Mexico’s External Debt Restructuring in 1989-90

Sweder van Wijnbergen

Who in the end profited most from the official resources devoted to Mexico’s last debt restructuring: Mexico or its commercial creditors? Mexico. But in establishing the basis for long-term growth the package seems a reasonable compromise between the conflicting interests of Mexico and its commercial creditors.
Mexico's suspension of debt service payments in August 1982 ushered in the international debt crisis. In two consecutive debt restructuring packages, in 1984 and 1987, Mexico began vigorous structural reform under the so-called Baker plan. Mexico's experience vividly demonstrates the strength of that plan and the reasons for its eventual failure — the fact that it was inherently a short-term process.

In December 1988, Mexico's President Salinas announced that external creditors were expected to contribute to a medium-term solution. In March 1989, the new U.S. Treasury Secretary, Brady, effectively legitimized the word “debt relief” in a speech that opened the way for the 1989 debt restructuring agreement that van Wijnbergen analyzes here.

That agreement offered commercial creditors the choice between exchanging old debt instruments for new instruments involving debt relief (lower interest rates or principal) but partially secured with collateral, or unsecured instruments without debt relief, but with a new money commitment attached.

Active debates on the merits of this package are often confused. In an extensive economic analysis, van Wijnbergen addresses the question: who in the end profited most from the official resources devoted to the deal: Mexico or its commercial creditors? He concludes:

Mexico made efficient use of the official funds available for debt reduction. The market value of the claims before enhancement declined by close to the full amount of the value of the additional foreign official resources devoted to the package. The rate of return on the use of official resources far exceeds the interest rate at which they were extended.

The market value after enhancement was basically the same as the market value of the outstanding claims before the deal — so Mexico's commercial creditors got a fair deal. The credit enhancement by and large made up for the debt relief. But no more than that — the official creditors' money benefited Mexico rather than its commercial creditors. The World Bank, the IMF, and the Government of Japan (which provided the official resources) achieved their objective of helping Mexico; the additional resources did not accrue to the creditors, which many feared and some deemed inevitable.

Finally, on the basis of available evidence, this package established the basis for sustainable growth in Mexico.
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I  INTRODUCTION

Mexico has throughout the eighties been at centerstage in the debates and events shaping the sovereign debt problem. Caught between a sudden collapse of its terms of trade and rising world interest rates, Mexico's suspension of debt service payments in August 1982 ushered in what has since become known as the debt crisis. In the years that followed, it became the de facto paragon of the approach of Mr. Baker, at the time the US Treasury secretary, to the debt crisis; after initial retrenchment and consolidation, Mexico started a vigorous process of structural reform, relying on international capital markets to support that process through rescheduling and new money in two consecutive debt restructuring packages (83/84 and 86/87). Mexico's experience over those years vividly demonstrates the strength of that approach; but equally clearly on display are the reasons for the eventual failure of the Baker plan.

While the reform process promised tangible benefits over the medium term, reschedulings and new money commitments came on a short term basis only, and each time after tortuous negotiations. This inherently short term process left continuing uncertainty as to whether similar accommodation would be available two three years down the road. It thus failed to provide a medium term framework within which the private sector could, with reasonable confidence, assume current policies to continue. The resulting uncertainty about exchange rates, future tax policy and financial regulation ruled out a return of flight capital and the recovery of private investment. As a consequence growth stagnated to such an extent that the social consensus behind the reform program came under increasing stress.

Towards the end of the de la Madrid administration, the view took hold that a different approach had to be taken. This view was pursued with vigor by the Salinas administration that took power in 1988 (and by and large carried over the economic team from the previous administration). On the one hand, the reform process was accelerated beyond anybody's expectations, and a comprehensive, imaginative macroeconomic stabilization program skillfully put in place. On the other hand, President Salinas, in his inauguration speech on December 1, 1988, gave external creditors notice that, while Mexico wished to avoid confrontation, they were expected to contribute to a medium term solution of Mexico's debt problem. At about the same time, the main international organizations took a considerably more flexible approach to debt management in their annual meeting in Berlin, September 1988. But the real breakthrough came when Brady, Baker's successor as Secretary of the Treasury in the US, in a speech at the State Department March 10, 1989, effectively legitimized the word debt relief. This speech opened the way for the negotiations between Mexico and its commercial creditors that, six months later, led to the agreement that is the subject of this paper.

The agreement reached on July 23, 1989 offered commercial creditors the choice to exchange old debt instruments for new instruments involving debt relief (lower interest rates or lower principal), but partially secured with collateral; or for unsecured instruments without debt relief, but with a new money commitment attached. Significantly, the option to just retain the old instruments at unchanged terms was not left open to any commercial creditor. An active debate has since begun on the merits of this package, a debate that, unfortunately, is often marred by basic confusion about and misunderstanding of both the facts and likely economic consequences of the agreement reached.
It thus seems an opportune moment to provide both a detailed description of the package and a comprehensive economic analysis.

Section II outlines the main course of economic developments in Mexico leading up to the agreement. A full understanding of this economic background is essential for an understanding of the urgency with which Mexico and its supporters in the international community approached the negotiations. Section III then outlines the structure of Mexico's external debt and its financing needs anticipated at the outset of the negotiations. This section also provides an overview of the economic considerations underlying the structure of the agreement finally reached, and a detailed description of that agreement.

Sections IV-VI then provide detailed economic analysis. Section IV first assesses the amount of debt relief, and asks the question whether this amount of debt relief represents a good return on the resources devoted to the deal. The paper then takes the point of view of Mexico's creditors and, in Section V, provides an assessment of the market value of all outstanding commercial claims on Mexico before and after the deal, and with and without the official credit enhancements provided, by third parties and by Mexico itself, to creditors choosing one of the debt relief options. The question addressed here is, who in the end profited most from the official resources devoted to the deal, Mexico or its commercial creditors?

This question cannot really be answered by simply reading off secondary market quotations of the various instruments traded before and after the deal. International events did not stand still over the six months of the negotiations, and it is thus difficult to disentangle the impact of the deal from other events influencing market evaluation of Mexico's credit risk. To separate out the impact of the deal, a formal framework is used based on financial option pricing techniques (see Claessens and van Wijnbergen (1989) and Annex I to this paper).

Section VI looks at what is arguably the most important aspect of the deal, its likely impact on the recovery of economic growth in Mexico. The section first assesses the impact of the deal on Mexico's financing gap. It then uses a quantitative framework developed for this purpose (cf van Wijnbergen (1989, 1990b) and Annex II to this paper) to assess the likely impact of the deal on Mexico's prospects for a recovery of economic growth.

Section VII draws all the threads together in a conclusion, making three points. First, Mexico made very efficient uses of the official funds available to it for debt reduction purposes. The market value of the claims before enhancement went down by close to the full amount of the value of the additional foreign official resources devoted to this package. On a different measure, the rate of return on the use of the official resources far exceeds the interest rate at which they have been extended. Second, although it follows by implication from the first observation, the market value after enhancement was basically the same as the market value of the outstanding claims before the deal. Mexico's commercial creditors thus got a fair deal, with the credit enhancement by and large making up for the debt relief granted, but not more than that. Thus, the official creditors' money in the end mostly benefited Mexico rather than its commercial creditors. Therefore, the World Bank, the IMF and the Government of Japan (who provided the official resources contributed to this deal) achieved their objective of helping Mexico; the additional resources did not accrue to the creditors, something that was widely feared in advance, and has been claimed as unavoidable by
some. Third and most importantly, on the available evidence this package seems sufficient to establish a basis for sustainable growth in Mexico.

II ECONOMIC BACKGROUND

In the years preceding the 1989/1990 debt negotiations, Mexico has gone through a rather tumultuous series of macroeconomic developments, and, towards the end, through an increasingly rapid process of structural reform. A better understanding of what happened in the years leading up to the negotiations explains much of the various parties negotiating positions, and of the urgency behind the proceedings. We therefore provide a brief survey of this period.

II.1 Macroeconomic Developments

A. The Period Leading Up to the Stabilization Program 88/89

Between 1950 and 1974, Mexico enjoyed a remarkable period of high growth, low inflation and moderate external debt accumulation. Real growth averaged 6.4%, and inflation was in single digits throughout the period, in line with the prudent fiscal policies followed. This era of fiscal conservatism came to an abrupt end in the early seventies. Government involvement in the economy expanded rapidly, and increased public expenditure pushed up aggregate demand and the rate of economic growth. However, the higher government expenditure was not matched by rising public sector revenues. As a result, the inflation tax and external debt became increasingly important sources of public finance. At the same time, a decline in private savings incentives (real interest rates turned sharply downward) prevented a matching increase in private savings; external debt thus increased, increased oil revenues notwithstanding. The period of single digit inflation ended in 1973, the real exchange rate started to appreciate and the accumulation of external debt accelerated above the GNP growth rate. A serious, but comparatively brief, financial and economic crisis in 1976 terminated following major oil discoveries in 1977. The ensuing prosperity lasted until 1982, when soaring domestic inflation, falling international oil prices, rising world interest rates, and massive capital flight led to a refusal by external creditors to roll over Mexico's short-term debt and a subsequent suspension of Mexican payments of interest on its external debt.

Over the 1982-88 period, economic growth ground to a virtual halt. This was accompanied by sharply falling living standards, a deteriorating infrastructure, high inflation, and a loss of investor confidence. Towards the second half of this period, a series of measures was taken to reverse Mexico's declining fortunes. Among the most important goals were: (a) macroeconomic stability; (b) a rationalized set of incentives for private sector investment; (c) reallocation of public spending to support private sector-led growth, improved social services and the environment; and (d) a

1/ A more detailed treatment can be found in Dornbusch (1988), Ortiz (1990) and van Wijnbergen (1989).

2/ The real exchange rate is defined as the price of foreign goods relative to domestic goods. Appreciation means a decline in this relative price.
credible financing plan to resolve the unsustainable overhang of external debt. In each of these areas, the Mexican Government has achieved notable progress.

B. Macroeconomic Stabilization

The onset of the financial and economic crisis of 1982 brought in its wake explosive inflationary and balance of payments difficulties. Initial strong fiscal and monetary adjustment efforts were alternately not sustained for a sufficiently long period (1983-85) or undermined by external shocks such as the collapse in international oil prices (1986). Inflation, rather than slowing down, accelerated, partially in response to the sharp real devaluation of the exchange rate necessitated by the 1986 downturn in the terms of trade. The subsequent de facto targeting of the real exchange rate, together with an increase in the frequency of wage and cost adjustments, introduced an element of inherent instability into the system, culminating in a run on the peso in the last quarter of 1987 and triple-digit inflation.

The Government responded with the "Economic Solidarity Pact" (Pacto), an agreement between business, labor, and government. This agreement called for accelerated structural reform, further tightening of fiscal and monetary policy, a freeze of minimum wages and of basic public and private sector prices, and, the cornerstone of the "Pacto", a freeze of the nominal exchange rate against the U.S. dollar. This partial freeze was extended at three-month intervals through the end of 1988, and renewed, with some modifications, by the new Mexican Administration under the name of "PECE" (Pact for Stabilization and Growth) through July 1990. The main adjustments brought about under the PECE initially were once-off catch up increases in selected public sector tariffs and in prices of key inputs, a two-stage 26% cumulative adjustment in the minimum wage, and a daily adjustment of the exchange rate of about one peso against the U.S. dollar. More recently, it has been announced that public sector prices will be adjusted more regularly but by smaller amounts, in line with general inflation targets. In addition, there has been substantial progress towards more flexible pricing, most recently in agriculture. The current policy stance is thus more flexible and more in line with current actual inflation than it was one year ago; arguably the PECE's "soft landing" has almost been achieved.

The fiscal measures, backed by the temporary exchange rate freeze and an array of formal and informal wage and price controls, have had a dramatic success in reducing the rate of inflation, from 159% in 1987 to 20% in 1989, a rate that will likely also obtain in 1990. At the same time, the economy has shown encouraging signs of economic recovery, led by a strong resurgence of private investment. Industrial production was 6% higher in the first half of 1989 than in the same period a year earlier, and the economy has grown by an estimated 3% in real terms for the year as a whole. The current account balance has deteriorated from a 1988 deficit of US$3 billion to an estimated deficit of more than US$5 billion in 1989. This is largely due to the acceleration in private sector investment and a drought-induced decline in net agricultural exports which has brought about a temporary decline in income. Manufactured export growth continues at an annual rate of about 10%, less than in 87/88 as the real exchange rate appreciated somewhat over the pacto period, in which the Peso was kept fixed against the dollar. Interest rates, although still high by historical standards, declined by about 20 percentage points within days after the announcement in July 1989 of a debt reduction
agreement between Mexico and its commercial bank creditors. The same factors have also led to more than US$2 billion in returned flight capital in 1989.

II.2 The Process of Structural Reform

A. Rationalized Private Sector Incentives

Mexico has, since 1985, transformed itself into one of the most open economies in the world through an extensive trade reform. Trade liberalization to date has lowered the percentage of domestic (non-oil) tradeable production covered by import quotas from 100% in 1984 to less than 17% at present. Maximum import tariffs were cut by similar magnitudes, from over 100% down to 20%. Non-oil merchandise exports, which represented less than one-third of total exports in 1984, have doubled their share since then.

These "core" reforms have been complemented by many others. Recognizing that the era of public sector-led growth had passed, the Government took a number of measures to stimulate greater private investment. In May 1989, foreign investment regulations were considerably relaxed and made more transparent. A long-standing prohibition against majority foreign ownership was removed, the fishing, petrochemical, and mining sectors were opened to foreign investors for the first time, the licensing of proposed investments under US$100 million was made automatic in those sectors, and approval of larger investments became automatic following a 45-day waiting period, unless the Government interposed formal objection within that waiting period. Since 1986, the tax system underwent a series of reforms bringing marginal tax rates more in line with levels in major industrial countries, encouraging the repatriation of flight capital, and increasing the sanctions for tax evasion. Also, profits are for tax purposes now adjusted for the effects of inflation on assets and liabilities, and the previous bias against equity finance has been reduced substantially.

To encourage improved mobilization of domestic savings, the Government initiated a parallel process of financial market liberalization, supported by a Financial Sector Adjustment Loan from the Bank. Commercial banks no longer face any ceilings on the deposit interest rates they can charge; the system of forced allocation of commercial credit towards favored sectors has been abolished and credit subsidies through official development banks have been reduced significantly. The principal development and agricultural banks in the public sector are in the midst of significant managerial and financial restructuring, designed to consolidate institutions, clean up balance sheets, and reform lending practices.

To reduce the role of the public sector in production, over 750 state-owned enterprises were sold, transferred, or liquidated between 1983 and the present. Many large-scale enterprises underwent major financial and partial managerial restructurings. More recently, the Government announced plans to sell the country's largest airline and its telecommunications company. It also placed in receivership for eventual sale or liquidation the country's largest mine. A radical deregulation of the transport sector has already been implemented. Such deregulation is useful in its own right, but it also increases the efficiency gains from the trade reforms undertaken earlier.

B. Reorientation of Public Spending
Since 1982, a major retrenchment of public expenditure has taken place. Non-interest spending declined from 35% of GDP in 1981 to around 20% in 88/89. The composition of the cutbacks was, perhaps, not ideal from the standpoint of growth. Real investment expenditures were cut more deeply than current outlays, posing the risk, now that growth is underway once again, that infrastructural bottlenecks might impose constraints on potential growth.

Also, some of the gains in reducing illiteracy, infant mortality, and nutrition during the seventies are threatened by the sharp cutbacks in public expenditures for social programs. The social sector's budgetary share declined from 20% or more in the years preceding the 1962 to around 13% currently. This trend is probably unsustainable, given the worsening inter-personal and inter-regional income disparities.

In recent years, authorities have sought to soften the blow of reductions in social expenditures. Global consumer subsidies for basic food items are being replaced by less expensive, but more targeted, subsidies to the poor. In 1989, a new "National Solidarity Program" has set aside US$400 million to coordinate the activities of existing agencies and provide limited additional budgetary support for agriculture, infrastructure, and social programs in Mexico's ten poorest states. For example, title to 300,000 urban plots is to be regularized, 150,000 hectares of semi-arid arable land rehabilitated, and tubewells, irrigation works, and rural infrastructure extended. And, starting in June 1989, a program to rehabilitate 25,000 primary and secondary schools began, with an expected cost of nearly US$220 million.

Given the severe fiscal constraints, the need to rebuild crumbling roads, bridges, and other infrastructure is at present only partially met. Resources are found by shifting public expenditure away from activities which could be better carried out by the private sector, such as steel, mining or telecommunications, to areas like transport infrastructure where the state's role is more easily justified. However, the restoration of sustainable growth will require a gradual increase in public investment over the next few years, for agriculture, the environment, transportation, energy, and the social sectors.

II.3 The Case for Debt Relief

Despite the far reaching reforms implemented in Mexico, international capital markets have not provided the resources needed to bridge the period between the current costs and the future benefits of the reform program. Continuing high external transfers generated uncertainty about whether the rapidly growing transfer burden could be met. This, in turn, generated increased uncertainty about future exchange rates, taxation, and financial regulation. Thus, to forestall further capital flight, Mexico had to pay unsustainable interest rates on its domestic debt. "Ex post" real interest rates were almost 50% in the weeks before the debt accord was reached.

Real interest rates so far above the real growth rate of the economy are explosive under any circumstance; however in Mexico there is an additional complication in that the government is in the middle of a stringent economic stabilization program in which fiscal retrenchment plays an important role. However at a 30% real interest rate (the average level for most of 1989), the current fiscal stance is far out of line with the stated inflation target of 18-20 percent. The reason is that, at 30% real interest rates on domestic
debt, the government needs more than 6% of GDP in extra revenues for domestic debt service alone. The uncertainty caused by future transfer problems, through its impact on domestic real interest rates, war thus a direct threat to the survival of the still highly successful stabilization program.

Therefore the beneficial domestic effects of the debt package will follow as much from reduced uncertainty and improved expectations about future policies as from the direct fiscal impact of any reduction in net transfers to foreigners. But for such expectational factors to come into play, the deal really needs to be of a medium term nature. Hence the imperative not only of a solution, but a solution that would likely forestall debt problems for the foreseeable future.

Against the background sketched so far, Mexico initiated the debt negotiations to seek international support for its far-reaching adjustment program and recovery of economic growth. The Government has already demonstrated its strong commitment to the program, but its continued success depends on the availability of external support. Because of the high domestic costs of continuing uncertainty, the required international support can make a substantial difference only if it is based on an unequivocal, medium term commitment by the creditors. Therefore, Mexico has pressed in the negotiations for a multi-year financing package.

The need for debt relief, in the case of Mexico, needs to be seen from this perspective. It was not so much the level of the country's debt, but the current flow of debt service payments that is too high, and causes too much uncertainty to allow growth and sustainability of adjustment. The need for debt relief has to be seen in this context. Debt relief offers the most certain way to reduce future net transfers for a long time to come. However new money commitments, if credible and stretched out far enough into the future, could have served equally well.

There are other arguments, however, both political and economic, that stress the importance of debt relief over new money commitments. Political because Mexicans have made such enormous adjustments, accepted such a large reduction in living standards, that any package without an extensive and visible contribution by external creditors would not be acceptable domestically. Economic because the new money commitments, while generous, stretch out for three and a half years only, possibly not enough to see a process of economic growth firmly established.

The conclusion should be clear. Mexico had the structural policies and domestic fiscal measures in place for sustainable growth to take off. What was missing was a sufficiently long period during which external creditors would allow this inherently sound economic program to get off the ground. The only way of obtaining a credible commitment to such medium term international accommodation is debt relief.

III THE DEBT AGREEMENT BETWEEN MEXICO AND THE COMMERCIAL BANKS

III.1 Structure of the Debt and Pre-Deal Financing Gap

A Structure of the Debt

At the end of 1988, Mexico's external debt was at $100.4 billion. Of this total, most is held by commercial creditors (see Table 1), with the remainder held by official creditors. Among official creditors, the Bank
holds $7.4 billion and the IMF $5 billion. Of the commercially held debt ($70.6 billion), a small amount ($5.1 billion) has never been rescheduled. The bulk of this $5.1 billion consists of PEMEX liabilities ($3 billion) that traditionally have been rolled over automatically.

Table 1: MEXICO: EXTERNAL DEBT BY CREDITOR AS OF END OF 1988
(US$ billion)

<table>
<thead>
<tr>
<th>Commercial banks:</th>
<th>70.6</th>
</tr>
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<tbody>
<tr>
<td>of which to:</td>
<td></td>
</tr>
<tr>
<td>Public Sector</td>
<td>65.1</td>
</tr>
<tr>
<td>of which:</td>
<td></td>
</tr>
<tr>
<td>Rescheduled</td>
<td>37.9</td>
</tr>
<tr>
<td>New Money</td>
<td>14.8</td>
</tr>
<tr>
<td>non-rescheduled</td>
<td>5.1</td>
</tr>
<tr>
<td>Inter-Bank</td>
<td>7.3</td>
</tr>
<tr>
<td>Private Sector</td>
<td>5.5</td>
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</table>

<table>
<thead>
<tr>
<th>Other Creditors:</th>
<th>29.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>of which to:</td>
<td></td>
</tr>
<tr>
<td>Public Sector</td>
<td>28.8</td>
</tr>
<tr>
<td>of which</td>
<td></td>
</tr>
<tr>
<td>IBRD</td>
<td>7.4</td>
</tr>
<tr>
<td>IMF</td>
<td>5.0</td>
</tr>
<tr>
<td>Bilaterals</td>
<td>8.7</td>
</tr>
<tr>
<td>Bonds</td>
<td>3.7</td>
</tr>
<tr>
<td>Others</td>
<td>4.5</td>
</tr>
<tr>
<td>Private Sector</td>
<td>1.0</td>
</tr>
</tbody>
</table>

TOTAL 100.4

The new financing package covers the sum of the $37.9 billion that was rescheduled during 1986/1987 and the $14.8 billion of new money that was provided in the previous two rescheduling exercises (1983/1984 and 1986/1987). This total ($52.7 billion) has since been reduced to $48.9 billion because of cross-currency exchange rate changes, debt-equity swaps and cancellation of debt held by Mexican institutions. Thus the basis covered by the debt package is $48.4 billion. A certain amount of sovereign debt is held by Mexican owned banks. Those claims will either be brought under the new money option described below, or will not receive enhancements if debt or debt service reduction options are chosen.


Based on simulations with the model presented in Annex I, Mexico's total gross financing needs over the 1989-1994 were estimated to amount to over $50 billion (Table 2). This level of financing would accommodate a growth target of an average 4% over the next six years, provided, however, that the non-interest current account would generate a surplus of 2.4% of GDP on average. At current interest rates and for the given structure of the country's debt, this leads to a cumulative current account deficit of around $23 billion (around 1.5 percent of GDP on average). In addition, reserves were assumed to
increase by $3.1 billion, as stipulated under the IMF Extended Fund Facility that came into operation May 1989, raising the total to around $26 billion. Total financing requirements include, in addition, the scheduled net amortization payments to commercial banks, bondholders, suppliers and holders of private non-guaranteed debt. These amortization payments were estimated at US$18.3 billion over the same period.

Table 2: MEXICO'S FINANCING NEEDS AND SOURCES 1989-1994 (bUSS) 1/

<table>
<thead>
<tr>
<th>Needs</th>
<th>Sources</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Account deficits</td>
<td>Direct Foreign Investment</td>
<td>21.9</td>
</tr>
<tr>
<td>and reserve changes : 26.2</td>
<td>International Financial Institutions</td>
<td>3.4</td>
</tr>
<tr>
<td>Net Scheduled Amort.: 18.3</td>
<td>of which:</td>
<td></td>
</tr>
<tr>
<td>of which to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comm. Banks 12.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonds 1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Priv. Non-Guar. Debt 4.3</td>
<td></td>
<td>2.3</td>
</tr>
<tr>
<td>Suppliers 0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Capital Outflow 6.52/</td>
<td>FINANCING GAP</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>51.1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>51.1</td>
</tr>
</tbody>
</table>

Notes:
1/ Totals may not add up due to rounding error.
2/ "Other Capital Outflows" is the bookkeeping counterpart to the current account item "imputed interest earnings on private assets held abroad."
3/ This does not include additional disbursements of US$ 950 million and US$ 600 million under the Interest Support Facilities of respectively the Bank and the IMF.

To meet the above needs, funding is expected to be available from net lending by bilaterals and the international financial institutions. In addition, substantial direct foreign investment (DFI) is projected to take place in response to the economic reforms described in the preceding Section, including the recent liberalization of the foreign investment regime. However, Table 2 indicates that funds available from these sources were short of gross financing needs; thus a financing gap was projected of $23.5 billion cumulatively over the period ending in 1994, or almost $4 billion per year. This includes amortization on commercially held debt ($12.7 billion). Therefore, the corresponding net financing required from debt service reduction, new money and return of Mexican flight capital would have to be $10.8 billion.

This scenario is sensitive to developments in the world environment. Every dollar decrease in world prices for Mexican oil costs Mexico $0.5 billion in foregone export revenues per annum. Thus if oil prices are two dollars lower than assumed, Mexico would lose up to $6.0 billion over six
The financing gap would increase correspondingly. Of course
unanticipated increases in the price of oil would reduce the financing gap.
Similarly, a one percentage point increase in international interest rates
would increase the cumulative current account deficit by close to $6 billion
over the period, with a matching increase in the financing gap. This
sensitivity to international interest rates highlights the potential benefits
of fixed interest debt instruments.

III.2 Economic Considerations Underlying the Package

From the Mexican point of view, two considerations were important in
judging any proposal: impact on cash flow and implied debt relief. On the one
extreme, rescheduling, capitalization of interest due and new money have a one
for one positive impact on cash flow but imply no debt relief. On the other
extreme are reserve financed debt buy-backs in the secondary market: these
imply debt relief equal to the amount of debt repurchased times the discount
at which it is bought, but actually lead to negative cash flow effects in the
year of purchase.

An alternative way of looking at cash flow effects is, to recognise that
Mexico because of the external credit constraints, must have a higher discount
rate than suggested by world interest rates. In that case, packages with equal
discounted value when evaluated at world interest rates may have a different
discounted value when evaluated at the Mexican, higher discount rate. In
particular, packages that give the debt relief early on would be preferred on
that criterion. Thus, a reserve based debt buy back would be worse than an
equal present value (evaluated at world interest rates) cut in interest rates
when evaluated at Mexican discount rates because of the early negative cash
flow effect of such buy backs.

The impact of Central Bank reserve losses on the precarious exchange
rate situation made reserve financed debt buy-backs ill advised. Any package
thus had to come down to a combination of cash-flow oriented interest-
capitalization/new-money schemes and debt-relief oriented debt exchanges. For
similar reasons, debt reschedulings with relending provisions, like those
incorporated in Brazil's package in 1988, were not advisable on a significant
scale. In an economy with open capital markets like Mexico, a relending
provision is tantamount to instantaneous prepayment at face value. Such an
arrangements would thus not only involve no debt relief, but would also result
in a major negative cash flow impact. The only way to avoid this is to
restrict on-lending to public sector agencies.

Debt buy-backs can be distinguished by the asset being sold (or type of
new debt issued) to finance the debt buy-backs. These could be publicly owned
assets; examples are a reserve financed debt-buy back or debt equity swap
involving a parastatal. When such schemes involve public assets, there are no
fiscal problems since the public sector already owns the asset.

Oil export volumes are projected to remain constant for the next six
years. The oil prices mentioned refer to the average price of Mexico's oil
exports. Recently, this price has stayed about $3.50 US$ below the price for
West-Texas Intermediate.

This Section draws on Pena and van Wijnbergen (1989).
The case of public debt for private assets (for example equity) is different: to execute such a public debt for private equity scheme, the public sector needs to acquire the asset first. Therefore, the government needs to raise the resources to acquire the private asset. For the evaluation of such public-debt/private-equity swaps it matters how the government raises the resources to acquire the private sector asset. This can be done through increasing the primary budget surplus, inflation tax, internal debt issue or external (net) debt increase (i.e., reserve losses).

The primary surplus is already strained to the limit as part of the current fiscal retrenchment. Use of the inflation tax (through a change in exchange rate policy) goes against the grain of the current stabilization program. Use of internal debt issue is ill advised as long as internal debt carries in excess of 30 percent real interest rates. Finally, we already mentioned that the use of reserves is not possible in the current precarious exchange rate situation.

These considerations ruled out public debt for private equity swaps. Anyhow, Mexico's experience in the 1987 program suggests that such schemes reduce debt but not really foreign liabilities: the average discount was slightly over 10 percent only (Sanguines (1989)). One could conceivably use the privatization program to engineer public debt for public equity swaps, but unless claims on future oil production are brought in, such schemes will never be big enough to have a major impact. Thus, while debt-equity swaps might play a small positive role in the government's privatization program, they cannot and should not play a major role in any debt reduction operation.

That left as the only option exit bond schemes and cash flow oriented measures. Exit bond schemes would require guarantees of principal and interest payments to allow significant debt relief. But any package also had to involve major cash flow oriented measures, such as for example interest capitalization.

An attractive option was reduced interest rates. Refinancing of old loans at lower interest rates implies debt relief because the discounted value of all future payment obligations falls; at the same time it provides early cash flow relief because it does not involve any purchase of assets up front. Finally, since there is no need for the public sector to obtain ownership of private assets, no fiscal problems arise. Thus interest relief combines the favorable cashflow effects of new money packages with the debt relief impact of discounted exchange offers.

But to maximize the amount of debt relief, there was no doubt Mexico had to offer its creditors a menu of choices. The reason why a single option deal would have reduced the amount of debt relief lies in the differences in regulatory and tax environment that Mexico's various commercial creditors face. For this reason, different schemes that would present equal debt relief to Mexico, could imply very different costs to its creditors. Thus, restricting the choice to one instrument only would, for given willingness to grant relief by the creditors, unambiguously reduce the amount of relief actually received by Mexico.

Finally, for maximum impact on credibility of the stabilization effort and hence on domestic interest rates, the more years are covered by any deal, the better: year to year deals keep the possibility of impending BoP crises open. A deal for the first three years would, unless accompanied by some sort of an understanding on what will be done beyond 1991, cast a large shadow over Mexico's adjustment program.
This is in particular an issue for the revival of private investment, because of the irreversible nature of capital accumulation. Uncertainty about the future will bias private savers towards more liquid assets, including foreign ones, until such uncertainty is resolved. Also, with the possibility of BoP crises still looming at the horizon, a major reduction in domestic real rates would seem unlikely: nominal rates would first of all reflect higher expected depreciation, raising "ex post" real rates; second, private investors would almost certainly require continued high premiums before they are willing to bear exchange rate risk, raising "ex ante" real rates too. This suggests that a short-term deal will not only preclude a recovery of private investment, but it will also perpetuate the current fiscal problems created by high real interest rates on domestic debt.

III.3 Negotiating Mexico's External Debt: A Brief Chronology of Events

Negotiations were extraordinarily complicated straight from the beginning. One complicating factor was the number of banks involved (more than 600). This problem was dealt with in what is by now a standard solution, through the formation of a Bank Advisory Committee with representatives of some 15 creditor banks. This committee conducted the actual negotiations with representatives of the Mexican Government, which were concluded with the July 23 agreement on a "term sheet" containing the outlines of the agreement.

But there were more players in the act. Prior to any negotiations with commercial creditors, Mexico sought to reduce net external transfers to its official creditors, and in addition, sought their support for the principles underlying subsequent negotiations with commercial creditors. An agreement was reached with the Paris club covering $2.6 billion of principal and interest payments falling due in the period 6/89-5/92. All amortization over the three year period was rescheduled over ten years with 6 years grace. Also rescheduled were 100% of interest payments due in the first year, 90% of interest payments in the second, and 80% of interest due in the third. Access to import financing of up to $2 billion per annum was also secured.

Even before this agreement, negotiations had started with both the World Bank and the IMF about a major package of support measures. In February 89, Mexico and the IMF reached agreement on an Extended Fund Facility for SDR 2.9 billion (about $4.1 billion) covering three years and an optional fourth one. At around the same time, the World Bank and Mexico successfully concluded extensive negotiations covering three Structural Adjustment Loans for $0.5 billion each, plus a commitment by the World Bank to a lending program of about $2 billion per year for the period 1990-1992.

Moreover, both institutions publicly supported Mexico's claim that reduction in Mexico's debt burden was called for in one form or another if growth was to recover in Mexico. In a historically unprecedented move, both the IMF and the World Bank allowed a portion of the resources extended to Mexico to be used for support of debt reduction operations ("Set Asides"). In another first, both institutions made available to Mexico an additional, one-time sum for debt reduction purposes (Interest Support Facilities of $0.6 billion from the IMF and $1.26 billion from the World Bank). At the same time, the Government of Japan, through its EXIM bank, offered financial support to Mexico to the extent of $2.05 billion, also to be utilized in the debt reduction package with the commercial banks.
Once negotiations with the IMF and the World Bank were concluded, negotiations with the Bank Advisory Committee began in New York early April. Although the negotiations were officially behind closed doors, the various proposals and counterproposals were widely reported in the press throughout the three months of negotiations. The initial skirmishing was about Mexico's financing needs were growth to recover, in which both the World Bank and the IMF played an advisory role, albeit an unofficial one.

When the negotiations moved on to debt relief, initial positions were far apart, with Mexico asking for 55% debt relief and the committee offering only 15%. Although various counterproposals brought the parties somewhat closer, negotiations in New York seemed to stall beginning of summer and were escalated towards a higher level. The final negotiations, in Washington DC, involved Secretary Brady, the chairmen of the most important banks involved, senior officials of the World Bank and the IMF and, from the Mexican side, finance minister Mr. Aspe and debt negotiator Curia. This phase was successfully concluded with the announcement of an agreement in principle on July 23, 1989. This agreement included a debt relief option involving 35% debt relief, exactly halfway the opening proposals of both parties. The structure of this agreement, which was further refined in subsequent negotiations between Mexico and its commercial creditors, is described in the next section.

III.4 Terms of the Agreement

On September 15, 1989, the Government of Mexico and the Bank Advisory Committee representing the commercial bank creditors reached agreement on a financing package covering the period 1989-92, restructuring approximately US$48.4 billion of Mexico's external debt. The agreement consists of a menu of financing options which includes two debt and debt service reduction facilities and four new money facilities. On the same day, the Government of Mexico disseminated a term sheet to all of its commercial bank creditors and invited them to participate in the financing operation. The following are the summary terms of the financing options offered by Mexico to its commercial bank creditors under the 1989-92 Financing Package:

A Debt and Debt Service Reduction Options

Option A: Collateralized Floating Rate Discount Bond Exchange.

Creditors may exchange eligible debt for new collateralized floating rate discount bonds issued by the United Mexican States in a principal amount equal to 65% of the principal amount of the eligible debt offered for exchange. The new bonds will be in registered form, will mature in a single installment on December 31, 2019 and will bear interest at a rate of 13/16% per annum over the six-month LIBOR rate for the currency in which the bonds are issued. (Bonds will be issued in: Canadian and U.S. Dollars; Belgian, French and Swiss Francs; Deutsche Marks; Dutch Guilders; Italian Lire; Japanese Yen; and Pounds Sterling). Payment of the full principal amount of the Discount Bonds on December 31, 2019 will be secured by a pledge by Mexico of zero-coupon U.S. Treasury obligations (or other comparable collateral for other currencies). Payment of interest will be secured by a pledge by Mexico of cash or permitted investments in the currency of the bonds in an amount equal to
eighteen months' interest (calculated at a constant interest rate of 10% per annum in the case of discount bonds issued in US dollars).

Option B: Collateralized Fixed Rate Par Bond Exchange.

Creditors may exchange eligible debt for Collateralized Fixed Rate Par Bonds issued by the United Mexican States in a principal amount equal to 100% of the principal amount of eligible debt offered for exchange. The Fixed Rate Par Bonds will also be in registered form; will be issued in the same ten currencies as under Option A above; and will mature in one maturity on the same day as the Floating Rate Discount Bonds. The interest rate payable on the Fixed Rate Par Bonds will be 6.25% per annum for those issued in U.S. dollars and corresponding rates for those issued in other currencies. Principal and interest payments on the Fixed Rate Par Bonds will be secured in the same fashion as for the Floating Rate Discount Bonds, except that instead of using the assumed constant interest rate concept, the interest payments on the Fixed Rate Par Bonds will be secured to their full contractual levels.

New Money Options

Option C: 1989-92 New Money Credit Agreement.

Lenders may elect to commit to lend up to 100% of their New Money Commitment (defined as 12.5% of Facilities 2 and 3 advances under the 1987 Multi-Facility Agreement and 25% of all other eligible debt) in the New Money Credit Agreement which will provide the United Mexican States (with an undertaking by Banco de Mexico to provide foreign exchange) with a 15 year (7 years grace) loan at an interest rate of (a) 13/16% over LIBOR, or (b) 13/16% over the three months Certificate of Deposit rate or (c) a fixed rate calculated to provide a comparable yield to maturity as the floating rate options. The loans will be made in the same currencies as the Debt and Debt Service Reduction Bonds, except that European Currency Units can also be lent under the New Money Credit Agreement. Amounts under this Agreement will be available for disbursement in six semi-annual tranches commencing on December 1, 1989 and concluding in July 1992. The first tranche will permit the disbursement of 40% of the loans and each subsequent tranche will permit the withdrawal of 12%.

Option D: New Money Bonds.

Each creditor may elect to purchase New Money bonds in an amount up to 50% of its New Money Commitment, although not more than $500 million of New Money bonds will be issued in total. New Money Bonds will be issued by the United Mexican States; they will be in registered form, issued in U.S. dollars; and will bear interest at the rate of 13/16% over LIBOR. They will be issued on the date of the borrowing of the first tranche under the New Money Credit Agreement, and will be repayable in equal semi-annual installments beginning in 1997 and ending in 2004 (15 year maturity, 7 year grace).
Option E: Onlending Facility.

Up to a limit of 20% of its New Money Commitment, each creditor may elect to make advances to a trust established by Mexico (with Banco de Mexico as trustee) for the purpose of onlending funds to Mexican public sector borrowers with the guarantee of the United Mexican States. These advances will have the same repayment schedule as the loans made under the New Money Credit option (15 years maturity, 7 years grace), at an interest rate of (a) 13/16% over LIBOR, or (b) 13/16% over the three months Certificate of Deposit rate. Advances made under the Onlending Facility may be in any of the currencies permitted under the New Money Credit Agreement; and the same restriction on availability applies as the one on loans under the New Money Credit Agreement.

Option F: Medium-Term Trade Credit Facility.

Up to a limit of 20% of its New Money Commitment, each creditor may elect to make advances to a trust established by Mexico (with Banco de Mexico as trustee) for the purpose of financing certain eligible trade credits (e.g., unguaranteed portions of bilateral trade credits to Mexican public sector borrowers, or trade credits to Mexican private sector borrowers for transactions approved by Mexico). The Medium-Term Trade Credit Facility will have the same primary terms and conditions as the Onlending Facility.

Creditors holding claims in their home currency can, if that home currency is not the US dollar, choose whether to maintain the original currency denomination or switch into US dollars. If they choose to remain in their non-dollar home currency, the total funds devoted to enhancement will not exceed what would have to be provided for an equivalent dollar claim. ²/ Banks holding Mexican obligations contracted in the 1983-88 period will reschedule them to 7 years grace with 15 years maturity to the extent they are not swapped for par or discount bonds. Mexico’s external creditors would provide all the necessary waivers to make feasible the issue of new debt and debt service reduction instruments with credit enhancement.

The Government would be entitled to buy back any of the newly issued discount or par bonds if (a) it is current on interest payments, and (b) the collateral account for interest support is either not drawn upon or replenished. This latter restriction lapses after end-1994.

Mexico would continue to service the interest on its existing loans on their contractual terms until the exchange takes place. However, the terms of the agreement would, upon signing, be implemented with retroactive effect from July 1, 1989. For the new money commitments, this implies that at the time of the signing, participating banks would disburse immediately all the installments due until and at that time, subject to the satisfaction of certain conditions precedent (which include the issuance of the discount and par bonds). Similarly, once the discounted and par bonds are issued, Mexico

²/ There is one exception to this rule. Up to 5% of the Yen-denominated debt held by Japanese creditors is eligible for full collateralization of principal through zero coupon bonds and 18 months of interest coverage.
would deduct from the initial interest payments the amounts of interest paid on the exchanged loans in excess of the interest due on the new bonds, after July 1989. This clause was introduced to eliminate any possible perverse incentive on the part of the banks to delay the signing of the agreement.

C  Debt-Equity Conversion

Banks participating in the 1989-92 financing package will have access to a debt/equity program which would be authorized up to $1 billion per year. This program would be limited to public sector companies that are being privatized and to qualified infrastructure projects. The lower limit of discount would be 35% on par bonds, new money and eligible old debt, and the conversion of discount bonds would not be higher than the face value.

D  Recapture Clause

Banks that have chosen discount or par bonds are eligible to recover some of the money given up through a "recapture clause". Under this clause, beginning July 1996, 30% of the additional oil revenues Mexico gets if the price of oil rises above $14 per barrel (to be adjusted for US inflation), will accrue to the banks that have granted debt and debt service relief. The total amount to be recaptured, however, will not exceed in any year 3% of the nominal value of the debt exchanged for debt reduction instruments at the time of the exchange (i.e. there is no indexation of this cap). Furthermore, the amount available under this clause will be scaled back by the percentage of the total debt brought under the two debt reduction options. These recapture clauses, once attached to new instruments, can survive early redemption of such instruments by at most five years.

E  Credit Enhancement

All discount and par bonds will be repaid in a single installment on December 31, 2019. The principal would be secured by the pledge of zero coupon US Treasury obligations (or other comparable securities for bonds in other currencies) with a maturity date matching that of the Mexican bonds. In addition, interest payments would be partly secured by a pledge of cash or permitted investments in the relevant currencies for an amount equal to 18 months of interest payments due. 6/ The securities and cash pledged as collateral will be held in special collateral accounts, to be managed by the Federal Reserve Bank of New York, as collateral agent. 2/ Creditors' debt service would be paid out of these collateral accounts in case the Government failed to make interest payments for longer than 30 days, for as long as there are funds in the accounts. To enable establishment of the special collateral accounts, waivers of the negative pledge restrictions are necessary and have been received from Mexico's commercial bank creditors.

6/ That is, covering three semi-annual interest payments.

2/ More than one account may be needed to secure interest payments denominated in different currencies.
The bondholders will appoint the Federal Reserve Bank of New York as collateral agent to hold the collateral for discount and par bonds for the benefit of the bondholders in the various currencies in which the debt exchange instruments are subscribed. The collateral agent, whose appointment would be set out in collateral pledge agreement with the Government, will open the collateral accounts and deposit into those accounts the cash and securities available for interest support. Interest earned on the funds held in the collateral accounts will be released to the Government. The balance in the collateral accounts, once the bonds for which interest support was provided have matured, will be returned to the Government.

To implement Mexico's credit enhancement scheme for the discount and par bonds, it is necessary for the Government to obtain limited waivers of the restrictions against giving security on other external debt -- the negative pledge restrictions -- contained in agreements that Mexico has entered into with the World Bank, IDB and other external creditors including the commercial banks. As the Morgan bonds were secured and had no negative pledge restriction, those bond holders did not have to be consulted.

Table 3  
**ENHANCEMENT FUNDS REQUIRED (US$ billions)**

<table>
<thead>
<tr>
<th></th>
<th>Discount Bond</th>
<th>Par Bond</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal collateralization:</td>
<td>1.18</td>
<td>2.22</td>
<td>3.40</td>
</tr>
<tr>
<td>Interest Coverage</td>
<td>1.82</td>
<td>2.11</td>
<td>3.96</td>
</tr>
<tr>
<td>Total</td>
<td>3.00</td>
<td>4.36</td>
<td>7.36</td>
</tr>
</tbody>
</table>

Note: Based on a 6 months based 30 year bond yield of 7.925%, or a cost of 9.7 cts per dollar, a debt base of $48.9 billion, and a mix of 46.7% Par Bond, 38.2% Discount Bond and 15.1% New Money plus other categories receiving no enhancement moneys. In particular debt held by Mexican banks is assumed not to receive any enhancement. Totals may not add up due to rounding errors.

According to the term sheet agreed upon July 23, 1989, a total of at least $7 billion is needed to secure the debt and debt service reduction instruments subscribed by Mexico's commercial creditors, and more if at the mix chosen $7 billion is not enough for full collateralization of principal and 18 months interest coverage. 49.8% of the debt not held by Mexican agencies has been committed to the par bond, and 46.7% to the discount bond, with the remainder going towards the new money option and to other categories receiving no enhancements. Placing Mexican creditors in the new money option for purposes of the calculations, results in a mix of 46.7% par bond, 38.2% discount bond and 15.1% new money. This mix would require $7.36 billion (Table 3), $0.36 billion more than has been committed so far. The calculation is based on the long term bond yield at which the US Treasury has agreed to sell 30 year zero coupon debt instruments to the Mexican Government.
The commitments and timing of the various sources are shown in Table 4 below. The Table outlines which of the various commitments will be available in February/March 1990 and the extent to which bridging facilities will be needed. Credit enhancement is scheduled to be implemented in March 1990.

Table 4  AVAILABILITY OF ENHANCEMENT MONEYS (US$ millions)

<table>
<thead>
<tr>
<th>Available Feb/March 1990</th>
<th>IMF 4/</th>
<th>IBRD</th>
<th>Mexico</th>
<th>Japan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest support</td>
<td>606</td>
<td>1260</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled Set Asides</td>
<td>272</td>
<td>375</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Advancing 1990 IMF Set Asides to Feb/March 90 364

Advancing a Portion of IBRD 1990 Set Asides to Feb/March 90 375

Japanese Parallel financing and Cofinancing 14001,2/

---

Enhancements Available

<table>
<thead>
<tr>
<th>Feb/March 90</th>
<th>1242</th>
<th>2010</th>
<th>1243</th>
<th>14001/</th>
<th>5895</th>
</tr>
</thead>
</table>

Enhancements available later

| 455 | 6502/ | 1105 |

Total Enhancements Available

| 167* | 2010 | 1243 | 20502/ | 7000 |

Total Enhancements Required 7250

Notes:
1/ Japanese money includes cofinancing for $1.25 billion, which is not directly available for credit enhancement purposes, and a bridge loan of US$150 million by Japanese commercial banks.
2/ The dollar value of the IMF contributions has been calculated on the basis of a SDR value of US$1.30.

For the World Bank’s contribution, a total of US$750 million was set aside from adjustment loans. The set asides could be used to provide principal or interest collateral for the discount bonds issued by the Government. The level for set asides amounts to 25% of all adjustment loans the Bank has made or expects to make to Mexico in the three-year period FY89-91. The Bank’s contribution for interest coverage on discount and par bonds have been made available through an “interest support loan”. US$950 million of the US$1.26
billion loan would be additional to the scheduled volume of lending. However, US$310 million of the interest support loan will be funded from within the scheduled lending volume for FY89-91.

IMF financial contributions to Mexico's debt reduction program have been made under the SDR2.8 billion extended arrangement in the form of set asides and through an augmentation of the arrangement in an amount equivalent to 40% of quota. Set asides and interest support under the extended arrangement and resources to be made available from the augmentation of the arrangement amount to a total of SDR 1.3 billion, which at the exchange rate of the day was roughly equivalent to US$1.7 billion.

To meet the enhancement requirements by February/March 1990, the Bank, the Export-Import Bank of Japan 8/ and the IMF have attempted to front load their contributions to the extent possible. The table above shows the degree to which front loading by each party was feasible. As the front loading obtained provided only US$5.9 billion by the target date, available funds fell short of the required US$7.25 billion. A group of commercial banks has provided a bridge loan to provide US$1.1 billion towards filling the gap. Furthermore, to cover the remaining US$360 million, an agreement has been reached to provide only the discounted value of interest enhancement funds up front, to be placed in safe securities in such a way that the full amount will become available in line with growing interest payment obligations. This is estimated to reduce up front requirements around US$250 million, leaving an estimated shortfall of some $100 million. The Government will fund the remaining shortfall from reserves.

III.5 Subscription by the Commercial Banks

This agreement, reached with the Bank Advisory Committee and supported by management of the major banks involved, the official creditors, the US Government and the Government of Japan, was in subsequent months presented to all creditor banks. Although the agreement also included a small early commitment fee expiring end of October, the majority of the commercial banks only submitted their preference towards the end of the year. This was partially due to the complexity of the deal, but partially also to lingering uncertainty about tax and regulatory treatment of the consequences of the various options in the different countries involved.

To become effective, banks holding at least 90% of the debt eligible for the exchange had to sign up. In the event of a shortfall, this threshold could be lowered to 80% if 50% of the creditor banks agreed to it. This arrangement was designed to avoid a small minority of banks exercising an effective veto right.

Table 5 and Figure 1 summarize the choices made (full detail is provided in Annex III). As is clear from the Table and the diagrams, par or discount bonds were the preferred options for most banks. Out of the non-Mexican creditors, most opted for one of the debt reduction options, with only 9.4% choosing new money.

Since 67% of the Mexican creditors chose new money, the overall new money option choice was higher, at 13.1 percent. The remaining 33% of the

8/ EXIM Bank loans are for cofinancing and are not directly available for credit enhancement purposes.
Mexican creditors opted for the discount bond. Thus with all creditors combined, the configuration of Fig. 1 comes out, with a total of $22.8 for par bonds and $18.8 brought under the discount bond option ($1.0 of which was brought in by Mexican creditors).

Table 5 Structure of Commitments

<table>
<thead>
<tr>
<th>Creditors:</th>
<th>Non-Mex</th>
<th>Non-Mex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perc. of:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Par Bond</td>
<td>49.8</td>
<td>46.7</td>
<td>46.7</td>
</tr>
<tr>
<td>Discount Bond</td>
<td>40.7</td>
<td>38.2</td>
<td>40.2</td>
</tr>
<tr>
<td>NM&amp;Others</td>
<td>9.4</td>
<td>15.2</td>
<td>13.1</td>
</tr>
</tbody>
</table>

Composition of Choices
Non-Mexican Creditors

Banks were explicitly denied the option to just hold on to their claims; in a process called "novation", all eligible debt was to be exchanged for one of the new debt instruments created under the agreement. Mexico made it clear it would not recognise any remaining old claims covered by the agreement after such a date. Legal experts widely expected this approach to hold up in New
York court (the venue where any legal proceedings would have to be settled), although precedents involving Costa Rica did not really support such views. The circumstances of that case (in particular the absence of any support by the US in that case) were apparently sufficiently different to warrant optimism this time around.

Mexico's extensive support was reflected in the fact that Governments in the major creditor countries publicly supported the approach early in the process during a G-7 meeting in February 1989. This extent of official support very likely contributed to the virtual absence of any serious attempt to free ride by simply holding on to existing claims. By the end of January, all banks had made their preferences known, paving the way for the official signing of the agreement on February 4, 1990 during a public ceremony in Mexico City.

IV EVALUATION OF THE AGREEMENT: DEBT RELIEF

This Section first assesses the amount of debt relief to which the July 23 agreement and the subsequent choices of the creditor banks have led to. One can look at the amount of debt relief from two angles. First, is it enough given the resources devoted to the package? In other words, have the enhancement moneys been used efficiently? Efficiency of use can be assessed in two different ways. In one approach, the operation is seen as a project on which a rate of return can be calculated. This rate can then be compared with the cost of financing of the enhancement funds. This Rate of Return approach is pursued in this Section. An alternative approach links the amount of debt relief obtainable to the amount of enhancement moneys available. This approach comes down to asking whether, in the end, the enhancement moneys accrued to the creditors or to Mexico. The answer to this question requires an assessment of likely market valuation before and after the deal, and with and without enhancement moneys. This approach is pursued in Section V.

The second angle from which to assess the extent the amount of debt relief is not from the point of view of use of enhancement moneys, but from Mexico's point of view. Is it enough to allow efficient growth to take place without the fiscal and balance of payment problems that have stymied the process of growth over the past six to seven years? This question is taken up in Section VI.

IV.1 How much Debt Relief?

Table 6 below summarizes the elements of debt relief embedded in each of the three options the commercial banks can choose between. In addition, the Table evaluates the impact of the actual subscription, a blend of 46.7% par bonds (IR), 38.2% discount bonds (PR), and 15.1% new money and others (NM). Discount bonds chosen by Mexican banks included in "others" (NM), i.e. they are not counted in the measure of debt relief.
Table 6: DEBT RELIEF IMPLIED BY THE THREE OPTIONS

<table>
<thead>
<tr>
<th>Percentage Debt Relief:</th>
<th>Without Recapture</th>
<th>With Recapture</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Money</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Interest reauction</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>Principal reduction</td>
<td>35</td>
<td>33</td>
</tr>
<tr>
<td>46.7% IR/38.2% PR/15.1% NM</td>
<td>26</td>
<td>25</td>
</tr>
</tbody>
</table>

Note: Debt relief is defined as the reduction in the discounted value of debt service as a percentage of the face value of the outstanding debt. Debt relief granted by Mexican creditor banks is not counted in this Table.

Of course, new money implies no debt relief. The principal reduction option involves 35% debt relief, since the mark-up of 13/16 of one percentage point on top of LIBOR will not be changed under this scenario. Evaluated at current interest rate projections, the low interest rate option implies 28% debt relief. This results in a debt relief percentage for the mix chosen of 26.4 percent of the face value of US$48.9 billion, or $12.9 billion.

Furthermore, the debt and debt service relief options qualify for the recapture clause. The value of these provisions depends both on expected future oil prices and on the variability of these prices. Thus any evaluation needs explicitly to incorporate the impact of uncertainty on the expected cost of this clause; evaluating the impact of the recapture clause on debt service obligations at some point in the future based on estimated oil prices is not enough. One way of doing this is presented in Claessens and van Wijnbergen (1990). The method proposed there starts by formulating a series of call option contracts on the price of oil that will exactly reproduce the contingent payment stream resulting from the recapture clauses. These option contracts are then priced using a variant of standard Black-Scholes formulas and an estimate of the the anticipated variance of oil prices implicit in the price of existing oil options. This procedure suggests that the recapture clause is worth about 2% of the amount brought under the debt/debt-service reduction options. Thus, the debt relief would be reduced to around 24.8% for the mix chosen. In absolute amounts, this would imply almost $0.8 billion less debt relief, for a total of $12.1 billion.

IV.2 Is there Enough Debt Relief? Rate of Return Approach

The Rate of Return approach compares the implicit rate of return on the enhancement money with the cost of financing the $7 billion. Such a rate of

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2/ This number is sensitive to the projections used for international interest rates. The Table uses a LIBOR of 8.5% for 1990 and 8% for the remaining years. The two debt relief options are equivalent in terms of implied debt relief if LIBOR would stay at 9.1% for the coming thirty years. However, the interest reduction option provides more than debt service relief. Because the interest rate on this exit instrument will be fixed, it also provides insurance against interest rate fluctuations.

10/ A similar approach is presented in Galan (1990).
return can be calculated by considering the whole package as a project with as net benefits the reduction in scheduled cash flow over the next thirty years that the deal will bring about. The gross benefits consist of (a) the old flow of debt service, including amortization, since old claims have been extinguished; (b) interest earnings on the interest collateral accounts; (c) amounts to be released from all collateral accounts in 2019, which at that time will include the face value of the discount bonds placed in the principal collateral accounts; (d) the new money disbursements; (e) the back payment for excess payments in 1989 due to the fact that the deal was retroactive to July 1, 1989. The gross costs, to be subtracted from the gross benefits, include: (a) the debt service on the new debt instruments, including amortization and the new money instruments; (b) the $7.04 billion placed in the various collateral accounts at the time the debt exchange took place.

This calculation indicates a real rate of return of 36%, clearly well above the cost at which Mexico is borrowing the enhancement funds, or the rate of return it could expect to earn on the reserves Mexico itself has devoted to the package. Moreover, such a rate of return calculation, by concentrating on the net foreign exchange savings, ignores the favorable domestic impact of the deal and as such is an underestimate of the benefits of the deal. Using the rate of return approach, the answer to the question of efficient use of enhancement moneys would thus seem to be unambiguously positive.

V. IS THERE ENOUGH DEBT RELIEF? MARKET EVALUATION

V.1 Market Valuation of the New Instruments

Among the many factors influencing market valuation of the package, three are likely to dominate. First, remaining Mexican credit risk and the extent to which different instruments are affected differently. Second, for given credit risk, the amount of debt relief (and hence capital loss for given credit risk) associated with the choice of any of the three options. Third, the tax and regulatory treatment of the income and balance sheet consequences of any swap.

The impact of credit risk and debt relief on the value of the new instruments is evaluated in Table 7. This table summarizes the projected secondary market valuation of the different instruments, assuming the actual mix chosen between interest reduction, principal reduction and new money. The Table lists the value, as a percentage of face value, with and without enhancements. This valuation is based on an option pricing model of secondary market valuation (cf Annex II and Claessens and van Wijnbergen (1989)).
Table 7  Projected Secondary Market Valuation of the New Instruments

<table>
<thead>
<tr>
<th>Percentage chosen</th>
<th>Without enhancements; Perc. of new face value</th>
<th>With enhancements; Perc. of new face value</th>
<th>Perc. of old face value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR</td>
<td>0.467</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>PR</td>
<td>0.382</td>
<td>0.61</td>
<td>0.39</td>
</tr>
<tr>
<td>NM</td>
<td>0.151</td>
<td>NA</td>
<td>0.26</td>
</tr>
</tbody>
</table>

IR : Interest Rate Reduction  
PR : Principal Reduction  
NM : New Money

The table suggests that as a percentage of the new face value and without any enhancement, the principal reduction exit bond would be quoted at the highest price, because it receives market interest rates as opposed to 6.25% fixed. With interest coverage as stipulated in the tentative agreement, the value would increase further. The low-interest instrument would trade for less, simply because it carries a lower interest rate (and, something that is not incorporated here, because the interest rate is fixed).

However, the unit value of the new claims is not the only factor entering the decision on which option to choose. After all, with principal reduction, old claims are exchanged at a 35% discount for new claims, while the low interest bond would be exchanged at par. To incorporate that discount, the secondary market valuation needs to be compared to the old face value; in this way any discount at the time of the exchange of the old debt for the new instrument is taken into account. This reverses the outcome of the comparison: the low interest option would remain the same with enhancements, since old and new face value are the same; but the value of the discount bond, inclusive of enhancements, would fall by 35%.

The second striking result in the table is the low valuation of the new money option. This option has clearly been presented as junior debt by the Mexican authorities, junior to the exit instruments. This has a major impact on valuation. Without subordination, the new money option would have traded at close to the unenhanced, new face value quotation of the principal reduction deal, since it carries market interest rates too but no guarantees. Its junior status reduces the valuation to 26 cts, however. This is the marginal price of Mexico's debt.

It is not possible to perform a similarly general analysis of the consequences of tax and regulatory aspects, since they are different per country; they could even depend on the particular balance sheet and profitability situation of individual creditors. In addition they have not fully been clarified in all countries.

In the US both instruments will be treated similarly for financial disclosure and accounting purposes. But for regulatory capital purposes it is likely that banks will have to recognize the 35% loss with the discounted bond, while apparently banks opting for the par bond may be able to avoid the capital loss recognition, thus reinforcing the attractiveness of the interest
reduction option over the principal reduction one. The Bank of England has recently increased mandatory provisions to levels close to 50%. The increased provisions are out of regulatory capital but are not tax deductible. Tax deductions can only be taken when the loss actually occurs. Hence, British banks have an incentive to take the discounted bond. Japanese banks are still unclear of the treatment of the different options for tax purposes. Since the tax impact will depend on the country the creditor is located in, and on any individual creditor's tax position, no attempt was made to incorporate tax aspects in the evaluation attempted here.

This analysis does suggest however, that the choice between par and discount bonds is a close call, and even more so once one takes into account the insurance value extended to Mexico through the fixity of interest rates on the par bond. With such small price differences, particular tax circumstances become important determinants of the choice made. Based on this fact, and the low value of the new money option, the actual choice made should not come as a surprise: of the foreign creditors, almost 90% opted for the discount and par bonds, in roughly equal amounts for each of the two exit instruments.

V.2 Market Valuation of the Debt Package: Did Mexico Strike a Good Bargain?

One view on how to evaluate the debt package focuses on the pre- and post-deal market value of the claims under negotiation, and the voluntary character of the Brady plan. Since, in such a voluntary approach, creditors always have the option not to negotiate, one cannot really expect the market value of the claims to go down as a result of the negotiations. This would rule out debt relief unless a third party is willing to offset the impact of debt relief on market value by enhancing, in one form or another, the market value of the new claims to be created after the negotiations.

In the views underlying this approach, there is a reduction in the burden of the debt (discounted value of expected payments) if the market value of the claims without the enhancements goes down; if the market value with the claims goes up by the full value of the enhancements, however, there is by implication no debt relief, thus defeating the purpose of the third party's enhancement effort. In that case the creditors have walked off with the third party's resources. The relevant question to ask, then, is: to which extent did the value with enhancements go up versus the value without enhancement go down? Some bargaining models predict an equal split between equal parties (Rubenstein (1984)); this would therefore seem a reasonable benchmark.

Evaluating the pre- and post-deal market value is more complicated than it sounds. Prices in the secondary markets for sovereign debt were very volatile in the period leading up to the Brady speech and the onset of the Mexican debt negotiations, fluctuating between 35 and 40 cts most of the time. Also, the new instruments are not fully traded yet (although quotes for the discount bond are out: 39 cts in February 1990, almost exactly the value predicted with the model used here). One way of benchmarking it would be to price the debt before the deal using the same model that was used in the previous section and that predicted the value of the discount bond within one percent correctly.

This yields a unit price for Mexico's debt "pre restructuring" of 39 cts, at the high end of, but within, the range observed in the 6 months leading up to the Brady speech. This would yield a total pre-deal market value of $19.14 billion. We can assess the market value of the set of new claims
using the values listed in Table 7. This yields a full market value with enhancements of only $19.26 billion, almost the same as the pre-deal market value. Evaluating without the enhancements, however, yields a much lower value of only $15.66 billion (Fig. 2). The market value of the enhancement moneys is thus $3.6 billion. Of this amount, only 3% (19.26-19.14) went to increase the market value with enhancements; almost all of the enhancement moneys served to reduce the pre-enhancement market value of Mexico's debt (19.14-15.66) and in that sense accrued mostly to Mexico rather than the creditor banks. The enhancement moneys thus did indeed go towards debt relief.

Even if the full face value of the recapture clause (i.e. not corrected for credit risk) is added to the post deal market value, we obtain $20.0 billion for the value with enhancements and $16.4 billion for the value without. This would still give Mexico 76% of the market value of the enhancement moneys, still a good result, and an underestimate of the actual number, since the recapture clause has been evaluated without incorporating credit risk. The conclusion is very clear: Mexico managed to obtain almost the complete value of the enhancement moneys (between 76% and 97%) and must thus be judged to have struck a remarkably good deal.

VI IMPACT OF THE DEAL ON THE FINANCING GAP, CREDITWORTHINESS AND GROWTH

VI.1 Impact on Financing Gap and Creditworthiness indicators

The impact of the debt package on Mexico's financing needs has been a source of much confusion. There is little argument about the direct impact of
the debt exchange itself. All remaining amortization on the discount and par
bonds has been shifted to the year 2019, and the amortization on the debt
exchanged for discount bonds has been reduced by 35%. Second, interest
payments have been cut by 35% on the par bond and on the discount bond
commensurately with the drop in the interest rate to 6.25%. All this is
estimated to yield an annual saving in interest rate payments of almost $1.3
billion per year from 1990 onwards (there will also be a retroactive payment
covering excess payments between July 1, 1989 and the implementation date of
the agreement; this will yield about $800 million just for 1989).

Where the confusion arises, however, is with the financing package for
the enhancements, the $7 billion. Some have mistakenly argued that the just
quoted number for interest savings ($1.3 billion per annum) overestimates the
gains because of the financing costs of the contributions by the World Bank,
the IMF and Japan (See for example Castaneda (1990)). This is however a
mistaken view because it ignores that the enhancement moneys are used to buy
assets the return on which will accrue fully to Mexico. The $3.5 to $4 billion
to be used for establishment of interest collateralization escrow accounts
will earn market rates of interest, all of which will instantaneously be
transferred to Mexico. Similarly, the moneys to be used for collateralization
of principal, which will be invested in zero coupon bonds, will earn a
competitive rate of return. This return may be in the form of capital gains,
but it nevertheless represents income accruing to Mexico. The fact that it is
earmarked for future debt reduction is irrelevant for the issue discussed
here.

A full accounting of the interest and principal savings should
incorporate the direct effects mentioned above; indeed also the full financing
costs of the foreign contributions to the enhancement moneys and, in fact also
the interest income foregone on Mexico's own reserves used for these funds;
but also the income generated in these collateral accounts. Because all
foreign loans are priced at market rates, and the assets in the collateral
accounts will also earn market rates, the latter two factors more or less
cancel over the 89-94 period.

Table 8 below shows the net impact of these three factors, plus the new
money contributions, on Mexico's financing gap. The "pre-deal" base case is
also shown, with and without the rescheduling of $12.7 billion of amortization
payments to the commercial banks for 1989-94.

<table>
<thead>
<tr>
<th>TABLE 8: FINANCING GAP ($ billion)</th>
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</thead>
<tbody>
<tr>
<td><strong>Base Case:</strong></td>
</tr>
<tr>
<td>Year</td>
</tr>
<tr>
<td>89-91</td>
</tr>
<tr>
<td>89-94</td>
</tr>
</tbody>
</table>

The mixture chosen would leave a gap of only $0.3 billion per year on
average, a number that is well within the margin of error of the estimates.
Moreover, for such a small number, it is not unreasonable to count on return
of flight capital in response to the renewed confidence in government
macroeconomic policies this deal has already led to and the favorable tax
treatment the Mexican Government has accorded to Mexican citizens repatriating
capital from abroad. In fact substantial return of flight capital has taken place in 1989 (around $2.5 billion).

Table 9 below lists the impact of the 46/38/16 mix on creditworthiness indicators and, for comparison, the corresponding "Base Case" projections. By assumption, in the base case the financing gap is filled by new money at LIBOR plus 13/16 so that planned output growth indeed does take place. Thus the improvement shown in the Table is a conservative estimate of the favorable impact of the debt deal; in reality new money would not have been forthcoming and hence growth could not have taken place. Nevertheless, all the indicators show substantial improvement in Mexico's creditworthiness indicators as a consequence of the package. Also, these measures take gross debt rather than net debt in that they do not incorporate as offsetting items the moneys in the collateral accounts; reducing the debt by the amounts contained in these accounts, which arguably leads to a more appropriate measure of public sector indebtedness, would lower the indebtedness indicators further.

<table>
<thead>
<tr>
<th>TABLE 9: CREDITWORTHINESS INDICATORS (percentages)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Debt/GDP</strong></td>
</tr>
<tr>
<td><strong>Year:</strong></td>
</tr>
<tr>
<td>89-91</td>
</tr>
<tr>
<td>92-94</td>
</tr>
<tr>
<td><strong>Debt service/ GDP</strong></td>
</tr>
<tr>
<td>89-91</td>
</tr>
<tr>
<td>92-94</td>
</tr>
<tr>
<td><strong>Interest/ GDP</strong></td>
</tr>
<tr>
<td>89-91</td>
</tr>
<tr>
<td>92-94</td>
</tr>
<tr>
<td><strong>Debt Service/Exports of Goods and non-factor services</strong></td>
</tr>
<tr>
<td>89-91</td>
</tr>
<tr>
<td>92-94</td>
</tr>
</tbody>
</table>

VI.2 Impact on Economic Growth

The debt relief package will thus reduce the net transfer Mexico needs to make to its creditors by almost $4 billion per year over the 1989-1994 period. Half of this amount would come from traditional rescheduling of amortization. The reduction in required external transfers will have a direct beneficial impact on Mexico's fiscal situation and its likely output growth. However, at least as important would be the indirect, "secondary" effects through renewed confidence. A reduced net external transfer means reduced pressure on the exchange rate. Also, because this is a medium term deal, the uncertainty about future exchange rates, financial regulation and taxation has been reduced considerably. This greatly reduces the risk associated with Peso-denominated public sector debt. One should therefore expect a reduction in domestic interest rates. Developments since the details of the package became known in July 1989 support this argument. Nominal interest rates fell from 56% to around 36% on an uncompounded basis immediately after the details
of the package became known. At the same time, the maturity structure of public debt has widened considerably, another indication of private confidence.

Figure 3 shows the impact on economic growth of the direct transfer effect and of the secondary effect through restoration of confidence and reduction of uncertainty. This is done by using an econometric model for Mexico to simulate what would happen without a debt package. The difference between this simulation and the base scenario based on the availability of the subscribed debt package, indicates the macroeconomic impact of Mexico's debt package. In the absence of the debt package, Mexico would have to service fully interest and amortization on all public commercial debt. This would need to be met out of an already severely cut back budget. Therefore, the Government would be forced to cut back public investment in line with the decline of "allowable" external net borrowing. The drop from the top line to the middle line in Figure 3 indicates the direct impact on growth of this cut back in public sector investment. Moreover, it is assumed that the Government would, even under such stressful circumstances, attempt to

11/ Nominal interest rates have since then rebounded to 40%.

maintain its stabilization effort. It would then be highly unlikely that domestic interest rates would come down without a debt package. Therefore, domestic real interest rates stay at 30% in this simulation; 30% is the value that prevailed on average in the year preceding the debt accord. Thus, private investment would decline because of higher real interest rates, compounding the negative impact on growth caused by the fall in public investment. This secondary effect causes the further decline in growth from the middle to the bottom line in the Figure 3.

Both effects have a major impact on growth. Output growth would be lower by one percentage point initially; as time goes by the difference in growth deepens to more than two percent by 1994, as both private and public investment decline. Over the next six years, average growth would be almost 2 percentage points lower, to reach only 2.6 percent of GDP by 1994 and less than that before. About half of the final slowdown in growth is due to the impact a failure to implement a debt deal would have on domestic real interest rates which, in turn, would reduce private investment. Not surprisingly, employment growth would slow down too, by about one percentage point on average.

In this scenario, without access to external funds, a real devaluation would be unavoidable. This is of course the main channel through which uncertainty on the external debt situation influences domestic real interest rates. While a full fledged treatment of the impact of external debt relief on interest rates and exchange rate expectations is left for another paper (van Wijnbergen (1990a), Fig. 4 gives an indication of the importance of debt relief for exchange rate expectations.

The figure lists the value of a qualitative real exchange rate misalignment indicator without and without the debt package. The variable
plotted is the ratio between aggregate demand for domestic goods (by foreigners and Mexican nationals alike) as a ratio of capacity output. This variable can be different from one if the model is run with a predetermined real exchange rate. A number below one corresponds to overvaluation (cf Appendix I) in the sense that a real depreciation would be needed for commodity market clearing. The indicator is imprecise and should only be used for qualitative interpretation of the impact of policy shifts, rather than pronouncements on whether the rate is overvalued at any given moment in time. The figure clearly shows the extent to which debt relief is likely to take pressure off the exchange rate by raising the real exchange rate compatible with planned policy settings.

If, instead of full service of existing debt obligations, one takes as alternative the case where all principal is rescheduled but interest is fully paid, the net marginal impact of the debt package on growth is still substantial. In that case, the direct transfer effect is halved, for a total of less than 0.5% per annum instead of slightly under one percent per annum. But a pure rescheduling exercise would leave a substantial financing gap ($10.8 billion), so no favorable domestic effects should be expected from rescheduling alone. Accordingly, the full secondary impact of the debt deal through its impact on domestic real interest rates and investor confidence would not be affected by the change in alternative against which the comparison is made. Thus, even judged against this less extreme alternative, one should still expect a net marginal effect of the debt deal on GDP growth of around 1.5 percent per annum over the 1989-1994 period.

Such econometric results should be interpreted with caution; however, in a well defined formal sense, they represent the best use of currently available information. Based on these results a clear conclusion emerges: the debt package does meet the minimum requirements for restoration of growth in Mexico. But without the debt package, growth can not be expected to exceed two percent in any of the coming six years; with the debt package, a gradual restoration of growth towards 5% per annum -- the Government’s goal -- is likely.

VII CONCLUSIONS

The purpose of the negotiations was, to provide Mexico with financing on a medium term basis, either through debt relief or through new money committed ahead for a sufficient number of years. With the package outlined above, Mexico’s financing gap will in fact be almost covered. The package would meet Mexico’s financing needs as currently projected and is compatible with a gradual recovery of growth in Mexico over the next six years. Thus the stage for renewed growth in Mexico seems set.

In addition, a substantial impact can be expected from renewed confidence in the economy by Mexicans holding assets abroad. Assumptions on return of capital flight are too hazardous to actually incorporate them in the quantitative projections underlying this assessment; however, the most recent developments in Mexico suggest a strong response of both private investment and private capital inflows to the announcement of the new debt package.

In addition, the low interest option chosen by half of the non-Mexican commercial creditors provides Mexico with insurance against interest fluctuations on the part of the old debt brought under this option. Thus, in
addition to the debt relief embedded in the package, Mexico has reduced its vulnerability to fluctuations in international interest rates.

Two final points. First, we have demonstrated in this paper that Mexico made very efficient uses of the official funds available to it for debt reduction purposes. The market value of the claims before enhancement went down by close to the full amount of the value of the additional foreign official resources devoted to this package. On a different measure, the rate of return on the use of the official resources far exceeds the interest rate at which they have been extended. Second, although it follows by implication from the first observation, the market value after enhancement was basically the same as the market value of the outstanding claims before the deal. Mexico's commercial creditors thus got a fair deal, with the credit enhancement by and large making up for the debt relief granted. Thus, most of the official creditors' money in the end mostly benefited Mexico rather than its official creditors. Therefore, the World Bank, the IMF and the Government of Japan achieved their objective of helping Mexico; the additional resources did not accrue to the creditors, something that was widely feared in advance, and has been claimed as unavoidable by some.

Thus, to sum up, the package as it came out seems a reasonable compromise between the conflicting interests of Mexico and its commercial creditors. And, most importantly, on the available evidence, this package seems sufficient to establish a basis for sustainable growth in Mexico.

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ANNEXES

I  GROWTH, DEBT RELIEF AND THE REAL EXCHANGE RATE IN MEXICO 13/
II  SECONDARY MARKET PRICING AND THE VALUATION OF THE RECAPTURE
     CLAUSE: AN OPTION PRICING APPROACH 14/
III  CHOICES MADE BY MEXICO'S CREDITORS

13/ This annex is based on van Wijnbergen (1990), "Growth, Debt Relief and the Real Exchange Rate in Mexico", mimeo, World Bank.

Annex I GROWTH, DEBT RELIEF AND THE REAL EXCHANGE RATE IN MEXICO 15/

Below we present the model used to assess the likely impact of the debt package on economic growth in Mexico.

I.1 Analytical Framework

A Purpose and structure of the Model

The model presented here is designed to shed light on the key questions raised before: can the objectives of external balance and satisfactory output growth be reconciled? What is the role of fiscal policy in this trade off? Which real exchange rate path is compatible with the various policy scenarios and growth requirements? What is the relation between exchange rates and external balance? The model is used in an empirical investigation of the trade off between output growth and external balance, and the role relative prices have to play in this trade off.

Real interest rates play an important role in the model. High real interest rates, by depressing private investment and consumption, create more room for fiscal deficits for any given external balance target. At the same time, high real interest rates complicate fiscal management, since they raise the cost of servicing the domestic part of the public debt. Crucial parameters are the sensitivity of private savings and investment with respect to the real interest rate; these receive detailed attention in the empirical section below.

A second channel between fiscal policy, output growth and external debt depends not so much on the interrelation between aggregate fiscal deficits, real interest rates and the current account, but more on the composition of the public sector expenditure program. A substantial part of aggregate investment in Mexico has traditionally been undertaken by the public sector. As a consequence, the government's allocation of its total expenditure over consumption and investment is an important determinant of output growth for any given aggregate expenditure level and time path of the real interest rate.

Another important relative price that is endogenized in the model is the real exchange rate. The real exchange rate plays a role in the allocation of expenditure over different goods at a given moment of time, similar to the way the real interest rate influences the intertemporal expenditure of expenditure for given intra-temporal allocation. This is a rather different approach from most other empirical models, where the real exchange rate, if it is endogenized at all, is often derived from current account considerations. In our setup, the real exchange rate also influences the current account, but in a rather complicated manner, through its impact on aggregate supply and investment behavior. No empirical evidence could be found to support the Laursen-Metzler notion that the real exchange rate also influences consumption expenditure.

It is in fact more natural to think of the real exchange rate as the relative price clearing the market for "Mexican" goods. Its equilibrium value is 'thus not derived from current account considerations, but from commodity

15/ This annex is based on van Wijnbergen (1990), "Growth, Debt Relief and the Real Exchange Rate in Mexico", mimeo, World Bank.
market clearing conditions. The level of external transfers, the composition of government expenditure over home and foreign goods, and commercial policy all have an important impact on the real exchange rate in this approach. Explicit nominal exchange rate policies targeting the real exchange rate may, if successful, cause persistent commodity market disequilibrium.

In the following pages, we provide a simplified exposition of the analytical structure of the model, the theory of which is presented fully in van Wijnbergen (1990b). We then discuss the empirical application to Mexico.

B Real Interest Rates, Fiscal Policy and Output Growth.

As long as domestic interest rates are not completely linked to foreign interest rates (plus exchange rate depreciation) there is an additional degree of freedom in macroeconomic policy. Then changes in domestic real interest rates can resolve potential discrepancies between fiscal deficits and external targets through their impact on the net private savings surplus (i.e. private saving minus private investment). In the process, private investment and hence output growth will be affected. This is one of the more important links between fiscal policy and output growth embedded in the model. The mechanism is shown in Figure 1. Underlying this figure is the following identity derived from the national accounts, but with behavioral content built into private savings and investment (cf van Wijnbergen (1990b) for a full-fledged theoretical derivation):

\[ CAS = FS + NPS(r) - FS + PS(r) - PI(r) \]

The private sector's surplus of savings over investment, \( NPS-PS-PI \), is shown as a function of the real rate of interest. A higher real interest rate will slow down private sector investment and increase private savings, thus increasing \( NPS \). Empirical evidence on these effects is presented in Section V. This is represented by the upward sloping line "NPS" in Figure 4.1.

The sum of \( NPS \) and the fiscal surplus (FS; this equals minus the deficit) equals the external deficit that is compatible with given real interest rates and with FS. The external deficit is represented by the line CA in Fig. 4.1. The horizontal line TCA is the target value for the current account. The real interest rate at which the current account target TCA equals the current account CA is the real rate at which fiscal policy and current account targets are in line.

FIG. 4.1 HERE (figs. are at the end of this Annex)

An increase in the fiscal deficit represents a decline in the fiscal surplus and hence a downward shift in the feasible current account line FCA. To still meet the same current account target, a higher interest rate is needed to call forth the required extra surplus of private savings over private investment (\( r \) shifts from \( r_A \) to \( r_B \)). A cut in fiscal deficits will thus allow lower real interest rates for given current account targets, and hence higher private investment.

The analysis so far is not enough to tie the link between fiscal deficits and output growth. It has focused on the impact of the fiscal deficit on private investment; output growth depends on total investment, however, not
just on private investment. Clearly, the impact of changes in fiscal deficits on output growth depends on whether the underlying adjustment is made out of public investment or out of public consumption. The model therefore breaks down public expenditure in public consumption and investment. Output growth depends on the sum of public and private investment.

Of course, interest rate arbitrage between domestic and foreign rates may eliminate any leeway for the domestic real interest rate to reconcile fiscal deficits with current account targets. In that case, another degree of freedom is lost. For any given rate of real depreciation, the link between fiscal deficits and the current account is direct if real interest rates at home and abroad cannot diverge more than the expected real rate of depreciation. The remarkably close link between the fiscal deficit and the current account in Mexico (cf Figure 4.2) suggest that interest arbitrage is in fact taking place in Mexico; the no-arbitrage version of the model, with real rates reconciling fiscal deficits and external balance, thus seems too extreme. We hence have used the model for given real interest rates, rather than fixing the fiscal deficit and having the real interest rate adjust endogenously. Of course the real exchange rate is not fixed in the real world, nor is its rate of change exogenously given. Policy measures will have a direct or indirect impact on both level and rate of change of the real exchange rate. To this we turn now.

FIG 4.2 HERE (figs. are at the end of this Annex)

C Commodity Market Clearing and the Real Exchange Rate.

The presentation has until now focused on the current account, fiscal deficits, and the real rate of interest. But what about the real exchange rate? Popular discussions of the current account invariably involve the latter variable. This stems from the days where the current account was analyzed using partial equilibrium trade flow equations, with little attention for the underlying macroeconomic and intertemporal aspects. Within modern theory, and within our approach, the real exchange rate of course does have an impact on the current account, but in a much more ambiguous and indirect manner than in the standard open economy models inherited from the fifties and sixties. The approach adhered to here starts from the simple observation that the real exchange rate can be viewed as the relative price of Mexican (non-oil) goods (we will omit the "non-oil" qualification in the remainder of this section) in terms of foreign goods. The "market" which the real exchange rate clears (possibly only after periods of disequilibrium), is the market for Mexican goods. The real exchange rate is thus a static relative price in that it measures the rate at which two different (aggregate) commodities can be exchanged at a given moment of time. The real interest rate measures the rate at which commodities can be exchanged at different moments of time, through savings or investment processes; it thus is an intertemporal relative price.

Consider the determinants of aggregate demand and supply in that market. Fig. 4.3 provides a diagrammatical elaboration (see Edwards and van Wijnbergen 1989 for a similar approach in a static framework). First aggregate demand for Mexican goods. One component comes from Mexican consumers (and investors). At a more appreciated real exchange rate (de < 0), Mexicans will tend to allocate their aggregate expenditure towards foreign goods rather than towards Mexican goods. Similarly, an appreciated real exchange rate will, ceteris
paribus, cause lower export sales (foreign demand falls off). This is represented by the upward sloping curve $A_d$ in figure 4.3.

FIG. 4.3 HERE (figs. are at the end of this Annex)

Aggregate supply of Mexican goods is likely to increase when the real exchange rate appreciates ($de < 0$), if only because imported intermediate goods will become cheaper in terms of Mexican goods (cf the empirical evidence presented below). The aggregate supply curve therefore slopes down in fig. 4.3 (note, again, that $e$ is defined as the relative price of foreign goods in terms of Mexican goods). The "equilibrium exchange rate" is the rate at which supply and demand for home goods are equal: the intersection of $A_d$ and $A_e$ in fig. 4.3. Above that intersection, there is excess demand for home goods and output will be supply determined: the exchange rate is undervalued (excessively depreciated). Below the intersection, supply exceeds demand and output is hence demand determined. In that case, the real exchange rate is overvalued and there is Keynesian unemployment (van Wijnbergen (198)).

An increase in government expenditure on home goods would shift the $A_d$ curve down and so reduce excess supply and Keynesian unemployment problems (dotted line in fig. 4.3). As a consequence, the commodity market clearing, "equilibrium" real exchange rate would fall ($de > 0$ from E to F in Fig. 4.3).

D The Real Exchange Rate, Interest Rates and the Current Account.

What about the current account? First note that the real exchange rate that equilibrates aggregate demand for Mexican goods with their aggregate supply, can do so at any level of the external deficit. An external deficit indicates that aggregate expenditure, by Mexicans but on foreign and domestic goods, exceeds aggregate income. It provides no indication however, that aggregate demand, by Mexicans and by foreigners, but now on Mexican goods alone, is in excess of aggregate supply of Mexican goods at the going real exchange rate.

That does not mean that the real exchange rate and the current account are entirely unrelated. Figure 4.4 draws on the preceding ones and demonstrates how the current account, the real interest rate and the real exchange rate interact. Consider first commodity market equilibrium, but now not in "e-A" space, but with the real exchange rate and interest rate on the axes. Assume that at E commodity market equilibrium obtains. If one then moves to the left (the exchange rate appreciates, $de<0$), excess supply develops. This was also demonstrated in fig. 4.3. To restore equilibrium, demand need to be curtailed; one way of doing that is raising real interest rates; that lowers demand for all consumption and investment goods (see the empirical evidence presented below), thus also for domestic goods. The commodity market equilibrium locus thus slopes upward in r-e space.

FIG. 4.4 HERE

Consider next the combinations of r and e that will allow achievement of a particular current account target, say CAS*, for given fiscal policy. If at E that target is achieved, moving up (higher r) will lead to overachievement: higher real interest rates will, ceteris paribus, reduce private consumption and investment and thus lead to a CA improvement. Which way will the exchange
rate have to move to bring the CA in line with its target? As theory suggests, and the empirical analysis presented below confirms, the answer is sometimes unclear. Theory suggests that for constant rate of time preference the exchange rate has no effect on the private consumption (Razin and Svensson (1983)). The empirical analysis presented below shows that this is in fact the case for Mexico. On the other hand, investment will be affected negatively, mostly because of the impact on intermediate import prices of a devaluation, but this effect takes place with a one year lag only. In the short run the only effect at play is the negative impact of a real depreciation on aggregate supply. Thus in the short run a real devaluation is in fact likely to deteriorate the current account. However, in the longer run the negative impact on investment will reverse this, like in the standard J-curve effect, although through a different mechanism. This means that to restore the CA to its target in the short run a depreciation is needed (the CA curve slopes upward, like the GM curve; see fig. 4.4.B), but in the longer run an appreciation will be necessary, leading to a negative slope (fig. 4.5A). Since this analysis has a medium run focus, we still concentrate on the case where the slope is negative.

What does this analysis suggest will happen if, say because of "inertial" inflation and a fixed nominal exchange rate, the real exchange becomes overvalued? This is represented by the move from E to D in Fig. 4.5.A. First of all, there will be excess supply of domestic goods and hence falling exports, declining capacity utilization, and Keynesian unemployment. What happens to the current account depends on whether the CA curve slopes up or down; if down, it deteriorates when moving from E to D and if up it actually improves. If the two effects wash out, nothing will happen to it. In the medium run however, a deterioration is more likely according to the empirical analysis presented below. If the government responds to the rising unemployment and falling capacity utilization by raising government purchases of domestic goods rather than devaluing, the GM curve shifts to the left and the commodity market problem is resolved. However, especially if this fiscal expansion is not matched by increased revenues, the CA will deteriorate and the CA curve shifts up. This means that the original CA target will increasingly get out of reach. Thus an overvalued exchange rate will lead to unemployment and possibly to a deteriorating CA as time goes by, or to no unemployment but a real CA problem if fiscal policy is used to offset the employment effects of the overvalued exchange rate. In this case the appropriate policy response to falling exports and sluggish capacity utilization is in fact a real depreciation, to which a nominal depreciation may contribute.

Of course, like in the preceding subsection, interest rate arbitrage takes away one degree of freedom: the real interest rate, for given RATE of depreciation, confines the economy to the line at \( r^* + e \). It will also pin down the growth rate, for given any public investment program; this can be seen in the left quadrant of diagram 4.4.

I.2 Empirical Application to Mexico

A Aggregate Supply and Aggregate Demand

Consider first aggregate expenditure. Government expenditure, both on consumption and on capital goods, is considered a policy instrument.
Consumption expenditure depends on estimates of permanent and temporary income, and on the after tax real rate of interest. The measure of permanent income is based on a simple trend regression of real disposable income on time, with a trend break from 1984 onwards (i.e. the decline in 1983 is interpreted as a surprise). The results of this regression are:

\[
(1) \quad \log(\text{YDR}_t) = 2.19 + (0.063 - D83PLUS*0.017)t \\
\quad (64.9) \quad (21.3) \quad (7.21)
\]

\[ R^2 = 0.96 \quad DW = 1.58 \quad 1965-1987 \]

Inflationary expectations are derived from a four year weighted average of actual CPI inflation rates. The predicted value of this weighting procedure is used in the calculation of real after tax interest rates. The nominal rate used is the nominal after tax time deposit rate series presented in Gil-Diaz (1988) for 1965-1986, and the three month after tax time deposit rate for 1987. With these definitions of temporary and permanent income and of the real interest rate, the econometric results for private consumption are:

\[
(2) \quad \log(\text{Cp}_t) = 5.18 - 0.44 \log(1+\text{rrTD}_t) + 0.70\log(\text{YDR}_t) + 0.86\log(\text{YDR}_t) \\
\quad (25.6) \quad (1.83) \quad (4.41) \quad (12.2)
\]

\[ R^2 = 0.97, \quad DW = 1.14, \quad 1970-1987 \]

The results are promising; a coefficient with respect to permanent income that is highly significant, but not significantly different from one; a coefficient on temporary income that is significantly lower than the coefficient on permanent income; and, finally, a significant (at the 10 percent level) and negative coefficient on the real after tax deposit rate. However, the low value of the DW coefficient indicates some remaining specification error. The regression results deteriorated significantly when the real exchange rate was included; that variable never received significant coefficients and was thus omitted. This finding has important consequences for the assessment of the impact of a real devaluation on the current account.

The second interest sensitive component of aggregate expenditure is private investment (fixed capital formation). Private investment depends on real interest rates, the relative price of intermediate inputs and the output capital ratio as a proxy of capacity utilization, for which no data are available before 1980. The real interest rate used is based on the pre-tax nominal interest rate reported in Gil-Diaz (1988); this rate is converted into a real rate using a VAR of GNP deflator inflation on its own past values going back three years, plus a constant term. The predicted values of this equation are used as proxy for inflationary expectations; this proxy, in turn, is used to derive the real interest rate, \text{rr}_{G\text{NP}}. The measure of intermediate imports prices is the dollar-based unit-value of intermediate imports deflated by the dollar-based Mexican GNP deflator. This yields the following results:
The results show a strong negative dependence of private fixed capital formation on real interest rates and on the relative price of intermediate imports in terms of final goods. Both enter with a lag, as should be expected; \( I_{pr} \) is actual investment expenditure, not orders.

Private investment and consumption expenditure plus total government expenditure and inventory accumulation (considered exogenous in the current version of the model) make up aggregate expenditure.

Aggregate supply of non-oil Mexican goods depends on the beginning of period capital stock, on the relative price of intermediate imports and on the relative final price of Mexican goods in terms of an index of foreign competitors' prices abroad. The latter is measured as an aggregate of the dollar-based WPI in Mexico's main trading partners, with 1980 export weights.

The equation shows a strong positive response to the (inverse of the) real exchange rate: a real appreciation increases aggregate supply. Also, an increase in the relative price of intermediate imports or a decrease in the capital stock both lower aggregate supply.

Aggregate employment, \( N_t \), depends on the real product wage and on aggregate non-oil output:

A small negative real wage elasticity, significant at a ten percent level, and an income elasticity substantially below one.

Next year's capital stock depends on this year's and on total fixed capital formation:

\[
K_{t+1} = (1-0.04)K_t + (I_{pr,t}+I_{g,t})
\]
The assumption of a four percent depreciation rate is based on SPP data with some correction for the likely understatement of true depreciation in the national accounts in inflationary periods due to historical cost accounting practices.

The intertemporal part of the model is rounded out by the current account identity:

\[
CA = y_t + X_{o,t} \cdot s_{E/P_GNP} - i^*B_t \cdot s_{E/P_GNP} - C_{pr,t} - I_{pr,t} - G_t
\]

B.2 Allocation of Expenditure and the Real Exchange Rate

The part of the model presented in the previous section focused mostly on intertemporal trade. It thus dealt with the allocation of current production and expenditure over the present and future periods, rather than over domestic and foreign goods. In line with that focus, the most important relative price variable was the real interest rate. In this section, the focus is intratemporal trade, allocation of expenditure over current Mexican versus current future goods, and the relevant relative price variable is the real exchange rate.

Consider first the allocation of domestic expenditure over foreign and domestic goods. We do this by explicitly estimating import demand equations for the different import categories. The volume of capital goods imported, \(M_{cap}\), depends on the relative price of capital goods imports versus investment goods in general (the GNP deflator for investment) and on aggregate investment:

\[
\log(M_{cap}) = 14.11 - 1.12 \log(P_{mcap,sE/P_{INV}}) - 0.74 \log(P_{mcap,s(-1)E(-1)/P_{INV}(-1)})
\]

\[
+ 0.71 \log(I_{pr+I_s}) - 0.88 \times MQUSH(-1)
\]

\(R^2=0.94, \ DW=1.40, 1970-1987\)

The variable MQUSH is the fraction of imports covered by QRs; it is included in an admittedly crude attempt to capture to many changes in trade regime that have taken place in Mexico over the sample period. The results show relatively high elasticities, all estimated with great precision (high t-statistics). The trade regime variable seems to pick up the degree of repressiveness of the trade regime: it enters with a strong negative sign.

Consider next consumption goods imports, \(M_{con}\):

\[
\log(M_{con}) = 2.34 - 2.2 \log(P_{mcon,sE/P_{CPI}}) - 1.23 \log(P_{mcon,s(-1)E(-1)/P_{CPI}(-1)})
\]

\[
+ 1.31 \log(C_{pr}) - 0.96 \times MQUSH(-1)
\]

\(R^2=0.82, \ DW=1.54, 1970-1987\)
Once again high and significant price elasticities and a strong negative impact of the proxy for trade intervention. Finally demand for intermediate imports, Mint:

\[
\log(\text{Mint}) = -18.7 - 0.64 \times \log\left(\frac{\text{P}_{\text{int}, \$E}}{\text{P}_{\text{GDP}}}\right) + 2.84 \times \log(y)
\]

\[
- 0.96 \times \text{MQUSH}(-1)
\]

\[R^2 = 0.91, \text{ DW} = 1.40, 1970-1987\]

This equation shows a somewhat lower, although highly significant price elasticity, and an unusually high income elasticity.

One can deduce total demand for Mexican goods by domestic residents in any given period by combining the import demand equations with the equations for aggregate domestic expenditure, and scaling by the relevant relative prices. To complete the analysis of commodity market equilibrium in the market for (non-oil) Mexican goods, an additional element is needed, however: foreign demand for Mexican goods or export demand.

In the specification of the export demand equation, we assumed that Mexican exporters compete not so much with domestic producers in Mexico's export markets, but with other exporters to the same markets. This is a reasonable assumption, given that Mexico's two main export markets are the US and the EEC. This means that the relevant activity variable is aggregate imports into Mexico's export markets (weighted by their share in Mexico's total exports), and the relevant relative price variable is the ratio of Mexico's export price over the aggregate price index of imports into Mexico's export markets. This yields:

\[
\log\left(\frac{\text{XD}_{\text{noil}}}{\text{XD}_{\text{noil}}(-1)}\right) = 1.55 - 0.95 \times \log\left(\frac{\text{RPXPF}}{\text{RPXPF}(\cdot)}\right)
\]

\[
- 0.12 \times \log\left(\frac{\text{RPXPF}(-1)}{\text{RPXPF}(-2)}\right) + 1.50 \times \log\left(\frac{\text{MF}}{\text{MF}(-1)}\right)
\]

\[R^2 = 0.59, \text{ DW} = 2.56, 1968-1987\]

where \(\text{RPXPF} = \frac{\text{P}_{\text{x}, \$}}{\text{P}_{\text{MF}}}\), the dollar price of Mexican non-oil exports over the aggregate dollar-based price index of imports into Mexico's export markets. MF is the volume of imports into those markets (again, weighted by each country's share in Mexico's total non-oil exports). Analysis of the error structure suggested estimation in terms of rates of change rather than of (log) levels. The equation performs reasonably well: significant price elasticities and a high, significant "income" elasticity. However it would probably be useful to distinguish different export markets.

The model is completed by a commodity market clearing equation for current Mexican non-oil goods:

\[
y_t = C_{pr, d} + I_{pr, d} + G_d + \text{XD}_{\text{noil}}
\]
Figure 3
References:


Annex II  SECONDARY MARKET PRICING AND THE VALUATION OF THE RECAPTURE
CLAUSE: AN OPTION PRICING APPROACH 15/

II.1  A Secondary Market Model

We develop a model for pricing a country's secondary market commercial
debt using option pricing techniques 12/. The setup is the following. Due to
uncertainty in the country's export earnings, import requirements and net
scheduled capital in-or outflows, the net amount of financing available each
period to service foreign commercial debt is uncertain. The uncertainty in the
amount of resources available to service foreign obligations can be due to
ability to pay as well as willingness to pay factors. For convenience, we lump
these factors together and assume that the creditors have appropriability of
any resources falling short of contractual debt service, or, alternatively and
equivalently, that the country is a perfectly willing, but sometimes unable
payer. Thus, each period the country will pay as much as its financial
resources allow to the commercial banks, but never more than its contractual
obligations in the period. Consequently, repayments may fall short of
commercial debt service obligations due.

We can represent this repayment behavior by the following:

(1a) \[ R^*(t) = \min (R_t, FX_t) \]

with \( R^*(t) \) equal to the repayment in period \( t \); \( R_t \) equals the contractual debt
service in period \( t \) and \( FX_t \) the resources available to service commercially
held debt, also in period \( t \). \( R_t \) is assumed known, although it is
straightforward to extend the methodology to stochastic contractual debt
service, such as in the case of floating interest rate debt (see for instance,
Fischer (1978) and Margrabe (1978)).

(1a) can be rearranged to yield:

(1b) \[ R^*(t) = R_t - \max[0, R_t - FX_t] \]

But \( \max[0, R_t - FX_t] \) equals the value of a put, with a strike price of \( R_t \),
which is written on the value of the foreign exchange available, \( FX_t \). 15/

16/ This Annex is based on "Secondary Market Prices under Alternative Debt
Reduction Strategies: An Option Pricing Approach", by Claessens and van
Wijnbergen (1989).

17/ Option pricing has been used before in the pricing of LDC debt by Kharas
et alii (1987); Cohen (1989) gives an analytical solution to the pricing
problem they solve numerically. These papers focus on the option a creditor
has to call a default, whereas we focus on the option the country has not to
service its debt in periods of low foreign exchange availability.

18/ The state variable \( FX \) is a non-traded asset and not as such priced in the
market. But if the state variable is spanned by other traded instruments, one
can price the non-traded asset and all results go through identically as in
the case of traded assets. See also section III.
equation 1b shows that the uncertain repayment can be represented by a certain repayment $R_t$ minus a put, with a strike price of $R_t$, which is written on the value of the foreign exchange available, $FX_t$.

This is shown graphically in Figures 1a and 1b. In Figure 1a, the shaded area represents the value of a put written on $FX_t$ with exercise price $R_t$. The put pays $\max(0, R_t - FX_t)$: whenever $FX_t$ falls below $R_t$, the put is in the money and its value is equal to $R_t - FX_t$; and whenever $FX_t$ is above $R_t$, the put is out of the money and thus worthless.

Figure 1b below shows first of all the payment obligation, $R_t$, which is independent of $FX_t$ and thus represented by a horizontal line ($FX$ is on the horizontal axis). Subtracting the put (shaded area) from the fixed payment $R_t$, yields the desired payoff function, $R_t^* = R_t - \max(0, R_t - FX_t)$. This is represented by the heavy line in Fig.1b, the line that goes from the origin out at a 45-degree angle until it cuts $R_t$ and then moves horizontally to the right. For any outcome of $FX_t$ above $R_t$, full repayment results and thus $R_t^* = R_t$. For a value of $FX_t$ below $R_t$, only $FX_t$ is paid and hence $R_t^* = FX_t$. Thus $R_t^*$ clearly also equals $\min(R_t, FX_t)$. 
Now that we have replicated the payoff stream at maturity, it is easy to calculate the current value of the uncertain payoff stream as the current value of the certain future obligation $R_t$ minus the current value of the put. This equals the discounted value of $R_t$, exp$(-rt)*R_t$ (where $r$ is the (continuously compounding) interest rate), minus the current value $P$ of a put with an exercise price of $R_t$, written on $FX_t$. If $V(R_t)$ is the present value of the claim, we can represent this as:

$$V(R_t) = \exp(-rt)*R_t - P(FX_t, R_t, r, t, \sigma).$$

where $P(FX_t, R_t, r, t, \sigma)$ is the current value of a put written on $FX_t$ with exercise price $R_t$, interest rate $r$, maturity $t$ and standard deviation $\sigma$. If one furthermore assumes that $FX$ behaves lognormally, the pricing of the put can be done using the Black and Scholes option pricing formula (see Black and Scholes (1973)). $P$ is then equal to the following expression:

$$P(FX_t, R_t, r, t, \sigma) = -FX_0*\exp((\mu-r)t)*N(d1) + \exp(-rt)R*N(d2)$$

where

$$d1 = [\log(FX_0*\exp(\mu t)/R_t) - (\sigma^2/2)t]/(\sigma/t)$$

$$d2 = d1 + \sigma/t$$

The formula assumes a constant interest rate $r$ for notational convenience only. The empirical application presented below allows for different maturity structures of interest rates.

Other density functions can easily be incorporated using numerical integration techniques.
\[ \mu = \text{the drift in } FX_t \text{ over the period } 0..t \]

The current value of a loan with the series \( R_t \) falling due over time is simply the sum of the current values of a series of these claims over the maturity of the contract. The present value \( V_L \) of a series of contractual obligations \( R_t \), for a maturity \( T \), is thus equal to:

\[
(4) \quad V_L = \sum_{t=1}^{T} R_t \exp(-rt) - \sum_{t=1}^{T} P(FX_t, R_t, r, t, \sigma)
\]

where \( R_t \) can be different for each period depending on the terms on the loan and the summation is over \( t=1,...,T \). Note that this implies that we can study the implications of different maturity structures on the price of debt, something which in most other pricing models by assumption does not affect the price of debt.

II.2 Pricing Exit Bonds with Fixed Guarantees

The methodology explained above can also be used to price guarantees that are provided by a third party for a specific payment falling due at a specific maturity date. Assume that the third party provides a guarantee for full payment of \( K \) at maturity date \( r \). Following a similar line of reasoning, one can represent the guarantee as a put option with an exercise price of \( K \), a maturity date \( r \) and written on an underlying asset \( FX \). Such a put can again be priced using the Black and Scholes formula:

\[
(5) \quad V_{FG} = P(FX_r, K, r, r, \sigma)
\]

Define the set of years \( r \) over which guarantees are provided as \( \{r'\} \); furthermore, assume for simplicity that \( K_r = R_r \) for all \( r \in \{r'\} \). Then the value of such a set of guarantees equals:

\[
(6) \quad V_{FG} = \sum_{r'} P(FX_r, K_r, r, r, \sigma)
\]

and the value of the loan with this set of guarantees attached becomes:

\[
(7) \quad V_{L,FG} = \sum_{t=1}^{T} R_t \exp(-rt) - \sum_{t=1}^{T} P(FX_t, R_t, r, t, \sigma) + \sum_{r'} P(FX_r, K_r, r, r, \sigma)
\]

Any type of fixed guarantee, whether of principal or interest and whether single or multiple years, can be priced using this methodology.

II.3 Pricing Exit Bonds with Rolling Interest Guarantees

A bond with rolling guarantees can also be priced using the same option pricing methodology. Assume the following rules. The guarantee is at time zero

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21/ The formula assumes a constant drift \( \mu \) for notational convenience only. The empirical application presented below allows for time varying drift parameter \( \mu \). The valuation formula differs from the Black-Scholes equation in that we do not assume \( \mu = \sigma \).
extended for coverage of one year of interest. If the country remains current on the guaranteed obligation, the guarantee will be extended for another year, and so on. In terms of our model, the guarantee will cover next year’s debt service obligation provided the foreign exchange available in each of the previous periods was above the debt service obligation of the corresponding year. As before, it is assumed that in case of partial repayment the claimholders acquire all the foreign exchange available in this period if it falls below the debt service obligation and can at most retain their debt service obligation if the state of nature is better this period.

In period one the repayment of $R_1$ is assured through the guarantee, implying that the current value of the debt service obligation is $\exp(-rt_1)R_1$. In period two the repayment is assured provided the country did not default in period one on its obligation, in which case the guarantee would have been called. If however the guarantee was called, the repayment in period two will be $\min(FX_2,R_2)$ as under the regular claim without any guarantee. This implies that the current value of the second period obligation will be equal to $\exp(-rt_2)R_2$ minus the current value of a put on $FX_2$ with exercise price $R_2$, plus a put which is conditional on the guarantee not being called the first period PC:

\[
V(R_2)_{RS} = \exp(-rt_2)R_2 - P(FX_2,R_2,r,t,\sigma) + PC(FX_2,R_2,r,t,\sigma)
\]

The first two terms are equal to the standard expression for a claim on a country, the contractual obligation discounted minus the value of a put. The third term represents the value of the guarantee, which is the value of a put conditional on no prior calls so that the guarantee is indeed effective. If $FX_t$ is serially independent over time, an assumption we make, the pricing of this last conditional put is particularly simple and yields:

\[
PC(FX_2,R_2,r,t,\sigma) = \Omega(2,R_1,FX_1,\sigma)P(FX_2,R_2,r,t,\sigma)
\]

where $\Omega(2,R_1,FX_1,\sigma)$ is the probability that the guarantee is not called prior to time 2. The value of the put which is conditional on no prior call simplifies to the value of an unconditional put multiplied by the probability of no prior call in any previous periods. Similar expressions follow for later periods.

**Multiperiod Guarantees**

More general expressions for $N$-period rolling guarantees can easily be derived using similar methodology. For an $N$-year rolling guarantee, the first $N$ repayments are fully guaranteed and thus valued without any credit risk discount. The claim value for period $N+1$ is the discounted contractual value minus the value of an unconditional put, plus the value of the guarantee. The value of the guarantee in that period equals the value of a put which is conditional on less than $N$ calls in the preceding $N$ periods. This last put option can similarly be priced as the conditional put derived for the one-year

---

22/ The pricing is done for a guarantee. Identical results obtain for an escrow account as long as the interest earnings on the escrow account are not retained in the account.
rolling guarantee. The only difference is that, for a N-period rolling
guarantee, \( \Omega \) now refers to the cumulative probability of at most N-1 prior
calls.

It is convenient to index \( \Omega \) by the number of years covered by the
rolling guarantee: \( \Omega_n \). Define, furthermore, \( \zeta_n(t) \) as the amount left in the
guarantee \( \cdot \) and at the start of year t, expressed in number of years of
interest covered, for a fund that originally covered N years. Thus the
following holds by definition:

(10) \( \zeta_N(t) > 0 \) for \( t \leq N \)

\( \Omega_n \) at time t depends on all R and FX of the periods preceding t. Call \( \{t'\} \) the
set of t' preceding t. From the definition of \( \Omega_n \) and \( \zeta_n \) it is clear that:

(11) \( \Omega_n(t, R_{t'}, FX_{t'}, \sigma) = \text{Prob}(\zeta_n(t) > 0) \)

(10) and (11) together imply:

(12) \( \Omega_n(t, R_{t'}, FX_{t'}, \sigma) = 1 \) for \( t \leq N \)

\( < 1 \) for \( t > N \) and \( \sigma > 0 \)

Martin and van Wijnbergen (1989) show that the value of \( \Omega_n(t, R_{t'}, FX_{t'}, \sigma) \) can
be derived using a simple recursion formula in conjunction with the initial
conditions in (12). This recursion formula greatly simplifies the numerical
analysis and is incorporated in the computer programs used for the empirical
analysis presented below.

With all this machinery developed, one can express the increment of the
value of rolling guarantees with N years coverage over the value of a N-year
fixed guarantee:

(13) \( V_{L, RG-N} - V_{L, FG-N} = \sum \Delta N \Omega_n(t, R_{t'}, FX_{t'}, \sigma) \cdot P(FX_t, R_t, r, t, \sigma) \)

\( \geq 0 \)

with obvious definitions of \( V_{L, RG-N} \) and \( V_{L, FG-N} \). Also, \( R_t \) in equ. (13) should be
understood to only include interest payments. The inequality in (13) shows
that, for the creditors, rolling guarantees are at worst of equal value to a
corresponding fixed interest guarantee; and if there is any positive
\( \Omega_n(t, R_{t'}, FX_{t'}, \sigma) \) for \( t > N \), even if only one, rolling guarantees are strictly
preferable from the creditors' point of view over fixed length guarantees with
similar coverage.

Equ. (13) suggests that the incremental value of switching from fixed to
rolling guarantees is influenced by the initial level of debt \( D_0 \), through the
impact of \( D_0 \) on \( R_t \):
The commitments and timing of the various sources are shown in Table 4 below. The Table outlines which of the various commitments will be available in February/March 1990 and the extent to which bridging facilities will be needed. Credit enhancement is scheduled to be implemented in March 1990.

Table 4 AVAILABILITY OF ENHANCEMENT MONEYS (US$ millions)

<table>
<thead>
<tr>
<th>Available Feb/March 1990</th>
<th>IMF</th>
<th>IBRD</th>
<th>Mexico</th>
<th>Japan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest support</td>
<td>606</td>
<td>1260</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scheduled Set Asides</td>
<td>272</td>
<td>375</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Advancing 1990 IMF Set Asides to Feb/March 90 364

Advancing a Portion of IBRD 1990 Set Asides to Feb/March 90 375

Japanese Parallel financing and Cofinancing 1400^1,2/

---

Enhancements Available

<table>
<thead>
<tr>
<th>Feb/March 90</th>
<th>1242</th>
<th>2010</th>
<th>1243</th>
<th>1400^1</th>
<th>5895</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enhancements available later 455 650^1 1105

Total Enhancements Available 1697 2010 1243 2050^1 7000

Total Enhancements Required 7250

Total Available for Debt Reduction Only (IMF and Bank Set Asides) 1841

Total Available for Interest Support Only; Interest Facility IMF and Bank 1866

Notes:

1/ Japanese money includes cofinancing for $1.25 billion, which is not directly available for credit enhancement purposes, and a bridge loan of US$150 million by Japanese commercial banks.

2/ The dollar value of the IMF contributions has been calculated on the basis of a SDR value of US$1.30.

For the World Bank's contribution, a total of US$750 million was set aside from adjustment loans. The set asides could be used to provide principal or interest collateral for the discount bonds issued by the Government. The level for set asides amounts to 25% of all adjustment loans the Bank has made or expects to make to Mexico in the three-year period FY89-91. The Bank's contribution for interest coverage on discount and par bonds have been made available through an "interest support loan". US$950 million of the US$1.26
II.2 Behavior of Foreign Exchange Available

The availability of foreign exchange to service Mexico's commercial bank debt depends predominantly on the behavior of Mexico's non-interest current account, which in turn depends to a large extent on the behavior of oil export earnings. Thus the variability of the financial resources available to service external debt is in the case of Mexico predominantly a result of the uncertainty of the price of oil. Even though the foreign exchange earnings of Mexico are non-traded assets, and as such not priced directly in the market, they are likely spanned by assets which are traded and whose current values are known. For example, Mexico's oil earnings can easily be spanned through forward or futures contracts traded on over-the-counter and exchange markets. Consequently, the pricing methodology underlying the option valuation, which assumed traded assets, can be used.

The behavior of Mexico's future oil earnings will depend on price behavior and expected quantity. It is projected that the quantity of oil produced will remain at its current level over the near future (1.2 million barrels per day) and will decrease in the late 1990s (to 0.8 million barrels a day). The standard deviation of the average price of Mexican oil over the last 8 years has been 23%. Similar standard deviations are observed for prices that are close substitutes of Mexican oil, such as Borneo light (25% over 87-89), and for the average OPEC oil price (40% over 87-89, 21 percent over 85-89). The standard deviation of the annual changes in most (nominal) oil prices over the period 1975-1988 has been at least 20% annually. Correcting for any trend in oil prices does not change these estimates significantly.

Another way to get an estimate of expected standard deviation is to use market information, such as actual prices of oil options. Given a pricing model, observed option prices can be used to back out volatilities that are consistent with those prices. Doing that one finds that the historical estimates of the standard deviation of oil prices are in fact consistent with those implied by the prices of options on oil traded on exchanges. Using the Black and Scholes formula on recent option prices implies volatilities of around 20%. Thus historical values for the volatility of oil prices closely approximate the market’s assessment of future volatility. We therefore use the historical volatility in our pricing exercise. 24/2

Commercial banks claims are de facto junior to many other claims on Mexico, e.g. official sector claims and bonds. Thus, the resources available to service the commercial debt have to be determined after these other creditors are serviced. This implies that amount of foreign exchange available for commercial bank debt servicing contains a component which is dependent on oil revenues and another, more deterministic part. The following procedure is therefore used. First, the non-oil, non-interest current account is projected in a deterministic fashion. The projections are based on the model reported in van Wijnbergen (1989) and van Wijnbergen and Pena (1989). Second, the non-oil, non-interest current account is adjusted for debt service to more senior claim.

24/ Consistent with our assumption of no serially dependence of FXt, we modelled in the application not the uncertainty in the change in the price of oil but instead the uncertainty in the level of the price of oil. The standard deviation of annual changes in the price of oil is therefore converted into the standard deviation of (the logarithm of) the price of oil.
holders, for foreign direct investment flows and for capital account
transactions such as reserve accumulation (see van Wijnbergen and Pena (1989)
for details). Third, oil earnings are added to the flow, thus introducing the
stochastic element in $FX_t$.

References:


ANNEX III: COMMITMENTS MADE BY NON-MEXICAN AND MEXICAN CREDITOR BANKS

**COMMITMENTS**

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<th>Total: 48.936</th>
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<td><strong>of which:</strong></td>
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<tr>
<td>#Non-Mex Banks</td>
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<tr>
<td>-Par Bonds</td>
<td>22.846 0.498</td>
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<tr>
<td>-Disc. Bonds</td>
<td>18.672 0.407</td>
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<td>Total DR</td>
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<tr>
<td>-NM/ no II,II</td>
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<tr>
<td>-NM/II,III</td>
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<tr>
<td>-II,III-unenh.</td>
<td>0.51 0.011</td>
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<td>-Disc. Bonds</td>
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<td>Total DR</td>
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<td>-NM</td>
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**PERC> NonMex Non-Mex Total**

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<th>Total</th>
<th>Total</th>
<th>NMcomm.:</th>
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<tr>
<td>Par Bond</td>
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<td>0.467</td>
<td>0.467</td>
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<tr>
<td>Disc. Bond</td>
<td>0.407</td>
<td>0.382</td>
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<td>0.094</td>
<td>0.152</td>
<td>0.131</td>
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