.

World Bank, (1990), Papua New Guinea Strategy for Adjustment and Growth, Report No. 8518-PNG, April.

Appendix

Debt Ratios and Currency Composition of PNG

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
PRINCIPAL RATIOS										
Total External Debt (%)										
EDT/XGS	66.1	121.9	175.9	195.9	197.3	203.0	166.2	158.5	130.5	161.5
EDT/GNP	29.2	48.1	72.3	77.0	81.7	90.5	77.6	77.0	66.5	74.2
TDS/XGS	13.8	19.0	25.1	30.1	40.1	32.7	26.9	24.6	26.6	34.3
INT/XGS	6.6	10.0	12.7	13.8	15.8	13.5	11.3	11.1	10.0	11.2
INT/GNP	2.9	4.0	5.2	5.4	6.6	6.0	5.3	5.4	5.1	5.1
Concessional/EDT	12.2	9.7	8.6	12.0	14.0	16.3	20.4	24.1	19.3	19.1

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
CURRENCY COMPOSITION OF DEBT OUTSTANDING (PERCENT)										
U.S.Dollars	35.0	27.9	39.0	46.4	45.5	39.0	35.7	29.2	28.9	31.9
Mixed Currency	27.4	41.3	36.2	31.1	29.0	28.9	28.0	27.6	29.9	31.0
Japanese Yen	4.4	3.7	3.4	3.0	8.4	14.2	16.1	18.0	20.8	23.0
Deutsche Mark	5.2	3.9	3.1	1.9	2.0	2.1	2.3	2.3	1.8	1.8
French Franc	.0	.0	.0	.0	.2	.4	.3	.3	.3	.2
Pound Sterling	2.7	2.3	2.4	1.7	1.2	1.3	1.9	2.1	2.0	1.5
Swiss Franc	5.8	4.5	3.4	2.5	4.2	7.2	9.5	10.3	9.6	6.1
Other Currencies	19.6	16.4	12.4	13.4	11.7	9.4	9.0	13.3	10.2	9.6
Exchange Rate Val Effects /a	0	-12	-20	-13	-20	40	87	140	-44	-50

Notes: a/ IBRD debt valuation effects are shown from 1985 onward, millions of dollars.

	Title	Author	Date	Contact for paper
WPS730	Wage and Employment Policies in Czechoslovakia	Luis A. Riveros	July 1991	V. Charles 33651
WPS731	Efficiency Wage Theory, Labor Markets, and Adjustment	Luis A. Riveros Lawrence Bouton	July 1991	V. Charles 33651
WPS732	Stabilization Programs in Eastern Europe: A Comparative Analysis of the Polish and Yugoslav Programs of 1990	Fabrizio Coricelli Roberto de Rezende Rocha	July 1991	R. Martin 39065
WPS733	The Consulting Profession in Developing Countries: A Strategy for Development	Syed S. Kirmani Warren C. Baum	July 1991	INUDR 33758
WPS734	Curricular Content, Educational Expansion, and Economic Growth	Aaron Benavot	July 1991	C. Cristobal 33640
WPS735	Traditional Medicine in Sub-Saharan Africa: Its Importance and Potential Policy Options	Jocelyn DeJong	July 1991	O. Nadora 31091
WPS736	Wages and Employment in the Transition to a Market Economy	Simon Commander Fabrizio Coricelli Karsten Staehr	August 1991	O. Del Cid 39050
WPS737	External Shocks, Adjustment Policies, and Investment: Illustrations from a Forward-looking CGE Model of the Philippines	Delfin S. Go	August 1991	A. Bhalla 37699
WPS738	Tax Competition and Tax Coordination: When Countries Differ in Size	Ravi Kanbur Michael Keen	August 1991	J. Sweeney 31021
WPS739	Managing Financial Risks in Papua New Guinea: An Optimal External Debt Portfolio	Jonathan R. Coleman Ying Qian	August 1991	J. Carroll 33715
WPS740	The Onchocerciasis Control Program in West Africa: A Long-term Commitment to Success	Bernhard H. Liese John Wilson Bruce Benton Douglas Marr	August 1991	O. Nadora 31091
WPS741	When Does Rent-Seeking Augment the Benefits of Price and Trade Reform on Rationed Commodities? Estimates for Automobiles and Color Televisions in Poland	David Tarr	August 1991	D. Ballantyne 37947

	Title	Author	Date	Contact for paper
WPS742	The Cost of the District Hospital: A Case Study from Malawi	A. J. Mills	August 1991	O. Nadora 31091
WPS743	Antidumping Enforcement in the European Community	Angelika Eymann Ludger Schuknecht	August 1991	N. Artis 37947
WPS744	Stainless Steel in Sweden: Anti-dumping Attacks Good International Citizenship	Gunnar Fors	August 1991	N. Artis 37947
WPS745	The Meaning of "Unfair in U.S. Import Policy	J. Michael Finger	August 1991	N. Artis 37947
WPS746	The Impact of Regulation on Financial Intermediation	Dimitri Vittas	August 1991	
WPS747	Credit Policies in Japan and Korea: A Review of the Literature	Dimitri Vittas	August 1991	
WPS748	European Trade Patterns After the Transition	Oleh Havrylyshyn Lant Pritchett	August 1991	N. Castillo 37947
WPS749	Hedging Commodity Price Risks in Papua New Guinea	Stijn Claessens Jonathan Coleman	August 1991	S. Lipscomb 33718
WPS750	Reforming and Privatizing Poland's Road Freight Industry	Esra Bennathan Jeffrey Gutman Louis Thompson	August 1991	B. Gregory 33744