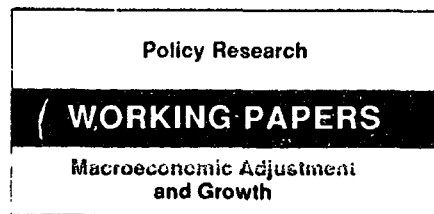


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Parallel Markets, the Foreign Exchange Auction, and Exchange Rate Unification in Zambia

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Zambia's failure with macroeconomic reform — including exchange-rate reform — is the result of macroeconomic (especially fiscal) laxity. And the exchange-rate premium is likely to rise as terms of trade worsen, foreign aid declines, and expectations of devaluations rise.

This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of a larger effort in the department to study the macroeconomic implications of multiple exchange markets in developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Victoria Barthelmes, room N11-025, extension 39175 (May 1992, 115 pages).

Since Zambia's independence in 1964, a large, thriving parallel market for foreign exchange has coexisted with a rich menu of official exchange rate policies aimed at achieving a more flexible exchange rate and price system as well as financial and trade liberalization. Despite aggressive policies in these areas, particularly for the exchange rate, the black market premium (defined as the ratio of the black market rate to the official rate) remains high — averaging 100 percent for 1970-88 and more than 400 percent in recent years.

Aron and Elbadawi examine the origins of the parallel market, the statistical properties of the parallel premium, and the shocks and macroeconomic policy changes that influence its evolution. Using annual data, they specify and estimate an eclectic error-correction model for the premium.

They find that the large parallel market might have caused problems in macroeconomic management and economic reform. A large exchange rate premium as an indication of foreign exchange shortages will have direct deleterious impact on copper production and export. It can also indirectly hurt copper exports through its negative effect on domestic incentives for the officially sanctioned copper economy. A high premium was also found to encourage overimporting (and probably overinvoicing) of officially traded imports.

Aron and Elbadawi find that foreign inflation and depreciation of the black market rate (in a cost-push manner) directly increase domestic inflation. Depreciation of the black market rate also signals indirectly that economic reform lacks credibility and that macroeconomic policy is unsustainable. Short-term changes in the premium reflect expected changes in policy and politics.

The major factor behind the failure of unification and economic reform is the fundamental endogeneity of the parallel premium in macroeconomic and trade policy — as well as in exogenous terms-of-trade and foreign aid shocks. Improving the terms of trade or

increasing foreign aid leads to a decline in the premium. This effect dominates the indirect effects of real wealth and real appreciation, which work to increase the premium. Expansive fiscal and monetary policy cause the premium to rise.

Of all the factors that influence the premium and have caused exchange rate unification to fail, terms-of-trade shocks dominate. But the driving force behind persistence of the premium was outright laxity in fiscal and monetary policy — especially in 1985 and the following two years of the exchange rate auctions, and during the collapse of economic reform in 1987.

Aron and Elbadawi conclude that exchange rate reform without fiscal reform may be futile. Fiscal retrenchment for the first two years of the crawling peg was influenced by political considerations. Zambia is one of the most urbanized countries in Africa: about half the people live in urban areas, and the urban middle class wields considerable influence. This explains the pervasive ensemble of price control and subsidy schemes that have survived reform attempts. But the ratio of government revenue to GDP has never been below 20 percent (one of the highest rates in Africa) despite sharp declines in terms of trade. More emphasis should be given to the political economy and distributional consequences (especially the rural-urban nexus) in the early stages of economic reform.

Zambia's economy, heavily dependent on copper exports, is particularly susceptible to external shocks. It is important to liberalize major trade and financial markets in such a way as to compress the parallel market and prevent the premium from serving as a major signal to the economy.

Increased foreign aid could help mitigate the destabilizing effects of terms-of-trade shocks. This is likely to be most helpful in the early stages of reform, when it can foster credibility and stabilize the free rate — before the foreign sector can begin to respond to real depreciation. Then there will be less need for aid flows to continue at their initial levels.

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I. INTRODUCTION

The economy of Zambia provides an example of a thriving and large black market for foreign exchange. This black market has co-existed with a rich menu of official policies aimed at achieving more flexible exchange rate and price system as well as financial and trade liberalization. Despite aggressive policies in these areas especially with regard to the exchange rate¹, the black market premium (defined as the ratio of the black rate to the official rate minus one) remains high. For the 1970-88 period, the premium averaged 100 percent and exceeded 400 per cent in recent years.

The presence of sizable parallel markets with substantial premiums, such as the one in Zambia, has important macroeconomic implications. The theoretical models of dual exchange rates, e.g. Lizondo (1987 a,b) and Dornbusch (1986), and their extensions and elaboration to the case of black markets, e.g. Dornbusch et al (1983) and Pinto (1987, 88a, 88b), derive a steady state solution for the premium that depends on the fiscal deficit ratio and the parameters of trade and exchange rate policy. Furthermore, key macroeconomic indicators such as inflation, foreign trade flows, and the real exchange rate can also be shown to be influenced by (or jointly determined with) the premium, e.g. Kamin and Elbadawi (1990), Elbadawi (1989). The empirical tradition on this literature however, is still in its infancy. One of the main objectives of this paper is to develop empirical models linking the premium to the above macroeconomic indicators and to use Zambian data to assess the extent and dynamics of these linkages.

¹Since the country's independence in 1964 to present, six distinct episodes of exchange rate regimes - including an auction - can be identified (see Table 1 (a)).

Evidence from the above models can shed light on the recent experience in Zambia of aborted reforms, macroeconomic instability and recurrent policy reversals.² The failure of the Zambian economic reform of the last decade, especially those aspects of the reform related to the foreign exchange auction experiment and the attempts at exchange rate unification, has been suggested to be the direct outcome of macroeconomic laxity, particularly with regard to fiscal policy, (Pinto, 1987). The evidence of our paper upholds this view. In addition, exogenous factors that operate through the trade accounts such as the terms of trade and foreign aid, and expectations reflecting asset market considerations, are important as potential determinants of the premium in Zambia. The empirical results of this paper predict a rising premium as a result of worsening terms of trade, declining foreign aid, or higher expectations of future devaluation.

Official dual markets have twice been created in Zambia: a two tier auction operated for two months in 1987, and in February, 1990, a dual exchange rate system was established. These episodes are either too short-lived or recently instituted to merit analysis. Thus, the structure of multiple markets for foreign exchange considered in this study will consist of an official market with an officially managed or auction-determined rate, and an illegal unofficial market with a freely floating rate. During the auction period, a quasi-legalization of the unofficial market occurred with the introduction of "own funds" import licenses. The quarterly black market premium for Zambia is shown in Figure 1 where the considerable regime shifts of the last two decades are clearly reflected in the evolution of the premium.

²In fact Pinto and van Wijnbergen (1987) argued that the failure to adjust policy for the existence of parallel markets may be the main cause behind recent macroeconomic instability in SSA.

A statistical analysis of the premium and black rate capturing broad changes in size and variability across exchange rate episodes is given in Table 1 (b).

Black market rates are available from mid-1970 which omits the period of the copper boom (1964-74). It is likely that the premium from 1964 to 1971 would reflect incentives for capital flight due to political uncertainty post Independence, the presence of exchange controls and an increased demand for foreign assets during the copper boom. The premium rose after the negative copper price shocks of 1971 and 1974, thereafter following an upward trend in tandem with the increasingly over-valued fixed exchange rate. In the controlled float episode from July, 1976, a continuous downward trend in the premium ensued which was maintained under the crawling peg, after 1983. A sharp rise for 1985 was due to the break with I.M.F. late in 1984, but the auction in its early stages saw a low premium. The premium fluctuated considerably during the auction, but the trend was to higher values after August, 1986.

Across exchange rate episodes the average premium has declined, though rose by a factor of ten in the final episode. The black market rate has continuously depreciated across the five episodes. Both the premium and the black market rate exhibit decreasing stability across exchange rate episodes (though variability declined during the auction). In part this may be related to bubbles and crashes reflecting agents' reactions to accumulated mismanagements and to speculation. Speculative aspects and the distribution of the premium are analyzed in Section V.

Three key aspects will be examined in this paper. First, the origin of the parallel market and the statistical properties of the premium are analyzed. The factors influencing the premium in various episodes are

considered and the premium is estimated using annual data.

Secondly, the effects of the premium on inflation and on recorded and unrecorded (illegal) trade flows are considered. There is a paucity of empirical research on the role of smuggling and misinvoicing of exports and imports in response to the premium and trade policy. An attempt is made here to quantify these responses and to link them to changes in policy and the premium. A premium on foreign exchange serves as a tax on exports and a subsidy on imports. The fiscal impact of the premium in Zambia is important in the unification of official and unofficial exchange rates, where a loss of revenue implicit in the demise of the unofficial market may have induced inflation tax to be substituted for it in the early stages of the auction (Pinto, op.cit).

Finally, Zambia has attempted unification of official and unofficial rates of exchange in two distinct episodes: first, by pre-announced monthly devaluations in the crawling peg episode (1983-85), and secondly, using a market determined rate in the foreign exchange auction (1985-87). What distinguishes the two episodes is the timing of unification, sequencing of accompanying measures of liberalization and portrayal of commitment to liberalization (i.e. credibility aspects). The episodes may usefully be contrasted and lessons drawn from the aborted auction episode.

The paper is organized as follows. A detailed narrative tracing the development, structure and operation of multiple foreign exchange markets is contained in Section II. In Section III the link between the premium and the macro-economy is examined, and in Sections IV and V, a model for the premium is specified and estimated. Section VI analyses the effects of the premium on recorded and unrecorded trade flows using econometric models for key foreign

trade aggregates, and in the case of unrecorded imports, data was constructed from estimates of overinvoicing ratios computed in this section. In Section VII, the impact of the premium on inflation was estimated using a simple, empirical inflation model; also, the fiscal impact of the premium, especially exchange rate unification a la Pinto (op. cit.), is estimated and analyzed. Finally, Section VIII concludes.

II. THE DEVELOPMENT OF MULTIPLE MARKETS FOR FOREIGN EXCHANGE IN ZAMBIA

1. A brief survey of official currency arrangements from 1964.

Parity changes since 1964 are discussed with reference to Table 2 (a). At Independence in 1964, Zambia's currency was pegged to the pound and was fully convertible. The kwacha replaced the Zambian pound on 16th January, 1968, halving the official rate (to K0.714/\$ or K1.7/ST) whilst retaining the link to the pound sterling. From 1964 until the early 1970s this fixed exchange rate was maintained. On 3rd December, 1971, the kwacha's ties to the pound were severed and it was linked to the U.S. dollar at the rate K0.714/\$. This represented a devaluation, given the kwacha's appreciation against the dollar following a de facto devaluation of the American unit on 15th August, 1971. The gold content of the kwacha was reduced to 7.89 per cent on 22nd December, which paralleled the U.S. dollar's devaluation of 18th December, thus leaving the official rate of exchange unchanged. The kwacha did not follow the February, 1973 devaluation of the U.S. dollar, and was realigned to K0.643/\$ on 15th February, based on an unchanged gold content.

Thereafter, with the increase in the dollar's value in consequence of floating and the devaluation of various currencies, the kwacha appreciated against the currencies of all major trading partners (save the Deutsche mark). By mid-1976, the value of the nominal effective exchange rate (trade-weighted) had risen over 25 per cent. On 8th July, 1976, ties with the dollar were severed and the kwacha linked to the SDR at SDR1.08479 on a controlled, floating basis, a de facto devaluation of 20 per cent. This rate was devalued by 10 per cent on 17th March, 1978 to SDR0.976311 and by a further 20 per cent on 7th January, to SDR0.78125. The link to the SDR was broken on 6th July,

1983: a crawling peg based on a basket of currencies of major trading partners, rather than the basket determining the value of the SDR, was introduced. A controlled devaluation was to be achieved of 1 per cent per month; the rate was increased to 2.5 per cent in 1984.

Dissatisfaction with the downward rate of adjustment and the inefficiencies of the accompanying manual exchange allocation system led to the adoption of a foreign exchange auction system in October, 1985. The rate to the dollar on 3rd October was K2.2, reaching K5.01 in the first of the weekly auctions, on 11th October, and K8.30 a year later on 11th October, 1986 in the 53rd auction. Thereafter the rate declined sharply reaching K15.25 in the 60th auction on 29th November, 1986 (an 86 per cent depreciation of the kwacha from the inception of the system).

From the 41st auction, new documentation was required to accompany bids, and from the 43rd auction (2nd August, 1986) a "Dutch Auction" replaced the former system.³ The Central Bank increased the amount of foreign exchange for auction three-fold from 2nd August, but this policy was not sustainable. These modifications failed to arrest the kwacha rate of depreciation.

Following riots on the Copperbelt and in Lusaka on 5th December, 1986, with the rate at K14.92 in the 68th auction, the auction was temporarily suspended (28th January, 1987). The rate was set at K9.00. Thereafter six auctions were held, beginning on the 28th March, 1987, under a two-tier auction system: an official window at K9.00 was restricted to debt service, essential imports and receipts of loans and grants, whilst the auction rate was allowed to fluctuate between this rate and an upper ceiling of K15.00

³In the "Dutch Auction", successful bidders paid the full amount of their bid regardless of the excess over the marginal bid, and this sum was surrendered as government revenue.

(this restriction was abandoned after four weeks). In the fifth of these auctions on the 24th April, the kwacha rate fell to its lowest value, K21.02; President Kaunda abolished the system on 1st May, after a final auction which served only to allocate foreign exchange at the rate of K15.00.

From 5th May, a fixed rate of K8.00 was installed. Requests for foreign exchange were filed through the commercial banks, and allocation of foreign exchange and issue of import licenses decided simultaneously by a Foreign Exchange Management Committee (FEMAC). Non-traditional exporters were allowed to retain 50 percent of their export earnings. Free trade of title to the retained foreign exchange occurred at a premium on the official rate, but required prior approval from FEMAC. A third, legal foreign exchange market was limited to larger non-traditional exporters and allowed the use of export earnings to purchase Zambia's commercial (pipeline) debt at a discount on international financial markets, then exchanged at the Bank of Zambia for kwacha equal to the official rate times the face value of the debt instrument. A devaluation to K16.00 occurred in June, 1989, and a further devaluation to K24.00 in December of that year.

As of February, 1990, a two-tier currency was re-introduced: an official rate of exchange was initiated at K27.80/\$, with the "market exchange rate" at K40.00/\$. The Bank of Zambia sold foreign exchange through the First Window (the official rate) under existing FEMAC procedures for imports, and purchased all foreign exchange earned by ZCCM. The Second Window operated at the market rate and was used for those goods eligible for foreign exchange allocation under the Open General License System (OGL). The sources to fund this window were non-traditional exports earnings and remittances received from donors.

Only 10 per cent of imports by volume were eligible for OGL allocation at

the inception of the system. By the 31st March, 1991, most imports had been transferred from the First to the Second Window, due to the gradual expansion of the OGL to cover over 92 per cent of imports. Donor funding accounted for 54 per cent of the funding of the Second Window in 1990 and all of it in 1991. In April, 1991, the rates were unified at K58/\$.

2. The emergence of an unofficial market in foreign exchange.

The origins of Zambia's unofficial market in foreign exchange lie in the control regime introduced and extended from Independence in 1964. Political uncertainty in the decade of nationalizations post 1964 and deterioration of the economy after the copper price shocks in the early 1970s provided further incentives for capital flight.

At the dissolution of the Federation of Northern Rhodesia, Southern Rhodesia and Nyasaland (1953-63), Zambia had been the only country of the three to relax exchange control restrictions imposed in 1961; however, these liberalization measures were minor. After a negative copper price shock in 1971, foreign exchange reserves were protected by tightening exchange controls. The overvalued exchange rate and foreign exchange controls created excess demand in the market for foreign exchange, and the parallel market burgeoned.

Import licensing, originally devised to avoid congestion after the closure of transport routes in the 1960s, increasingly served to control import levels. In 1972, a restrictive import licensing system was introduced. Certain categories of imports were banned, but capital and intermediate goods imports were liberally licensed. Import licensing was further tightened early in 1975 following the precipitous decline in copper prices in 1974. These

measures continued to be strictly enforced until the liberalizing reforms of the early 1980s. Price controls had been applied from Independence to producer prices of agricultural goods, the prices of "essential commodities" and some parastatal company products. Interest rate controls rendered real interest rates negative from 1966 onwards, reaching below -10 percent between 1976 and 1980, and just preceding and following the auction. Evasion of price and trade controls by smuggling and misinvoicing, and consequences for the size of the parallel market and the premium are discussed in the section on unrecorded trade (Section VI.2).

Various liberalization measures were implemented preceding the foreign exchange auction and during its operation. Most price controls were lifted in December, 1982 and interest rates decontrolled late in 1985. The trade account was liberalized in October, 1985 concomitant with the floating of the exchange rate. External capital controls remained in place throughout the nineteen month auction period. Quasi-legalization of the black market was also effected just prior to the auction with the introduction of export retention schemes and "own funds" import licenses.⁴ At its termination most of the liberalizing measures were reversed. The impact of the liberalizing reforms on the premium is considered in Sections III and VI, and quantified in Section VII.2.

3. An evaluation of exchange rate policy in Zambia.

Six distinct exchange rate episodes have been identified for Zambia since Independence in 1964 (see Table 1 (a)). Exchange rate policy is analyzed with

⁴ Remittance of foreign exchange held abroad, or payment for imports of goods and services out of funds held abroad, was allowed without restriction or declaration as to the source of the funds.

reference to Figure 2 (a) where nominal and real effective exchange rates for the official rate are contrasted with the parallel real effective exchange rate.⁵ The official REER and NEER are set to 100 in 1980 while the parallel REER is 60 in 1980 to reflect the actual premium. The premium is the distance between the two REER indices divided by the height of the parallel REER index. As they move closer together, so the premium declines. The lower the parallel REER and the higher the official REER indices, the higher the premium. The parallel rate is expected to display more short-term volatility (this is discussed in Section III), but discounting for the risk of illegality, may serve as a proxy for a market rate. Thus the effective rates in Figure 2 (a) may be used both descriptively to contrast the official REER and NEER, and to assess the misalignment of the official REER from a "market rate" (parallel REER).

In episode 1 (1964-1976Q2), the exchange rate was fixed, initially to the pound sterling, and subsequently to the dollar. Exchange rate policy was inactive in this period. From 1971 the nominal rate became increasingly overvalued, culminating in severance from the appreciating dollar. The appreciation contributed to the deterioration in trade and current account balances following the severe negative shock to copper prices in 1974 and rise in oil prices after 1973. At the same time wage costs were rising and mining

⁵ The real effective exchange rate (REER) is the geometric average of trade-weighted real exchange rates (RER_i) for the six major trading partners, excluding South Africa, where $RER_i = NER_i \cdot CPI(\text{Zambia}) / CPI_i$, and NER_i is the nominal bilateral exchange rate in foreign currency per kwacha. The weights, W_i , are import weights, based on partner-country recorded exports, to avoid the misinvoicing bias (South Africa does not record exports to Zambia). Weights were redefined for 1968-72, 1973-77, 1978-82 and 1983-88. The CPI rather than WPI was used as there are less likely to be definitional discrepancies across countries (IFS, I.M.F.).

profitability falling with increased production costs and transport difficulties. ⁶ The overvalued rate further encouraged capital intensive production methods towards which a bias already existed given the nature of tariff policy. Little variation is apparent in the official REER (inflation averaged 6 per cent for 1970-73) save for a muted response to the shocks of 1971 and 1974. The parallel REER is considerably devalued relative to the official REER and tracks the terms of trade shocks closely.

Progressive devaluations of the kwacha from 1976 until the auction of 1985, had their origins in conditionality associated with International Monetary Fund credit agreements with the government. Their aim was to redress external imbalance in the Zambian economy by enhancing the competitiveness and profitability of the export sector and encouraging the development of new exports and import substitutes. The IMF's involvement with economic policy management in Zambia began in 1971 with the negotiation of a compensatory financing facility for SDR19 million, following a negative copper price shock and the flooding of Zambia's second largest mine. Financial flows between Zambia and the IMF have since been considerable. The first stand-by agreement was negotiated in 1973 covering one year and was accompanied by mild conditions. The post-1975 stabilization programs with the IMF in 1976, 1978, 1981, 1983 and 1984, with the exception of the 1976 program, all involved higher conditionality (Ndulo and Sakala, 1986).⁷

In episode 2 (1976Q3-1983Q3) the rate was pegged to the SDR and two

⁶The Rhodesian border with Zambia was closed in 1973 while civil war in Angola rendered the Benguela Railway route unusable.

⁷ The exchange rate components of the agreements are summarized in Appendix A.

devaluations enacted, of 10 per cent in March, 1978 and a maxi-devaluation in January, 1983 of 20 per cent. The NEER fell steadily until 1980, in tandem with the official REER (inflation from 1976-80 averages 15 per cent, but reached 10 per cent by 1980). The parallel REER appreciated in 1979 reflecting the more realistic official REER and a positive terms of trade shock in 1979/80. In the aftermath of the 1979/80 copper boom, inflation rose (it averaged 13 percent, 1980-83) and nominal rate depreciation was insufficient to prevent misalignment of the official REER and NEER. The premium narrowed after 1979 as a function of devaluation, terms of trade changes and increased foreign borrowing, reaching 30 percent in 1983.

The large devaluation of January, 1983 heralded a new exchange rate episode, episode 3 (1983Q4-1985Q3), where from mid-1983 the SDR link was substituted by a basket of currencies of major trading partners and a crawling peg employed. Given high levels of inflation (averaging 26 percent from 1983-85), the official REER continued to be overvalued, but the premium narrowed reaching 40 percent in the month preceding the auction.

During 1984 and 1985 the importance of role of the exchange rate as an economic policy instrument to induce the required structural adjustment was increasingly emphasized, culminating in the foreign exchange auction (episode 4 (1985Q4-1987Q2)). The stated objectives of the foreign exchange system and its accompanying measures (Bank of Zambia, 1985) were to ensure the responsiveness of the rate to changes in the demand for and supply of foreign exchange and to provide foreign exchange in a timely manner. Foreign exchange would be attracted into the banking system while the parallel market would have reduced importance. Subjectivity and the reliance on administrative mechanisms in the allocation of foreign exchange would be eliminated. A larger

volume and broader range of exports was expected to result. Further, foreign investment would be encouraged by facilitatio of the remittance of dividends and profits.

The principal feature of the weekly foreign exchange auction was that the auction rate applied to all foreign exchange transactions. Predetermined amounts of foreign exchange were allocated outside the system, but at the auction rate, for the government's imports, ZCCM and non-traditional exporters' export earnings retention quotas, crude oil imports and related port charges and IATA payments by Zambia Airways.⁸ Foreign exchange for all other imports and service payments, including the remittance of profits, dividends and transfers were obtained through the auction. The source of funds for the auction was foreign exchange from the commercial banks arising from exports of goods and services and external loans and grants. Wide support was received from the international community, especially the World Bank, the IMF and bilateral donors.

Both the parallel and official REER fell during the auction, and the gap between them narrowed.⁹ Thus the premium fell to about 30 percent in 1986, a level considered compatible with the maintenance of exchange controls. Nevertheless, high levels of inflation (see Section 7 on the Pinto Effect) induced overvaluation in the official REER.

The reversion to a fixed rate with periodic devaluations for over two years after the auction constituted episode 5 (1987Q3-1989Q4) with persistently high inflation, the official REER was progressively more

⁸ Petroleum and IATA payments were included in the auction from February, 1986.

⁹ This is seen more clearly with monthly data (discussed in Section 7).

overvalued and the real depreciation gains of the auction episode were eroded. Meanwhile the premium soared, exceeding 400 percent in 1988. This regime was superimposed by an official multiple rate system from early 1990, which was unified in the first quarter of 1991.

III. THE PARALLEL PREMIUM AND THE MACRO-ECONOMY IN ZAMBIA: 1965-1989

The premium and the stock of black market currency are generally considered to be jointly determined by the interaction of stock and flow conditions in the black market for foreign exchange (Dornbusch et al, 1983). Portfolio balance considerations, given expected yields on domestically and foreign-held assets, will govern the stock of assets willingly held; that is, there is a level of the premium that will establish stock equilibrium. Current and expected changes in economic policy or changes in exogenous variables, such as terms of trade and foreign aid, will affect the portfolio composition through the wealth effect. Flow considerations are especially emphasized in black market models: the level of the premium will influence the flows into and out of foreign currency by altering profit opportunities for smuggling, the faked invoicing of trade, tourism and the remittances of migrants. Factors affecting flow conditions, and therefore the spread, include trade controls and the risks and costs of engaging in illicit activity.

In the Introduction, the considerable changes seen in the annual black market premium were briefly discussed with reference to Figure 1. Statistics for the premium by exchange rate episode (Table 1 (b)) showed a decline in the mean premium until episode 5, while variability tended to increase with the exception of the auction period.

Examination of monthly data organized by exchange rate episode in Figure 3 (a) shows that some periods have experienced more volatility than others. The increased variability reflects the short-run impact of "news" on the premium. The black market is integrated with forward looking asset markets so that the assumption of rational expectations in conjunction with portfolio

decisions means that expectations about political events and changes in economic policy may be apparent in the premium before they occur, while political and economic shocks have an immediate impact. Whether this variation in the premium will be positive or negative depends upon the change induced or expected to be induced in the private sectors' desired holdings of foreign exchange. Dornbusch et al (1983) find expectations of major devaluations, in addition to variables capturing changes in asset stocks and the flow of foreign exchange, to be significant in explaining the Brazilian black market premium, while politics and interest rates were major determinants of the Argentinian premium (Dornbusch and Moura Silva, 1987).

In the short-run, portfolio considerations and expectations are likely to be the major determinants of the premium. The long-run steady state premium has been shown in models employing the above theoretical framework to depend on such fundamentals as the terms of trade, the budget deficit, capital flows and the trade regime (see for example Lizondo (1987b), Pinto (1988a) and Section V of this paper).

In what follows, first, the Zambian experience is considered in the light of the above cited literature. Linkages between the premium and the macro-economy are examined for each exchange rate episode, with recourse to macroeconomic indicators in Table 3 (a) and monthly premium trends in Figure 3 (a).

Secondly, we specify and estimate a simple monthly model of expectation of future devaluation, drawing on the discussion of episodes. This model accommodates the reactions to anticipated economic policy as well as to political and economic events, and can be used to study the evidence on the determinants of expectations in Zambia. Furthermore, if expectations of

future devaluations are important for the determination of the premium and our model of expectation is correctly specified, the derived series of expected devaluation should closely approximate the actual behavior of the premium.

1. Macroeconomic linkages by exchange rate episode.

1.1 Episode 1: 1964-1976Q2

Zambia attained independence from Britain in 1964, the first year of the copper boom, at the dissolution of the Federation of Northern Rhodesia, Southern Rhodesia and Nyasaland (1953-63). A very small industrial base was inherited, with manufacturing contributing less than 7 per cent of GDP and 10 per cent of formal sector employment in 1964. Agriculture contributed 12 per cent of GDP in 1964, due largely to the output of the 1200-1300 expatriate, commercial farms along the line of rail to the copper belt, most agriculture being rural and subsistence-based. Dominant in the economy from the 1920s was the copper sector, owned and managed by foreign interests and providing the major impetus for the development and settlement of the economy. At Independence copper contributed 40 per cent of GDP, 20 per cent of formal sector employment, 90 per cent of goods exports and over 60 per cent of tax revenues.

Zambia's early economic development was characterized by an increasing role for government in the economy and the imposition of economic controls. The origin of these controls lies in the practical implementation of the Zambian philosophy of "Humanism", a version of African Socialism developed in the pre- Independence political struggle by Kaunda and the United National Independence Party (articulated in Kaunda (1974)). It was considered a political necessity to address pre-Independence health and education (racial)

differentials and to provide housing, to "Zambianise" employment, and gain from expatriates economic control of agriculture, mining and industry, creating Zambian entrepreneurs. Diversification of the economy away from copper was accorded priority, a long-held view, the first allusions to which were in the 1930s (King (1987)). Agricultural and industrial development were therefore emphasized.

The 1968 Mulungushi Reforms expanded the government holding company for industry, finance and real estate by means of a 51 per cent state participation in 26 existing private enterprises, and it grew rapidly thereafter due to further take-overs and new investment. In 1976, the public share in manufacturing was over 50 per cent. Nationalization of the two major mining companies (a 51 per cent equity share) followed in 1969 with the compensatory issue of 6 per cent bonds, unconditionally guaranteed by the government and serviced out of dividends. The financial sector proved unamenable to nationalization, but various state financial intermediaries have since been created. State involvement in agriculture was via State farms and subsidized statutory monopolies dealing with the largest marketed trade. Substantial subsidies and loans were extended to parastatals while food subsidies guaranteed a quiescent urban population (politically important, comprising 50 per cent of the population). Economic controls were introduced and steadily extended post Independence, particularly after the first negative copper price shocks of the early 1970s. These included interest rate controls, wage controls, price controls in agriculture and industry, exchange controls and quantitative restrictions on trade.

The pattern of copper prices from 1950 to 1990 is shown in Figure 3 (b). A positive shock to copper prices from 1964 induced a trade surplus. Foreign

reserves were accumulated reaching a maximum in 1970 while capital inflow was modest. Government savings were positive until 1970 and amounted to about a third of national savings. Public sector capital and current expenditures rose strongly in line with the ambitious First National Development Plan (1964-71), but the budgetary position was sustainable until 1970, given high mineral revenues.

From 1965-76 real income grew at an annual average rate of 2.4 per cent. The aggregate figure reflects a decline in mining growth over the period due to rising costs and transport difficulties (-2 per cent), and slow growth in transport and communications and construction ((1.8 per cent and 1.4 per cent, respectively).

Although emphasis had been given to agricultural development, output growth was low with continued reliance on imported food and agricultural raw materials. The domestic terms of trade were against agriculture with producer prices set below border prices. Services expanded rapidly at 6.7 per cent with government demand while the manufacturing sector achieved the highest rate of growth from a low base at 7.7 per cent. However, wage increases, low interest rates, generous investment and depreciation allowances, low tariffs on capital goods and an over-valued exchange rate encouraged an import-substituting, capital intensive mode of production. By 1976, the manufacturing sector received almost 40 per cent of visible imports of which about 15 per cent were capital imports.

Thus despite an increasing government role and stated commitment to diversification, the negative copper price shock in 1974 impinged upon an economy still highly dependent upon copper (see Table 3 (b)). The first negative shocks of the early 1970s had induced balance of payments and budget

crises. The copper price recovered from 1973, but after the crash in mid-1974 persistent budget and trade deficits were the norm. These were sustained by decumulation of reserves, borrowing and the appreciation of the currency. Zambia's link with the I.M.F. was initiated with extended facility agreements in 1971-72 followed by a standby agreement in 1973. Zambian borrowing appeared to be pro-cyclical with nominal copper prices: borrowing was heavy in the 1970-75 period while Zambia was rationed by creditors during 1976-77. The imposition of more stringent import and exchange controls was discussed in Section II.2.

Black market rates are available from mid-1970 (averages of monthly rates). The trends for misinvoicing in Tables 6 (b) and (c), however, suggest considerable over-invoicing from 1964. The premium from 1964-70 is likely to reflect this increased demand for foreign assets during the copper boom as well as the effects of stringent exchange controls and political uncertainty in the first decade after Independence. The flow of illegal foreign exchange is responsive to the terms of trade, inducing a rise in the premium when the terms of trade deteriorate. In 1971 following a negative terms of trade shock the level of the premium was over 50 per cent. Thereafter it responded appreciably to changes in the terms of trade, falling with the 1972-74 improvement and rising after the 1974 crash. From 1973 the exchange rate fixed to an appreciating dollar became increasingly over-valued which exacerbated the premium's sharp rise to a maximum in 1977, only exceeded in the late 1980s after the auction.

1.2 Episode 2: 1976Q3-1983Q3

In the aftermath of the precipitous decline in copper prices from 1974, the government entered into several conditional credit agreements with the I.M.F. In line with the 1976-77 I.M.F. stand-by facility the tax base was altered, wages were frozen, subsidies cut by 30 per cent and development expenditure decreased by a third. The budget deficit was reduced but three-quarters of it was funded domestically, which added to inflationary pressures, as evidenced in Table 3 (a). With a highly restrictive import policy and a small rise in the price of copper the current account balance showed some improvement. Thereafter the pattern of large budget and trade deficits continued, mitigated only by the rise in copper prices from 1979.

The 1978-80 I.M.F. stand-by facility reduced credit and inflationary pressures, but crowded out the private sector, most credit being absorbed by the government and mining companies. From 1975, there was little capital inflow, but payments arrears built up (by 1980 amounting to \$600 million) and net foreign assets declined. Foreign reserves had by this time largely been eroded. The foreign exchange constraints forced a contraction in the manufacturing sector, services declined with government demand and agriculture continued to stagnate. Although a 1981-83 extended facility was successful in reducing the budget deficit in 1981, it became inoperative in 1982, in which year the attempt to maintain government services and employment in the face of falling revenue induced a deficit of 18 per cent of GDP. The payments deficit was financed mainly by the accumulation of arrears.

The black market premium exhibits two phases of behavior within this episode: in the first, until mid-1979, the level remains on average above 150 percent; in the second, the premium falls by 70 percent and thereafter

gradually declines, with decreased volatility. The first phase is characterized by sharp rises in inflation and large budget deficits. Zambia was rationed by foreign creditors, reserves were eroded and the terms of trade continued to decline. Tight import and foreign exchange controls compounded these effects in keeping the premium high. The second phase begins with a recovery of the copper price in 1979, resulting in a relaxation of borrowing constraints. More restrictive macroeconomic policies were pursued which together with inflows of foreign borrowing sustained the low level of the premium, even when copper prices fell in 1981 (though volatility briefly increased). Exchange rate policy was passive during the entire period, save for two devaluations.

The devaluation of March, 1978 has a negligible impact but in January, 1983 a maxi-devaluation of 20 per cent provides a classic instance of expectational response in the premium (this is the only example of a one-off maxi-devaluation throughout). The theoretically predicted time path for the adjustment of the black market to current expectations of a future devaluation of the nominal exchange rate is shown in Figure 3 (c) (Dornbusch et al (1983)). Speculators expect that in the long-run a convergence to the initial steady state level of the premium will ensue; this would necessitate a future depreciation of the black market rate. The profit opportunities this presents induces an immediate increase in the demand for foreign exchange and hence a jump in the premium from A to A'. Thereafter, the premium rises over time to A'', in combination with a growing stock of foreign currency. When the official devaluation is realized, an immediate fall in premium from A' to A''' occurs, due entirely to the fall in the official rate. The black rate does not alter concomitantly with the official rate since this change was

anticipated in the initial jump to A'. Thereafter, the transitory accumulation of foreign currency is gradually depleted, and the premium returns to its initial steady - state level.

The behavior of the premium in Zambia around 1983 is shown in Figure 3 (c) to follow the theoretically predicted path. The black market rate did not alter at the time of the devaluation, but depreciated subsequently.

The derived expected devaluation series covering the period before and after the January 1983 devaluation is depicted in Figure 3 (e) (discussed in III.d). It is noteworthy that both series confirm the prediction of the theoretical model. This supports two assertions mentioned at the beginning of this section. First, expectations are important as determinant of the free rate premium; and secondly, our empirical model of expectation seems to be well specified, at least for the period in question.¹⁰ The non-normal distribution of the premium suggested by such speculative responses is discussed further in Section V.

1.3 Episode 3: 1983Q4-1985Q3

This episode coincides with the onset of liberalizing reforms in connection with the 1983-84 IMF stand-by agreement, later intensified in the auction period. Following the January 1983 devaluation more emphasis was placed on active exchange rate policy to facilitate balance of payments adjustments. The Fund recommended delinkage from the SDR, given that its value is determined by a basket of currencies with little relevance for Zambia's trading patterns. A mechanism for gradual, systematic exchange rate

¹⁰This demonstration has employed monthly black market rates which therefore embody lags in reaction time. They were derived from Pick's Currency Yearbook, concerning which data cautionary comments have already been made.

adjustment was installed. Most of the performance criteria under the program were met. The budget deficit was reduced from 19 to 8 per cent of GDP, in particular by cutting subsidies and personal emoluments. However GDP continued to decline and inflation began to accelerate. The final purchase in the agreement was disallowed due to postponement of paying arrears. Most measures associated with the stand-by facility of 1984-86 were implemented. However, GDP fell by 2.7 per cent and inflation rose above 20 per cent. The facility was inactive from September, 1984 when criteria for the reduction of external payments arrears were not met, and it was canceled in 1986.

The black market premium showed a steady fall in this period from 30 per cent to about 17 per cent in September, 1984. An instance of the short-term response of the premium to news is provided by the increase of 10-fold on termination of the IMF program. The steady decline persisted after this jump, but from the higher level and at a reduced rate, despite the increased rate of crawl.

1.4 Episode 4: 1985Q4-1987Q2

As Figure 3 (a) and Table 1 (b) show, the auction period displays an increased volatility in the premium together with a spectacular trough in April, 1987. The auction raises a number of interesting issues for the analysis of the role of the black market premium. These include the extent to which unification was achieved and the rate which ensued, the short-run impact of shocks and signals on the premium, and finally, the fiscal effects of the unification (Pinto, 1987).

Some models predict that anticipation of unification will induce the parallel rate to move to the level expected to obtain on unification. This

appears to hold for Zambia, with overshooting; Figure 3 (d) shows the extent to which depreciation of the parallel rate tracked the official rate around the auction episode. The premium follows a downward trend within the first quarter of the auction. Thereafter short-run influences shape its path.

An important aspect of expectations formulation in the context of structural adjustment is the private sectors' assessment of the sustainability of liberalization measures and the government's commitment to them. These issues of credibility have increasingly been emphasized (Calvo, 1987). Sachs (1989) further suggests that past experience of aborted liberalization attempts makes players particularly sensitive to official signals of commitment and credibility.

Zambia's foreign exchange auction provides an interesting illustration of these phenomena. During the auction there were several mechanisms for the transmission of official signals. The amount of foreign exchange put up for auction each week was a visible official control variable: fluctuations induced increasing excesses of dollars requested over those allocated (see Appendix Table A.3(a)). The degree and nature of intervention in the running of the auction affected credibility. Intervention included disqualification of bids, more stringent documentation requirements, suspension temporarily or permanently of the auction and alteration of the type of auction system.

Table 3 (c) details shocks and signals influencing the black market premium during the nineteen month auction period. The short-run influence of shocks and signals appear to dominate the behavior of the premium during this period, which also shows sensitivity to "news" about the auction. Official actions signalling commitment and sustainability decrease the premium, and visa versa. The response to political news is evident on Dr. Chivuno's

appointment as Governor of the Central Bank: he was known to be opposed to the auction. Efficiency in implementing the system would be observed at the micro-level: the large back-log in allocated dollars that built up from August, 1986 was not sustainable (disbursement delays averaged 10 weeks and were not cleared until May, 1987) and the premium is seen to rise thereafter.

The implication of speculative responses on the part of firms to official signals was further to impair economic sustainability of the liberalization. Visible speculative behavior implied an uncertain macro-economic environment which decreased business confidence. Very rapid devaluation in the final stages, due to speculation by firms, actually rendered the premium negative. With an imminent end to the auction and a clamp-down on illegal activity in prospect, the risk aspect of black market activity is revealed in a deficit with respect to the official rate being paid in kwacha for the purchase of dollars. This phenomenon was observed for Brazil (Dornbusch et al, 1983).¹¹

The auction can be divided into two phases, a stable period from its inception to August, 1986, and an unstable period thereafter, until its demise in April, 1987. This division is based on whether or not there is an appropriate response in the official exchange rate to the quantity of dollars allocated. Although the advent of Chivuno saw a trebling of allocated dollars, a perverse response in the exchange rate can only be observed from Auction 47, on the last day of August (see Appendix A.3(a)). The fiscal position in these two phases of the auction is analyzed in Section 7.2.

¹¹We hope in the future to study the impact on the premium of signals and speculative responses during the auction period in the context of a rigorous empirical model using weekly auction data.

2. A Model of Expected Devaluation

The derivation of a forecast equation for expectations of future devaluation starts with the following assumed government reaction function:

$$(3) \quad \Delta \log E_{0,t+1} = b_0 + \sum_{i=0}^k b_{1i} \log (RER_b / RER_0)_{t-i}$$

where

$$RER_b = \frac{E P_b^*}{p} \quad \text{and} \quad RER_0 = \frac{E_0 P^*}{p}.$$

This reaction function implies that if the official real exchange rate RER_0 was overvalued (smaller) relative to the black market real exchange rate there will be a pressure on the authorities to devalue. Note that given the particular definitions of the real exchange rates adopted, the reaction function is actually governed by previous periods' levels of the premium (since $RER_b / RER_0 = q$).

Now we also assume that agents in the economy know this reaction function and that this influences their considerations; they also take into consideration the record of previous devaluations and the history of monetary emissions. Furthermore, given the various regime shifts over the period considered (see above) a set of dummy variables is included to account for this effect on expectations. Based on this, the following linear forecast equation is used to generate expectations:

The results show significant effects for the role of the authorities reaction to past overvaluation of the official real rate relative to the free real rate given by $\log RER_t - \log RER_0$ (or simply $\log q$). This factor however, only takes effect with a lag. Overvaluation two months earlier has a positive effect on expected devaluation. The effect of expansive fiscal or monetary policy is reflected by the statistically significant and appreciable positive coefficient of the log of the stock of nominal broad domestic money. This effect is more immediate than that of real overvaluation currently influencing expectations of next period devaluation. This evidence shows the importance of fiscal and monetary policy in shaping agents' expectation about future devaluations.

The model also shows, as expected, that starting from an initial condition of high official exchange rate is likely to reduce expectations of future devaluations. This is reflected by the large negative and statistically significant elasticity obtained for $\log E_{0,t-1}$ in the model. The remaining influences on the model are accounted for by a variety of past economic and political events (see Table 3 (c)). In all cases the obtained results are consistent with the interpretation of the model and the discussions of the various episodes in the coming sections.

In January, 1983 a maxi-devaluation was effected which would of course reduce expectations of an immediate future devaluation. The dummy proves to be slightly significant, given the degrees of freedom, and displays the expected negative sign.

All the other dummies serve to capture signals of credibility in the course of the auction episode. The auction was initiated in October, 1985.

In the first of the weekly auctions, the rate fell from K2.2 to K5.01/\$ and thereafter stability was maintained in the rate, generating no expectation of an immediate devaluation.

From June, 1986 weekly bids were published in an effort to stabilize the auction, a credibility signal likely to decrease speculation. But from September, 1986, after the institution of a 'Dutch Auction', the foreign exchange pipeline began to build up, indicating possible unsustainability of the auction and inducing speculation. In January, 1987 after riots on the Copper Belt, the auction was suspended for nine weeks. Expectations of devaluation were clearly negative; this was dramatically reversed in March, 1987, when a two-tier auction was reinstated. In April, 1987 just prior to the abolition of the auction experiment, tremendous speculation drove down the rate and repressive reaction from the authorities actually rendered the premium negative. A fixed rate was again in prospect.

IV. A MODEL OF THE PARALLEL PREMIUM

The preliminary analysis presented above indicate that the parallel market premium in Zambia is influenced by (or jointly determined with) a variety of factors including macroeconomic and trade policies, agents expectations, as well as exogenous determinants such as TOT and foreign aid.¹²

In this section we develop first a basic model of dual exchange rates in which the premium will be specified as a function of the stock of money, and the uncovered interest parity differential, reflecting the asset market condition; as well as the flow determinants which include the official real exchange rate (E_o/P_N), permanent real wealth (or stock of money), and the parameters of trade policy.

This basic model which does not endogenize the official RER is more suited for estimation with finely sampled data such as monthly data. The main emphasis in such estimation should be to distinguish the long-run flow determinants of the premium from the short-run (dynamic) asset market influences. In this case a formal analysis of stationary and cointegration can be quite useful, because it will resolve the problem of endogeneity and provide a justification for an error-correction dynamic framework -- which allows the distinction between short-run and long-run effect.

The second objective of this section is to extend the basic model by endogenizing RER, as a function of its fundamentals as well as allowing for other exogenous factors such as foreign aid. This extended model will be estimated in section (V) using annual data. In this model the obvious

¹² It is also evident that in the very short run a combination of market thinness and agents reactions to frequently changing policies might have caused the premium to follow a skewed or non-stationary process (see appendix table A.5(a)).

emphasis will be on a more detailed view of the determinants of the premium.

1. The Basic Model

We assume a dual exchange rate system where an officially sanctioned share, z , of total exports, are required to be surrendered to the authorities at the official rate. Also a share of imports, v , of total private sector imports, I , is allowed through the official market at the rate E_0 along with the exogenously given government imports \bar{I}_g . The rest of the commercial transactions are settled at the black (free) market according to the freely floating dual rate, E_b . The effectiveness of the above arrangements depends on the extent of leakages between the two markets which in turn depends on the tax adjusted level of the premium $\left(q = \frac{E_b}{E_0(1-t_x)} = \frac{q}{1-t_x} \right)$, and enforcement

efforts, 1_{ENF} .

Therefore we define export smuggling and under-invoicing ratio, ϕ_x , relative to the z exports (zX) as:

$$(4.1) \quad \phi_x = \phi_x \left(\frac{q}{1-t_x}, 1_{ENF} \right)^{13}$$

(+) (-)

As for imports we abstract from smuggling and concentrate on modelling

¹³where 1_{η} is an indicator function in η .

the over-invoicing ratio of official imports (ϕ_I), ϕ_I :¹⁴

$$(4.2) \quad \phi_I = \phi_I \left(\frac{q}{1+t_I}, 1_{ENF} \right)$$

(+) (-)

Equation (4.1) sets an arbitrage condition for the decision to smuggle or under-invoice exports according to the excess of E_s over the tax adjusted nominal official rate $E_o(1-t_x)$. In eq. (4.2) also, the higher the ratio $E_s/E_o(1+t_i)$ the higher the incentive to over-invoice the set of imports (ϕ_I) allowed through the official market. On the other hand enforcement efforts will raise the cost of smuggling or mis-invoicing and therefore both ϕ_x and ϕ_I will decline as a result of intensified enforcement efforts.

Key relative prices needed for the specification of total private sector exports, x , and imports, I , are the real exchange rates for exports and imports, which we define as follows:

$$(4.3) \quad RER_x = \frac{P_x^*}{P_N} \cdot [z \cdot \phi_x E_b + (1-z) (1-t_x) E_b + z (1-\phi_x) (1-t_x) E_o]$$

$$= e_o \cdot P_x^* [z \phi_x \cdot q + (1-t) (1-t_x) q + z (1-\phi_x) (1-t_x)]$$

where, e_o , the official RER is equal to $\frac{E_o}{P_N}$.

Similarly RER_I is given by:

¹⁴ $\phi_I = (\text{official over invoiced imports/actual official imports}) - 1$.

$$(4.4) \text{ RER}_I = P_I^* [(\phi_I+1) vE_o(1+t_I+t_{QR}) + (1-v) E_b (1+t_I)] / P_N$$

$$= e_o \cdot P_I^* [(\phi_I+1) v(1+t_I+t_{QR}) + (1-v) (1+t_I) q]$$

where t_{QR} is the implicit tax rate that reflects scarcity rent in imports channeled through the official market. Now write total exports as a positive function of RER_I :

$$(4.5) \quad X = X(\text{RER}_I) \\ (+)$$

Next we define total private imports,

$$(4.6) \quad I = I(\text{RER}_I, \frac{M + E_b F}{vE_o + (1-v) E_b}) \\ (-) \quad (+)$$

where $M+E_b F$ stands for private sector financial wealth with M being the stock of domestic money, and F the stock of foreign assets held by the private sector. Nominal wealth is deflated by vE_o , $(1-v)E_b$, the average unit cost of imports.

Now we state the following flow equilibrium conditions of the model:

$$(4.7) \quad \dot{F} = [\phi_x \cdot Z + (1-Z)] X + v\phi_I \cdot I - (1-v) I$$

$$(4.8) \quad \dot{R} = (X-I) - \dot{F} - \bar{I}_g + NkF$$

where \dot{R} is the change in official reserves, and the last term in the right

hand side of (4.8) is official net capital flows.

The second part of the model is a portfolio equilibrium condition which gives the relative stock of foreign and domestic monies as a function of the uncovered interest parity differential. Letting X_{t+1} denote conditional expectation of X_{t+1} conditional on information available at time t , the portfolio balance condition can be stated as:

$$(4.9) \quad \frac{M_t}{M_t + E_b F_t} = g(i_t^* + {}_t\Delta \log E_{b_{t+1}} i_t), g' < 0$$

We also have

$$(4.10) \quad {}_t\Delta \log E_{b_{t+1}} = {}_t\Delta \log q_{t+1} + {}_t\Delta \log Eo_{t+1}$$

where Δ is the difference operator. Expectations of future devaluations are based on the expectations model given in equation (3.2) of section III above. As we mentioned in section III this model accounts for the impact on expectation of past economic policy as well as past economic and political events.

By imposing the flow equilibrium condition on the unreported current account equation (i.e. $\dot{F}=0$ in (4.7)), we obtain the following expression

for the stationary level of F.

$$(4.11) \quad F = F (RER_x, RER_I, m, q, t_x, t_I; z, v, 1_{ENF})^{15}$$

(+) (+) (-) (+) (+) (+) (?) (?) (-)

where $m = \frac{M}{E_0}$ is the stock of real domestic money, clearly for given values of the right hand side (especially RER_x , RER_I , and m), equation (4.11) is a steady state solution for F that provides a long-run (non-dynamic) expression for the premium depending on the fundamentals of the flow equilibrium condition.

Equation (4.9) on the other hand is a dynamic specification that governs the dynamics of the premium, and hence its short-run determination. Putting (4.11) in (4.9) and using (4.10), we obtain the following basic model of the premium in a linear logarithmic form:

$$(4.12) \quad \begin{aligned} \log q_t - \lambda_t \log q_{t+1} &= \delta_0 + \delta_1 (i_t^* + {}_t\Delta \log E_{0,t+1} - i_t) \\ &+ \delta_2 \log m_t - \delta_3 \log RER_{x_t} - \delta_4 \log RER_{I_t} \\ &+ \delta_5 \log (1-t_x)_t + \delta_6 \log (1+t_I)_t \\ &+ \delta_7 1_{[ENF, v, z]} \end{aligned}$$

This equation provides a basis for estimating a basic cointegrated relationship for the premium.^{16 17} Specifically, if a forward-looking solution of this martingale exists, and if the variables involved (or a subset of them) are cointegrated, then a cointegrated specification and a

¹⁵ Actually the sign on RER_I is ambiguous, unless $v \neq > 1-v$ (see equation 4.7).

¹⁶ Refer to the discussion in the second paragraph of this section.

¹⁷ The potential endogeneity of RER_x , RER_I and m_t for example, is not a problem under individual nonstationarity and cointegration.

corresponding error-correction dynamic equation can be obtained as well.

2. Endogenizing the RER

As we mentioned above, equation (4.12) contains at least four endogenous variables: the premium, q ; the real exchange rates, RER_x and RER_i ; the stock of money, m ; and the domestic interest rate, i . In this subsection, we will endogenize the real exchange rates by deriving an expression for the real rates by solving for the equilibrium condition in the nontraded goods market.¹⁸

Following Rodriguez (1989, 1991), the internal balance condition can be stated as follows:

$$(4.13) \quad D_N (P_I, P_X, P_N) \cdot A - S_N (P_N, P_I, P_X) \cdot Y = 0$$

$$\quad \quad \quad (+) (+) (-) \quad \quad \quad (+) (-) (-)$$

¹⁸We abstract here from the potential endogeneity problems of m and i ; but under monetary rule $\dot{R}=0$ for example, the steady state level of m , is given by $m^* = \frac{g-t}{\pi}$ where π is the steady state rate of crawl of the official exchange rate, hence the steady state stock of money does not depend on q (see Elbadawi [1991] for details). Regarding the interest rate, no data on the potentially endogenous market determined rate is available for Zambia in a consistent basis over the period considered; we are therefore left with the official rate which can be considered predetermined, at least for the period before the auction. This, however, may call into question the suitability of the official rate for reflecting the opportunity cost of holding foreign money as required in specification (4.9).

where A is nominal absorption, Y is nominal income, and the definition of P_N is extended here to include a weighted average of purely domestic goods, as well as of those imported items where scarcity rent (i.e. $t_{QR} > 0$) exists. This leaves P_x and P_I to be determined by foreign prices, exchange rates and explicit taxes. Now abstracting from misinvoicing we can state the following two basic definitions for P_x and P_m .

$$(4.14) \quad P_x = P_x^* [(1-z)(1-t_x) E_b + z(1-t_x) E_o]$$

$$(4.15) \quad P_I = P_I^* [(1-v)(1+t_I) E_b + v(1+t_I) E_o]$$

Now imposing the nominal price homogeneity condition on the home good equilibrium condition (4.13), we obtain:

$$(4.16) \quad \begin{aligned} D_N \left(\frac{P_I}{P_N}, \left[\frac{P_x}{P_I} \right] \cdot \left[\frac{P_I}{P_N} \right] \right) \cdot (1 + td) \\ = S_N \left(\frac{P_I}{P_N}, \left[\frac{P_x}{P_I} \right] \cdot \left[\frac{P_I}{P_N} \right] \right) \end{aligned}$$

where $td = \frac{A-Y}{Y}$ is the resource balance deficit normalized by GDP.

The solution of (4.16) and definition (4.14) and (4.15) lead to the following expressions for P_x/P_N and P_I/P_N :

$$(4.17) \quad \frac{P_I}{P_N} = \frac{P_I}{P_N} \begin{pmatrix} \frac{P_X}{P_I}, & td \\ (-) & (-) \end{pmatrix} = \frac{P_I}{P_N} \begin{pmatrix} \frac{P_X}{P_I} \left[\frac{P_X^*}{P_I^*}, t_x, t_I, v, z, g \right], & td \\ (-) & (+) \begin{matrix} (-) & (-) & (+) & (-) & (?) \\ (-) & (-) & (+) & (-) & (?) \end{matrix} \end{pmatrix} \begin{pmatrix} (-) \\ (-) \end{pmatrix}$$

$$(4.18) \quad \frac{P_X}{P_N} = \frac{P_X}{P_N} \begin{pmatrix} \frac{P_X}{P_I}, & td \\ (+) & (-) \end{pmatrix} = \frac{P_X}{P_N} \begin{pmatrix} \frac{P_X}{P_I} \left[\frac{P_X^*}{P_I^*}, t_x, t_I, v, z, g \right], & td \\ (+) & (+) \begin{matrix} (-) & (-) & (+) & (-) & (?) \\ (-) & (-) & (+) & (-) & (?) \end{matrix} \end{pmatrix} \begin{pmatrix} (-) \\ (-) \end{pmatrix}$$

From the definitions of RER_X and RER_I in (4.3) and (4.4) and from equations (4.14) and (4.15) that give the expressions for P_X and P_I , we can define RER_X and RER_I in the following generic forms:

$$(4.19) \quad RER_X = \frac{P_X}{P_N} \cdot g_X \begin{pmatrix} z, 1_{ENP} \\ (?) (?) \end{pmatrix}$$

$$(4.20) \quad RER_I = \frac{P_I}{P_N} \cdot g_I \begin{pmatrix} v, 1_{ENP} \\ (?) (?) \end{pmatrix}$$

Now let us define an economy wide real exchange rate as a weighted geometric average of RER_X and RER_I ,

$$(4.21) \quad RER = RER_X^a \cdot RER_I^{1-a} = \left(\frac{P_X}{P_I} \right)^a \cdot \left(\frac{P_I}{P_N} \right) \cdot g_X^a g_I^{1-a}$$

where $0 < a < 1$ is the share of exports in traded goods.

Finally using (4.17) and (4.18) in (4.21) we can obtain the reduced form

for RER;

$$(4.22) \quad RER = RER \left(\begin{array}{cccccccc} \frac{P_x^*}{P_I^*}, & 1-t_x, & 1+t_x, & q, & td; & v, & z, & 1_{ENF} \\ (+) & (+) & (-) & (?) & (-) & (?) & (?) & (?) \end{array} \right)$$

where we assumed the more direct effect of $\frac{P_x^*}{P_I^*}$ on RER through $\frac{P_x}{P_I}$ to be

stronger than its influence through $\frac{P_I}{P_N}$, but in general the coefficient of

TOT could not be signed a priori. Now substituting (4.21) and (4.22) in (4.12) gives the following extended expression for the premium presented in equation (4.23) below. The right hand side of the specification includes net capital flow term NKF. NKF enters into (4.23) directly through the official balance effect (equation (4.8)), and as a proxy for the total current account deficit GDP ratio (td).

$$\begin{aligned}
 \log q_t - \lambda_t \log q_{t+1} &= \delta_0 + \delta_1 (i_t^* + {}_t\Delta \log EO_{t+1} - i_t) \\
 &+ \delta_2 \log m_t + \delta_3 \log (1-t_x)_t \\
 &+ \delta_4 \log (1+t_I)_t - \delta_5 NKF_t \\
 (4.23) \quad &- \delta_6 \left(\alpha_0 + \alpha_1 \log \left[\frac{P_X^*}{P_M^*} \right] + \alpha_2 \log (1-t_x)_t \right. \\
 &\left. - \alpha_3 \log (1+t_I)_t - \alpha_4 NKF_t + \alpha_5 1(v, z, ENF) \right) \\
 &\qquad\qquad\qquad (?) (?) (?)
 \end{aligned}$$

or

$$\begin{aligned}
 \log q_t - \lambda_t \log q_{t+1} &= \gamma_0 + \gamma_1 (i_t^* + {}_t\Delta \log EO_{t+1} - i_t) \\
 &+ \gamma_2 \log m_t + \gamma_3 \log (1-t_x)_t \\
 &+ \gamma_4 \log (1+t_I)_t - \gamma_5 \log \left(\frac{P_X^*}{P_M^*} \right)_t \\
 (4.24) \quad &- \gamma_6 NKF_t \\
 &+ \gamma_7 1(v, z, ENF) \\
 &\qquad\qquad\qquad (?) (?) (?)
 \end{aligned}$$

where as before direct effects are assumed to dominate indirect effects (for the cases of $\log (1+t_I)$ and NKF).

V. EMPIRICAL DETERMINATION OF THE PREMIUM

Estimation of this model with monthly (or even quarterly data) proved to be quite a formidable task because the regime shifts - which tend to average out in the annual estimation - are important in this case. Therefore, we elected to undertake this exercise in a rigorous and detailed fashion in a separate future work. In section III above however, we discussed the role of expectations as a determinant of the premium using monthly data.

In this paper therefore, only the extended model of equation (4.24) will be estimated using annual data. Tables A.5(a) and A.5(b) contain some indirect diagnostic tests, based on the statistical properties of the annual premium. It is clear from the tables that both the unconditional distributions of the premium and the rate of change of the premium exhibit departures from normality, while no departure from normality is found for the conditional distribution of the premium rate of change (the residual of (5.24')). The potential causes of the departures from normality are mentioned in footnote (9) above; but the important economic implication of the above simple tests, is that the determination of the premium, at least in the long-run, is solely accounted for by economic fundamentals.

1. The Annual Model

An eclectic error-correction model based on equation (4.24) of the previous section is estimated using annual data from the period 1970-1987. The variables involved in the estimation are reported in table A.5(c) and equation (5.24') contains the results of OLS estimation. To conserve on the degrees of freedom; we impose the condition that the RER fundamentals (TOT, taxes, and NKF) enter only in levels, ie. they are restricted to influence

only the long-run specification of the premium.

$$\begin{aligned}
 (23') \quad \Delta \log q_t &= 1.69 - 0.40 \log \text{TOT}_t \\
 &\quad (1.50) \quad (-1.58) \\
 &\quad - 0.03 \log \text{GRANT}_t - 0.21 \log m_t \\
 &\quad (-.91) \quad \quad \quad (-1.33) \\
 &\quad + 0.42 \Delta \log m_t \\
 &\quad (1.63) \\
 &\quad + 0.31 (i_{t-1}^* + {}_{t-1} \Delta \log E_0 - i_{t-1})^{19} \\
 &\quad (2.20) \\
 &\quad \quad \quad -0.45 \log q_{t-1} \quad + 0.24 \text{DUM}(70-77) \quad - 0.15 \text{DUM}(82-87) \\
 &\quad \quad \quad (-2.35) \quad \quad \quad (2.45) \quad \quad \quad (-1.30)
 \end{aligned}$$

$$R^2 = 0.82, \quad R^{-2} = 0.62, \quad \text{DW} = 1.60, \quad Q(7) = 3.4$$

where t-statistics are in parentheses and the method of estimation is OLS, and Q (7) is the Box-Pierce statistic for residual autocorrelation to 7th order. Given the paucity of the data and the short period available for estimation, the above estimating equation is fairly successful. The explanatory power of the model is quite satisfactory and no evidence of mis-specification is present. Most of the variables are statistically significant and the signs of the coefficients are all consistent with the predictions of the theoretical model.

The asset market determinants: the interest parity differential and the change in the stock of real domestic money, have significant and positive

¹⁹The expected devaluation series used in the construction of the interest parity differential term of the above equation, is based on the annualized predicted values obtained from the appendix estimating equation (A.1'). This equation is a quarterly version of equation (3.2) discussed in section III above; see also table A.5(c).

influence on the premium. Interestingly enough the level of the stock of real domestic money (reflecting the real wealth effect) was not found to be significant. The explanation for this is that the TOT and GRANT (proxy for NKF) terms provide for better indicators of the flow effect of permanent wealth. In an economy highly dependent on the export of a single commodity and on foreign aid like the Zambian economy, these two factors may be major determinants of permanent real wealth.

The effects due to the levels of log TOT and log GRANT on the premium are both negative.²⁰ No satisfactory measure for the relative tax variable is available, and hence we dropped it from the regression.²¹ The effect due to the TOT operates through at least three channels. Two indirect channels through the real wealth and real exchange rate flow effects. An improvement in TOT leads to appreciation in real wealth and hence a rise in the premium. The effect of TOT improvements through the RER channel depends on whether the change in TOT leads to RER depreciation or appreciation. The third, and what appears to be the dominant, channel is the direct effect of TOT on the supply of foreign exchange which will have the effect of reducing the level of the premium.

The effect of foreign aid (GRANT) on the premium operates through two channels. A reduction in foreign aid (directly) worsens the official current account (equation (10)), as well as the unofficial current account balance through a reduction in v (the share of official foreign exchange sale to

²⁰The effects due to TOT and GRANT are statistically significant at the levels 0.15 and 0.40 respectively. TOT and GRANT appears to be correlated, however, and re-estimation of the above equation with GRANT dropped improves the significance of TOT coefficient.

²¹In fact we included a term given by import tax revenue to GDP, but the results worsened substantially.

imports) A reduction in foreign aid however, will ceteris-paribus lead to real depreciation and hence a reduction in the premium. The results show that this last channel is dominated by the direct effect on the flow balance. The above evidence indicates that the recent sharp declines in the copper prices as well as the increasing difficulties of external finance, might have compromised economic reforms aimed at reducing the premium and achieving ultimate exchange rate unification. The negative significant effect of the lagged log of the premium, shows that a high premium in the previous period is likely to lead to less increase in the rate of growth of the premium in the following period. Also the negativity of the coefficient of $\log p_{t-1}$ implies that in the long run, the premium depends negatively on TOT and GRANT. Finally DUM (70-77) and DUM (82-87) represent two different exchange rate and trade regimes where the premium rose over the first period and steadily declined during the second, see figure 1 of section 1 above.

VI. THE EFFECTS OF THE PREMIUM ON TRADE.

In this section the importance of the premium's link to reported and unreported (illegal) foreign trade transactions will be assessed. We will estimate econometric specifications (based on the reduced forms of section IV above) for reported import demand and reported copper export supply,²² while the extent of misinvoicing in foreign trade will be quantified using various statistical techniques.

1. Reported Trade Flows.

Reported Total Private Imports:

According to equations (4.1) and (4.6) of section (IV) above, we can write reported private imports $(I_r = v \cdot \phi_I I + (1-v)I)$ in the following generic form:

$$(6.1) \quad I_r = \left(v \cdot \phi_I \left(\frac{q}{1+t_I}; 1_{ENP} \right) + (1-v) \right) \cdot I (e_o, q, m, F; v, 1_{ENP})$$

(+)
(-)
(-)
(-)
(+)
(+)
+ (-)

According to the above equation $e_o = E_o / P_N$ has a negative impact on recorded imports, while I_r is positively influenced by real wealth (m and F). The effect due to the premium could not, however, be signed a priori: a rise in q discourage demand for aggregate imports I , but it also lead-for a given tax rate-to an increase in the over-invoicing ratio, ϕ_I . Furthermore, clearly both I and q are jointly determined; hence the endogeneity of q must be corrected for in the estimation of the I_r specification. I_r is also

²² Zambian exports other than copper are very marginal. Also the technology and arrangements of copper exports in Zambia do not allow for misinvoicing or smuggling of copper.

influenced by discretionary government policy: positively by the ratio of official foreign exchange sale, v , and negatively by government enforcement efforts.

Based on equation (6.1), we estimated an empirical linear logarithmic dynamic equation for I , using quarterly data from 1970:3-1987:4. The empirical specification is based on the framework developed in Moran (1989).

Moran (1989) specified a demand for imports I_r^d , and a linear relationship

linking the long-run volume of imports I_r^* with long-term reserves r^* given

by

$$(6.2) \quad I_r^* = \alpha_0 + \alpha_1 I_r^d, \quad 0 \leq \alpha_1 \leq 1.$$

And another specification linking actual change in reserve to foreign exchange availability, f , and actual imports:

$$(6.3) \quad \Delta I_r = f_t - I_{r_t}$$

Subject to these two conditions and a specification for the demand for imports I_r^d

he posed the problem as choosing I , to minimize:

$$(6.4) \quad C_t = b_1 (I_{r_t} - I_r^*)^2 + b_2 (I_{r_t} - r_t^*)^2 + b_3 (I_{r_t} - I_{r_{t-1}})^2 + b_4 (I_{r_t} - I_r^d)^2.$$

In our case we use a linear logarithmic specification for I^d , based on

(6.1) with real wealth (m and F) represented by real output.²³

$$(6.5) \quad \log I_{r_t}^d = a_0 + a_1 \log q_t + a_2 \log e_{o_t} + a_3 \log y_t + a_4 \log (1+t_r)_t + a_5 1_{[INF,v]}$$

where $1_{[INF,v]}$ represent indicator variables for enforcement and commercial policy.

Minimizing (6.4) above and using (6.2), (6.3), and (6.5), we obtain the following estimating equation for reported imports, where we impose the

condition that $I_r^* = f = \text{constant}$.

$$(6.6) \quad \log I_{r_t} = \beta_0 + \beta_1 \log q_t + \beta_2 \log e_{o_t} + \beta_3 \log y_t + \beta_4 \log (1+t_r)_t + \beta_5 \log I_{r_{t-1}} + \beta_6 \log r_{t-1}$$

The estimation results of (6.6) using quarterly data from 1970:3 - 1987:4 is presented below.

$$(6.6') \quad \log I_{r_t} = -6.06 + 0.09 \log q_t - 0.18 \log e_{o_t} + 0.63 \log y_t + 0.22 \log R_{t-1} + 0.72 \log I_{r_{t-1}}$$

(-1.53) (1.30) (-2.98) (1.21) (5.36) (11.88)

-2

R = 0.87, DW = 1.94, Q(24) = 27.2

t - statistics are in parentheses and the method of estimation is OLS.²⁴

²³We also used M2/Eo for real wealth but it was found to be insignificant.

²⁴Attempts to correct for the potential endogeneity of the premium, q, by running a 2SLS were not successful in producing a meaningful empirical specification for I.

Other potential determinants of I, such as foreign trade taxes, and the indicator variables for foreign trade policy such as own resources or enforcement efforts were all not found to be significant. The above results seem to provide broad support for the predictions of the model. The effect due to e_t is appreciable and significant. Official real appreciation will lead to increased demand for official or recorded imports.

The effect due to the premium is significant at 10 percent significant level and with positive though small short-run elasticity at 0.09; the derived long-run elasticity, however, is high at 0.32. This result shows that the effect of the premium through the over-invoicing ratio dominates its negative influence on aggregate demand for import. The effect due to real income is quantitatively high, with a 0.63 short-run elasticity and a long-run elasticity bigger than 2; but the income effect is only marginally significant. The results also show the presence of considerable inertia in the demand for reported imports: the elasticity of lagged imports is equal to 0.72 and is significant at any reasonable significant level. Finally it is also clear from the positive and significant effect due to official reserve that the effect of foreign exchange constraint is an important factor in the determination of the level of reported imports.

Copper Exports:

Four main considerations figure in our empirical estimation of copper export specifications in Zambia. First, we decided to model it as export supply with foreign prices for copper taken as exogenous. The exogeneity of foreign prices is justified by the slowing international demand for copper and

the declining share of Zambian copper exports.²³ In this case, the main relative price factor should reflect the relative domestic structure of incentives for copper production. Specifically, we considered a relative price, RER_{cub} , given by the ratio of the domestic price of copper to the building price index, the latter being a proxy for the domestic price of non-traded goods. Second, the technology of copper export supply in Zambia effectively precludes smuggling or mis-invoicing of copper exports; thus the parallel premium is not likely to have a direct disincentive impact on copper export supply. The premium, however, is a good proxy for foreign exchange shortages, which during 1975/76-1989 became the most important constraint, with a direct impact on copper production and exports.

The third consideration in modelling copper exports in Zambia is the issue of regime shifts. There is clear evidence of a regime shift in the production and export of copper over the 1960-1990 period. From 1960-1975, transport presented the principal constraint for the copper companies. Zambian production fell 75,000 tons in 1966, due to transport problems and fuel shortages associated with the unilateral declaration of independence in Rhodesia (1965). Another one-shot event that impacted on copper exports was the Mufulira mining disaster in late 1969. The completion of the TAZARA railway line late in 1975 saw a surge in exports in 1976 as accumulated stocks were cleared. From 1975/76-1989, foreign exchange and skills shortages predominated. Increased government control after nationalization in 1970 made

²³The Zambian share of world copper production fell from 13 per cent in 1961 to 6.7 per cent 1982-84 (World Bank Commodity Staff Working Papers, No. 15, 1987).

the companies susceptible to multiple and sometimes conflicting objectives.²⁶ During the 1980s, the major factors responsible for a 30 percent fall in production were skills and foreign exchange shortages, transport problems and poor mineralogy (a declining ore grade over time). Further, there was considerable government diversion of the company's resources into non-mining expenditure. These constraints outweighed the effect of a more favorable RER_{cub} .²⁷

There were two episodes of export revenue taxation: a dual regime of royalties from 1960 and an export tax on sales from mid-1966 up to mid-1969; and a mineral export tax on sales from 1984-88. The precise impact of taxation on the copper sector requires a more detailed study, but it can be argued that the taxation regime of the 1960s (aimed at windfall gains during the 1964-74 boom) constituted no serious disincentive to supply in the current and immediate future, but rather to new mining investment (Garnaut and Ross, 1985). The taxation episode in the 1980s, however, proved damaging to the company.

The fourth and final consideration is that the exportable volume of copper will be affected by capacity constraints; increasing production in the short-run can be quite costly, hence considerable inertia may be present in the production and export of copper.

The above considerations motivated us to model the export of copper (in thousand of tonnes) as a linear logarithmic function of the following

²⁶ The copper companies were 50 percent nationalized in 1970, but continued to be managed by the previous owners until early 1975. The state's share was increased to 60 percent in 1979, and the companies were merged to form a single copper company in 1982.

²⁷ The constraints during the 1980s are discussed in detail in Aron (1992).

variables: the real exchange rate for copper as defined above, expected to have a positive effect since real depreciation should improve the external competitiveness and the domestic incentive structure for copper; the rate of change in the parallel rate premium as a proxy for foreign exchange shortages, which should have a direct negative impact, and also possibly, though of lesser importance, an indirect negative effect through its influence on the domestic price of nontraded goods; the volume of copper exports in the previous year to account for the inertia and capacity constraints; finally, a host of dummies reflecting the various regime shifts we discussed above.

The following regressions were estimated using annual data from 1960-89 (t-statistics are in parenthesis).

$$\begin{aligned}
 (6.7) \quad \log EXP_{cu_t} &= \frac{3.50}{(4.76)} + \frac{0.21}{(3.00)} \log RER_{cub_t} \times DUM(1976-89=0) \\
 &+ \frac{0.45}{(3.92)} \log EXP_{cu_{t-1}} - \frac{0.14}{(-2.46)} \Delta \log q_t - \frac{0.18}{(-2.30)} DUM(1966) \\
 &+ \frac{0.20}{(2.74)} DUM(1972) + \frac{0.26}{(3.46)} DUM(1976) - \frac{0.14}{(-3.02)} DUM(1985-88)
 \end{aligned}$$

$R^2 = 0.87$, $\bar{R}^2 = 0.83$, Durbin H Statistics = -1.56, s.e. = 0.07

$$\begin{aligned}
 (6.8) \quad \log EXP_{cu_t} &= \frac{3.26}{(4.52)} + \frac{0.12}{(2.93)} \log RER_{cub_t} + \frac{0.49}{(4.37)} \log EXP_{cu_{t-1}} \\
 &- \frac{0.15}{(-2.63)} \Delta \log q_t - \frac{0.15}{(-2.03)} DUM(1966) \\
 &+ \frac{0.18}{(2.46)} DUM(1972) + \frac{0.24}{(3.41)} DUM(1976) \\
 &- \frac{0.18}{(-3.82)} DUM(1985-88)
 \end{aligned}$$

$R^2 = 0.87$, $\bar{R}^2 = 0.83$, Durbin H Statistics = -2.13, s.e. = 0.07

Equation (6.7) estimates the joint influence of the RER_{cb} and the regime shift for 1976-89. Comparing the coefficient of the interaction term $\log RER_{cb} \times DUM(1976-89)$ in (6.7) to the coefficient of $\log RER_{cb}$ in (6.8) confirms the presence of this regime shift. Furthermore, the relative stability of estimated coefficients of other variables in the two equations indicates that the effect on copper exports of the regimes shifts operates through the structure of incentives for copper i.e. the RER_{cb} effect. Overall both equations lend strong support to the model, with individual effects statistically significant and consistent with prior expectations. The model explains over 80 percent of the variations in the dependent variable. Equation (6.7), which captures the regime shift, will be considered for further analysis.

Equation (6.7) shows export supply to be strongly influenced by the relative structure of incentive in the domestic economy as reflected by the 21 percent short-run elasticity for the RER_{cb} effect, which also reflects the influence of regime shifts operating through the RER_{cb} . In the long-run when full adjustment and substitution take place, the estimated effect due to RER_{cb} will be much higher with an elasticity close to 0.5 (equal to $0.21/0.45$). This result shows that copper export, despite its technology of production and export arrangement, is strongly linked to the rest of the economy. Also according to equation (6.7), a 100 percent rise in the premium will lead to about 14 percent decline in the export of copper in the short-run, with the corresponding decline in the long-run as high as 30 percent. As we suggested earlier, the premium is likely to be reflecting the direct effect of foreign exchange shortages. The estimated combined effects for the RER_{cb} and the

premium on Zambia's copper exports thus provides a strong argument for unification based on its macro-level resource allocation effects (Pinto (1989) makes a similar argument for Ghana).

Finally, the estimated effects due to the dummies are all consistent with the likely influences of the episodes they represent. The dummy for 1972 captures the surge in exports due to recovery from the 1969/71 Mufulira mining disaster. The transport dummies, D66 and D76, capture increased constraints after U.D.I., and the export surge with the opening of TAZARA. Lastly, the results show that the mineral export tax on sales (DUM(1985-88) had a serious disincentive effect on copper exports.

The export supply is characterized by considerable inertia, with the lagged export supply having an elasticity of 0.45. This result is fairly consistent with the prevailing technology in the sector.

2. The misinvoicing of foreign trade

The misinvoicing of foreign trade arises in response to excess demand created by the use of exchange controls and trade restrictions. An overvalued exchange rate and foreign exchange controls create excess demand in the market for foreign exchange, leading to the formation of a black market with a premium on the official rate of exchange. Profit opportunities created by the existence of dual rates induce additional supply and demand in the market. Importers, using legal trade channels, may over-invoice their imports to obtain extra currency and sell the balance on the black market. Similarly, exporters have an incentive to under-invoice exports.² The illegal proceeds

²Where there are restrictions on the private holdings of foreign assets, flight from domestic currency via over-invoiced imports or under-invoiced exports could be illegally directed abroad.

of smuggling activities channelled through the black market provide a further source of supply.

Additional foreign exchange requirements arising from under-invoiced imports or over-invoiced exports would be also met by the unofficial market for foreign exchange. This type of misinvoicing of trade is due to evasion of trade and price controls. In Cooper (1974) the blanket term "smuggling" is used to encompass four types of evasion of duties and taxes: the under-invoicing of exports and imports, under-assessment of duties, the mis-classification of imports, and failure to record trade, in which case it is either of the "ships in the night" variety using illegal ports of entry, or pass~~e~~d covertly through legal channels. Over-invoiced exports may also arise where export subsidies exceed the discount obtainable on the unofficial market.²⁹ Finally, where price controls imposed on exports or importables create a premium with respect to border prices there is an incentive to evade these controls by smuggling through illegal channels.

The successful pursuit of "smuggling" and capital flight is constrained by the vigilance of customs officials and the degree of complicity in illicit trade. Low penalties, laxity in enforcing penalties and difficulties in policing large borders will facilitate illegal trade.

The combinations of incentives arising in consequence of various controls serve to drive misinvoicing in different directions.³⁰ A mix of smuggling types and modes of capital flight may be present at any one time.

²⁹Foreign exchange retention schemes aimed at promoting non-traditional exports constitute a de facto subsidization.

³⁰There are a number of legitimate reasons for inconsistent trade data apart from illegal trade activities, and these are discussed in Section 2.1.

Penalties for different kinds of illicit trade and the degree of enforcement may differ. In the aggregate therefore, whilst an order of magnitude for unrecorded trade may be achievable from discrepancies in reported exports and imports when matched against partner-country trade data, attribution to a particular form of illegal activity is not straightforward, and may be impossible. Cancellation effects may well result in an understatement of the magnitude of unrecorded trade.

For an individual importer who faces dual incentives to under-invoice for evasion of tariffs or quotas and to over-invoice in the face of a substantial black market premium, the direction of misinvoicing will be determined by the difference between the black market premium and the rent due to an import license or the rate of tariff, further discounting for the risk entailed in engaging in illegal dealings.

By its nature, illicit trade is difficult to detect and to quantify. However, where strong incentives have been created for these activities, detection and an estimate of magnitude is important. Reported statistics will not reflect the actual extent of trade nor the nature of capital flows. Under-invoicing of imports and exports and smuggling results in the recorded volume of trade being smaller than the "true" volume, while over-invoicing of imports and exports, will exaggerate the volume of trade. Where illicit activities are extensive, reported trade statistics will be inaccurate and policy prescriptions relying on them may be compromised.

In the last two decades a growing literature has attempted to integrate illegal trade phenomena into the pure theory of international trade. Statistical methods originating from the Morgenstern (1950) study continue to be explored to assess the accuracy of international trade statistics and to

detect and quantify illicit trade activities. In Yeats (1990), two decades of Sub-Saharan export data were examined for trade discrepancies with developed countries and other African countries. Major disparities were found, and these were substantially larger for intra-African trade. The study concludes that these data are unreliable as regards the level, composition, direction and trends of African trade. In what follows, methods from the empirical literature are briefly outlined and are applied to Zambian import statistics.

2.1 Statistical methods for the detection of unrecorded trade.

Direct methods of detection such as apprehending smugglers, comparing individual invoices with world prices and interviewing traders, are clearly limited in scope. Indirect methods rely on comparisons of quantity, price and value data, both between partner countries and within the country. Table 6 (a) summarizes expected price, quantity and value discrepancies for different kinds of illicit trade (adapted from Bhagwati (1981)). This classification encompasses most reported statistical methods for the detection and quantification of faked invoicing and smuggling, and indicates the possibilities for distinguishing amongst different kinds of illicit trade.

The indirect methods are applicable at various levels of disaggregation. Available data may only permit aggregate comparisons of quantity, value and price data. Aggregate comparisons provide a lower bound for illicit activity, but where individual classes of commodities can be examined, more information will be provided about incentives for illegal trade and the nature of the activity.

Discrepancies in value data between countries may be due either to the misrepresentation of prices or of quantities of imports. Partner-country-data

comparisons of quantity or value were first explored by Morgenstern (1950). Discrepancies between the imports recorded by a country and exports to that country recorded by its trading partners (or between recorded exports and partner-country imports) may be due to a number of factors besides false invoicing, some of which can be corrected for.³¹ But once allowances have been made for these factors, a positive or negative percentage difference indicates mis-invoicing. In the case of imports, a positive percentage difference implies net over-invoicing ($PfQf - PcQc < 0$ in column 5 of Table 6 (a)), while a negative figure indicates net under-invoicing. The reverse holds true in the case of own-country exports.³²

2.2 An approximate quantification of misinvoicing in Zambia.

The empirical analysis is confined to unrecorded imports. Zambia has a

³¹(a) International transport and insurance costs may be captured by converting imports from a c.i.f. to an f.o.b. basis. Bhagwati et al (1974) assume this discrepancy to be 10 per cent on average. Yeats (1990) has calculated transport correction factors for trade with the U.S.A.. (b) Lags in recording imports which have already been recorded as exported by the partner country leads to an understatement of own country imports. Averaging successive years, before comparing data may smooth this discrepancy (Naya and Morgan, 1974). (c) Under-invoicing by partner countries will understate their exports and in the comparison show up as overinvoicing of own country imports. The incentives for trading partners to fake invoicing can be assessed and the comparison be conducted across several countries. (d) Other error sources are less easily adjusted for: errors of commodity classification, different recording definitions and simple errors in counting and recording. Multiple exchange rates may also cause trade discrepancies where rates alter during the period reported, or where the wrong rate is used for conversion.

³²Where the data is available, partner-country-data comparisons of traded volumes may establish discrepancies, as in Richter (1974) for Indonesian rubber exports. Even without comprehensive quantity data, it is possible to distinguish between value discrepancies arising from quantity as opposed to unit price differences, because they generate different inequality signs for the disparity between the declared landed import price and the domestic price of the import (column 1 of Table 6 (a)).

high import-dependence: imports as a percentage of GDP averaged over 30 per cent from 1964 to the present day. The principal imports are capital and intermediate goods which display product differentiation.

Under-invoicing of exports in Zambia is unlikely to be a significant component of capital flight, given the predominance of metals in the composition of exports trading at known world prices. This has been confirmed by Yeats (1990) where export discrepancies for Zambia in 1982-83 with industrial countries were in the range of transport correction factors.³³ Export smuggling in the emerald industry, on the other hand, is reputedly rife. The report of the 1979 Commission of Enquiry into the emerald industry claims 35-40 per cent of the world market share for Zambia and suggests that 80 per cent of the emeralds produced are mined and exported illegally. The report recognized the role of a substantial black market premium in stimulating emerald smuggling.

In Table 6 (b), the recorded exports of Zambia's trading partners are compared with Zambian recorded imports from 1968 to 1985. The ratios $R = 100 \cdot (M_z - X_f) / X_f$, where M_z are Zambian-recorded f.o.b. imports and X_f , partner country-recorded f.o.b. exports, are shown for the U.K. and the U.S.A. (which comprise on average 22 per cent and 10 per cent of Zambian imports, respectively), for the six main trading partners, excluding South Africa and Saudi Arabia,³⁴ and for the O.E.C.D. as a whole (comprising 60 per cent of

³³Export trade with Malawi in 1982-83 (largely non-copper), however, showed clear evidence of under-invoicing (possibly exacerbated by import over-invoicing on the part of Malawians).

³⁴South African exports to Zambia are contained within an aggregate for trade with Africa and comparison was unfortunately not possible: in the last decade South Africa has provided about one fifth of Zambia's imports. Saudi Arabian trade is predominantly in oil, which analogous to copper is unlikely to be misinvoiced; but other studies have found significant discrepancies due

imports). Outside of the above-mentioned countries, trade is erratic and limited, and the data patchy; so further comparisons were unlikely to be meaningful.

Increasing product differentiation probably facilitates misinvoicing as departures from standard prices make confirmation of prices more difficult. Disaggregating imports to focus upon manufactured imports (SITC 5-8) in the comparison should amplify disparities (Bhagwati et al, 1974). However, the majority of Zambian imports already falls into SITC categories 5-8: these account for 77 per cent of imports in 1970 and 1975, and 70 per cent in the early 1980s.³⁵

Trends shown for the U.K. and the U.S.A., the largest non-oil trading partners apart from South Africa, are similar to those for the six main partners and the O.E.C.D. (R-values are larger for the individual countries, in part because cancellation effects are diminished). All four series suggest that capital flight through overinvoicing was rife during the copper boom, 1966-1974. After the 1971 copper price shock exchange controls and import levels became more restrictive. The premium doubled in 1972 and over-invoicing was sustained; but the terms of trade recovery from 1973 saw a diminution of the premium and misinvoicing. A precipitous fall in the copper price in 1974 induced a further tightening of trade policy and exchange controls. The premium more than doubled from 1975-77, further influenced by an increasingly overvalued exchange rate and the persistence of poor terms of trade. In tandem, misinvoicing grew (this is most apparent in the U.S.A. figures).

to confusion over the ownership of refineries and petroleum (Bhagwati, 1974).

³⁵Categories SITC 1-4 comprise food, beverages and tobacco, crude materials, animal fats and mineral fuels. The exclusion of Saudi Arabia then serves to remove the mineral fuels category.

From a peak of 190 per cent in 1977, the premium fell steadily during the second and third exchange rate policy episodes until the auction. Between 1978 and 1979 alone, the fall amounted to almost 40 percentage points, induced primarily by favorable copper prices. Misinvoicing was negligible until 1981 when a sharp deterioration in the terms of trade saw a revival of over-invoicing. In the two years preceding the auction of October, 1985, the premium averaged 30 percent, a low level compatible with the maintenance of exchange controls. Under-invoicing appears to have taken place in 1984, while misinvoicing falls in 1985 with the onset of the auction.

Given the paucity of data in the 1980s, the complementary nature of import unit value comparisons proves useful. A rough aggregate measure of the misinvoicing trend for imports is achieved by the comparison of import unit values between countries with a similar composition of imports. The difference in their respective tendencies to over invoice may be captured by the difference in reported CIF import unit values, converted to a common currency (Bevan et al, 1990).

In Table 6 (c), the Kenyan import unit value for manufacturing converted to Kwacha is compared with the constructed value for Zambia.³⁶ Disaggregated import unit value indices for manufacturing were chosen to ensure that a similar composition of imports was being compared, but also because product differentiation in manufactured goods make them the most liable to misinvoicing. The trends for misinvoicing compare well with the partner-country-data trade comparisons. What is clearly apparent in the series is a tendency to over-invoicing when copper prices fall (after 1974 and 1981) and

³⁶The Kenyan black market premium was not pronounced over this period averaging 10 per cent for 1975-80 and 20 per cent for 1981-84; in 1985 and 1986 it virtually disappeared.

under-invoicing where terms of trade improve (1973/4 and 1979/80). An interesting feature is the high level of over-invoicing seen during the early 1980s, which fell back prior to the foreign exchange auction, when under-invoicing predominated.³⁷

This correspondence between the R-values and changes in the premium and trade regime may be shown more formally by regressing the trade ratios on a constructed series for the smuggling incentive. Following McDonald (1985), the incentive is defined as $I=(q/(1-t_i))-1$, where q is the premium expressed as a ratio, and t_i is the import tax rate. McDonald (1985) examined exports only, where t_x was proxied by the average tax rate for the export aggregate. For import restrictions in Zambia, quotas are more important than tariffs. A measure of implicit trade policy is given by the differential between the CIF value of imports (pre-trade policy prices) and the retail price of domestic import substitutes (post-trade policy). This is shown in Figure 6 (a) and is used here as a proxy for t_i , capturing the endogenous trade liberalization of the boom period and subsequent tightening of restrictions. The initial figure is set at 15 per cent, the average tariff value for non-luxury goods in 1969.

Statistical characteristics are given in Table 6 (d) for I and the smoothed series of R-values (expressed as a ratio of reported imports to partner exports). The mean of I is fairly large (1.27) with wide variation about the mean. A positive correlation between the trade discrepancies and the smuggling incentive is suggested in Figure 6 (b)³⁸, and supported by the simple correlation coefficient of 0.75 (1969-80) (Table 6 (d)).

³⁷ The fiscal implications of this altered trend in misinvoicing on exchange rate unification are examined in Section VII, 2.

³⁸ This is shown only for the U.S.A. and the O.E.C.D.: other series showed a similar correspondence.

The trade ratios were regressed on I and the lagged dependent variable and dummy variables used to capture regime shifts and exogenous shocks:

$$TR_t = a + bI_t + cTR_{t-1} + D .$$

The results are shown in Table 6 (e) and compared with McDonald's results for Zairean exports. The constant should display the level of the trade ratio in the absence of smuggling if trade is constant; otherwise the steady-state level ($a/(1-c)$) should approximate 1 if transport costs have been accounted for. All three import regressions incorporating the lagged dependent variable display the latter feature. In the McDonald study, for the nine countries examined, fifteen export regressions were run and in only four of these did I prove significant. For Zambian O.E.C.D. imports too, the coefficient on the smuggling incentive for the first two regressions is positive but not significantly different from zero. Previous misinvoicing exerts a significant influence on current misinvoicing. The 1974 and 1976 dummies have the expected signs: the 1973/74 terms of trade recovery saw the premium fall and with it misinvoicing; after 1975, poor terms of trade combined with tightened controls produced the opposite effect. Inclusion of the lagged incentive in the third regression produces a combined positive coefficient for I with improved significance and the dummy has the expected sign.

Some limited support is provided by these results for the trade ratio and smuggling incentive link. However, the results are sensitive to the period examined and the dummies included, while poor data and institutional and regime changes exacerbate the problems of equation instability.

VII. THE EFFECTS OF THE PREMIUM ON DOMESTIC INFLATION AND FISCAL BALANCE.

In this section we will assess the importance of the premium's link to domestic inflation and investigate the impact of exchange rate unification on the fiscal balance. We will estimate a simple econometric model of inflation in which the premium affects domestic inflation directly through the traded goods prices and indirectly through disequilibrium in the money market. We estimate a seigniorage Laffer Curve for the auction period and establish empirically the location on this curve of sub-periods of the crawling peg and auction episodes. The government is shown to be a net buyer of foreign exchange and fiscal revenue implications are drawn.

1. Domestic Inflation

To study the relevance of the parallel rate (or premium) to domestic inflation we consider the following simple model. Let the domestic price of tradeables, P_T , be given by

$$(7.1) \quad P_T = E_0^\alpha E_b^{1-\alpha} P^* \quad ^{39}$$

where P^* stands for foreign price and $0 \leq \alpha \leq 1$. Let the price of nontraded goods, P_N , be specified as a mark-up over P_T .

$$(7.2) \quad P_N = P_T^\beta (1 + \mu)$$

and the rate of change in the mark-up function μ is made to depend on excess

³⁹ A more general specification than (7.1) can be considered where $P+E_0$ could be adjusted for taxes and P^*E_0 for the unit cost of smuggling (e.g. Chhibber and Shafik (1990)). These extensions will not influence the final inflation equation however, if we assume zero rates of changes in smuggling cost and tax rate.

demand for nontradeables.

$$(7.3) \quad \beta = f(c_N - Y_N)$$

Excess demand for nontradables ($C_N - Y_N$) can in turn be linked to disequilibriums in the balance of payment and the monetary sector. A balance of payment surplus (deficit) must be accompanied by an excess demand (supply) for nontraded goods of equal magnitude, measured in domestic prices. Given the importance of copper prices to both private sector incomes and public sector revenues, and the limited effectiveness of the authorities in Zambia at shielding the domestic economy from balance of payment surpluses brought about by the price of copper; we specify the excess demand for nontradables to depend on the real price of copper, P_{cop} i.e.

$$(7.4) \quad C_N - Y_N = g(P_{\text{cop}})$$

Equations (7.3) and (7.4) permit a direct link between inflation and the price of copper -- reflecting the usual Dutch disease phenomenon.

The income-expenditure model focuses on the goods markets and therefore it neglects the link between the aggregate market for goods and the money market. In an economy such as the one in Zambia where a sizable and tolerated dual market coexist with a highly regulated official sector, monetary disequilibrium ($M^d > P \cdot m^d$) can lead to nontraded goods price increases, depreciation in the black market exchange rate, and worsening in both the regulated official as well as the unreported private current accounts. To the extent that the black market is allowed to float freely, the impact of monetary disequilibrium is likely to be more reflected in terms of nontradables price inflation and depreciating black market rate (or rising

premium). Based on the above discussion, we add to the mark-up function the change in the rate of depreciation of the black exchange market rate, $\Delta \hat{E}_b$,

to reflect monetary disequilibrium:

$$(7.5) \quad M^s - P \cdot m^d = \lambda (\Delta \hat{E}_b)$$

Now using (7.4) and (7.5) on $(\hat{\mu} = f(C_N - Y_N, M^s - P \cdot m^d))$ we write the

following expression for the rate of change in the mark-up function:

$$(7.6) \quad \hat{\mu} = \bar{\alpha}_1 \log Pcup + \bar{\alpha}_2 \Delta \hat{E}_b$$

Now we define the aggregate price equation, P, as a weighted geometric mean of P_T and P_N .

$$(7.7) \quad P = P_T^\lambda P_N^{1-\lambda} \text{ and } 0 < \lambda < 1.$$

Equations (7.1) - (7.7) lead to the following expression for domestic price inflation.

$$(7.8) \quad \pi_t = [\lambda + \beta(1-\lambda)] [\beta_t^* + \hat{E}_{0t}] + (1-\alpha) [\lambda + \beta(1-\lambda)] \hat{q}_t + (1-\lambda) [\tau_1 \log Pcup_t + \tau_2 \Delta \hat{E}_{bt}]$$

Direct estimation of (7.8) did not produce satisfactory results. Estimation of (7.8) in terms of acceleration of inflation is successful, however. Therefore, the following empirical reduced form is estimated using annual data from 1970 to 1986.

$$(7.9) \quad \Delta\pi_{t+1} = \delta_0 + \delta_1 [\hat{P}_t + \hat{E}_{0t}] + \delta_2 \hat{Q}_t + \delta_3 \log Pcup_t + \delta_4 \Delta \hat{E}_{bt} + \delta_5 \Delta \pi_t$$

An interesting hypothesis to test is $H_0: \delta_1 = \delta_2$. This hypothesis implies that official exchange rate depreciation does not enter as a factor leading to accelerated domestic inflation. Rather, the cost push factors causing domestic price inflation are foreign inflation and black market depreciation. Before discussing the results of estimating the above equation we briefly review the evolution of domestic prices in Zambia.

The story of inflation and the black market rate in Zambia is succinctly told in graphs 7 (a) and 7 (b). The first graph shows the quarterly evolution of aggregate inflation in the consumer price index (CPI), the wholesale price index (WPI), in addition to the rate of depreciation in the black market rate. While the black rate has experienced considerable volatility during the period, CPI inflation was very stable and WPI is only slightly more variable.

The observed low CPI and WPI price inflation is due to the fact that most of their components are affected by price controls. Price controls have been applied to three major categories of prices from Independence: producer prices of agricultural goods, prices of "essential commodities" and the prices of some products of parastatal companies. Price controls were applied until December, 1982, when there was a decontrol of retail and wholesale prices, save for maize meal, wheat flour and bread and candles. Apparently the parastatal prices continued to be restrained after decontrol. Riots ensued in December, 1986 after maize prices (the only remaining controlled price) were decontrolled (see Table 3 (c)). After the auction was abandoned in May, 1987, price controls were again applied. It appears that price controls were not

rigorously enforced in the 1970s; ⁴⁰ however, control of parastatals' prices has obviously been easier to enforce than for the private sector.

The PIC lists of "essential" commodities on which price controls were imposed in 1973 and 1987, contain most of the principal components of the CPI. The WPI series on the other hand is comprised of electricity (state owned and price controlled), agriculture (where producer prices are held below border prices), mining (where metal dominates and the products are not consumed domestically), and manufacturing (which includes parastatal manufacturing).

Given the nature of the above data, it is perhaps not surprising that neither CPI nor WPI inflation lend any satisfactory validation to the above model. A price series based on disaggregating the WPI into the manufacturing components and then excluding the parastatal-dominated manufacturing categories (food, beverages, and tobacco)⁴¹ would seem to be the least affected by controls. This construct (WMI) should be the appropriate series to use for the estimation.

Using the created WMI series, two versions of equation (7.9) were estimated. The results are shown in equation (7.9') and (7.9'') below, t-statistics are in parenthesis.

$$(7.9') \quad \Delta \pi_{t-1} = 1.40 + 0.50 [\hat{P}_t^* + \hat{E}_{0t}] + 0.60 \hat{Q}_t + 0.30 \log Pcup_t + 0.12 \Delta \hat{E}_p$$

(4.87) (2.29) (3.20) (4.67) (1.12)

⁴⁰According to the Zambian Prices and Income Commission (PIC), there were few prosecutions and in response to shortages a rampant black market was in evidence by the late 70s.

⁴¹Within the parastatal sector, output is concentrated predominantly in food, beverages and tobacco; further, the parastatal share of manufacturing GDP in this category was over 70 per cent between 1970 and 1980.

$R^2 = 0.75$, $DW = 2.38$

$$(7.9'') \quad \Delta\pi_{t+1} = 1.45 + 0.57 [\hat{\beta}_t + \hat{\beta}_{B_t}] + 0.31 \log PCUP_t + 0.11 \Delta \hat{B}_{B_t}$$

$(5.70) \quad (3.32) \quad (5.68) \quad (1.09)$

$R^2 = 0.77$, $DW = 2.38$

Equation (7.9') is the unrestricted version of (7.9), while (7.9'') imposes the restriction $\delta_1 = \delta_2$. This restriction could not be rejected at any reasonable significance level ($t = -0.56$). The acceptability of this restriction by the data is also reflected in the similarities of the two empirical results in (7.9') and (7.9'').

With the above restriction taken as a maintained hypothesis, the result in (7.9'') indicates that foreign inflation and depreciation of the parallel rate are important cost push factors causing acceleration in the rate of domestic inflation in Zambia. Furthermore, previous period exchange rate devaluations were not shown to influence current period change in domestic inflation. The income effect channeled through the balance of payment is also found to lead to an increase in domestic inflation. The other channel of excess demand for nontraded goods -- working through the money market and reflected by the change in the rate of depreciation of the parallel rate -- has however, smaller and only slightly significant effect on inflation.

2. The Fiscal Balance.

Pinto (op.cit.) argues for the primacy of fiscal policy and the need to design the pace of exchange rate policy to be consistent with fiscal reform. The rationale is that if the government is a net buyer of foreign exchange from the private sector, there is a trade-off between the premium as a tax on

exports and the inflation tax, when the inflation elasticity of the demand for domestic currency is less than 1. The inflation elasticity rises with the rate of inflation (as the incentive for flight from domestic money increases) giving rise to a seigniorage Laffer Curve (see Figure 7(c)). For inflation rates above the seigniorage-maximizing level of inflation the unit inflation tax will fall and no trade-off is present. Thus, if the fiscal deficit remains high while credibility is low, aggressive exchange rate policy could lead both to unsustainable post-unification inflation and a higher premium as flight from domestic money intensifies, resulting in a decline in seigniorage revenue. Both sides of the Pinto proposition were tested using monthly data for the two unification episodes in Zambia, the crawling peg and the foreign exchange auction.

The fiscal revenue implications of a devaluation-driven unification, where the government is a net buyer of foreign exchange, are summarized in Table 7 (a). The Bank of Zambia's foreign exchange budget was used to show that the government was a small net buyer of foreign exchange during the auction (Table 7(b)). The effect of auction-related grants and loans is to diminish this position. In Table 7(c), it is established that the signs for inflation tax in both phases of the auction correspond with those predicted in column [3] of Table 7(a).

Following Pinto (1985), the seigniorage maximizing rate of inflation (π^*) for the entire period of the auction was estimated with monthly data by fitting a Laffer Curve of the type:

$$(7.10) \quad V = a \pi + b \pi^2 ,$$

(+) (-)

where V , the inflation tax, is defined as the real stock of money times the

growth rate of nominal money (expected signs of the coefficients are indicated). The first order condition then yields the seigniorage maximizing level of inflation ($\pi^* = a/2b$). The results of the estimation are contained in equation (7.10') below:

$$(7.10') \quad \begin{aligned} V = & 767.38 \pi - 99.81 \pi^2 + 3806.21 \text{ OCT85} \\ & (2.88) \quad (2.33) \quad (2.37) \\ & + 8007.17 \text{ SEP86} - 1168.42 \text{ MAR87} - 2211.04 \text{ JAN87} + 5685.89 \text{ APR87} \\ & (3.30) \quad (0.98) \quad (1.72) \quad (2.67) \end{aligned}$$

DW = 2.35 $R^2 = 0.58$ N=19,

where t-statistics are in parentheses and the method of estimation is OLS. The signs of the significant coefficients for inflation and its square are as expected. Regime shifts were captured using dummy variables for particular months (see Table 3(c)). Solving for the first order condition gives the result that π^* is 3.84.

In Table 7(b), monthly averages of inflation, seigniorage, the premium, official depreciation and the budget deficit are shown for sub-periods of the unification episodes. The crawling peg sub-episodes and stable phase of the auction lie on the good side of the Laffer Curve. There is a trade-off between the premium and rate of official depreciation in the first three sub-periods, with sustainable deficits and reasonable credibility of reform. In the unstable phase the trade-off disappears: both the premium and inflation rise strongly, while the budget deficit is high and credibility low. Monthly inflation and depreciation rates are shown in Figure 7(d).

The signs for Central Bank profits, predicted in column [1] of Table 7(a), were confirmed for both phases of the auction (Table 7(b)). Average

monthly profits due to foreign exchange transactions alone in the stable phase⁴² fell and were low at K16 million; they increased to K62 million on average per month in the unstable phase, when the premium was high and official depreciation accelerated.⁴³

Finally, the movement of illegal activity onto markets where it can be taxed is predicted to produce a favorable fiscal effect for episodes lying on the good side of the Seigniorage Laffer Curve (Table 7(a), column (2)). Assessing this potential effect for import revenue in Zambia's auction⁴⁴ is complicated by the fact that the minimum rate of customs duty was raised and its coverage extended in February, 1986; further, misinvoicing data suggests a move from over- to under-invoicing in the auction, decreasing recorded revenue. Subject to these caveats, average quarterly receipts for taxes on imports⁴⁵ for the auction as a whole increased to K78.5 million, from K59.2 million in the preceding seven quarters. Quarterly averages, however, do suggest a 10 percent decrease in revenue from the stable to the unstable phase; the decline may be underestimated if overinvoicing increased in the unstable phase.

In conclusion, our results for Zambia lend support to both halves of the Pinto Proposition.

⁴² Profits on foreign exchange transactions alone due to the presence of dual rates were estimated as follows: $P = (X_p - M_p) \cdot (E_b - E_0)$, where E_b is the black rate and E_0 , the official rate of exchange. Data were available from 1986 only; the final quarter of 1985 is thus not included in the total for the stable phase.

⁴³ However, a pipeline in foreign exchange disbursements began from August 1986, with a ten week lag. Given the rate of depreciation of the currency in the unstable phase, the Central Bank was forced to make current purchases of foreign exchange at a premium on the originally agreed sale price. Bates et al (1991) estimate this premium to be about 25 percent and suggest pipeline losses with an upper bound of K1 billion.

⁴⁴ Section VI found little evidence for large-scale smuggling activities in exports.

⁴⁵ The sum of sales tax and customs duties, deflated by the quarterly WPI, 1985 prices.

VIII. THE PROBLEMS OF UNIFICATION: SOME CONCLUDING REMARKS ON THE LESSONS FROM ZAMBIA.

In a country like Zambia where the black market for foreign exchange is wide-spread and tends to have strong macroeconomic links, traditional objectives of economic reforms, such as stabilizing the macroeconomy and achieving real depreciation, are equivalent to the objectives of stabilizing the free market rate and reducing the premium, and perhaps ultimately achieving exchange rate unification or at least successfully delinking the black market from the major sectors of the economy. In this section we address three main issues related to the question of unification, drawing from the analysis of previous sections. First, we consider the evidence for problems that the presence of a large parallel market might have caused in macroeconomic management and economic reform in Zambia. Secondly, we review the recent experience and indicate what went wrong with previous unification attempts, again drawing from the evidence of our analysis. Thirdly, we attempt to identify some lessons that can be gleaned from the above discussion.

First, the econometric analysis of this paper (see section VII) shows that a large premium can have deleterious effects on copper exports, directly as an indicator of foreign exchange shortages and indirectly through its negative influence on the domestic structure of incentives for the officially sanctioned copper economy. A high premium also was found to encourage over-importing (and probably over-invoicing) of officially traded imports. The black market rate was also found to have a significant effect on domestic inflation through at least two channels. Depreciation of the black market rate and foreign inflation directly increase domestic inflation through the

cost-push channel. The other effect is indirect and operates through the money market disequilibrium.

Our analysis based on monthly data clearly reveals that the short run evolution of the premium reflects the impact of anticipated political events and changes in economic policy. The evolution of the premium also fits well with the story of expected devaluation based on the model of this paper. Thus the premium does not only affect inflation and the real exchange rate but it also serves as a signal for lack of credibility of economic reform and unsustainability of macroeconomic policy. As such, some form of exchange rate unification must have been either an explicit or an implied objective of recent economic reform in Zambia. The concept of unification we have in mind does not call for a zero level of the premium, however. At least for the case of capital controls, liberalization may not be possible nor desirable for some time to come in Zambia. It is important, however, to liberalize major trade and financial markets in a way that will compress the parallel market and prevent the premium from serving as a major signal to the economy.

Secondly, this quest for unification perhaps explains the primacy accorded to exchange rate policy in the conduct of macroeconomic policy over the last decade. Considerable official depreciation was achieved during the crawling peg period (July 1983 to October 1985) with the rate of annual nominal devaluation averaging 27 percent compared to less than 8 percent during the immediate two years preceding the crawl. Despite considerable official depreciation the premium remained high and in the final year of the crawl it rose considerably to match the pre-crawl historical average. The premium declined quickly and sharply when the auction system was introduced, as part of the IMF-supported economic reform in the fourth quarter of 1985.

The decline in the premium from 68 percent in 1985 to 31 percent in 1986 came to a halt in the second year, and in 1988 the year following the suspension of the auction, it soared to 418 percent.

According to the analysis of this paper, the major factor behind the failure of unification and economic reform in general is the fundamental endogeneity of the parallel premium with respect to macroeconomic and trade policy as well as exogenous shocks in terms of trade and foreign aid. As we saw in section IV the expansive fiscal and monetary policy that has been pursued and sharply declining terms of trade could not be consistent with the unification objective. The econometric analysis of this paper shows that improvement in the terms of trade or an increase in foreign aid will lead to a decline in the premium. It appears that the direct influence of these two factors in the stock of foreign money dominates their indirect effects through real wealth and real appreciation, which work to increase the premium. With regard to the role of economic policy, our results show that the direct effect and the indirect effect (operating through expectations of future devaluation) of expansive fiscal and monetary policy will cause the premium to rise.

In terms of the relative importance of the above two sets of influences on the premium that may have caused the failure of exchange rate unification and other objectives of economic reform, it appears that adverse external terms of trade shocks dominate. During the first two years of the peg (1983-1984) the fiscal deficit as a ratio to GDP averaged about 7.5 percent, compared to more than 18 percent in 1982. The rate of growth in the supply of (narrow) money declined from 22 percent in 1982 to 15 and 9 percent for the following two years. The terms of trade on the other hand have experienced

dramatic declines throughout the 80's decade. Compared to 1980 the terms of trade declined by 43 percent in 1981 and by 80 percent for the first two years of the crawling peg regime. Therefore, the apparently considerable effort at macroeconomic restraint (at least compared with the history of macroeconomic policy in the country) while substantial nominal devaluation was being effected by the crawl policy, was clearly undermined by the sharp negative terms of trade shock.

For the last year of the peg regime and the two years of the auction (1985-1987) the terms of trade continued to be low and stable at around 30 percent of the 1980 index. The driving force behind the persistence of the premium during this period, however, was outright laxity in fiscal and monetary policy. The fiscal deficit ratio increased by 100 percent to average 15 percent for the period, and the rate of M1 growth increased from 12 percent for the previous period to 41 percent in 1985, and to more than 60 percent for 1986-87. The analysis of the paper shows the premium to be responsive to economic and political development and that the premium is influenced by agents' expectations of future devaluation, influenced in turn by past fiscal and monetary policy. This implies that the perceived incredibility or unsustainability of the program, especially during 1985 and the following two years of the auction, had a hand in the failures of the crawling peg and the auction regimes, and the ultimate collapse of the economic reform program in 1987.

We conclude with a subscription to Pinto (1987) in that 'Zambia's experience indicates that exchange rate reform without fiscal reform may be futile'. While we uphold the view that emphasize the role of fiscal policy we hasten to point out that the unsustainability of the fiscal retrenchment that

was pursued for the first two years of the crawling peg seemed to be influenced more by political economy considerations than by the Pinto effect. Zambia is one of the most urbanized countries in Africa with the share of the urban population estimated at 50 percent. Also the Zambian urban middle class is known to have wielded considerable influence over the years. This explains the pervasive ensemble of price control and subsidy schemes that survived the reform attempts of the last decade. On the other hand, government revenue as a ratio to GDP has never been less than 20 percent despite the sharp declines in the terms of trade, this rate being one of the highest in Africa. Therefore the case of Zambia suggests that more emphasis should be given to the political economy and the distributional consequences, especially the rural-urban nexus, at the early stages of the economic reform program.

Finally, it is evident that the economy of Zambia being heavily dependent on copper, is particularly susceptible to external shocks. In this regard increased foreign aid could be very effective in mitigating the destabilizing effects of the terms of trade shocks. This is likely to be most helpful in the early stages of reform to foster credibility and stabilize the free rate, before the foreign sector can start to respond to real depreciation; hence there will be less need for aid flows to continue at initial levels.

TABLE 1 (a):
Exchange rate policy episodes in Zambia 1964-90

| Period | Policy |
|---------------------------|--|
| 1. 1964-71 1971q4-76q2 | Rate fixed to the pound sterling. Rate fixed to the dollar. |
| 2. 1976q3-83q3 | From July, pegged to the SDR with occasional devaluations. |
| 3. 1983q3-85q3 | From July, the SDR link substituted by a crawling peg on a basket of currencies of trade partners. |
| 4. 1985q4-87q2 | Foreign exchange auction; Dutch Auction; two-tier auction. |
| 5. 1987q3-89q4 | From May, a fixed rate to the dollar with occasional devaluations. |
| 6. 1990q1-1991q1 | From February, a dual exchange rate system. |

TABLE 1 (b):
Basic statistics for the black market premium and black rate
(monthly data)

| PERIOD | N | MEAN | STANDARD DEVIATION | MINIMUM VALUE | MAXIMUM VALUE | COEFFICIENT OF VARIATION (%) |
|------------------------------|----|--------|--------------------|---------------|---------------|------------------------------|
| black market premium: | | | | | | |
| Oct. 1970- Jun. 1976 | 69 | 89.69 | 38.56 | 29.63 | 177.52 | 43.02 |
| Jul. 1976- Mar. 1983 | 84 | 102.27 | 59.50 | 19.32 | 260.10 | 58.18 |
| Jul. 1983- Sep. 1985 | 27 | 49.26 | 32.27 | 9.67 | 102.80 | 65.50 |
| Oct. 1985- Jun. 1987 | 21 | 40.26 | 31.69 | -46.12 | 93.07 | 78.70 |
| Oct. 1985- Jun. 1987 (2) | 20 | 44.58 | 25.39 | 15.67 | 93.07 | 59.95 |
| Jul. 1987- Dec. 1989 | 30 | 481.32 | 367.69 | 25.00 | 1221.48 | 76.39 |
| black rate: | | | | | | |
| Oct. 1970- Jun. 1976 | 69 | 0.82 | 0.15 | 0.55 | 1.08 | 18.73 |
| Jul. 1976- Mar. 1983 | 84 | 0.63 | 0.14 | 0.35 | 0.85 | 21.88 |
| Jul. 1983- Sep. 1985 | 27 | 0.40 | 0.14 | 0.21 | 0.59 | 35.60 |
| Oct. 1985- Jun. 1987 | 21 | 0.10 | 0.03 | 0.04 | 0.14 | 29.67 |
| Jul. 1987- Dec. 1989 | 30 | 0.03 | 0.03 | 0.01 | 0.10 | 92.26 |

SOURCE: Pick's Currency Yearbooks and International Finance Statistics (I.M.F.).

NOTES:

1. Monthly data from Pick's Currency Yearbooks.

2. Period 4 statistics for the premium are calculated with and without the premium of -46 % for April, 1987, which was due to rapid devaluation of the official rate (the black rate was unaffected).

TABLE 2 (a): Major parity changes since 1964

| Period | Parity change |
|----------------|---|
| 1964, October | Zambian Pound fully convertible with Pound Sterling. |
| 1968, January | Kwacha (K) replaces Zambian Pound, halving official rate (K0.714/\$), and decimalizing. |
| 1971, December | Pound Sterling link substituted by U.S. Dollar (K0.714/\$): a de facto devaluation. Gold content reduced by 7.89 per cent on 18th December. |
| 1973, February | Following U.S. devaluation, realigned to K0.643/\$. |
| 1976, July | Dollar link substituted by SDR (K1=SDR1.08479): a de facto devaluation of 20 per cent. |
| 1978, March | Devalued by 10 per cent: K1=SDR0.97631. |
| 1983, January | Devalued by 20 per cent: K1=SDR0.78105. |
| 1983, July | SDR link substituted by trade weighted basket: a de facto devaluation of 11 per cent; crawl rate of 1 per cent per month. |
| 1984 | Rate of crawl increased to 2.5 per cent per month. |
| 1985, October | Rate determined by marginal market-clearing bid in a weekly auction administered by the Central Bank. |
| 1986, August | Dutch auction introduced: successful bidders exchange at their bid, not the marginal rate: excess accrues as tax revenue. |
| 1987, January | Auction temporarily suspended. |
| 1987, February | Official Parity Rate created pegged to a basket of currencies, with range K9.0-12.5/\$, for Government, Parastatal and Central Bank transactions. |
| 1987, March | Weekly auction reinstated for all other transactions, starting at K15/\$ (two-tier auction). |
| 1987, May | Auction suspended: rates unified at K8/\$ for all transactions. |
| 1988, December | Devalued to K10/\$. |
| 1989, June | Devalued to K16/\$. |
| 1989, December | Devalued to K24/\$. |
| 1990, February | Two-tier system: official rate at K28/\$ and managed float initially at K40/\$. |

SOURCE: World Currency Yearbook (1986) and Central Bank publications.

TABLE 3 (a): The parallel premium and the macro-economy.

| YEAR | PREMIUM (%) | DEPRECIATION (%) | | INFLATION (%) | | MONETARY M1 growth | AGGREGATES seignor | M2/GDP |
|------|-------------|------------------|----------|---------------|-------|--------------------|--------------------|--------|
| | | official | parallel | CPI | WP | | | |
| 1964 | . | 0.0 | . | . | . | . | . | . |
| 1965 | . | 0.0 | . | 7.4 | . | . | . | 15.1 |
| 1966 | . | 0.0 | . | 10.8 | . | 37.5 | 4.4 | 17.1 |
| 1967 | . | 0.0 | . | 4.4 | -0.9 | 15.9 | 1.7 | 17.7 |
| 1968 | . | 0.0 | . | 11.0 | 8.0 | 31.8 | 3.0 | 20.6 |
| 1969 | . | 0.0 | . | 2.3 | 9.8 | 12.8 | 1.0 | 21.4 |
| 1970 | 36 | 0.0 | . | 3.0 | -2.2 | 2.6 | 0.2 | 29.2 |
| 1971 | 51 | 0.0 | . | 5.8 | -6.1 | 6.8 | 0.6 | 27.0 |
| 1972 | 109 | 0.0 | -28.0 | 5.3 | 4.9 | 1.4 | 0.1 | 25.3 |
| 1973 | 95 | 9.6 | 19.1 | 6.5 | 21.7 | 28.6 | 1.8 | 25.8 |
| 1974 | 80 | 1.3 | 8.0 | 7.9 | 13.4 | 2.6 | 0.1 | 23.3 |
| 1975 | 90 | 0.0 | -3.5 | 10.2 | -5.6 | 24.4 | 1.5 | 31.2 |
| 1976 | 161 | -9.8 | -36.2 | 18.5 | 17.9 | 21.1 | 1.1 | 32.9 |
| 1977 | 190 | -9.7 | -17.6 | 19.9 | 21.7 | -1.9 | -0.1 | 35.2 |
| 1978 | 124 | -1.3 | 6.0 | 16.6 | 16.6 | 1.0 | 0.0 | 28.4 |
| 1979 | 85 | 0.8 | 48.4 | 9.6 | 24.2 | 30.2 | 1.1 | 31.3 |
| 1980 | 69 | 0.6 | 7.8 | 11.6 | 9.2 | 0.5 | 0.0 | 29.6 |
| 1981 | 64 | -9.2 | -5.1 | 14.2 | 5.3 | 8.6 | 0.2 | 28.1 |
| 1982 | 46 | -6.5 | 4.0 | 12.4 | 6.7 | 22.3 | 0.6 | 36.4 |
| 1983 | 29 | -25.8 | -17.7 | 19.5 | 24.1 | 15.3 | 0.4 | 34.8 |
| 1984 | 37 | -30.3 | -28.1 | 20.1 | 27.9 | 9.4 | 0.2 | 34.6 |
| 1985 | 68 | -33.8 | -52.3 | 37.4 | 47.3 | 41.6 | 0.6 | 29.7 |
| 1986 | 31 | -62.9 | -50.9 | 51.6 | 115.9 | 87.1 | 0.7 | 31.3 |
| 1987 | 42 | -17.8 | -20.3 | 43.1 | 84.4 | 40.0 | 0.2 | 31.9 |
| 1988 | 418 | 8.1 | -59.2 | 55.6 | . | 62.7 | 0.3 | 45.0 |

| YEAR | BUDGET (%GDP) | | CURR. ACCOUNT (%GDP) | | FOP. ASSEST (net % GDP) | FOR. RESERVES (\$ mill) | TOT |
|------|---------------|------|----------------------|----------|-------------------------|-------------------------|-------|
| | surplus | exp. | rev. | official | | | |
| 1964 | 5.8 | 17.8 | 21.2 | 14.9 | . | . | 17. |
| 1965 | 3.4 | 21.3 | 26.7 | 8.7 | . | 21.0 | 195.6 |
| 1966 | 3.5 | 23.4 | 29.7 | 6.0 | . | 18.6 | 204.8 |
| 1967 | -4.1 | 26.9 | 25.1 | 1.2 | . | 14.0 | 174.5 |
| 1968 | -9.9 | 28.3 | 27.4 | -0.2 | . | 13.2 | 193.5 |
| 1969 | 2.7 | 22.7 | 24.5 | 25.8 | . | 20.4 | 362.9 |
| 1970 | 1.9 | 26.6 | 34.2 | 6.3 | . | 31.3 | 508.0 |
| 1971 | -16.4 | . | . | -15.0 | -22.4 | 15.4 | 277.1 |
| 1972 | -13.1 | 32.1 | 21.9 | -11.0 | -22.8 | 5.6 | 158.4 |
| 1973 | -16.7 | 29.5 | 24.0 | 5.3 | 10.2 | 4.3 | 185.5 |
| 1974 | 3.4 | 28.1 | 34.3 | 0.6 | 1.0 | 4.0 | 164.4 |
| 1975 | -21.5 | 42.8 | 28.3 | -29.3 | -54.3 | -3.8 | 142.0 |
| 1976 | -14.2 | 36.1 | 23.9 | -4.7 | -12.3 | -4.7 | 92.7 |
| 1977 | -13.1 | 35.6 | 25.1 | -8.6 | -24.7 | -7.1 | 66.3 |
| 1978 | -14.4 | 29.7 | 24.4 | -10.6 | -28.3 | -33.3 | 51.1 |
| 1979 | -9.1 | 30.4 | 22.3 | 1.1 | 2.0 | -22.9 | 80.0 |
| 1980 | -18.5 | 37.1 | 25.0 | -13.8 | -23.4 | -27.0 | 78.2 |
| 1981 | -12.9 | 36.7 | 23.2 | -18.5 | -30.0 | -33.2 | 56.2 |
| 1982 | -18.6 | 39.0 | 23.1 | -14.6 | -21.3 | -40.3 | 58.2 |
| 1983 | -7.8 | 32.2 | 24.2 | -8.1 | -10.7 | -47.1 | 54.5 |
| 1984 | -8.4 | 29.2 | 22.1 | -5.6 | -7.1 | -54.2 | 54.2 |
| 1985 | -14.9 | 34.9 | 21.8 | -15.3 | -27.0 | -93.5 | 200.1 |
| 1986 | -16.2 | . | 23.3 | -16.9 | -22.6 | -112.5 | 70.3 |
| 1987 | -13.7 | 4.9 | 21.1 | -6.4 | -8.8 | -55.8 | 108.8 |
| 1988 | -12.9 | 34.3 | 20.9 | -7.2 | -38.9 | -54.1 | 134.0 |

SOURCE: Government Financial Statistics (IMF); International Financial Statistics (IMF); Central Bank Publications; Pick's Currency Yearbooks.

TABLE 3 (b): Zambian copper dependence, 1964-1989

| Year | Cu export volumes (1963=100) | Cu price (constant '63 prices) | Cu value (% of GDP) | Cu earnings (% of total forex) | Mineral revenue (% of total revenue) |
|------|------------------------------|--------------------------------|---------------------|--------------------------------|--------------------------------------|
| 1964 | 116.8 | 43.05 | 59.12 | 88.46 | . |
| 1965 | 117.1 | 56.98 | 48.27 | 90.22 | . |
| 1966 | 102.7 | 65.10 | 54.31 | 93.31 | 65.13 |
| 1967 | 103.0 | 47.96 | 45.35 | 92.34 | 61.45 |
| 1968 | 110.3 | 52.62 | 48.59 | 94.80 | 57.58 |
| 1969 | 125.2 | 59.26 | 55.13 | 94.52 | 58.62 |
| 1970 | 117.3 | 53.77 | 55.89 | 95.30 | 55.50 |
| 1971 | 108.9 | 38.96 | 38.12 | 92.78 | 36.92 |
| 1972 | 122.0 | 35.47 | 36.41 | 90.63 | 18.84 |
| 1973 | 115.1 | 51.02 | 43.93 | 94.20 | 28.09 |
| 1974 | 115.5 | 48.29 | 44.43 | 92.68 | 52.32 |
| 1975 | 110.0 | 26.11 | 29.75 | 90.40 | 13.29 |
| 1976 | 127.9 | 29.17 | 36.31 | 91.59 | 2.56 |
| 1977 | 114.3 | 24.81 | 32.52 | 91.22 | 0.00 |
| 1978 | 101.6 | 22.48 | 26.55 | 87.02 | 0.02 |
| 1979 | 111.7 | 28.84 | 33.86 | 82.62 | 0.00 |
| 1980 | 95.6 | 28.93 | 28.53 | 85.44 | 5.45 |
| 1981 | 94.6 | 22.97 | 23.73 | 88.31 | 1.30 |
| 1982 | 106.2 | 20.09 | 23.79 | 90.00 | 0.00 |
| 1983 | 98.9 | 21.87 | 22.23 | 88.31 | 5.27 |
| 1984 | 89.7 | 19.27 | 20.91 | 87.12 | 8.68 |
| 1985 | 82.3 | 19.68 | 27.72 | 79.98 | 8.40 |
| 1986 | 78.9 | 15.75 | 28.12 | 97.37 | 13.42 |
| 1987 | 83.1 | 17.98 | 34.92 | 85.06 | 4.85 |
| 1988 | 68.3 | 24.86 | 36.89 | 84.76 | 2.20 |

SOURCE: Zambian Monthly Digest of Statistics.

TABLE 3 (c): Short-run influences on the black market premium during the auction period.

| Month | Auction rate | BM rate | BM premium | Shocks and signals |
|-------|--------------|---------|------------|---|
| SEP85 | 0.461 | 0.270 | 41.365 | - Interest rates decontrolled. |
| OCT85 | 0.190 | 0.100 | 47.445 | - Auction instituted; import licenses |
| NOV85 | 0.171 | 0.120 | 29.825 | abolished; no funds import licenses. |
| DEC85 | 0.174 | 0.130 | 25.296 | |
| JAN86 | 0.168 | 0.110 | 34.468 | |
| FEB86 | 0.152 | 0.130 | 14.494 | - Increase in dollars offered announced; |
| MAR86 | 0.145 | 0.120 | 17.313 | I.M.F. standby concluded; TAZARA etc |
| APR86 | 0.144 | 0.120 | 16.605 | included in auction. |
| MAY86 | 0.141 | 0.100 | 29.200 | - Chivuno appointed governor of BOZ. |
| JUN86 | 0.136 | 0.110 | 19.344 | - Bids published from this date. |
| JUL86 | 0.150 | 0.130 | 13.550 | - Stringent documentation requirements. |
| AUG86 | 0.178 | 0.140 | 21.483 | - Dutch Auction; "auction pipeline" begins; |
| SEP86 | 0.154 | 0.100 | 34.900 | monetary measures to control money supply. |
| OCT86 | 0.116 | 0.060 | 48.204 | - Reduction in dollars offered announced. |
| NOV86 | 0.081 | 0.050 | 38.511 | - Bid deposit of 30%; bank rate 30% . |
| DEC86 | 0.077 | 0.060 | 22.149 | - Maize price decontrol, food riots; recontrol. |
| JAN87 | 0.073 | 0.040 | 44.899 | - Auction suspended from 28th Jan. for |
| FEB87 | 0.111 | 0.070 | 36.772 | nine weeks. |
| MAR87 | 0.113 | 0.090 | 20.195 | - Two-tier auction from 28th March; |
| APR87 | 0.054 | 0.100 | -85.586 | bid deposit raised to 40% . |
| MAY87 | 0.125 | 0.100 | 20.000 | - Auction abolished 1st May: rate K15/\$ for |
| JUN87 | 0.125 | 0.070 | 44.000 | allocation on 2nd May, thereafter K8/\$. |

TABLE 6 (a):
Expected disparities for import data comparisons in the presence of
trade policy and a black market premium

| Activity | 1 Pc-Pct | 2 Pc(1+t)-Pd | 3 Pct(1+t)-Pd | 4 Pf-Pc | 5 Qf-Qc | 6 PfQf-PcQc |
|---------------|-------------|-----------------|------------------|------------|------------|----------------|
| price O.I. | + | + | - | - | 0 | - |
| price U.I. | - | - | + | + | 0 | + |
| quantity U.I. | 0 | + | + | 0 | + | + |
| smuggling | 0 | + | + | 0 | + | + |

SOURCE: Adapted from Bhagwati (1981).

NOTES:

1. For the imported commodity:
Pf is the f.o.b. price, corrected for insurance and freight;
Pc the declared landed price at customs (i.e. c.i.f. prices before tariffs and taxes are imposed);
Pct the "true" landed price, equal to Pc in the absence of misinvoicing;
Pd the domestic price defined as $Pd = Pct + tPc$, i.e. the true landed price plus the tariff as applied to the declared price;
Qf the partner-country recorded export quantity;
Qc the recorded import quantity;
t the legal tariff rate;
2. The inequality signs in (3) obtain for the following reason:
 $pct(1+t) - pd = pct - tpct - pct - tpc = t(pct - pt)$, i.e. negative for over-invoicing

TABLE 6 (b): Partner-country-data trade comparisons: percentage faked invoicing (R-values).

| YEAR | U.K. | U.S.A | Six Major Partners | O.E.C.D. |
|------|--------|--------|--------------------|----------|
| 1968 | 36.86 | 73.76 | 35.98 | 36.34 |
| 1969 | 30.61 | 76.16 | 34.15 | 31.89 |
| 1970 | 36.48 | 64.51 | 29.80 | 29.31 |
| 1971 | 13.25 | 58.49 | 20.02 | 20.77 |
| 1972 | 15.86 | 44.41 | 13.22 | 16.91 |
| 1973 | 13.17 | 22.56 | -1.10 | 2.20 |
| 1974 | 3.69 | -9.41 | -12.59 | -15.85 |
| 1975 | 3.32 | 34.54 | 14.05 | 9.41 |
| 1976 | 32.77 | 47.71 | 9.69 | 2.37 |
| 1977 | 2.67 | 48.98 | 12.91 | 8.59 |
| 1978 | 12.54 | 8.18 | 7.05 | 6.41 |
| 1979 | 6.10 | 2.65 | 0.03 | -4.10 |
| 1980 | 2.23 | -21.63 | -8.76 | 3.76 |
| 1981 | 17.52 | 32.94 | 15.50 | 2.37 |
| 1982 | 20.00 | 37.83 | 10.78 | 10.61 |
| 1983 | . | . | . | . |
| 1984 | -14.27 | -56.44 | -30.71 | -29.27 |
| 1985 | -8.09 | 2.67 | -14.79 | -14.55 |

SOURCE: Direction of Trade Statistics (IMF) and Foreign Trade Statistics, (O.E.C.D.) .

NOTES:

1. The trade ratios are $R = .00.(M_z - X_f)/X_f$, where M_z are Zambian-recorded f.o.b. imports and X_f , partner country-recorded f.o.b. exports.
2. The six main trading partners, excluding South Africa and Saudi Arabia, are U.S.A., U.K., France, Italy, Japan and Germany.
3. For all imports in 1983 and 1986-88 and for imports from Japan in 1981 only partner data was available.
4. Simple two-year averages for export and import figures to alleviate discrepancies due to lagged reporting smoothed but did not alter trends. These smoothed ratios were used for the regressions reported in Tables 4 (d) and (e).
5. No adjustment was required for transport costs: Zambian import data is reported on an f.o.b. basis.
6. Given currency convertibility in the trading partners considered (this would not have applied to South Africa) the likelihood of faked export invoicing is diminished and was not corrected for.

TABLE 6 (c): Quantifying faked invoicing using import value comparisons (1975=100).

| YEAR | Kenya IUV (manuf.) | Zambia IUV (manuf.) | Percent extra 0.1 | Zambia import volume index | Value ('75 k mil) |
|------|-----------------------|------------------------|----------------------|-------------------------------|----------------------|
| 1965 | 43.37 | 43.97 | 1.40 | 75.11 | 7.67 |
| 1966 | 43.37 | 41.13 | -5.15 | 80.85 | -30.48 |
| 1967 | 43.37 | 42.57 | -1.83 | 101.82 | -13.64 |
| 1968 | 44.51 | 44.31 | 0.45 | 101.04 | -3.31 |
| 1969 | 44.51 | 45.76 | 2.81 | 99.90 | 20.52 |
| 1970 | 49.07 | 50.59 | 3.11 | 98.23 | 22.33 |
| 1971 | 53.64 | 54.64 | 1.86 | 108.95 | 14.87 |
| 1972 | 59.35 | 59.69 | 0.57 | 102.96 | 4.31 |
| 1973 | 70.10 | 68.77 | -1.90 | 80.00 | -11.11 |
| 1974 | 93.55 | 83.78 | -10.45 | 102.64 | -78.49 |
| 1975 | 100.00 | 99.99 | -0.01 | 100.00 | -0.04 |
| 1976 | 103.13 | 108.60 | 5.30 | 70.14 | 27.23 |
| 1977 | 126.31 | 122.08 | -3.35 | 67.52 | -16.54 |
| 1978 | 148.80 | 141.81 | -4.70 | 49.78 | -17.11 |
| 1979 | 162.28 | 166.50 | 2.60 | 51.48 | 9.81 |
| 1980 | 195.25 | 185.38 | -5.05 | 48.47 | -17.93 |
| 1981 | 225.65 | 328.41 | 45.55 | 32.17 | 107.27 |
| 1982 | 240.53 | 304.03 | 26.40 | 20.24 | 39.13 |
| 1983 | 363.46 | 381.17 | 4.87 | 11.94 | 4.26 |
| 1984 | 492.97 | 602.87 | 22.29 | 9.70 | 15.83 |
| 1985 | 817.94 | 624.15 | -23.69 | 9.76 | -16.94 |
| 1986 | 2101.25 | 1190.69 | -43.33 | 15.93 | -50.55 |

SOURCE: Kenyan Statistical Abstracts and Zambian Monthly Digests of Statistics.

NOTES:

1. The import unit value indices for Kenya and Zambia were disaggregated and only the manufacturing sector IUVs used for comparison.
2. The choice of 1975=100 is due to minimal overinvoicing in that year according to partner-country-data trade comparisons.

TABLE 6 (d): Statistics for the smuggling incentive and trade ratios.

| Country | Time mean | INCENTIVE range | INCENTIVE mean | TRADE RATIO range | TRADE RATIO coefficient | Correlation | Trade Variable |
|---------|-----------|-----------------|----------------|-------------------|-------------------------|-------------|---------------------|
| Zaire | 1964-78 | 1.64 | 0.71-3.22 | 1.71 | 1.28-2.29 | 0.21 | all exports |
| | 1972-78 | 1.81 | 1.04-3.22 | 1.90 | 1.40-2.29 | 0.53 | all exports |
| Zambia | 1969-80 | 1.27 | 0.43-2.38 | 1.15 | 1.03-1.35 | 0.65 | imports (U.K.) |
| | | | | 1.35 | 0.88-1.75 | 0.64 | imports (U.S.A.) |
| | | 0.71 | 0.06-1.50 | 1.12 | 0.92-1.35 | 0.65 | imports (Six part.) |
| | | | | 1.11 | 0.91-1.34 | 0.64 | imports (O.E.C.D.) |

SOURCE: Calculations based on Table 6 (b); McDonald (1985).

NOTES:

1. Zaire was the only African country studied in McDonald (1985): here adapted from his Table 2.
2. Incentive: $i = (q/(1-t_i)) - 1$, where q is the black market premium and t_i , a trade policy proxy.
3. Trade Ratio: Zambia recorded imports/partner country recorded exports (two year averages).

TABLE 6 (e): Regressions of the trade ratios on the smuggling incentives.

| Country | Time period | constant | I | T | I _{t-1} | Dummies | DW | Adj. R ² | Trade Variable |
|---------|-------------|----------------|----------------|----------------|------------------|----------------------------|--------------|---------------------|------------------|
| Zaire | 1964-78 | 1.56 (4.45) | 0.09 (0.73) | - | - | - | 1.23 | 0.22 | All exports |
| | | 0.26 | 0.02 | 0.73 | | -0.17 | | | |
| Zambia | 1969-80 | 0.30 (1.73) | 0.01 (0.43) | 0.72 (5.89) | - | -0.17 (-3.45) [0.74] | 1.63 | 0.85 | O.E.C.D. imports |
| | 1969-80 | 0.12 (0.51) | 0.02 (0.45) | 0.83 (4.57) | - | 0.10 (1.25) | 2.16 2.14 | 0.67 0.66 | O.E.C.D. imports |
| | | 0.57 0.14 | 0.39 0.12 | 4.50 0.82 | -0.08 | [0.76] 0.06 | | | |
| | 1969-80 | 0.11 (0.32) | 0.09 (1.60) | 0.83 (3.34) | -0.06 (-1.16) | 0.07 (0.61) | 1.53 1.44 | 0.66 0.65 | O.E.C.D. imports |
| | | 0.61 | 1.54 | 3.20 | 1.14 | [0.75] | | | |

Source: Data in Table 6(d); McDonald (1985).

NOTES:

1. The regression for Zaire excludes 1971 (McDonald, 1985).
2. Dummy years indicated below the t-statistics

TABLE 7 (a): An anatomy of possible fiscal implications of exchange-rate devaluation-driven unification.

| INFLATION | NET REVENUE | | |
|------------------------|---|-----------------------------|-------------------------|
| | (1) Foreign Exchange Transactions | (2) Foreign Trade Tax | (3) Inflation Tax |
| $\bar{\pi} \leq \pi^*$ | (-) | (+) | (+) |
| $\bar{\pi} \geq \pi^*$ | (+) | (-) | (-) |

TABLE 7 (b): Central Bank profits due to foreign exchange transactions.

| Date | [1] Export earnings (\$,m) | [2] Xp (forex purchases) | [3] Mp (forex sales) | [4] Net purchases (\$,m) | [5] Auction- related loans(\$,m) | [6] Central Bank profits, P (kwacha,m) | [7] Net profits as % annual GDP |
|-------|-------------------------------------|-----------------------------------|-------------------------------|-----------------------------------|---|---|--|
| JAN86 | 57.3 | 40.7 | 26.6 | 14.1 | 25.9 | 44.18 | 0.34 |
| FEB86 | 59.4 | 34.8 | 32.2 | 2.6 | 0.0 | 2.90 | 0.02 |
| MAR86 | 59.8 | 40.7 | 40.1 | 0.6 | 8.8 | 0.87 | 0.05 |
| APR86 | 59.1 | 41.6 | 37.8 | 3.8 | 14.8 | 5.26 | 0.04 |
| MAY86 | 67.0 | 47.1 | 26.7 | 20.4 | 15.6 | 59.57 | 0.46 |
| JUN86 | 51.2 | 30.7 | 29.9 | 0.8 | 20.1 | 1.41 | 0.01 |
| JUL86 | 57.0 | 35.1 | 34.2 | 0.9 | 7.8 | 0.94 | 0.00 |
| AUG86 | 65.2 | 46.5 | 36.6 | 9.9 | 4.7 | 15.19 | 0.12 |
| SEP86 | 64.8 | 37.0 | 26.8 | 10.2 | 7.8 | 35.60 | 0.27 |
| OCT86 | 49.8 | 17.6 | 19.4 | -1.8 | 0.9- | -14.46 | -0.11 |
| NOV86 | 48.8 | 36.1 | 16.4 | 19.7 | 0.3 | 151.73 | 1.17 |
| DEC86 | 65.4 | 45.2 | 13.6 | 31.6 | 0.4 | 116.65 | 0.59 |
| JAN87 | 58.9 | 26.4 | 11.7 | 14.9 | 0.0 | 167.25 | 0.85 |
| FEB87 | 51.2 | 20.2 | 20.5 | -0.3 | 22.0 | -1.58 | 0.00 |
| MAR87 | 83.0 | 39.6 | 23.0 | 16.6 | 0.2 | 37.25 | 0.20 |
| APR87 | 53.8 | 23.4 | 23.7 | -0.3 | 15.4 | 2.57 | 0.01 |
| MAY87 | 61.3 | 33.7 | 27.2 | 6.5 | 0.0 | 13.00 | 0.07 |
| JUN87 | 70.3 | 39.4 | 16.0 | 23.4 | 0.0 | 147.09 | 0.75 |
| JUL87 | 96.1 | 63.1 | 23.6 | 39.5 | 0.0 | 122.89 | 0.63 |
| AUG87 | 75.0 | 42.3 | 56.0 | -13.7 | 2.7 | -27.40 | -0.14 |
| SEP87 | 49.1 | 21.8 | 28.8 | -7.0 | 0.0 | -21.78 | -0.11 |
| OCT87 | 87.4 | 29.4 | 26.7 | 2.7 | 0.0 | 12.15 | 0.06 |
| NOV87 | 109.7 | 56.7 | 44.9 | 11.8 | 0.0 | 53.10 | 0.27 |
| DEC87 | 96.4 | 47.6 | 29.8 | 17.8 | 0.0 | 111.89 | 0.57 |

SOURCE: Calculations using monthly data from Bank of Zambia Foreign Exchange Budget Reports.

NOTES:

1. Xp is central bank purchases of foreign exchange from ZCCM (Zambia Consolidated Copper Mining Company) and non-traditional exporters, less their foreign exchange retentions (which are [1]-[2]).
2. Mp is central bank sales of foreign exchange to the private sector ("total auctionable funds" in the BOZ budget). The source is auction-related loans [5] and portion of [2].
3. Column [4]=[2]-[3] shows the government to be a small net buyer of foreign exchange. The effect of auction-related grants and loans is to diminish this position.
4. Profits on foreign exchange transactions alone due to the presence of dual rates were estimated as follows: $P=(Xp-Mp).(Eb-E0)$, where Eb is the black rate and E0, the official rate of exchange.

TABLE 7 (c): An empirical assessment of the location of unification episodes on the Seigniorage Laffer Curve.

| EXCHANGE RATE EPISODE | AVERAGE MONTHLY | | | $\Delta E_0/E_0$ | real deficit ('80 prices) | credib. rating |
|------------------------------|-----------------|-----------|-----|------------------|------------------------------|-------------------|
| | π | \hat{v} | q | | | |
| Crawling peg regime: | | | | | | |
| 1. Jul83-Oct84 | 1.4 | . | 1.2 | 3.4 | -169 | good |
| 2. Nov84-Sep85 | 2.9 | . | 1.9 | 0.7 | -163 | diminished |
| Auction regime: | | | | | | |
| 1. Oct85-Aug86 (STABLE) | 3.5 | 893 | 1.3 | 2.9 | -237 | good |
| | $\pi^* = 3.8$ | | | | | |
| 2. Sep86-Apr87 (UNSTABLE) | 4.3 | -470 | 1.6 | 20.6 | -589 | poor |

SOURCE: Calculations using monthly data (IFS) and quarterly budgetary data (Bank of Zambia, Quarterly reports).

NOTES:

1. \hat{v} stems from equation 7.10' and was estimated from October, 1986 to April, 1987.
2. The first month of the auction was excluded from the calculation of average inflation during the stable auction phase. In the unstable phase, the two months of suspension and the final month of the auction were excluded. If September, 1986 (when a sharp monetary contraction occurred) is excluded in the unstable phase, average inflation rises from 4.3 to 6.
3. The credibility rating stems from the analysis in Section III and Table 3 (c).

FIGURE 1:
The quarterly black market premium for Zambia showing exchange rate episodes.

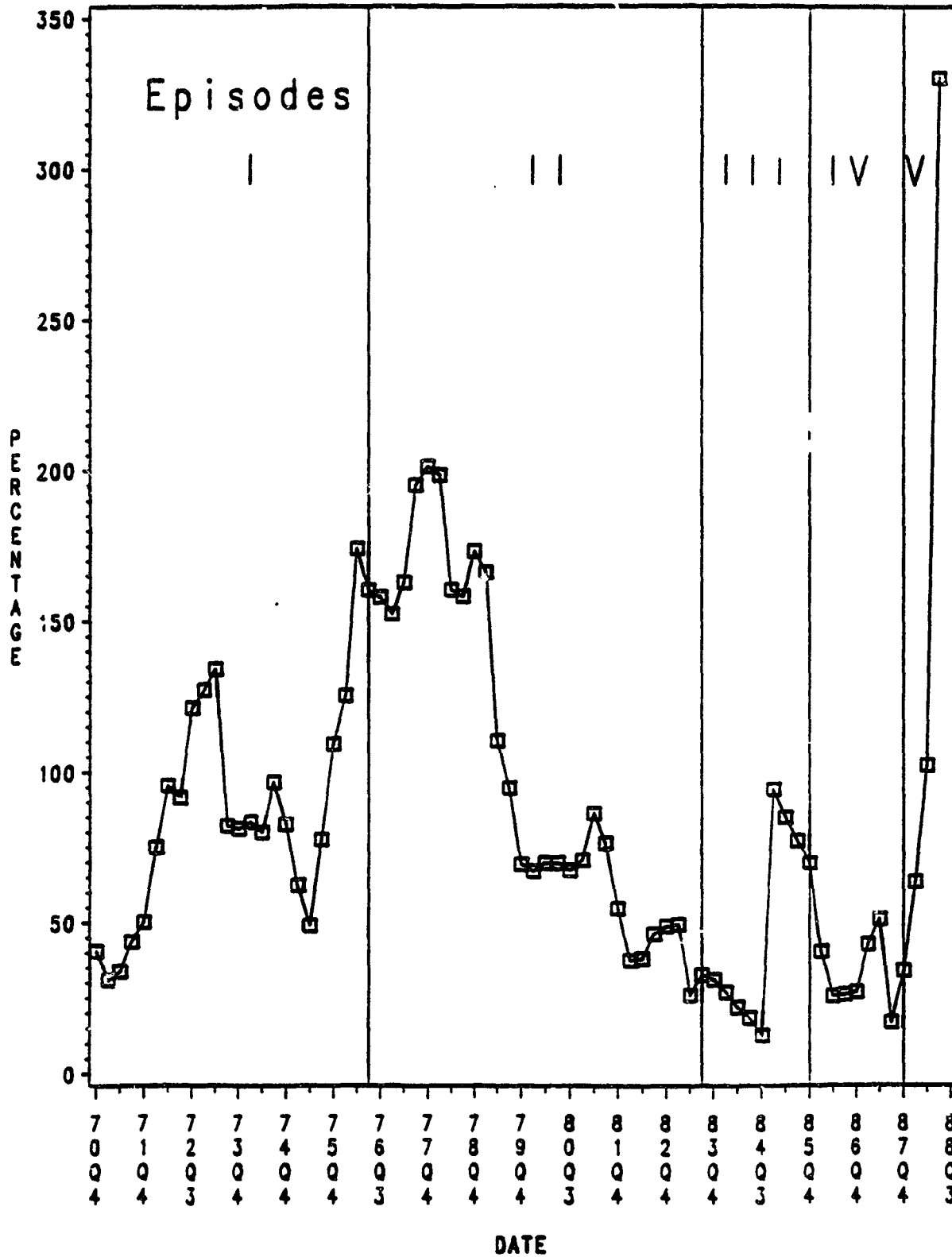
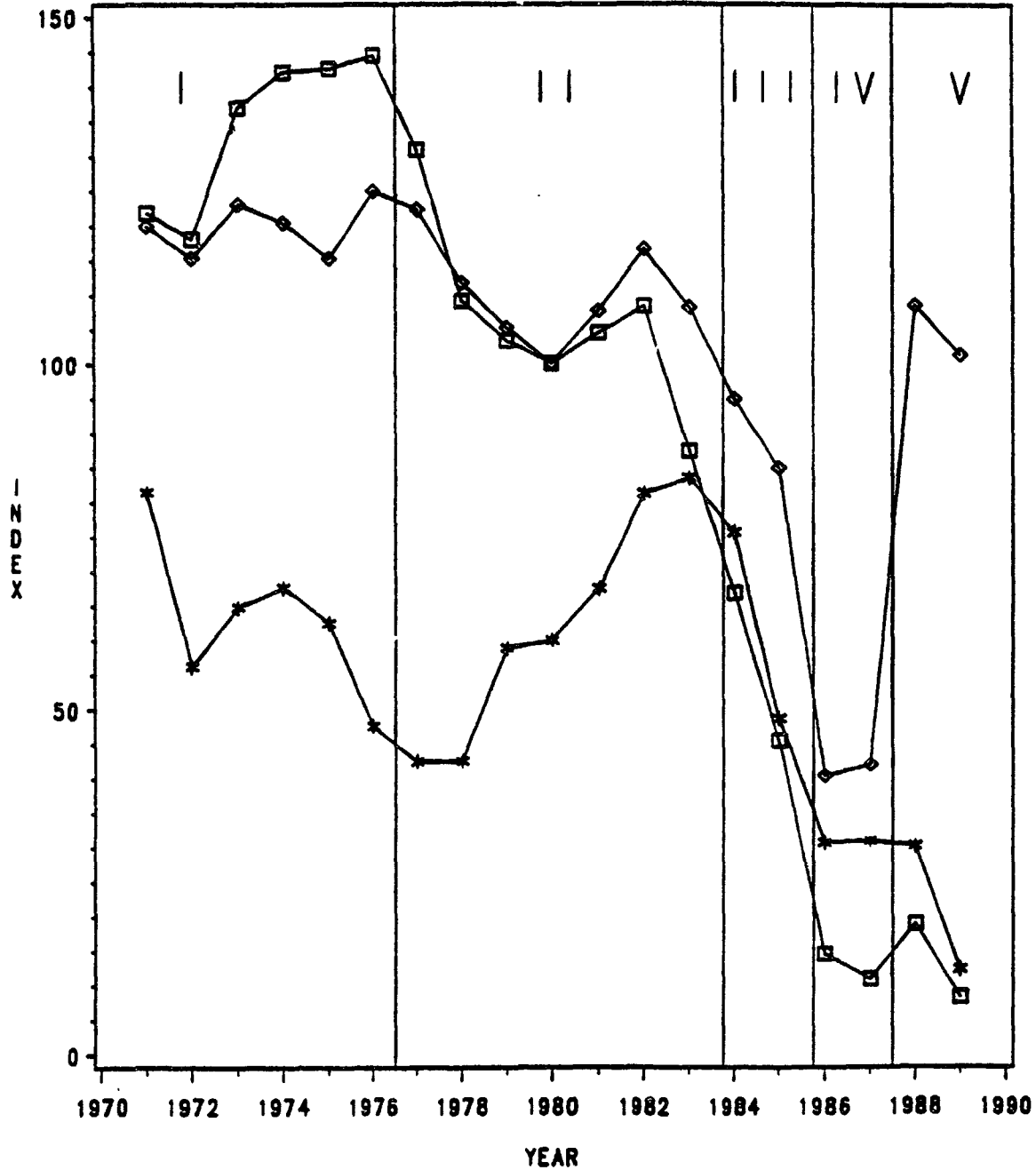


FIGURE 2 (a):

Nominal and real effective exchange rates by episode
(1980=100 for the official rate)



AN INCREASE IN THE INDEX DENOTES APPRECIATION.

square: nominal effective exchange rate calculated using the official rate

diamond: real effective exchange rate calculated using the official rate

star: real effective exchange rate calculated using the parallel rate

FIGURE 5 (a):
The monthly wheat market premium for Zambia: 1970-1980.

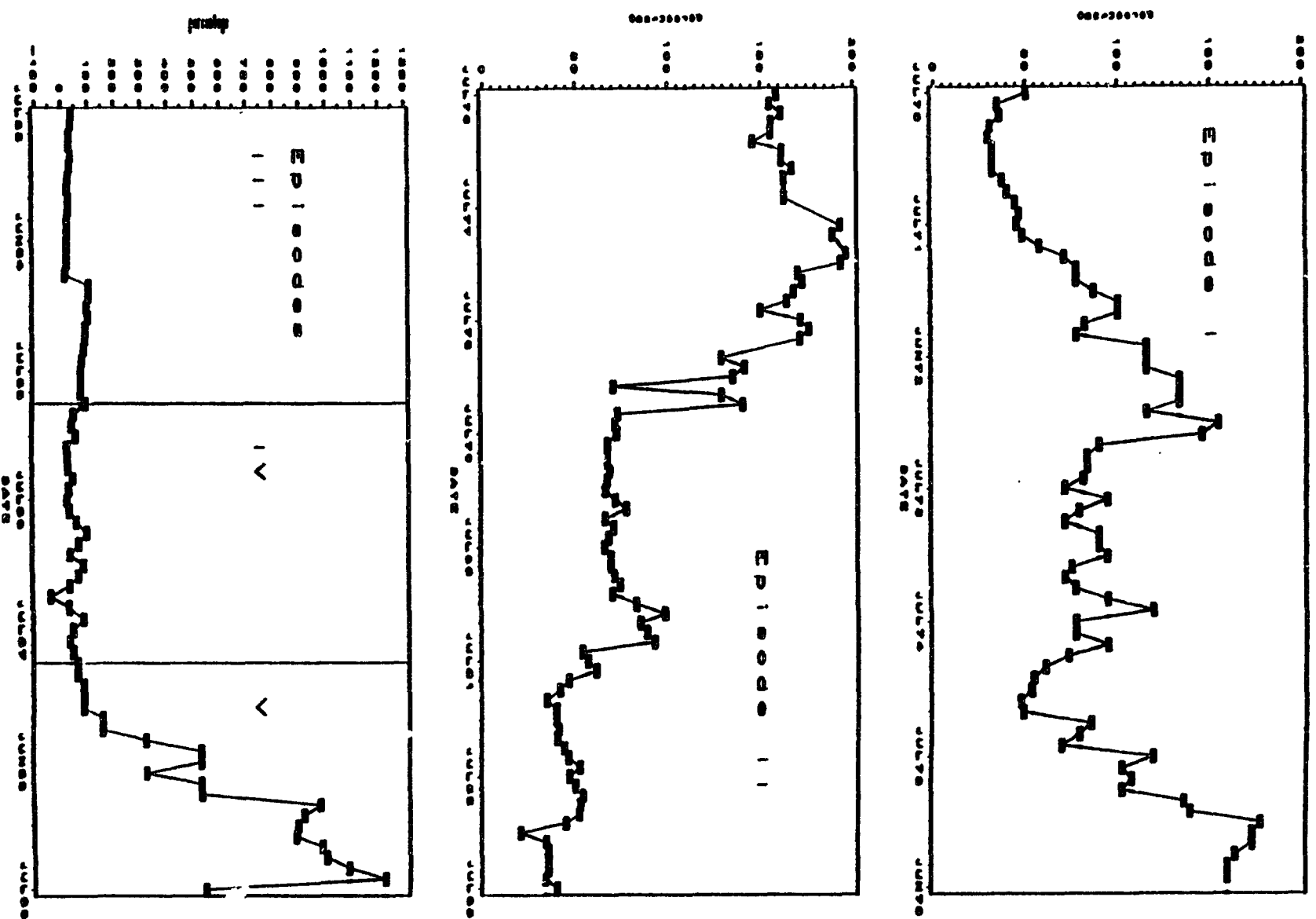
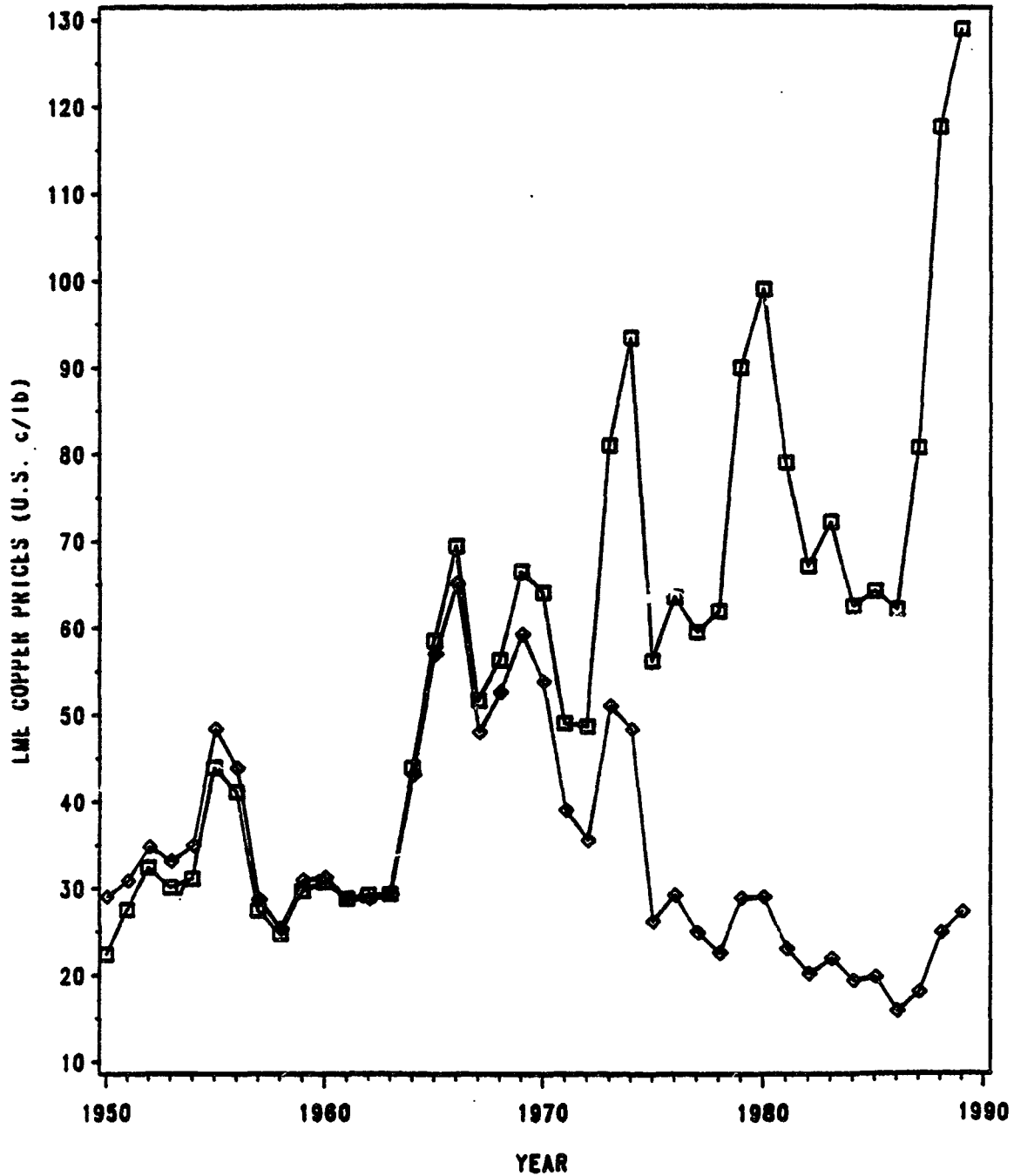


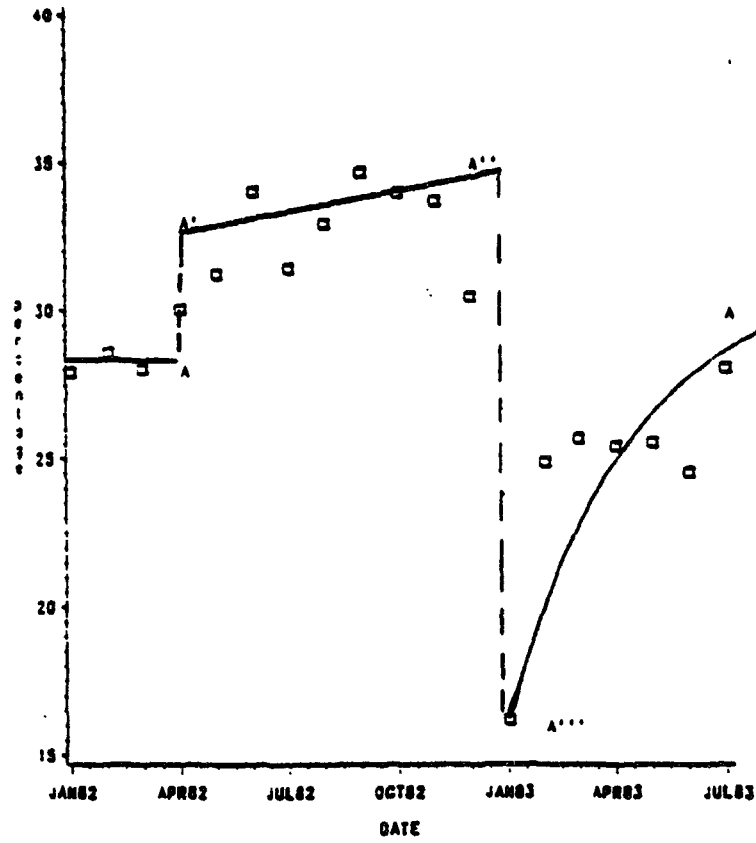
FIGURE 3 (b):
World Copper Prices: LME prices in
U.S. c/lb (MUV deflated, 1963 prices)



KEY:
square: current prices
diamond: constant prices

FIGURE 3 (c):

Expectations of a maxi-devaluation:
(monthly black market premium Jan. 1982-Jul. 1983).



The theoretical path of the premium in the adjustment process (Dornbusch et al (1983)).

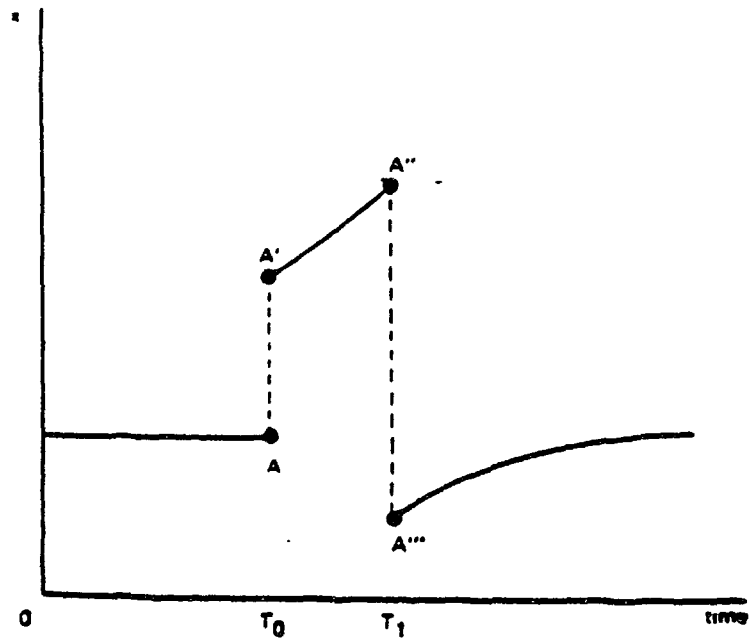
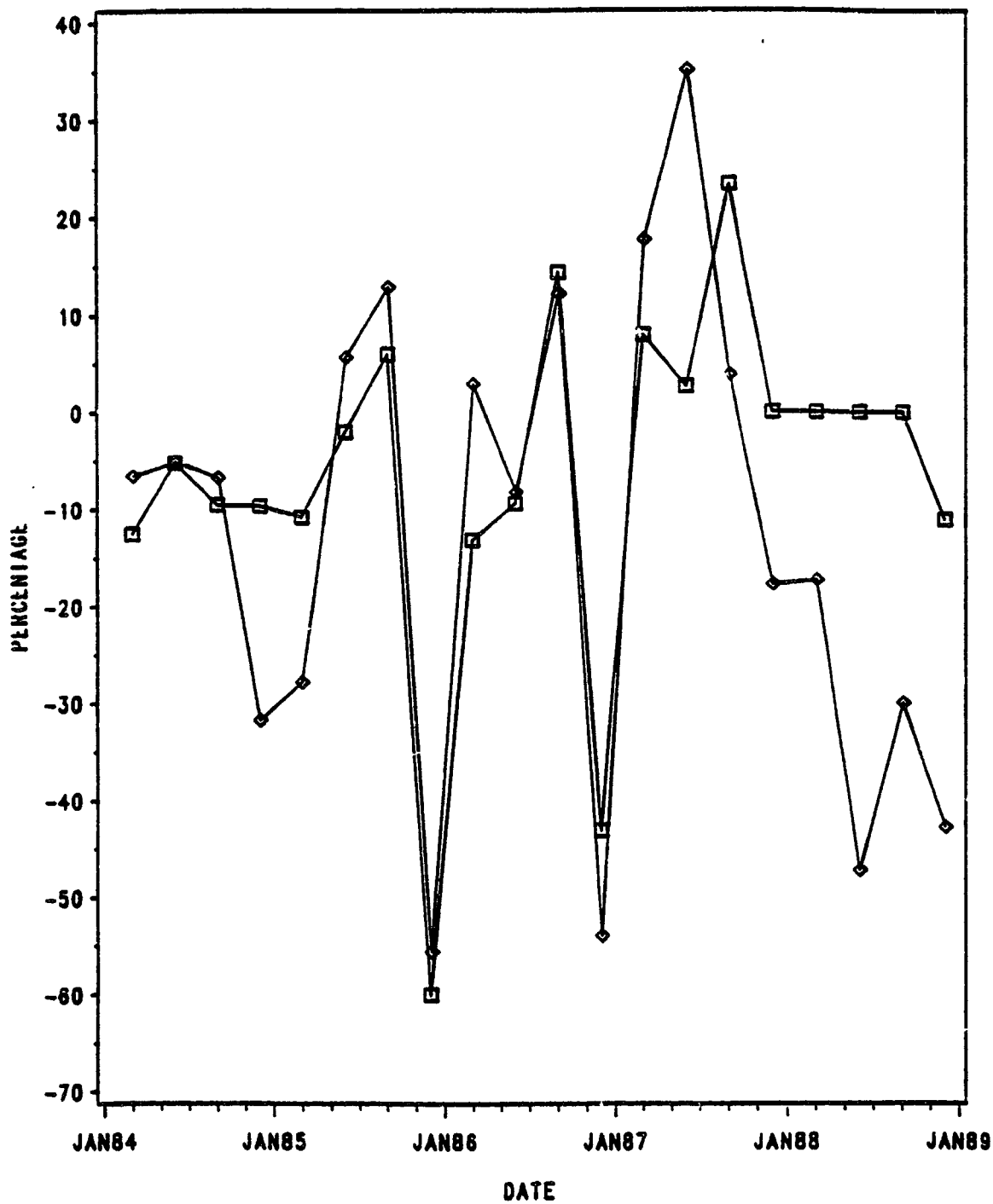


FIGURE 3 (d):

Zambia: nominal and official parallel market exchange rate depreciation



KEY:

square: quarterly official rate depreciation

diamond: quarterly parallel rate depreciation

Figure 3(e): EXPECTED DEVALUATION

(Estimated using monthly data)

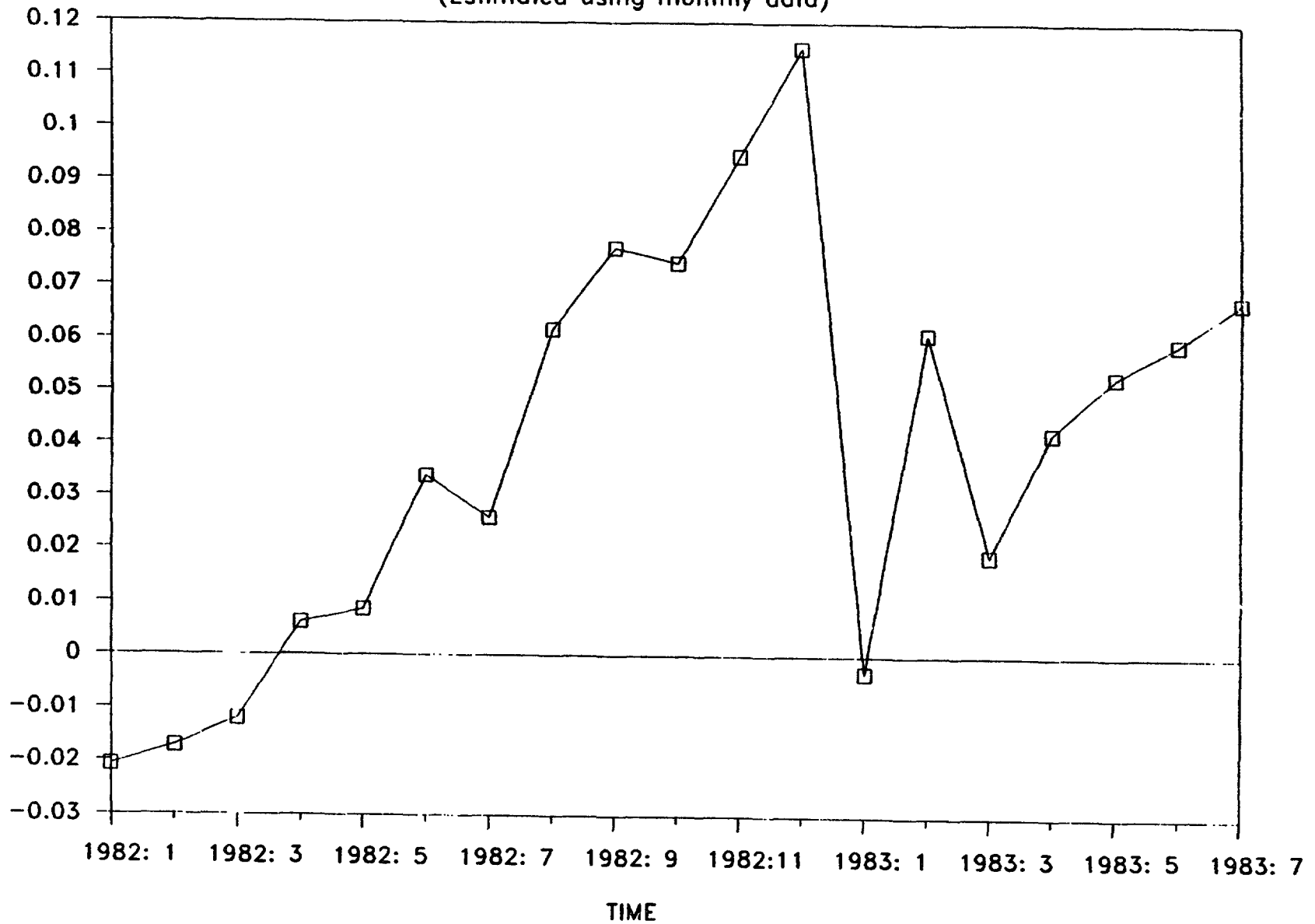
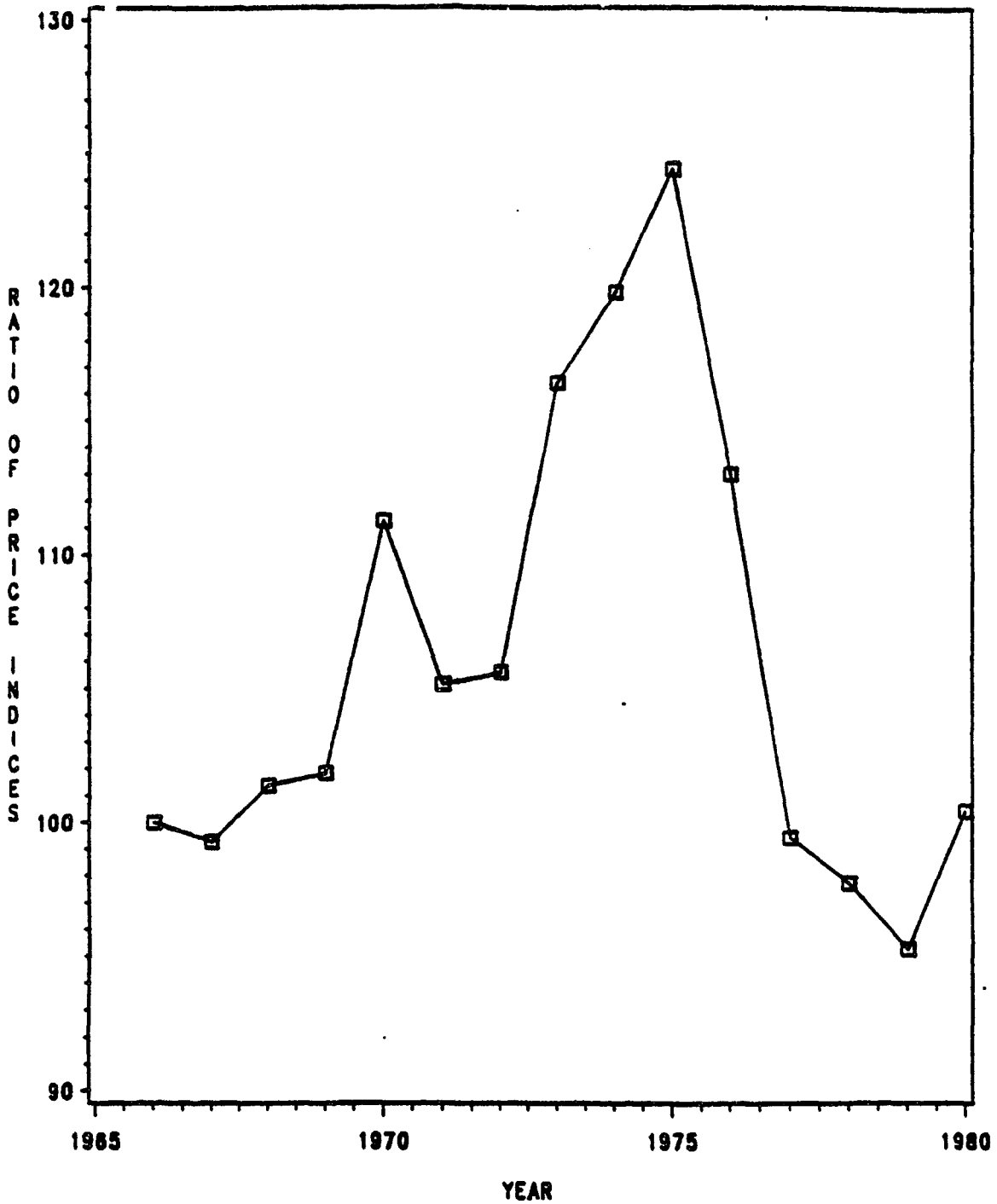


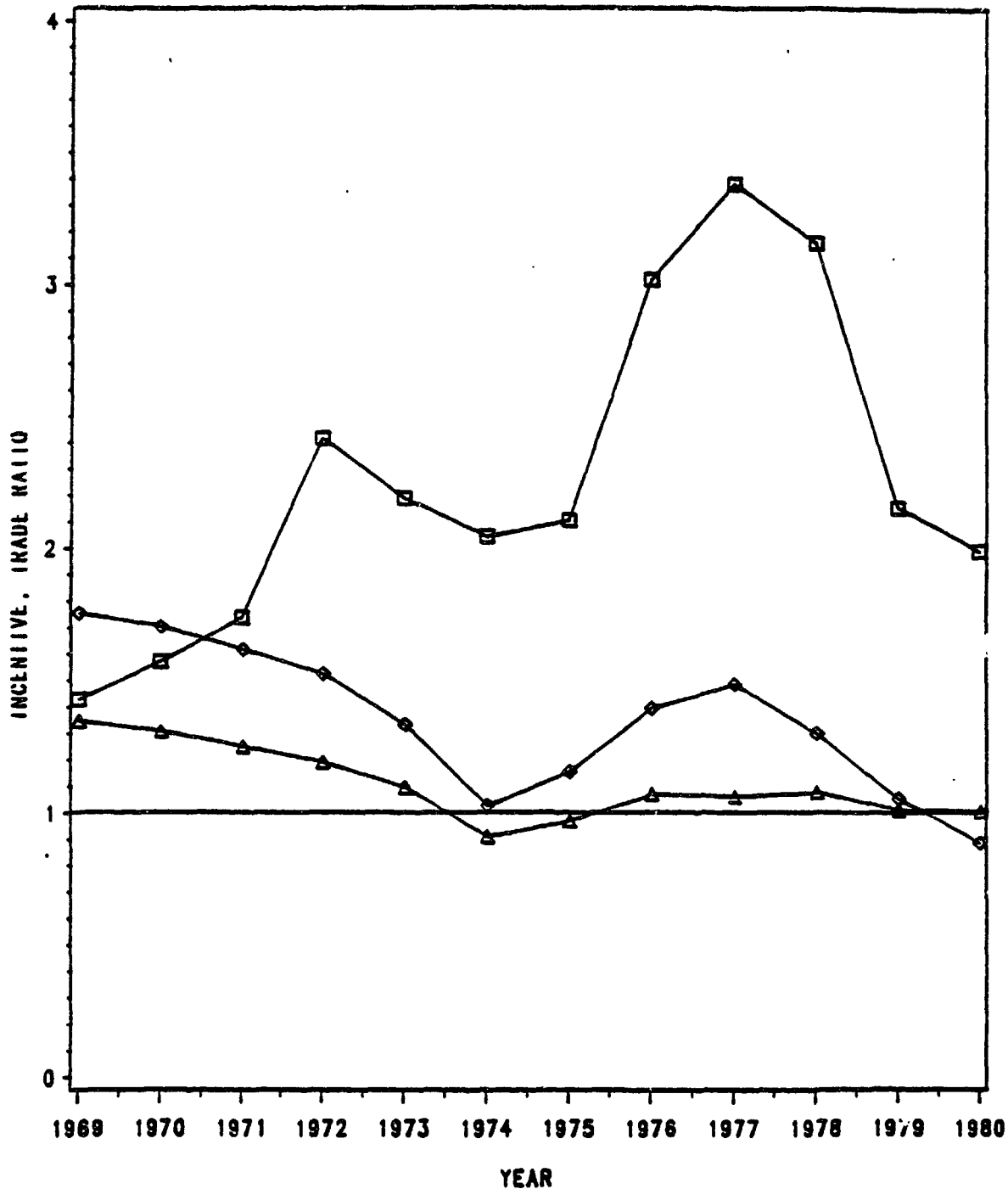
FIGURE 6 (a):

A proxy for trade policy in Zambia: ratio of imported to retail manufacturing price indices (1966=100)



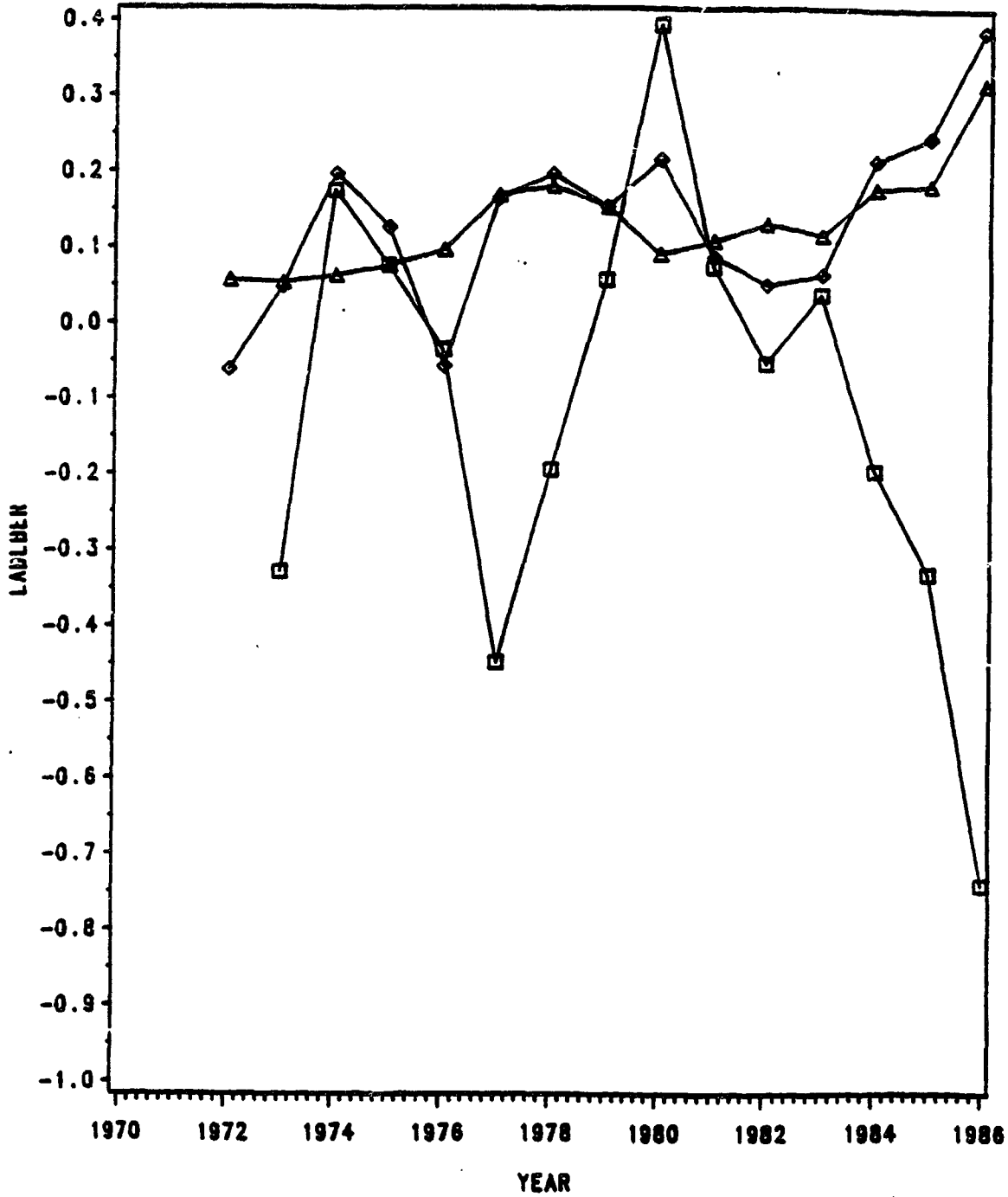
AN INCREASE IMPLIES TRADE LIBERALISATION

FIGURE 6 (b); - 100 -
Smuggling incentives and trade data ratios.



KEY
square: *I incentive*
diamond: *U.S.A. trade ratio*
triangle: *O.E.C.D. trade data ratio*

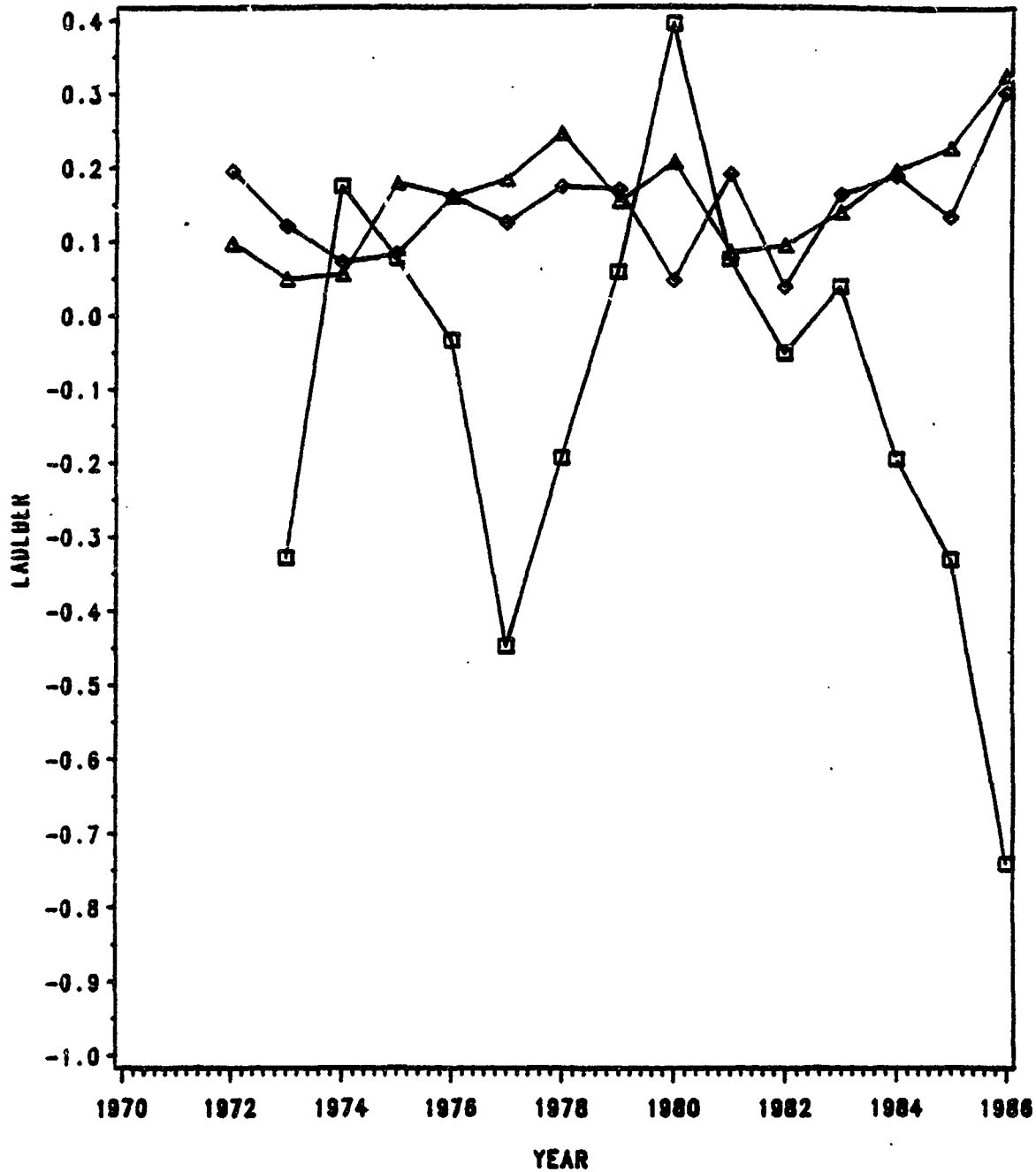
FIGURE 7 (a):
Inflation (CPI, WP) and parallel rate depreciation



KEY:
square: annual parallel rate depreciation
triangle: annual CPI inflation
diamond: annual WP inflation

FIGURE 7 (b):

Inflation (disaggregated index) and parallel rate depreciation



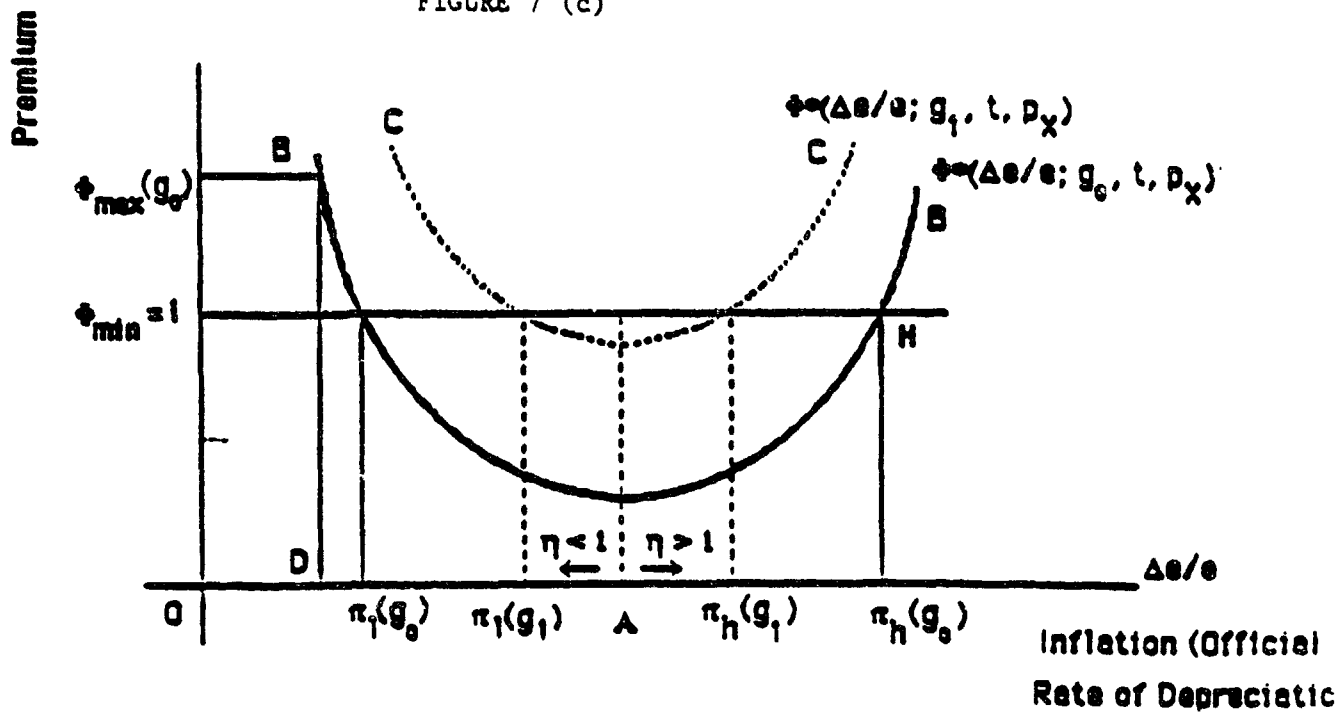
KEY:

square: annual parallel rate depreciation

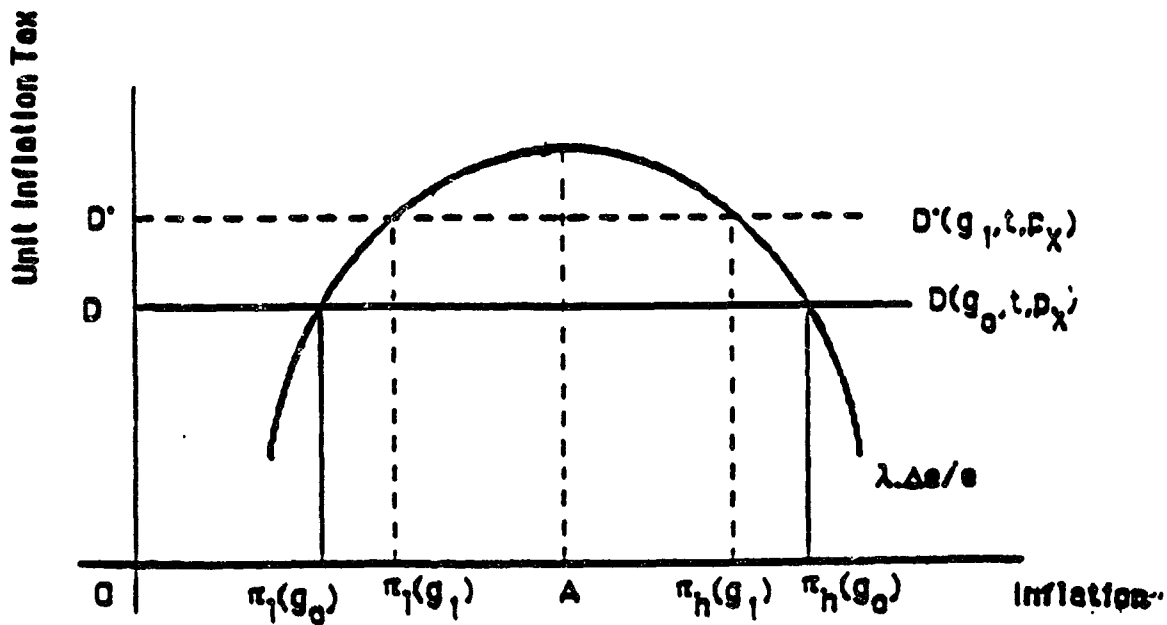
triangle: annual inflation rate of price index for wholesale manufacturing price index excluding food, beverages and tobacco

diamond: annual inflation rate of the food, beverages and tobacco sub-sector of the wholesale manufacturing price index

FIGURE 7 (c)



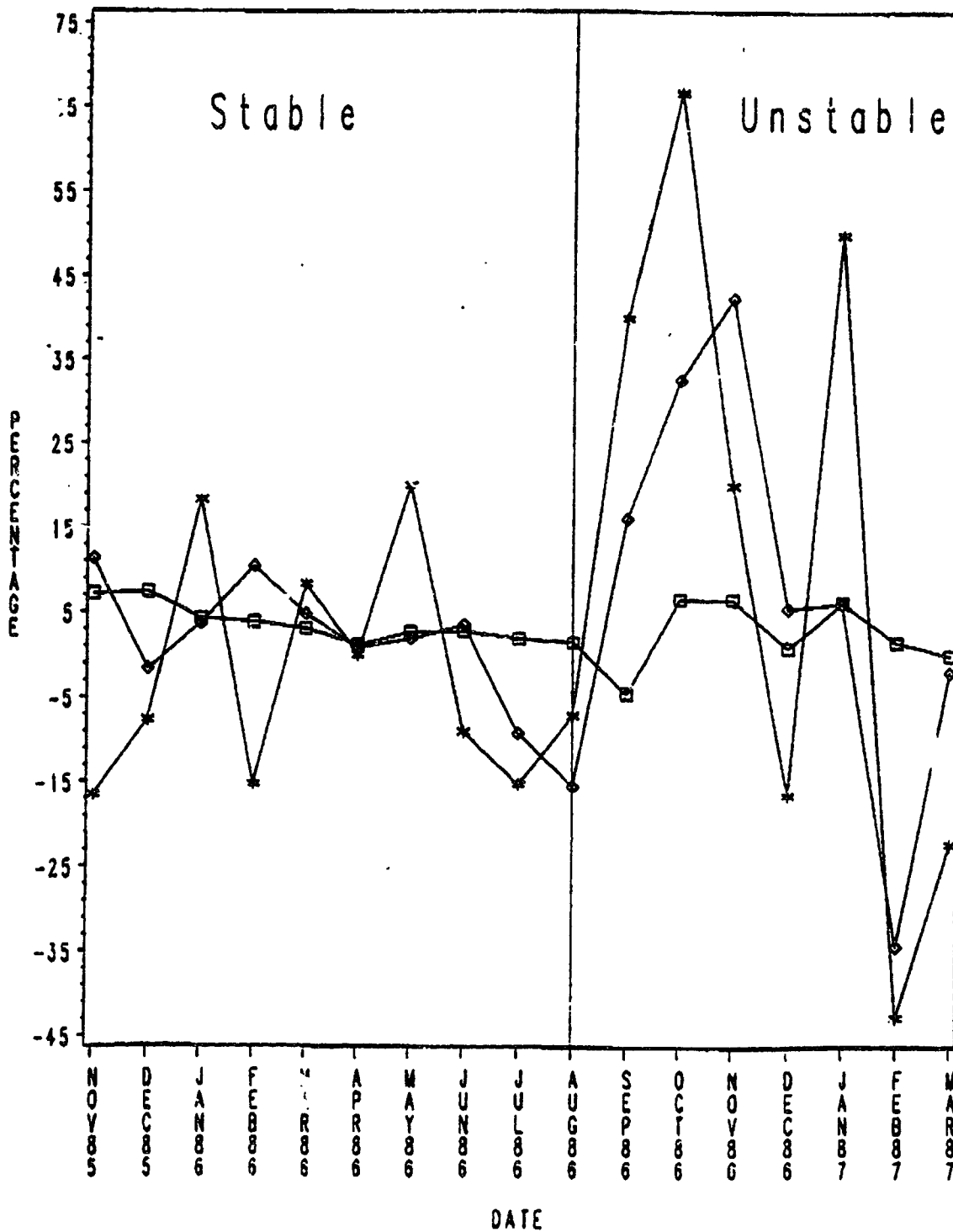
Steady-State Inflation and Premium



Dual Equilibria Upon Unification

FIGURE 7 (d):

Inflation and exchange rate depreciation during the auction



KEY:

- square: monthly inflation rate (CPI)
- diamond: monthly official rate depreciation
- star: monthly black rate depreciation

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APPENDIX TABLE A.2 (a): A summary of the exchange rate components of I.M.F. programmes with Zambia 1976-85.

-
1. The 1976-77 stand-by included a 20 per cent devaluation of the kwacha in terms of the SDR.
 2. A 10 per cent devaluation against the SDR was a condition of the 1978-80 stand-by.
 3. The 1981-83 extended facility conditions for the external sector were that the government should periodically review and adjust the exchange rate for the maintenance of competitiveness.
 4. The 1983-4 stand-by agreement aimed to arrest the deterioration in the balance of payments. In January, 1983 a 20 per cent devaluation against the SDR occurred and in July, 1983, a flexible exchange rate policy was adopted, delinking the kwacha from the SDR and pegging it to a basket of six currencies.
 5. A 1984-86 stand-by facility aimed in the external sector to consolidate the progress of 1983 in reducing external imbalance. The facility was inactive during 1985 and canceled in February, 1986.
-

APPENDIX TABLE A.3 (a):

A summary of the weekly auction results.

| Auction: week date | Number of bids: total accepted | | Kwacha offered | Dollars: req. alloc. | | Bid Range | Exchange rate |
|-----------------------|-----------------------------------|-----|-------------------|-------------------------|------|--------------|------------------|
| 1 11/10/85 | 299 | 94 | 79.7 | 16.9 | 4.8 | 2.75-15.00 | 5.01 |
| 2 18/10 | 397 | 137 | 82.8 | 12.5 | 5.0 | 3.11-12.00 | 6.10 |
| 3 25/10 | 345 | 186 | 69.1 | 10.3 | 5.2 | 2.44-9.15 | 7.00 |
| 4 31/10 | 270 | 241 | 74.1 | 10.2 | 7.5 | 4.64-9.00 | 6.44 |
| 5 08/11 | 232 | 181 | 52.6 | 8.1 | 6.2 | 4.22-7.50 | 6.25 |
| 6 15/11 | 229 | 195 | 30.8 | 4.8 | 4.1 | 3.50-7.50 | 6.03 |
| 7 23/11 | 234 | 213 | 31.2 | 5.0 | 3.9 | 4.22-7.50 | 5.80 |
| 8 30/11 | 205 | 166 | 29.9 | 4.9 | 4.2 | 5.00-7.05 | 5.75 |
| 9 07/12 | 187 | 169 | 27.3 | 4.6 | 4.2 | 4.22-7.00 | 5.74 |
| 10 14/12 | 201 | 180 | 30.7 | 5.2 | 4.5 | 5.50-6.65 | 5.75 |
| 11 21/12 | 172 | 160 | 27.3 | 4.6 | 4.3 | 5.60-7.05 | 5.77 |
| 12 28/12 | 101 | 100 | 21.0 | 3.5 | 3.5 | 5.60-6.65 | 5.70 |
| 13 04/01/86 | 117 | 106 | 29.5 | 5.0 | 4.6 | 4.95-6.50 | 5.76 |
| 14 11/01 | 164 | 105 | 31.9 | 5.4 | 4.1 | 4.52-6.50 | 5.36 |
| 15 18/01 | 234 | 102 | 41.5 | 6.7 | 3.3 | 4.52-7.50 | 6.01 |
| 16 25/01 | 309 | 151 | 67.7 | 10.2 | 4.7 | 4.52-7.50 | 6.40 |
| 17 01/02 | 287 | 260 | 40.6 | 6.5 | 6.1 | 4.00-7.50 | 6.36 |
| 18 08/02 | 254 | 143 | 44.2 | 7.2 | 3.9 | 4.00-7.11 | 6.51 |
| 19 15/02 | 281 | 205 | 45.2 | 6.7 | 5.2 | 5.05-7.50 | 6.68 |
| 20 22/02 | 304 | 191 | 75.7 | 11.9 | 7.7 | 5.05-7.50 | 6.78 |
| 21 01/03 | 301 | 136 | 71.5 | 10.2 | 5.4 | 5.54-7.50 | 7.01 |
| 22 08/03 | 287 | 141 | 55.9 | 7.7 | 5.9 | 6.00-8.00 | 6.90 |
| 23 15/03 | 246 | 143 | 53.2 | 7.4 | 5.6 | 6.50-9.50 | 6.75 |
| 24 22/03 | 357 | 253 | 76.2 | 10.8 | 8.8 | 6.00-7.65 | 6.91 |
| 25 29/03 | 193 | 173 | 57.7 | 8.3 | 7.4 | 6.00-7.60 | 6.85 |
| 26 05/04 | 258 | 216 | 58.1 | 8.3 | 7.2 | 6.50-7.60 | 6.87 |
| 27 12/04 | 246 | 171 | 64.9 | 9.3 | 3.7 | 4.50-7.50 | 6.98 |
| 28 19/04 | 273 | 176 | 81.5 | 11.4 | 8.6 | 6.50-7.50 | 7.06 |
| 29 26/04 | 281 | 196 | 64.3 | 8.8 | 6.8 | 4.50-7.50 | 6.98 |
| 30 03/05 | 236 | 200 | 50.9 | 7.2 | 6.3 | 4.50-7.50 | 7.00 |
| 31 10/05 | 274 | 234 | 63.3 | 8.9 | 7.6 | 5.50-7.50 | 7.03 |
| 32 17/05 | 297 | 148 | 75.3 | 10.6 | 3.7 | 3.50-7.50 | 7.11 |
| 33 24/05 | 279 | 153 | 50.9 | 7.8 | 4.0 | 5.50-7.50 | 7.23 |
| 34 31/05 | 332 | 244 | 75.0 | 10.1 | 7.3 | 6.25-8.00 | 7.31 |
| 35 07/06 | 318 | 170 | 53.2 | 7.3 | 4.0 | 6.50-8.00 | 7.26 |
| 36 14/06 | 397 | 244 | 82.2 | 11.1 | 7.0 | 6.51-7.75 | 7.32 |
| 37 21/06 | 383 | 267 | 90.2 | 12.2 | 8.0 | 7.10-7.65 | 7.39 |
| 38 28/06 | 404 | 134 | 92.2 | 12.3 | 7.0 | 5.00-7.61 | 7.51 |
| 39 05/07 | 518 | 151 | 116.6 | 15.2 | 7.6 | 5.50-7.70 | 7.71 |
| 40 11/07 | 451 | 168 | 133.1 | 13.9 | 7.3 | 5.50-9.00 | 8.07 |
| 41 19/07 | 396 | 82 | 126.0 | 15.2 | 4.4 | 5.00-9.51 | 5.03 |
| 42 26/07 | 600 | 155 | 166.7 | 23.5 | 7.5 | 4.01-9.53 | 6.08 |
| 43 02/08 | 760 | 634 | 169.0 | 24.0 | 20.8 | 5.01-9.10 | 5.01 |
| 44 09/08 | 501 | 329 | 99.3 | 17.5 | 10.3 | 4.01-7.53 | 5.35 |
| 45 16/08 | 542 | 220 | 89.4 | 15.4 | 6.0 | 4.50-6.85 | 5.76 |
| 46 23/08 | 621 | 173 | 111.3 | 18.2 | 3.8 | 5.00-6.85 | 6.26 |
| 47 30/08 | 690 | 264 | 136.7 | 20.4 | 9.9 | 5.00-7.75 | 6.87 |
| 48 06/09 | 674 | 501 | 165.0 | 22.8 | 13.6 | 5.00-7.99 | 7.00 |
| 49 13/09 | 418 | 326 | 94.7 | 12.9 | 11.7 | 5.00-8.01 | 5.64 |
| 50 20/09 | 484 | 99 | 101.5 | 14.8 | 3.1 | 4.50-7.83 | 6.37 |
| 51 27/09 | 606 | 167 | 136.9 | 20.1 | 6.0 | 5.10-8.00 | 7.09 |
| 52 04/10 | 712 | 172 | 165.1 | 22.3 | 5.6 | 5.04-8.11 | 7.64 |
| 53 11/10 | 769 | 128 | 177.5 | 22.8 | 5.0 | 5.50-8.56 | 8.30 |
| 54 18/10 | 734 | 125 | 192.8 | 22.6 | 2.6 | 5.06-10.25 | 9.35 |
| 55 25/10 | 493 | 84 | 150.0 | 17.3 | 4.1 | 5.50-11.51 | 10.32 |
| 56 01/11 | 517 | 119 | 146.9 | 13.8 | 4.0 | 6.00-12.50 | 11.51 |
| 57 08/11 | 439 | 111 | 133.1 | 12.2 | 4.2 | 6.00-13.15 | 12.30 |
| 58 15/11 | 407 | 116 | 138.5 | 11.3 | 4.2 | 6.00-14.41 | 13.48 |
| 59 22/11 | 324 | 122 | 134.4 | 8.4 | 4.1 | 6.00-15.17 | 14.68 |
| 60 29/11 | 273 | 140 | 104.4 | 7.2 | 4.1 | 6.00-16.52 | 15.25 |
| 61 06/12 | 221 | 130 | | 5.6 | 4.1 | 6.00-18.00 | 12.10 |
| 62 13/12 | 333 | 107 | | 12.4 | 4.0 | 6.00-16.00 | 11.90 |
| 63 20/12 | 310 | 116 | | 8.4 | 4.0 | 6.00-13.77 | 12.50 |
| 64 27/12 | 258 | 141 | | 6.6 | 4.1 | 6.00-14.20 | 12.71 |
| 65 03/01/87 | 192 | 118 | | 5.7 | 4.1 | 6.00-13.76 | 12.97 |
| 66 10/01 | 232 | 55 | | 9.9 | 4.1 | 6.00-13.98 | 13.51 |
| 67 17/01 | 257 | 111 | | 8.9 | 4.0 | 6.00-15.00 | 14.12 |
| 68 24/01 | 250 | 109 | | 8.9 | 4.8 | 6.00-15.31 | 14.92 |
| 1a 28/03/87 | 625 | 151 | | | | 9.10-20.00 | 15.00 |
| 2a 04/04 | 457 | 62 | | | | 9.25-20.00 | 16.99 |
| 3a 11/04 | 370 | 71 | | | | 13.00-20.75 | 18.75 |
| 4a 16/04 | 270 | 81 | | | | 13.00-21.50 | 19.95 |
| 5a 24/04 | 250 | 98 | | | | 14.00-23.90 | 21.01 |
| 6a 02/05 | 192 | 158 | | | | 15.00-25.00 | 15.00 |

Auction abandoned: new rate fixed at 8.00 (K/\$)

SOURCE: 1. Bank of Zambia unpublished study: "The Foreign Exchange Auction System: a review of the first year of operations", for auctions 1 to 35.
2. The "Times of Zambia" for auctions 36 to 68 and 1a to 6a.

Table A.5 (a)

The Parallel Premium and its determinants:
Tests for Normality (Annual Data)

| <u>Variable</u> | <u>Skewness</u> | <u>Kurtosis</u> |
|----------------------------|-----------------|-----------------------------|
| Unconditional distribution | | |
| 1. log q | 1.73 (0.005)* | 3.85 (.005) |
| 2. Δlog q | 2.96 (0.00002) | 9.10 (.14x10 ⁹) |
| Conditional Distribution | | |
| 3. Residual of eq.23' | -0.33 (0.56) | -0.96 (1.09) |

Table A.5 (b)

Dickey Fuller and Augmented Dickey Fuller
Tests for Unit Roots
(Zambia)

| Variable | DF | ADF | Differenced | DF | ADF |
|-------------------------------|-------|-------|-------------|--------|-------|
| log q | -0.91 | -2.31 | ΔLogq | -6.53 | -4.35 |
| log m | -2.12 | -2.29 | Δlogm | -10.05 | -2.76 |
| log e | -1.83 | -2.23 | Δloge | -10.51 | -2.98 |
| IPD | -2.85 | -1.09 | ΔIPD | -5.06 | -1.14 |
| Residual of equation (23') | -3.23 | -3.03 | | | |

Notes:

q = Black Market Rate/Official Exchange Rate

m = Broad Money/Official Exchange Rate

e = Official Exchange Rate/CPI

$$IPD = (1 + \hat{i}_t^*) \Delta \hat{\log} E_{o_{t+1}} - (1 + \hat{i}_t)$$

where $\Delta \hat{\log} E_{o_{t+1}}$ is obtained from the appendix equation (A.1),

$$\text{and } \hat{i}_t = \left(\frac{M1}{M1+QM} \right)_t \cdot i_t.$$

TABLE A.5 (c)

The Black Market Premium and Related Macroeconomic Variables in Zambia

| Year | Premium | TOI | Official Aid (US\$ mill) | M2 Nominal (k mill) | Int. Rate Par. Diff. | For. Trd. Tax/GDP (%) |
|------|---------|--------|--------------------------|---------------------|----------------------|-----------------------|
| 1970 | 1.36 | 314.20 | | 356.00 | NA | NA |
| 1971 | 1.51 | 191.80 | | 319.00 | -0.02 | NA |
| 1972 | 2.09 | 164.80 | 1.30 | 341.00 | -0.07 | 3.15 |
| 1973 | 1.95 | 240.50 | 1.40 | 411.00 | -0.17 | 2.08 |
| 1974 | 1.80 | 171.70 | 0.90 | 441.00 | -0.07 | 2.03 |
| 1975 | 1.90 | 100.60 | 14.50 | 494.00 | 0.59 | 2.41 |
| 1976 | 2.61 | 111.30 | 8.90 | 623.00 | 0.23 | 1.59 |
| 1977 | 2.90 | 95.40 | 33.80 | 699.00 | 0.11 | 1.70 |
| 1978 | 2.24 | 90.90 | 19.50 | 639.00 | -0.01 | 1.47 |
| 1979 | 1.85 | 108.30 | 25.80 | 832.00 | 0.24 | 1.71 |
| 1980 | 1.69 | 100.00 | 25.60 | 907.00 | 0.43 | 2.08 |
| 1981 | 1.64 | 79.80 | 24.00 | 979.00 | 0.47 | 1.79 |
| 1982 | 1.46 | 70.90 | 29.10 | 1309.00 | 0.28 | 2.04 |
| 1983 | 1.29 | 77.90 | 53.70 | 1454.00 | 0.41 | 2.47 |
| 1984 | 1.37 | 70.10 | 23.00 | 1704.00 | 0.19 | 3.61 |
| 1985 | 1.68 | 71.50 | 19.70 | 2102.00 | 0.88 | 4.93 |
| 1986 | 1.31 | 71.50 | 173.20 | 4062.00 | 0.44 | 7.87 |
| 1987 | 1.42 | 79.70 | 289.90 | 6266.00 | 0.12 | 6.95 |
| 1988 | 5.18 | | 831.60 | | 0.16 | 3.61 |

NOTES:

Premium = Blackmarket Rate/Official Exchange Rate

Interest Rate Parity Differential calculated as:
 $((1+WROI(t)) \cdot (1+EHAT(t+1)) / (1+ZROI(t))) - 1$, where

$$ZROI = \left(\frac{MI}{MI+QM} \right) \cdot ZROI; \quad ZROI \text{ is the Zambia domestic interest rate given by the annualized 3-6 months}$$

fixed deposits rate of the commercial banks, and WROI is the annualized deposit rate for the U.K.

EHAT (Expected Devaluation): estimated from Equation A.1'

EXPECTED DEVALUATION

Equation (A.1')

$$\Delta \log E_{0,t+1} = -1.19 + 0.17 \log q_{t-1} - 0.28 \log q_{t-2}$$

(-3.82) (1.56) (-1.76)

$$+0.82 \log q_{t-3} \quad 0.69 \log q_{t-4}$$

(4.58) (-5.36)

$$-0.11 \log E_{0,t-1} \quad -0.26 \log E_{0,t-2}$$

(-1.06) (-2.17)

$$+0.69 \log E_{0,t-3} \quad -0.52 \log E_{0,t-4}$$

(3.67) (-3.23)

$$+0.18 \log M2_t$$

(3.84)

$$+0.21 DCM(85:3-87:2)$$

(3.01)

$R^2 = 0.58, R^2 = 0.51, DW = 1.99,$

$Q(24) = 15.36$

(t-statistics in paranthesis)

Fig A-1: BLACK MARKET PREMIUM
IN ZAMBIA (Quarterly)

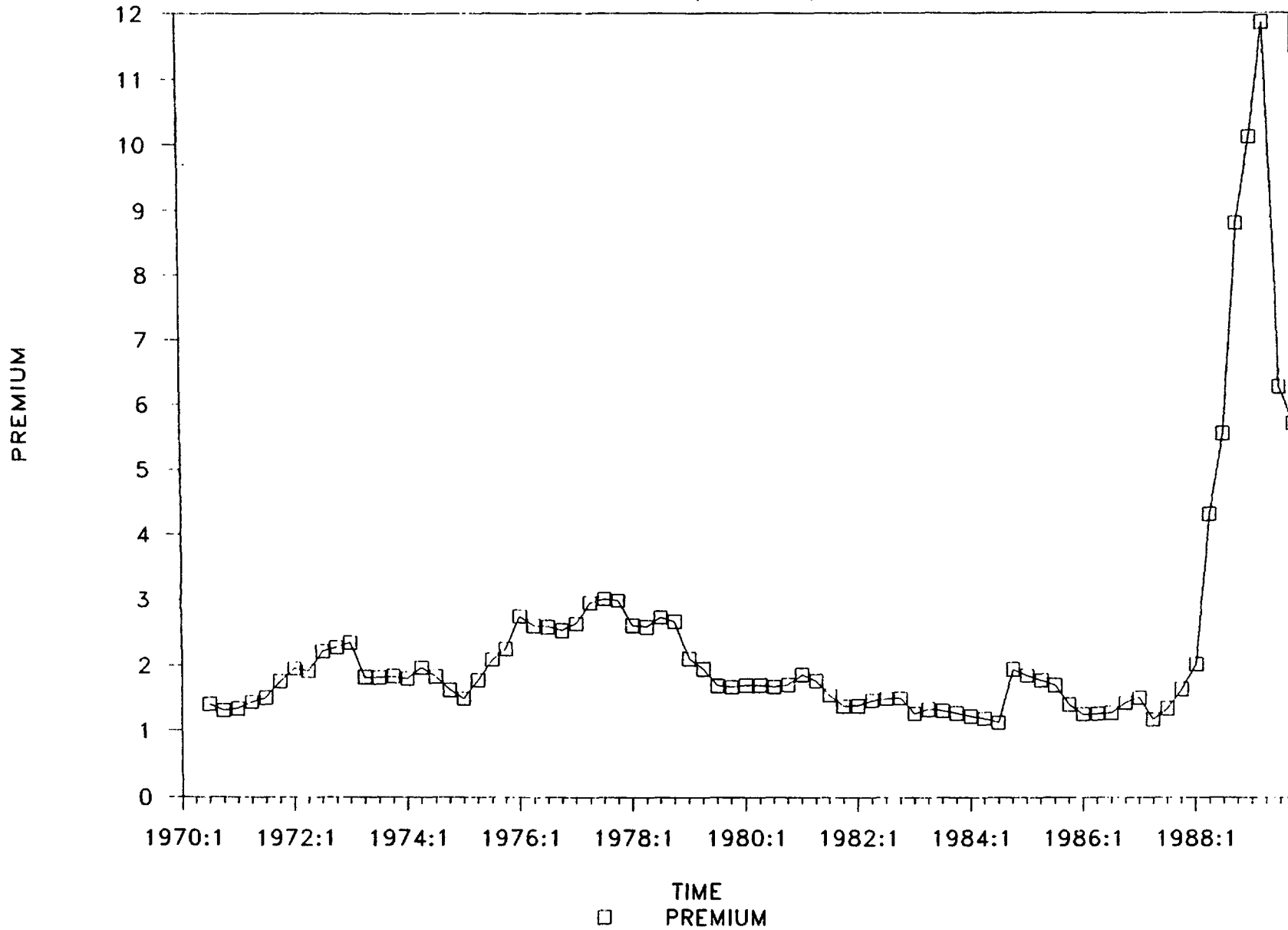


Fig A-2: REAL EXCHANGE RATE

IN ZAMBIA (Quarterly)

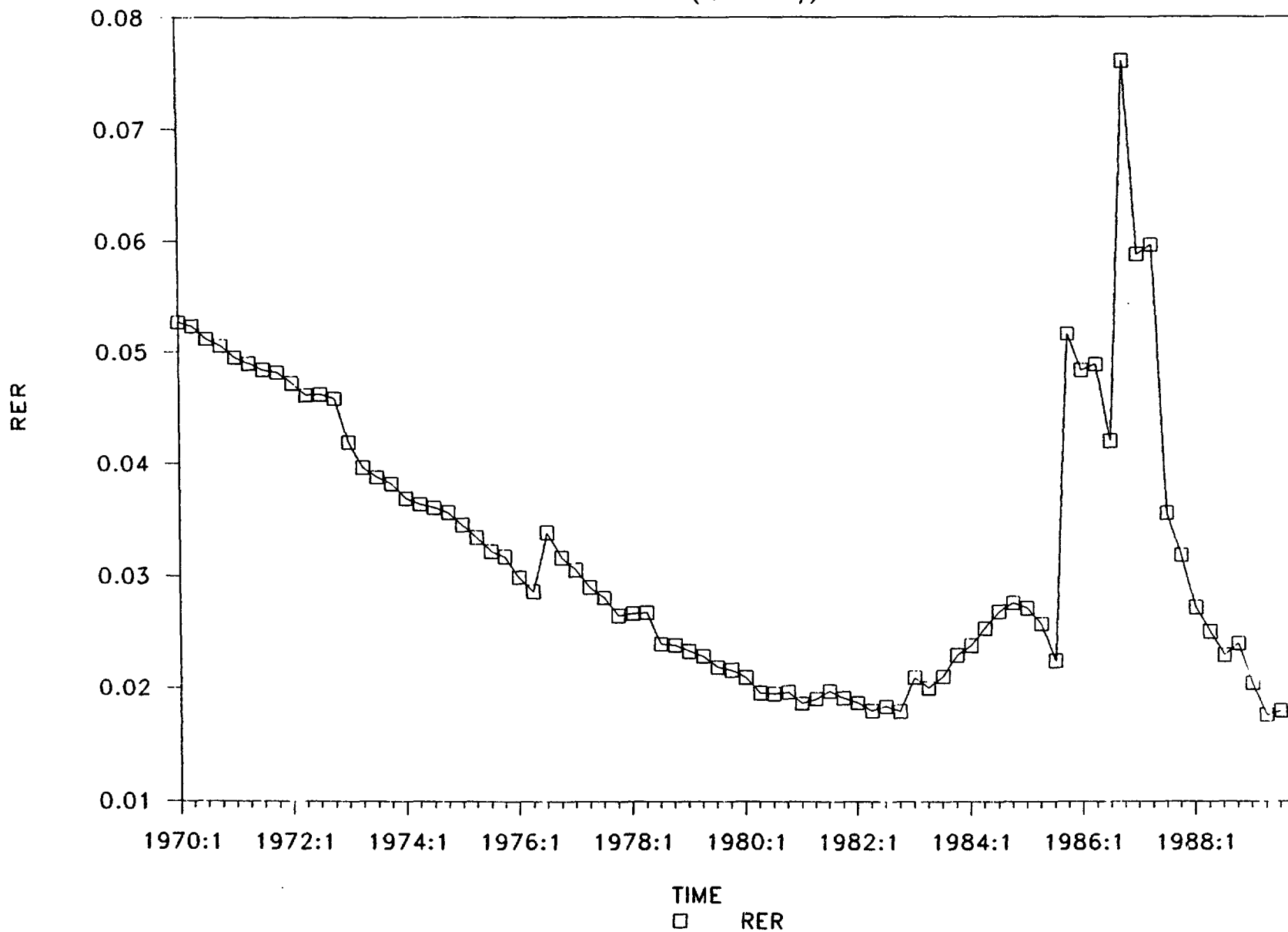


Fig A-3: REAL MONEY SUPPLY
IN ZAMBIA (Quarterly)

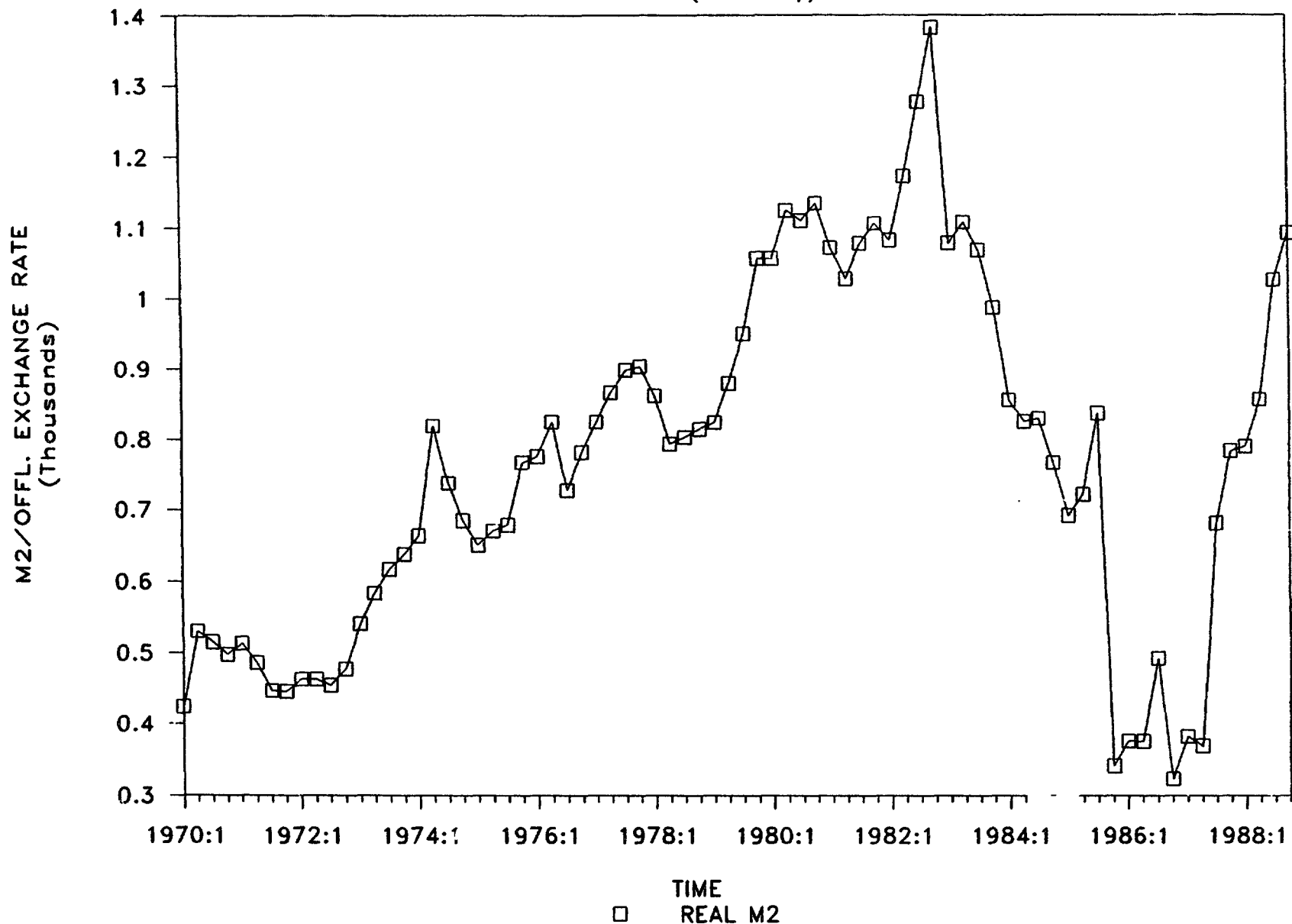
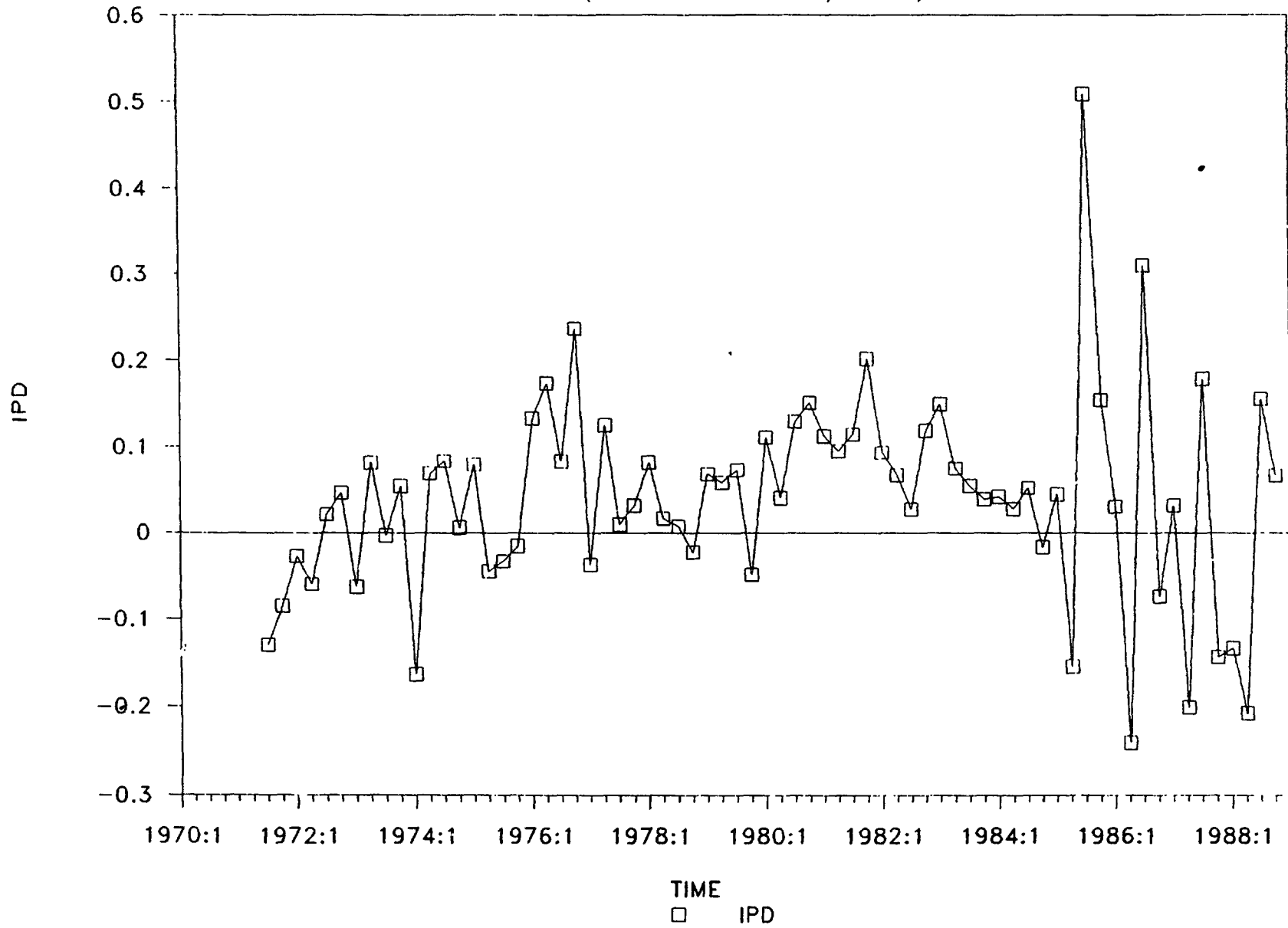


Fig A-4: INTEREST RATE PARITY DIFFERENTIAL

IN ZAMBIA (Based on Quarterly Model)



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