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Inflation, Price Controls, and Fiscal Adjustment in Zimbabwe

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Inflation always has a monetary dimension, but managing inflation is not a simple question of monetary management. Other factors to contend with are the indexation process (including policies on wage and price controls), the level and financial composition of fiscal deficits, and supply conditions. How these interact has crucial implications for policy design, as shown in this paper on Zimbabwe.

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Adjustment programs typically include not only fiscal reform but also price liberalization, devaluation, and trade policy reform — including reduced subsidies. Authorities implementing such programs commonly fear the potential inflationary effects of a combination of devaluation, reduced subsidies, and price decontrol.

Given this combination, a simplistic monetarist diagnosis of inflation is insufficient. If inflation — even if only in the short run — can rise because of devaluation or reduced subsidies, attempts to control it completely may require fiscal and monetary control so great as to cause recession. If cost-push factors arising from the adjustment program generate inflation, it may be necessary to allow for the inflation and plan for a slower adjustment program, one that is more acceptable socially. The design and pace of a successful adjustment program hinge on the correct diagnosis and management of inflation.

This empirical study of Zimbabwe is the first in a series that will include studies on Ghana, Cote d'Ivoire, and Malawi. The study addresses the impact of government policies on inflation and price changes. The authors characterize the situation in terms of the three main transmission mechanisms for inflation: the fiscal-monetary process; direct cost-push factors; and real factors.

All of these are important in Zimbabwe, but there are often conflicts. Low food or utility prices keep prices down but lead to higher subsidies and hence to higher deficits, the financing of which can increase inflation. Similarly, exchange rate devaluation is often viewed as inflationary, but insufficient exchange rate adjustment can lead to both parallel markets and a tight import constraint, resulting in lower growth of output.

The authors conclude that one must always go beyond a simple monetary account of the inflation process even if inflation always has a monetary dimension. Other significant factors are management of the indexation process (including policies on wage and price controls), the level and financial composition of fiscal deficits, and supply conditions.

This paper is a product of the Public Economics Division, Country Economics Department, Copies are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Ann Bhalla, room N10-061, extension 60359 (74 pages with charts and tables).

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I: INTRODUCTION

Adjustment programs typically involve a complex policy package which include price liberalization, devaluation and trade policy reforms, as well as public enterprise and fiscal reform, including reduction in subsidies and rationalization of the public investment program (CEC, 1988). A common fear of the authorities implementing such programs is the potential inflationary effects of a combination of devaluation, subsidy reduction and price decontrol. In this situation a simplistic monetarist diagnosis of inflation is insufficient. If inflation, even if only in the short-run, can rise due to cost-push elements arising from devaluation or a reduction in subsidies, attempts to control it completely may require fiscal and monetary control so large that it will bring unwarranted recession in the economy. If cost-push factors arising from the adjustment program generate inflation in the economy, it may be necessary to allow for this inflation, and plan for a slower but less painful adjustment program, and therefore one that is more acceptable socially. The implication of a less drastic and slower adjustment program could be larger external financing. The design and pace of a successful adjustment program therefore depends critically on a correct diagnosis of inflationary forces in the economy. This paper on Zimbabwe is the first in a series that will present empirical work on this question in Sub-Saharan Africa.[1]

1/ The other countries in this study are Ghana, Côte d'Ivoire and Malawi.

Zimbabwe has had a fiscal deficit of close to 10 percent of GDP for almost a decade, continued losses on agricultural marketing boards, a mixture of profits and losses on other parastatals and a moderately overvalued exchange rate. The Government places high priority on maintaining control over general inflation (in the 10-15 percent range) and has used a combination of careful monetary policy and price and wage controls to effect this. It is concerned both about slipping into a devaluation/inflation spiral and over the impact of price changes on the real wage of low-income urban households.

The framework used for the analysis of inflation in Zimbabwe in this paper is designed to directly address the impact of government policies on inflation and price changes. It attempts to integrate within one framework three transmission mechanisms for inflation in Zimbabwe: via the fiscal-monetary process; via direct cost-push factors; and through real factors. All of these are important in Zimbabwe (as described in Section II), but there are often conflicts between the policies. Low food or utility prices keep prices down but lead to higher subsidies, and consequently higher deficits whose financing can lead to higher inflation. Similarly, exchange rate devaluation is often viewed as inflationary, but insufficient exchange rate adjustment can lead to both the emergence of parallel markets in the short run, and a tight import constraint in the medium term due to lowered export earnings, resulting in lower output growth. The framework developed in this paper is designed to address these and other policy choices for Zimbabwe.

The model (described below in Section III) goes beyond the simple monetarist approach which is usually adopted in analysis of African inflation in three ways: first, it undertakes a broad disaggregation of prices between controlled and uncontrolled as well as traded and non-traded prices and

incorporates an account of wage behavior; second, it includes both standard fiscal/monetary accounting relations and the effect of price and exchange rate changes on the fiscal deficit; third, it incorporates simple real economy relationships between investment, output, trade and the real exchange rate.

The approach adopted here, in some ways, synthesizes the monetarist and cost-push schools of inflation. The monetarists à la Friedman (1968) argue that cost-push factors such as food prices, wage or exchange rate changes can only cause a shift in the price level but cannot explain how it translates into sustained inflation. For this to happen one needs monetary accommodation, without which the inflationary process stalls. While this is no doubt true we argue in this paper, that while money can be viewed as the proximate cause of inflation, cost-push factors can drive inflation directly or indirectly by bringing about changes in the rate of monetization and the velocity of circulation of money. The latter process works through the impact of exchange rate and wage changes, as well as changes in administered food and public service prices (a common feature in most developing countries), which affect the size of the fiscal deficit which in turn gets monetized and leads to inflation.

The focus of previous analytical work in this area has been on the interaction between exchange rate changes and inflation. When the exchange rate is administered it acts as a stabilizer to the inflationary process but at the cost of trade imbalances or growth (Khan and Lizondo, 1986). This happens because as inflation accelerates due to high fiscal deficits or cost-push factors such as an increase in food prices, the real exchange rate appreciates. Where the nominal exchange rate is allowed to adjust to inflation the inflationary process can become automatic (Drazen and Helpman,

1986 and van Wijnbergen, 1988). This is because inflation and exchange rate changes feed on each other. Similar problems arise in the case of dual exchange rates (Dornbusch, 1986 and Pinto, 1988), when the government attempts to control exchange rate changes and there is a parallel (free) market for foreign exchange. As the official rate remains fixed and the parallel rate depreciates, export earnings channelled into the official exchange market decline and the duality in the exchange market becomes unsustainable. With a rising black market premium the implicit tax on exchange rate transactions in the official market increases. When the government attempts to unify the two markets, it loses the implicit tax. Unless accompanying fiscal changes are brought about, the higher fiscal deficit (due to the loss in the implicit tax on foreign exchange transaction) must be monetized leading to higher inflation which leads to further depreciation of the parallel market exchange rate. A destabilizing process from unification to higher deficits, higher inflation and an increase in the parallel market premium can be established. Pinto (1988) shows the conditions under which this destabilizing process can develop.

Dual foreign exchange markets are not important in Zimbabwe, but the interactions between the exchange rate, the budget and inflation are. This is one aspect of the overall impact of changes in relative prices and wages on the budget. For example, exchange rate changes can lead to higher budget deficits in the short run which in turn fuel inflation, requiring further exchange rate changes to maintain a competitive real exchange rate. This type of issue is tackled through the fiscal component of the model that allows examination of the nature and size of these effects and the level of compensating fiscal changes that are necessary to avoid an inflationary spiral.

While exchange rate changes contribute to inflation, insufficient exchange rate adjustment appreciates the real exchange rate, reducing exports, importing capacity and growth. This provides an example of another set of influences on inflation that have received attention in structuralist accounts of inflation which emphasize real constraints or shortages in driving inflation. While Zimbabwe has clearly experienced an aggregate supply-side constraint via import rationing, but it is not characterized by severe sectoral imbalances. Accordingly real factors are captured at an aggregate level, rather than in terms of sectoral output factors.

This paper is divided as follows. Section II describes the central elements of macro-economic adjustment, wage and pricing policy and the financial system in Zimbabwe. Section III describes the model and presents the empirical estimates of the model. In Section IV the results of policy simulations on three key issues in Zimbabwe are described--exchange rate depreciation, reduction in food subsidies and wage-price decontrol. The last Section concludes.

II: INFLATION, MACROECONOMIC ADJUSTMENT AND PRICE-SETTING IN ZIMBABWE

Zimbabwe is a country of apparent paradoxes for an economist. Two are notable in relation to inflation: the coexistence of a quite moderate inflation rate with a large, and predominantly domestically funded, budget deficit; and the existence of both widespread price controls and tight foreign exchange rationing, but the absence of significant parallel markets. Happily--for the economist--these are only apparent, and empirical investigation reveals a quite well-behaved pattern of relationships. Here we describe the principal characteristics of the economy that relate to inflation: the main trends and relations between inflation and other factors; the pattern of a macroeconomic closure; the price and wage-setting process; and the characteristics of the financial system. The section is concluded with an account of the main current concerns that have a bearing on inflation.

A. Trends and Relations.

The pattern of inflation for the past two decades is illustrated in Figures II.1-3, using the high and low income indices of consumer inflation and the GDP deflator.[2] These reveal that Zimbabwe is traditionally a relatively moderate inflation country that has experienced one significant

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2/ The Central Statistics Offices maintains two consumer price indices for high and low income households. These are based on expenditure weights from surveys in the late 1970s; they are in the process of revision on the basis of the 1984/85 household expenditure survey. When overall consumer inflation is referred to, this is the unweighted average of the two indices.

Figure II.1

Annual Inflation Rate for Urban Household

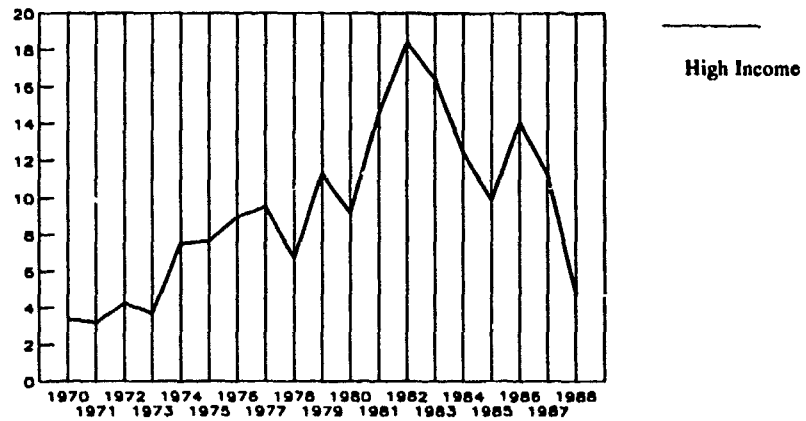


Figure II.2

Annual Change in Import Price and Average CPI

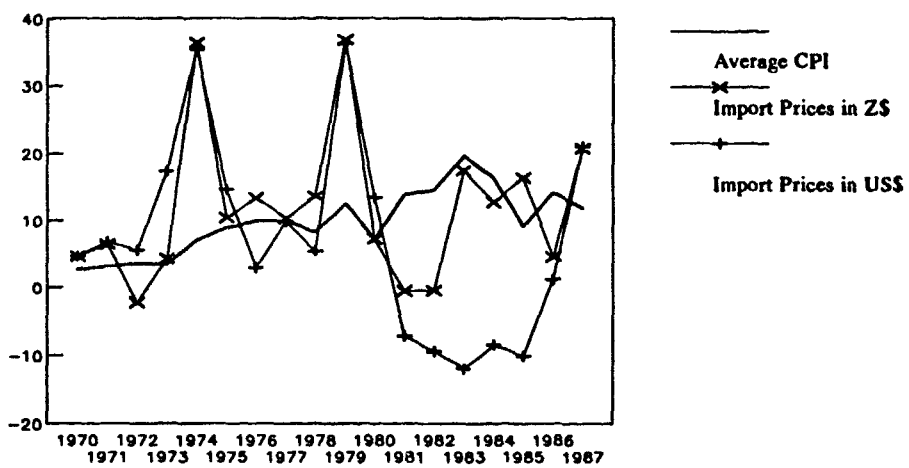
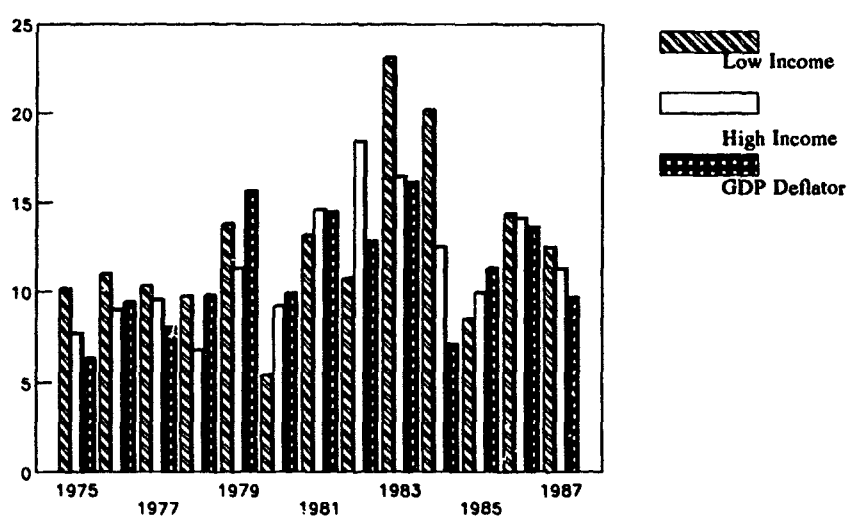


Figure II.3

Annual Change in CPI and GDP Deflator



surge in prices since independence--in the 1981-82 period. The inflation rate dropped after this episode, but there has been a general upward shift in the average rate compared with the pre-independence period: as Figure II.2 shows, in the 1970s domestic inflation was often below foreign inflation whereas the reverse is generally true in the 1980s.[3] This figure also reveals two other striking results. First, changes in import prices were dominated by changes in foreign currency terms prior to independence while exchange rate movements have become much more important in the 1980s. Second, there appears to have been a remarkable degree of insulation of domestic price movements from changes in import prices, this is vividly so for the two oil ks but is also true for many of the post-independence years. This will be important to the subsequent analysis.

With respect to the three domestic indices, Figure II.3 shows a quite similar pattern of change for consumer prices and the GDP deflator. This suggests the Government has not introduced a wedge between producer and consumer prices; indeed overall consumer price inflation outpace producer inflation in the 1980s. This is evidence for the assessment of whether there has been any permanent repression of consumer inflation in Zimbabwe. Of course, it could be that both producer and consumer inflation have been repressed[4] and so this was directly explored further, using a test for

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3/ This applies whether an index of Zimbabwe's import prices or other international indices are used.

4/ Or that the GDP deflators are heavily influenced by measured consumer prices.

repressed inflation developed for China.[5] This also found no evidence of significant repression of inflation over the medium term.

The result on the overall inflation rate is, however, consistent with selected prices or groups of prices being held down. As Figure II.3 indicates, there has been a divergence between inflation for the low and high income households in many years. Zimbabwe, like many countries, has tighter controls over the prices of selected wage goods and public services. However, unlike some others, periods of suppression of price rises have been followed by significant increases--the overall low income index has risen above the high income index since 1982. This is further explored in section III for foods and services--the two cases where policy interventions have driven a wedge between price changes for the two indices (see Figures III.3 and 4). Econometric results presented in Section III confirm that the effects of policy intervention is to change the rate of increase of the low income index, not the high income index. At least until the price freeze imposed in mid-1987, the high income index is probably a reasonably good measure of underlying consumer inflation in the economy.

The next set of figures compares consumer inflation with the level of economic activity and the budget deficit. Figure II.4 reveals a roughly contracyclical relationship between growth in output and inflation--years of output recovery have been associated with relatively lower inflation and vice versa. Figure II.5 shows the absence of any simple correlation between

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5/ This essentially assesses whether there is an inconsistency between the observed growth in money holdings and a reasonable money demand function--see Feltenstein and Ha Jimin (1988).

Figure II.4

Annual Inflation and GDP Growth

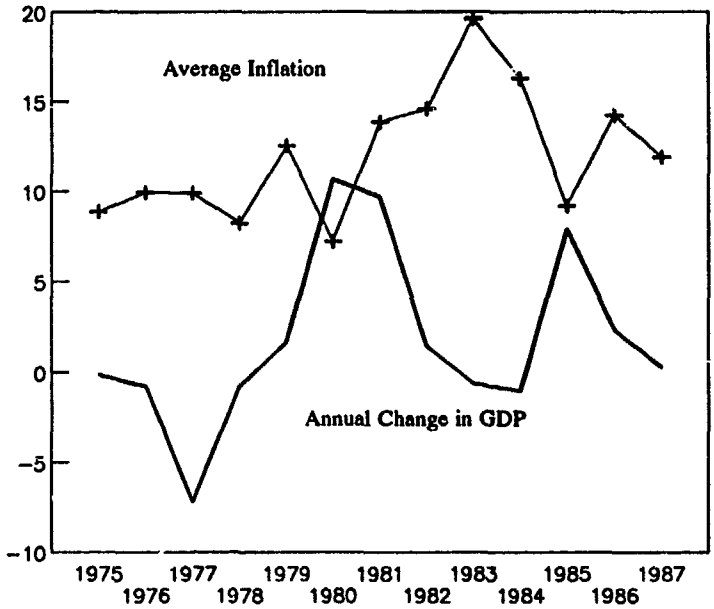
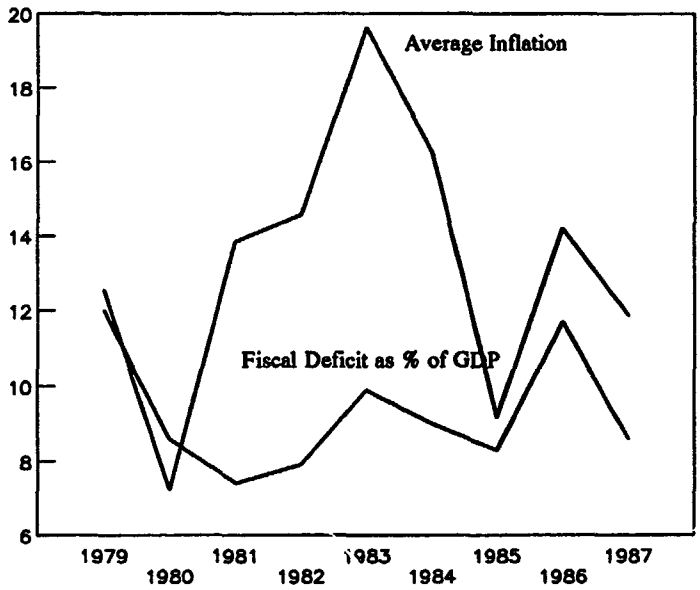


Figure II.5

Inflation and Fiscal Deficit



inflation and the budget deficit, especially during the sharp acceleration of inflation in the early 1980s. At the beginning of the 1980s and in the 1985-86 period, there is some coincidence in the directions of movement, but the overall picture is that inflation has moved up and down while the deficit has remained consistently high by international standards, at 9-11 percent of GDP. This is largely a consequence of the way in which the Government has effected macroeconomic adjustment and the relatively well-developed nature of the financial system which is used to finance the high budget deficit--these are reviewed in the following subsections.

Finally, Figures II.6 and 7 summarize the history on wages.[6] There is a long-run trend of a gentle rise in the real wage that is roughly in line with the growth in the average productivity of the formal labor force. This is broken in the immediate post-independence period when significant rises in the minimum wage pushed nominal wage growth way above consumer inflation, leading to a relatively large growth in real wages (especially for agricultural workers, the lowest-paid group in the formal employment). This proved unsustainable and subsequent nominal wage growth has been held below consumer inflation, such that by the mid-1980s real wages had adjusted back to their long-run trend position. However, the figures indicate an apparent passthrough of the 1980-81 wage increases into consumer inflation with a lag of about a year. Econometric results confirming these conclusions are given in Section III.

6/ This uses average earnings information as the best available proxy for wage rates.

Figure II.6
Real Wage Per Employee

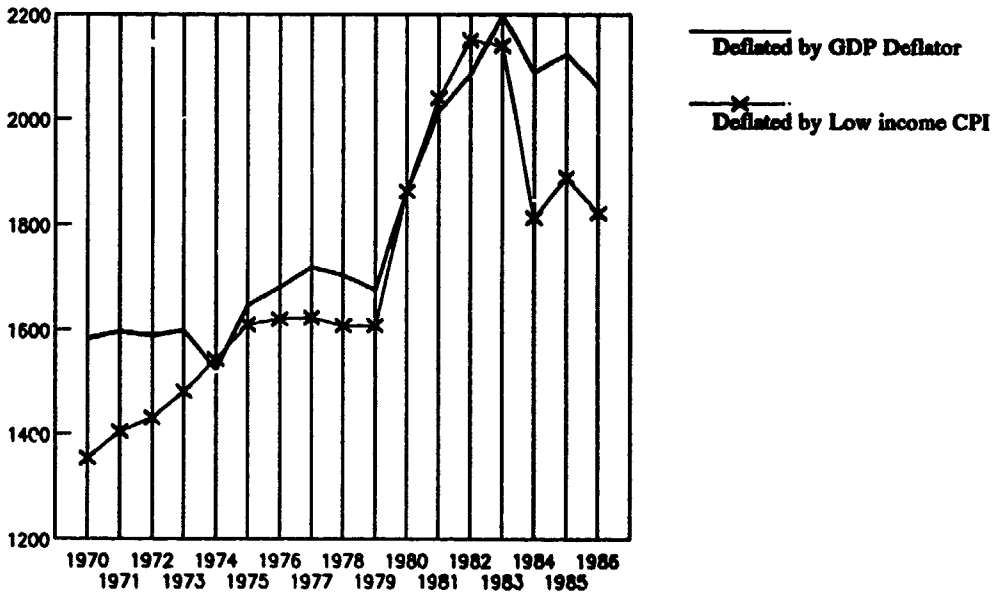
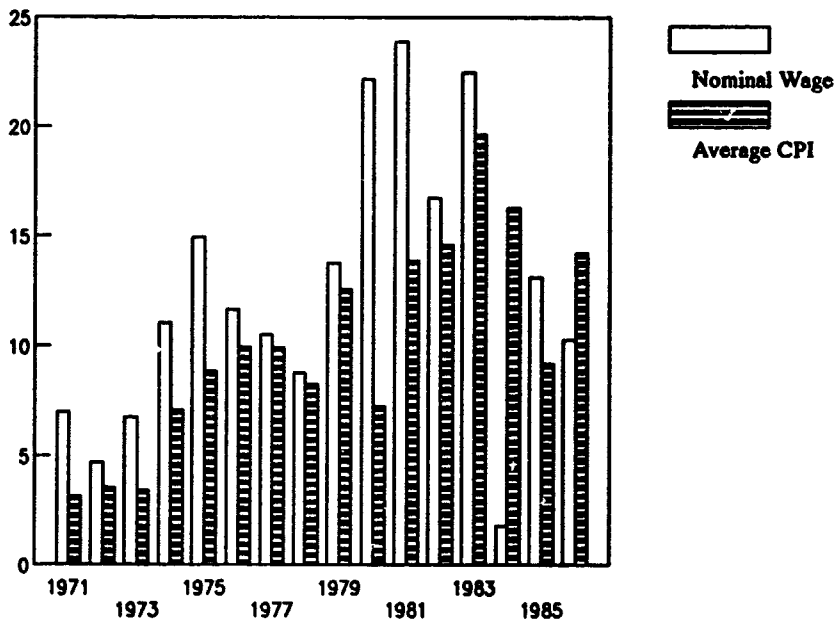


Figure II.7
Annual Change in Nominal Wage and Average CPI



B. Macroeconomic Adjustment Mechanisms

A brief account of the nature of macroeconomic adjustment in Zimbabwe is necessary to understand the price-setting process and the inflation story. The dominant factor in arranging macroeconomic balance is the system of administered allocation of foreign exchange. This applies to virtually all uses of foreign exchange in the country, including both capital and current transactions. It has two broad effects: first, it closes the capital account and thereby insulates the domestic financial system from international financial developments; second, it determines both the level and composition of imports. While some illegal transactions are reported, both in terms of black market sales of foreign exchange (at a foreign exchange premium of the order of 100 percent) and transfer pricing by multinationals, these do not appear to have a major influence either on domestic financial developments or product markets. This is not to say, of course, that Zimbabwe is running a uniquely water-tight economy, or that these illegal outflows have not been of quantitative significance. But controls are sufficiently effective to have a radical influence on domestic savings investment balances, and, unlike many countries, product market prices are by and large influenced by the official exchange rate and markups on that, and not the parallel market rate.

The controls on the capital account apply both to outflows and inflows of capital. At independence the Government inherited a position of sizable holdings of domestic assets owned by foreign companies and individuals. These assets were largely held in the form of either blocked financial assets[7] or equity holdings in firms in the productive sectors,

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7/ These are only blocked from expatriation; they form part of the domestic money supply or other domestic financial assets.

especially in mining, manufacturing and estate agriculture. Two principal options have emerged for expatriation of these assets. First, firms and individuals can purchase government convertible bonds with a maturity of 12 and 20 years respectively. Since these are denominated in Zimbabwe dollars and bear an interest rate of five percent, there is a significant implicit capital loss in foreign exchange terms--the fact that most owners of blocked funds chose to take this option when it became available in 1984 is evidence that the cost of illegal capital outflows is high. Second, since about mid-1987, the Government has been allowing repatriation of funds in a one to two-year period to foreign firms who disinvest under certain conditions, that includes a discount on book values of 70 percent or more. With respect to new inflows, there are strict controls on both new foreign investments and foreign borrowing, that are enforced through a committee system of approval.

The dominant effect of capital account controls is to keep savings in the country. Current account controls directly complement these within the overall objective of maintaining short-run external balance: the level of affordable imports is set for each six-month period on the basis of forecast exports, capital flows and desired net reserve movements. While the primary focus is on external balance, this is also the principal determinant of internal balance, since the availability of capital goods imports is an important determinant of investment activity, while imports of intermediates have a major influence on output in the import-dependent sectors. This obviously influences the pattern of consumption and probably also influences the consumption level of higher income households.

The management of foreign exchange allocations provides the core of the explanation of the coexistence of large budget deficits without apparent indications of internal instability (whether in the inflation rate or in the monetary system). Current account deficits of the order of 12 percent of GDP emerged in 1981-82. These were reduced to close to zero by 1986-87 largely through reductions in imports, though measures to encourage exports, including a real effective depreciation of about 25 percent also played a role. Cutbacks in private expenditures were largely effected by reduced import allocations to achieve broad consistency with the budget deficit and available foreign savings. The net effect was to foster a net private savings rate of the order of 10 percent of GDP in the mid-1980s compared with less than five percent in 1981-82 that substituted for the significant reduction of foreign financing of the deficit. Exchange rate, monetary and wage and price policy played an important, but essentially subsidiary role.

C. Price and Wage Determination

The Government operates a quite comprehensive system of price and wage determination for the public and private sectors. The price control system dates back to the formation of the foreign exchange allocation system and can be viewed as directly complementary to this. A major microeconomic objective is to prevent firms from obtaining excess profits as a consequences of the shortages created by foreign exchange rationing, while the main macroeconomic objective is to support greater price stability. Minimum wages were also established prior to independence, but the extent of government influence on wages increased substantially during the 1980s.

The price control system can be subdivided into two parts. For a limited set of products, the price is set by the Government; these cover basic foods, including maize-meal, bread, beef and milk, the producer prices for the major agricultural products,[8] most energy products, selected other intermediate products, including cotton lint, fertilizer and steel, and the prices of most urban and transport services. The bulk of other products are technically covered by an allowable mark-up. For manufacturers this is generally based on the margins obtained in 1981, while specific margins are set for different levels of distribution. Even for the commodities subject to specific price control, a major factor behind any price adjustment is consideration of cost changes, though this is obviously affected by other objectives, including the maintenance of "reasonable" prices for wage goods and the need to reduce subsidies in the budget. The use of regulated prices to moderate overall inflation has not been an explicit objective, but no doubt also has an influence on pricing decisions.

The overall picture is thus of a price-setting process governed by markups, with a subset of publicly-determined prices adjusting with a lag (or occasionally a lead). Although prescribed markups dominate in principle, it is quite easy for changes in demand pressure to influence prices since both manufactures and retailers in practice have some latitude. An initial increase can then swiftly pass through the system in line with the regulations. It is difficult to obtain direct evidence for variations in markups through the

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8/ The most important exception is tobacco, that is dominated by large-scale farmers.

cycle, but indirect support is provided by the short-run shifts in the rate of change of nominal wages and prices. This is associated with variations in the share of profits in the economy.

As noted above, a change was effected in July 1987, when the Government imposed a freeze on price and wage adjustments that in principle applied to all products. This price freeze was largely a consequence of an attempt to hold down recurrent expenditures through avoiding increases in public wage. This was extended to private wages (that in principle, if not in practice move together--see below) and then to prices. As Figures II.8 and II.9 show this led to a marked deceleration in inflation for both the low and high income baskets of goods in the second half of 1987. Inflation was previously expected to be around 15 percent and there appears to have been some genuine repression in the inflation rate for a while. The freeze was partially lifted in early in 1988, but only a five percent nominal increase was automatically approved. The low-income index has become quite erratic on a month-to-month basis as it tends to be dominated by specific increases of a limited number of goods. There is some evidence of a squeeze in margins in poorer corporate profits in the results reported in mid-1988, but there was also reported to be evasion of the price freeze. Probably for the first time, many observers became skeptical of the pace of price change reported in the CPI.

Controls on wage adjustments have been more comprehensive than on prices (prior to the wages and prices freeze). The Government's view since independence has been that the trade union movement has been too weak to operate in a collective bargaining framework and the Government has had to intervene to ensure an adequate level of wages. It has also had the objective

Figure II.8
Annualized CPI for High Income Urban Households

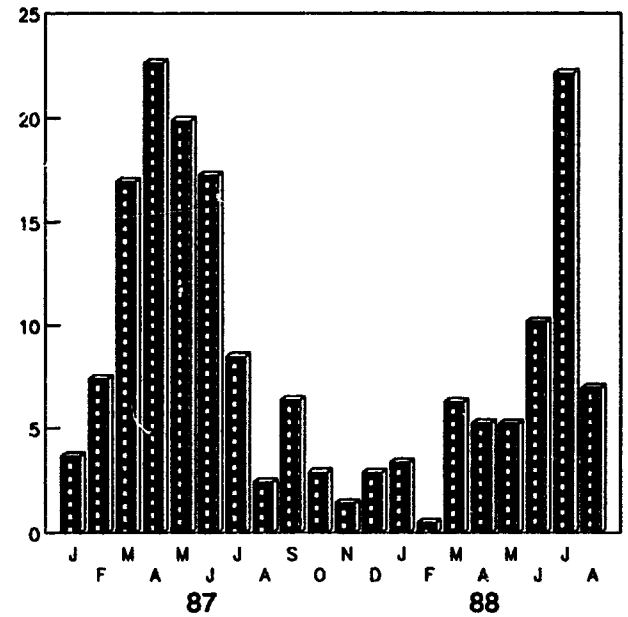
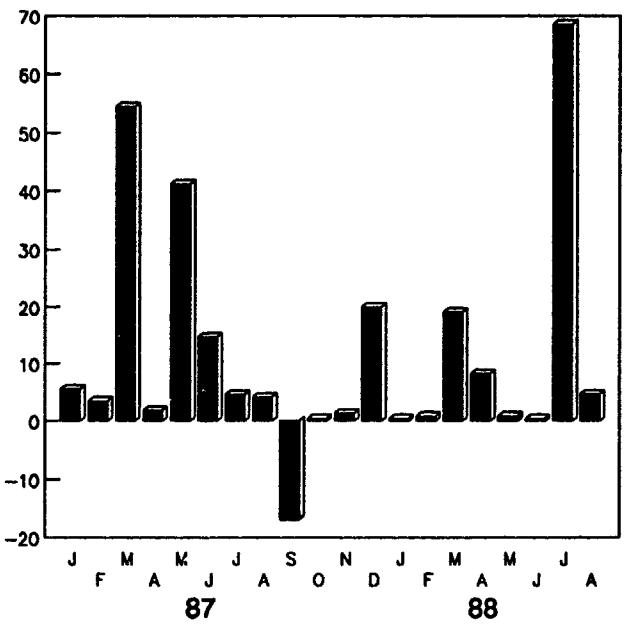


Figure II.9
Annualized CPI for Low Income Urban Households



of narrowing the wide overall wage and salary differentials inherited from the pre-independence racial divisions. This has led both to the establishment of nation-wide minimum wages (divided by three or four broad sectors) and instructions on the required rate of increase for different salary levels in both the public and private sectors. As discussed elsewhere,[9] these policies initially raised average wages above their trend level in 1980-81 and subsequently held wage increases below the rate of inflation, bringing real wages back to about the trend level by the mid-1980s. Narrowing of differentials has been successful in the public sector but appear to have not been effective in the private sector. There is some evidence for a cyclical pattern of wages through the business cycle but, especially since independence, this has been heavily influenced by policy intervention--this will be important for the analysis of inflation.

D. The Financial System

Zimbabwe's financial system is unusually deep for a country of its income level. Total financial assets are equivalent to almost 120 percent of GDP--a comparable relative size to Chile, Philippines and Venezuela, and greater than Turkey or Nigeria. Money to GDP ratios are not high and, as Figure II.10 shows, have experienced some instability in the 1980s.[10] However, the monetary banking sector is relatively well-developed in terms of institutions, including the Reserve Bank of Zimbabwe, two discount houses,

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9/ See World Bank CEM (1987) and Fallon (1987).

10/ This paper has used the Reserve Bank's definition of broad money, which is relatively tight, since it only includes time deposits up to 30 days maturity--the use of broader definitions of quasi-money do not have any substantive effect on the results.

Figure II.10

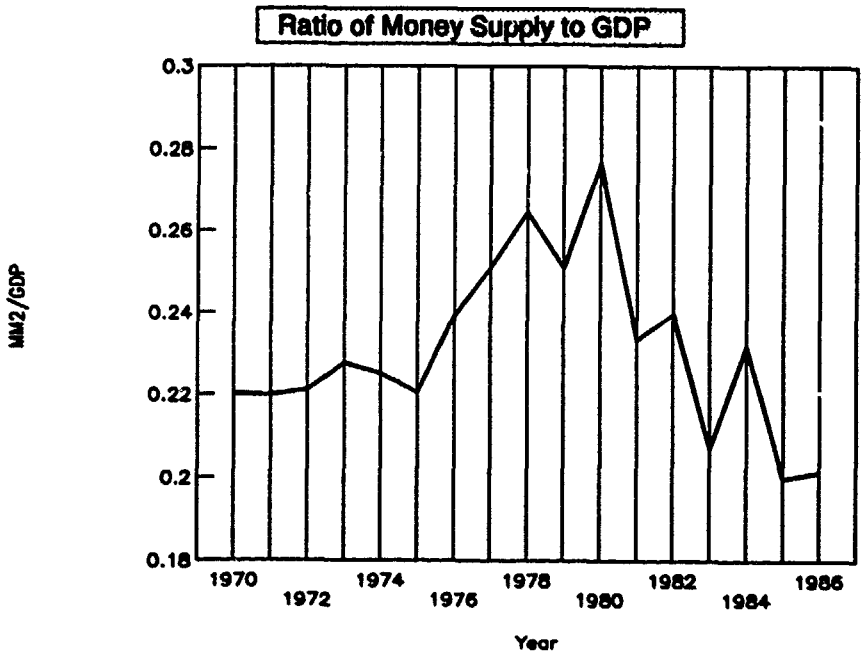
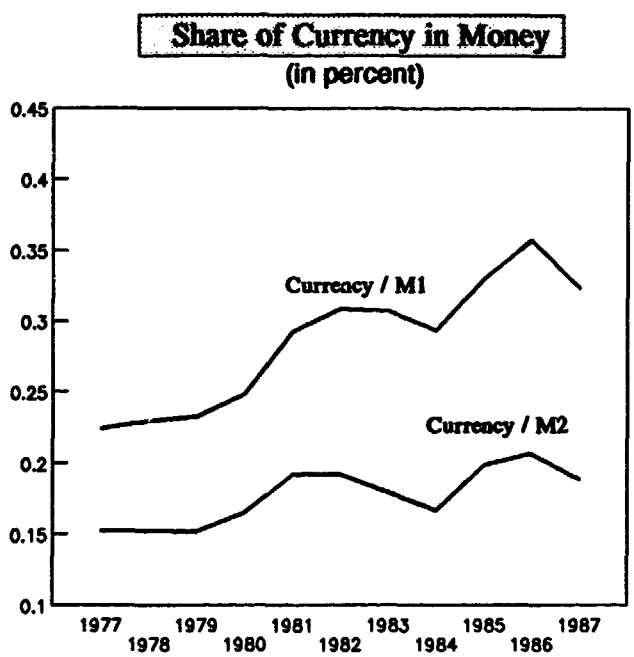


Figure II.11



five commercial banks and accepting houses. Of equal importance is the extent of the non-monetary sector, whose total assets significantly exceed broad money; it includes building societies (mortgage companies), finance houses, the post office saving bank, insurance companies and pension funds. The latter two groups of institutional investors are quantitatively of greatest importance and have played a major role in capturing long-term financial savings--and subsequently lending much of them to the Government. The size of the insurance companies' assets relative to GDP are roughly the same as Australia's and substantially more than other developing countries. The relative depth of the financial system is due to two factors: the well-developed formal sector and the fact that after sanctions were imposed in 1965 there was a need to replicate, within the country, the financial services that had previously been, in part, provided from London.

We saw in Figure II.10 that money has, if anything, grown slightly slower than nominal GDP. Within this, currency has displayed both significant variation and a slightly upward trend, as illustrated in Figure II.11. The jump in 1980-81 appears to be explained by a sharp discontinuity in maize pricing policy (in an excellent harvest year) that encouraged a sudden shift by smallholders into marketing maize and, in many cases, purchasing maizemeal. With the correction of pricing anomalies there was a reversion to a lower share of currency in money, but at higher, and more monetized level. A further shift from money to demand deposits or post office savings accounts is also occurring, but it is not clear when this process will outweigh the shift into currency as parts of the economy start the process of monetization. By contrast, the non-monetary sector has tended to grow both steadily and faster

than nominal GDP, largely because of a strong underlying growth in demand for life insurance and pension schemes and, until 1988, buoyant growth in the post office's assets (in part due to the favored tax position for deposits there).

The working of the system is of considerable importance to its treatment in the account of inflation. Two issues are of importance--interest rate determination and financial asset substitution. The story is complex: many interest rates are technically uncontrolled, but display a high degree of stability in nominal terms, as Figure II.12 shows. The rate of inflation is the major determinant of changes in the real rate in most years and real deposit rates are often negative. A number of controls underly this pattern. The most important is the indirect effect of the foreign exchange controls that were outlined above. These have a major influence both on levels of deposits by the formal sector and on private sector credit demand. On top of this are measures designed to channel credit into public sector finance, including various liquid asset requirements that are biased toward public debt instruments, prescribed assets ratios for the institutional investors (who currently have to have 60% of their asset in public liabilities) and moral suasion, that is of most importance in the provision of credit by the commercial banks to the Agricultural Marketing Authority. If the pattern of directed credit and net private credit demand (largely determined by the foreign exchange allocation system) shows signs of being inconsistent with nominal interest rate stability, the monetary authorities take additional measures, the most important of which are equivalent to variations in required reserve ratios, to restore this. As an abstraction, this is best characterized in terms of interest rates being policy-determined and not endogenous--with the exception of one or two episodes in 1982 and 1984, the closure of the system has clearly lain completely elsewhere.

Figure II.12
Nominal and Real 3 Months Deposit Rate

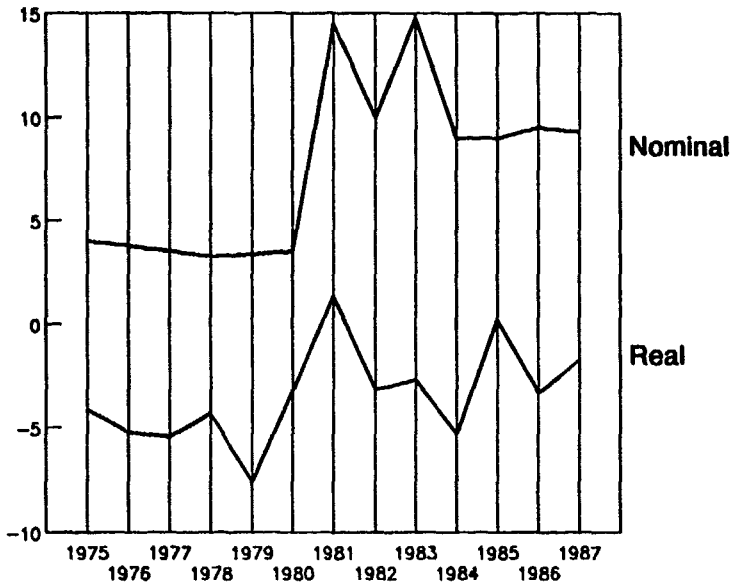
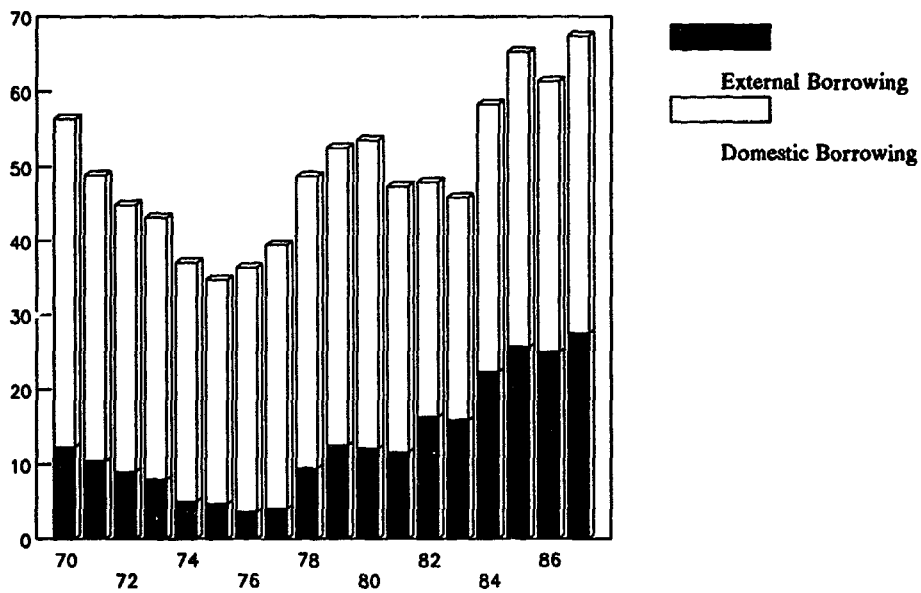


Figure II.13
Central Government Debt Ratio to GDP



With respect to substitution amongst financial assets, the dominant pattern appears to be of the structure of assets being determined by the sharply differing characteristics of the assets--especially between assets in the monetary and non-monetary system. Changes in asset distribution appear to be affected by structural factors rather than relative interest rates. There are exceptions to this: in particular the tax-free character of interest on deposits in the post office attracted deposits from commercial banks and the building societies in the early and mid-1980s. However, there are restrictions on the size of these deposits and the most important shifts (with the building societies) lie within the non-monetary sector and have largely been managed by the Government in terms of this particular relative return. Overall, we have used as an initial characterization a picture in which shifts between money and non-monetary financial assets are not endogenous for short-run macroeconomic adjustment, thus allowing the monetary dimensions of inflation to be captured in terms of a simple money demand function. This is an area that will be explored further.

The non-monetary sector is, however, central to the budgetary finance story. The central government deficits that were shown in Figure II.5 have been largely financed without recourse to financing from the Reserve Bank. Foreign finance played an important role in the early 1980s, but this has been largely replaced by domestic purchases of medium and long-term government bonds (called government "stock" in Zimbabwe). This has often been at low or negative real interest rates but despite this there has been a significant rise in the share of central government debt in GDP, as Figure II.13 shows. The institutional investors and the post office have played a major role in this. While both are heavily influenced by government regulations or

directions, it should again be emphasized that the net private saving surplus generated by the foreign exchange allocation system has its counterpart in strong demand for any public debt instruments and an underlying liquidity in the monetary system. The gains in terms of reduced pressures of deficit finance on inflation are likely to be temporary unless the surplus were to be sustained and real interest rate to be kept low.

E. Current Issues

Issues of inflation are closely interwoven with the major issues in macroeconomic management in Zimbabwe. The following are some of the principal areas of concern.

(i) The fiscal deficit has been financed in a largely non-inflationary manner to date--how long is this sustainable? Budget speeches in the past two years have emphasized the high potential cost of any need to shift to deficit finance through use of the overdraft with the Reserve Bank and also a keen awareness of the cumulative effects of the growing interest rate bill.

(ii) Within the existing system the Government is continually making decisions over the exchange rate, regulated prices and, once a year on wages. There is a general perception that these can have cost-push, or dampening effects, on the rate of inflation, but the relative weight given to this and other factors has varied substantially from year to year and for decisions over different prices in the same year.

(iii) The Government initiated the process of unwinding the price freeze in 1988 but is now uncertain where to go next with uncertainty over the extent of pent-up inflation--and how to manage it--the key problem. What is a

reasonable approach to managing this decontrol and then effecting a disinflationary process and what target for the exchange rate, money and regulated prices would be appropriate to complement the decontrol?

(iv) What would be the consequence for the interrelationship between macroeconomic adjustment and inflation in the event of a shift in policy regime i.e. a reduction in the quantitative direction of foreign exchange?

III: THE MODEL

While the model as spelt out in this section appears fairly complex its reduced-form structure is quite straightforward, and can be summarized in three simplified equations.

$$P = f\ (M,\ Y,\ e,\ Pf,\ Z_1) \qquad \ldots(1)$$

$$M = f\ (e,\ P,\ Z_2) \qquad \ldots(2)$$

$$Y = f\ (e.Pf/P,\ Z_3) \qquad \ldots(3)$$

Equation (1), which will be derived later, states that prices (P) are a function of money (M), output (Y), the exchange rate (e), foreign prices (Pf) and other cost-push elements (Z_1). Monetary growth (equation (2)) in turn depends on prices and the exchange rate through the impact of these prices on the fiscal deficit. The endogenized fiscal deficit is therefore one mechanism through which prices and the exchange rate affect monetary growth. The other mechanism is through nominal wage adjustments which are then accommodated by the monetary authorities. Monetary policy and other influences on the deficit also affect the rate of monetization and are represented by Z_2. Finally, equation (3) has real output as a positive function of the real exchange rate and other constraints represented by Z_3. This is, of course, a simplification of a more complex pattern of output determination. If output is supply-constrained, an increase in the real exchange rate (real depreciation) should increase exports and the country's importing capacity leading to an increase in output. In a demand-determined model, the same result holds; exports (X) rise and imports (M) fall as the real exchange rate depreciates; (X-M) rises. This basic structure allows us, for example, to examine three routes through which exchange rate changes affect inflation: first, through a direct cost-

push effect on prices; second, through its impact of the various components of the budget, that in turn affects inflation through monetary channels depending on how the budget is financed; third, through the influence on the trade balance and real output.

The detailed model is described in three parts which expand on the three basic reduced-form equations we have listed: in Section III.A we derive and present estimates of the overall inflation equation. This involves a discussion of different factors which affect inflation in Zimbabwe: import prices, wage-induced inflation and changes in administered prices. In Section III.B we describe the equations which capture the monetary and fiscal systems. These include the effects of how changes in individual prices affect different components of the budget. It also includes equations and identities which describe how fiscal deficits translate into money creation which then feed back into inflation. Section III.C describes the real side interactions that are included in the model.

A. Inflation, Wage, Monetary Interactions

(i) The Inflation Equation

The overall inflation equation is derived using a combination of a monetarist and a mark-up model. We distinguish between three types of goods: traded (p_1), non-traded without specific controls (p_2) and those with controls (p_3). In Zimbabwe very few commodities would come under the first category. Very few final products are imported and almost all are subject to domestic mark-ups. The overall rate of inflation ($\dot{p}$) is a weighted average of the rate of inflation in the three categories.

$$\dot{p} = \lambda_1(\dot{p}_1) + \lambda_2(\dot{p}_2) + (1-\lambda_1-\lambda_2)\dot{p}_3 \qquad \ldots(4)$$

Let us for the moment ignore controlled commodities. We will reintroduce them into the analysis later.

If there is free trade, then the change in domestic goods prices will equal the change in foreign prices plus the change in the nominal exchange rate, (Corbo and McNelis (1987)).

$$\dot{p}_1 = \dot{p}_f + \dot{e} \qquad \ldots(5)$$

where $\dot{p}_1$ represents the rate of change in prices for commodities that are freely traded.

For commodities with quantitative restrictions and non-tradeables, prices will be determined through a mark-up over unit labor costs ($\dot{w}p$) and the cost of imported materials ($\dot{m}c$) (Bruno (1979), Gordon (1975) and Corbo (1985)). The degree of mark-up will depend on demand pressures in the economy (ED). The change in unit labor cost is defined as the difference between wage growth and productivity growth in the economy. The change in p_2 can be captured by the following equation.

$$\dot{p}_2 = a1\ \dot{w}p + a2\ \dot{m}c + a3\ ED \qquad \ldots(6)$$

$$a1+a2 < 1\ ,\ a3 > 0$$

Following Corbo and McNelis (1987) we assume that:

$$\dot{m}c = \dot{p}f + \dot{e}$$

Inserting Equations 5 and 6 into 4 (and ignoring $\dot{p}_3$ for the moment) we get a reduced form equation for overall inflation.

$$\dot{p} = a_1\lambda_2\dot{w}p + (\lambda_1+\lambda_2 a_2)(\dot{e}+\dot{p}_f) + a_3\lambda_2 ED \qquad \ldots(7)$$

As can be seen, the fact that λ_1 is close to zero for Zimbabwe does not affect the structure of the model.

To apply this model to empirical data for Zimbabwe we have to specify the change in excess demand (ED) and the change in unit labour costs ($\dot{w}p$). In developed countries information on labour productivity and capacity

utilization are readily available.[11] However in most developing countries[12] among them Zimbabwe, time-series data on these variables are not available and an alternative approach is necessary.

(ii) Specifying Excess Demand

Using Walras Law we assume that excess demand in the goods market is equivalent[13] to excess supply in the money market. Although substitution is possible between money and alternative financial assets we follow Khan (1980) who argues that the substitution between money and goods is quantitatively far more important because of the relatively under-developed nature of financial markets in developing countries. Moreover, the problem is compounded by government controls on interest rates and financial assets that are available. Although Zimbabwe's financial markets are relatively better developed in comparison with other African countries, as a first approximation we assume that shift between money and financial assets derive from government controls and long-run trends in the economy, and is not an endogenous factor in short-run adjustment (see Section II). This indicates that the characterization suggested by Khan is applicable in this case.

11/ See for example Gressani, Guiso and Visco (1988) for an application of this type of mark-up model for Italy.

12/ With some exceptions, see Corbo and McNelis (1987) for an application to Korea, Israel and Chile. However, their study was for the manufacturing sector only and even so used the difference between money and output growth to define excess demand.

13/ An excess demand variable was constructed taking the differential between actual and trend GDP but gave very poor results. Similar results were obtained for over 30 countries using data for 1956-72 by S.S. Bhalla (1981).

We specify excess money supply as the log difference of real money supply to real money demand.

$$ED = \log (M/p) - \log (Md/p) \qquad ...(8)$$

This can be written as:

$$\dot{M}t - \dot{p}t + \log (M(t-1)/p(t-1)) - \log (Md(t)/p(t)) \qquad ...(9)$$

where $\dot{M}(t)$ is changes in the supply of money and md(t) is money demand in log form.

The money demand function is formulated in a standard manner.

$$\log(Md/p) = d0 + d1 \log(y) + d2\ i + d3\ \dot{p}e \qquad ...(10)$$

where $d1 > 0$, $d2 < 0$ and $d3 < 0$

y is real income, i is the deposit interest rate and $\dot{p}e$ is the expectation on inflation.[14] Substituting 10 into 9 we get

$$ED = \log (Mt/p(_{t-1})) - \dot{p}_t - (d_o + d_1 \log y + d_2 i + d_3 \dot{p}_e) \qquad ...(11)$$

Substituting Equation 11 into 7 gives the following reduced form inflation equation.[15]

$$\dot{p} = b_o + b_1 (\dot{w}p) + b_2(\dot{e}+\dot{p}_f) + b_3 \log (M_t/p_{t-1})$$
$$+ b_4 \log y + b_5\ i + b_6\ \dot{p}e \qquad ...(12)$$

14/ We used M2 which is defined as currency plus demand deposits plus 30-day time deposits. The interest rate used is the 3-month deposit rate.

15/ Instead of substituting the excess money supply into the inflation equation and then estimating the reduced form, an alternative approach is to calculate excess money supply as the difference between money and predicted money demand. This is now being explored and preliminary results are encouraging.

where $b_1 = (a_1\lambda_2/x)$; $b_2 = (\lambda_1+\lambda_2 a_2)/x$; $b_3 = a_3\lambda_2/x$; $b_4 = -\lambda_2 a_3 d_1/x$;

$b_5 = -\lambda_2 a_3 d_2/x$; $b_6 = -\ a_3\lambda_2 d_3/x$; $x = 1+a_3\lambda_2 \geq 1$

$0 \leq b < 1$, $0 < b_2 < 1$, $0 < b_3 \leq 1$, $b_4 < 0$, $b_5 > 0$, $b_6 > 0$.

Three alternatives are considered for specifying the expected inflation term in the model. Under the first, assuming rational expectations or perfect foresight (Muth, 1974, Bruno, 1978)

$$\dot{p}e(t) = \dot{p}(t)+n(t) \qquad \ldots(13)$$

where n(t) is uncorrelated with $\dot{p}e(t)$

In this case Equation 12 simply transforms into

$$\dot{p}_t = C_o + C_1(\dot{w}p) + C_2(\dot{e}+\dot{p}_f) + C_3 \log (M_t/p_{t-1}) + C_4 \log (y) + C_5\ i \qquad \ldots(14)$$

where $Z = 1 + \underbrace{a_3\lambda_2 d_3}_{(x)} > 0$; $C_i = b_i/Z$ and the expected signs of C_i are the same as of b_i

An alternative approach is to use lagged inflation $\dot{p}(t-1)$ as an indicator of expected inflation. A third uses Cagan's (1956) adaptive expectations mechanism where:

$$\dot{p}^e = \frac{(1-\eta)}{1-\eta.L} \cdot \dot{p}$$

where η is the adaptive expectations coefficient and L is a Lag Operator. These three formulations were tested against each other. Both the use of lagged inflation and adaptive expectations performed poorly in comparison with the rational expectations formulation . The test results are presented in Appendix 1.

(iii) Wage-Induced Inflation

Finally we need to specify the change in unit labour costs ($\dot{w}p$) which is defined as the difference between real wages and labor productivity. In Zimbabwe accurate data on labor productivity are not readily available and we therefore estimated the change in unit labour costs by first estimating a real wage equation for Zimbabwe as follows.

Real wages adjust to their desired level with an adjustment lag ϕ.

$$\dot{w}-\dot{p} = \phi\ (\log(wd/p)-(\log w(t-1)/p(t-1))) \qquad \ldots(15)$$

where $0 < \phi < 1$

wd(t) is the desired level of wages in year t.

$$\log\ (wd/p) = k_0 + k_1\ t + k_2 D \qquad \ldots(16)$$

The desired real wage is a function of productivity growth which follows a time trend. The long-run trend in real wages follows this path quite accurately (see Figure III.1) in the case of Zimbabwe except for the period of government interventions in the labour market following independence in 1980-83. The 1980 wage hike raised labor compensations beyond productivity increases in an autonomous effort by the government to improve income distribution. The increase could not be sustained and real wages started to fall in 1983. A dummy variable (D) was used to account for this administered increase in wages in the period 1980-83

The estimated change in real wage equation is:

$$\dot{w}(t)-\dot{p}(t) = \phi \cdot k0 + \phi \cdot k1 \cdot t - \phi\ (\log(w/p)_{t-1}) + \phi k_2 D \qquad \ldots(17)$$

Empirical results for the period 1968-85 are as follows.

$$\dot{w}-\dot{p} = \underset{(2.51)}{-0.5222} + \underset{(4.00)}{0.0181}\ t - \underset{(5.20)}{-1.0125}\ \log(w/p)_{t-1} + \underset{(4.98)}{0.1445}\ D$$

$$\bar{R}^2 = 0.65$$
$$D.W. = 2.34$$

Figure III.1

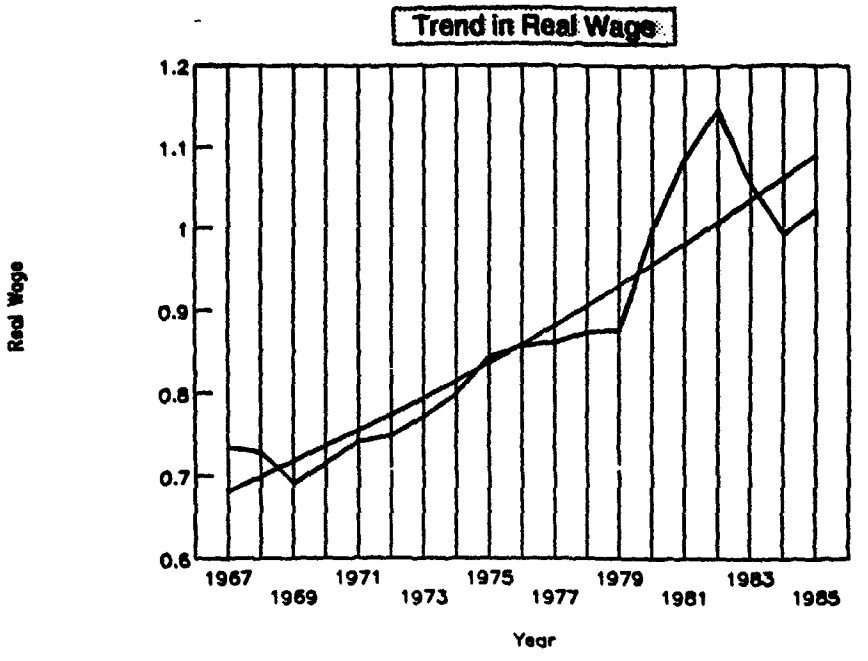
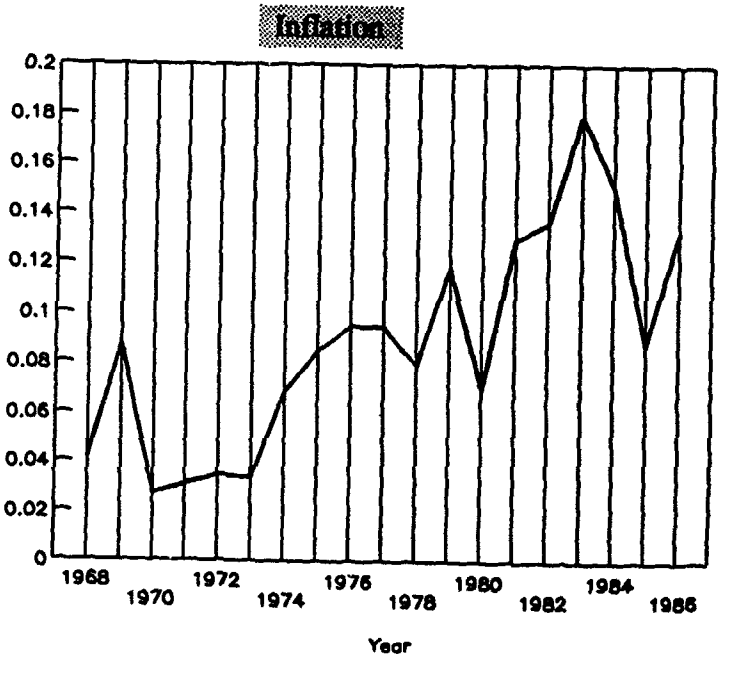


Figure III.2



The equation results show that the desired rate of increase in real wages (k1) is about 1.8 percent per annum and all of this increase is actually attained in one year (ϕ=1.01). The coefficient of the dummy variable is highly significant showing that on average real wages exceeded productivity increases by 14 percent in 1980-83. Equation 17 can be used to determine changes in unit labor costs i.e. wage increases which exceed productivity growth. In the case of Zimbabwe these are mostly caused by government wage policy as the degree of unionization is low (as discussed in Section II). This residual component of wage inflation ($\dot{w}p$) which is used as our indicator for changes in unit labor costs can then be calculated as

$$\dot{w}p(t) = \dot{w}(t) - \phi k0 - \$k1\ t + \phi(\log(w/p)_{t-1}) \qquad \ldots(18)$$

(iv) <u>Estimates of the Overall Inflation Equation</u>

The inflation equation estimated with TSLS for the period 1969-1986 using annual data is presented in Table III.1. The model explains inflation in Zimbabwe very well (see Equation III.1.1). The adjusted R_2 is 0.79 and the coefficients all have the correct signs as well as high t-statistics. The first round impact of imported prices on domestic inflation is fairly low: its coefficient has a value of 0.14 but is highly significant. The coefficient for changes in unit labor costs ($\dot{w}p$) is also highly significant and has a value of 0.35.

It is possible to derive some of the parameters of the structural equations such as those for the money demand function.

$$d_1 = -\frac{C_4}{C_3}$$

where d_1 is the income elasticity of real money demand. The derived values of d_1 is 1.33.

TABLE III.1: Inflation Equations; TSLS
(1969-86)

	Equation	Constant	$\dot{e}+\dot{p}_f$	$\dot{w}p$	$\log(M/P_{-1})$	$\log y$	i	C_f	C_s	$\bar{R}^2$	D.W.
III.1.1.	Over-all Inflation ($\dot{p}$)	0.6312	0.1402	0.3463	0.0818	-0.1462	0.83			0.79	1.99
		(1.55)	(2.42)	(2.56)	(1.94)	(2.21)	(3.42)				
III.1.2.	$\dot{p}$	0.4034	0.0996	0.2750	0.1161	-0.1430	0.59	-0.5073		0.89	1.89
		(1.34)	(2.28)	(2.74)	(3.62)	(2.98)	(3.12)	(3.40)			
III.1.3.	$\dot{p}$	0.7159	0.0828	0.3119	0.1058	-0.1764	0.96		-0.2651	0.87	2.44
		(2.23)	(1.66)	(2.92)	(3.10)	(3.32)	(4.92)		(2.83)		
III.1.4.	$\dot{p}$	0.5150	0.0761	0.2736	0.1213	-0.1619	0.73	-0.3713	-0.1584	0.91	2.46
		(1.83)	(1.83)	(3.01)	(4.15)	(3.62)	(3.86)	(2.38)	(1.76)		

All Equations were estimates with two stage least square, using TSP. The instruments used were change in import prices, lagged nominal interest rates, lagged real money balances, lagged money growth, lagged inflation, lagged log GDP, fiscal deficit as a share of GDP, C_f, C_s and the lagged difference between real wages and productivity growth.

$\dot{e} + \dot{p}_f$ = Change in import prices in Zimbabwe $
M/P_{-1} = M2 deflated by lagged CPI
y = real GDP
i = 6-month deposit interest rate
C_f = difference between food inflation for low income versus high income
C_s = difference between service inflation for low income versus high inflation
$\dot{w}p$ = change in unit labor cost

TABLE III.2: Inflation: Low and High Income
(1969-86)

	Equation	Constant	$\dot{e}+\dot{p}_f$	$\dot{w}p$	$\log(M/P_{-1})$	log y	i	C_f	C_s	$\bar{R}^2$	D.W.
III.2.1.	Low income $\dot{P}_L$	0.4118	0.0929	0.1473	0.1469	-0.1696	0.83	-0.6505	-0.3443	0.89	2.83
		(1.09)	(1.66)	(1.21)	(3.75)	(2.82)	(3.29)	(3.11)	(2.85)		
III.2.2.	$\dot{P}_L$	0.2344	0.0786		0.1665	-0.1622	0.85	-0.6989	-0.3456	0.88	2.86
		(0.66)	(1.40)		(4.46)	(2.66)	(3.28)	(3.33)	(2.80)		
III.2.3.	High Income $\dot{P}_H$	0.6135	0.0593	0.3912	0.0964	-0.1541	0.64	-0.0962	-0.0214	0.89	2.19
		(2.15)	(1.40)	(4.25)	(3.25)	(3.39)	(3.33)	(0.61)	(0.23)		
III.2.4.	$\dot{P}_H$	0.6635	0.0624	0.4019	0.0918	-0.1571	0.70			0.90	2.23
		(2.63)	(1.74)	(4.79)	(3.15)	(3.82)	(4.65)				

All Equations were estimates with two stage least square, using TSP. The instruments used were change in import prices, nominal interest rates, lagged real money balances, lagged money growth, lagged inflation, lagged log GDP, fiscal deficit as a share of GDP, C_f, C_s and the difference between wages and productivity growth.

$\dot{e} + \dot{p}_f$ = Change in import prices in Zimbabwe $
M/P_{-1} = M2 deflated by lagged CPI
y = real GDP
i = 6-month deposit interest rate
C_f = difference between food inflation for low income versus high income
C_s = difference between service inflation for low income versus high inflation
$\dot{w}p$ = change in unit labor cost

The coefficients of the structural equation cannot be identified. If we assume that there are no freely traded goods, an assumption which is probably accurate for Zimbabwe as very few goods follow the law of one price, and for the moment ignoring controlled commodities then

$$\lambda_1 = 0, \ \lambda_2 = 1, \ \lambda_3 = 0$$

It is now possible to derive the parameters of the structural equations. These are

$$a_1 = 0.58, \ a_2 = 0.16$$

This shows that the average mark-up has been of the order of 26% in Zimbabwe.

(v) Food and Public Service Prices

The model was first estimated assuming $\dot{p}_3 = 0$, namely there were no commodities under price controls. In Zimbabwe one important source of such price changes could come from changes in administered prices. As discussed in Section II, these controls largely apply to commodities in the consumption basket of low income consumers. The Government sets the price at which most farm products are purchased from domestic producers and sold to consumers by several state marketing boards. The Government also regulates the prices of goods and services such as fuel and electricity, housing and public transportation. The losses of the parastatals providing these services are covered by subsidies from the Government.

Price regulations affect some sectors of the economy more than others. In the case of Zimbabwe, the sectors that are more directly affected by price intervention are foodstuffs and services for low-income consumers. The price indices for high and low income consumers are presented in Figures

III.3 and III.4 for food and public services. The difference in high and low income inflation for these commodities is entirely due to the effect of direct price intervention, or an incomes policy.

$$cf = \dot{p}h_f - \dot{p}l_f \qquad \ldots(19)$$

$$cs = \dot{p}h_s - \dot{p}l_s \qquad \ldots(20)$$

If the government imposes price controls on commodities which are consumed by the poor cf and cs will be positive. When these prices are adjusted to reduce subsidies, as happened for food items after 1982 and public services after 1984, cf and cs will be negative. The coefficient of cf and cs in the inflation equation would be expected to be negative, because with price controls cf and cs rise leading to a decline in inflation.

The inflation equation was re-estimated with cf and cs and the results are reported in Table III.1 (Equations III.1.2 - III.1.4). Both variables have the correct signs and have high t-statistics. The coefficient of the import price variable is reduced significantly - from 0.14 to 0.08 - when cf and cs are added into the equation. This is important because it confirms that the impact of import prices on domestic inflation depends to a large extent on the pass-through. If imported food on fuel or fertilizer prices are not passed through automatically, then their impact will be reduced.

In order to confirm our hypothesis that price controls affect only the low income CPI we estimated separate inflation equations for the low-income population and the high-income population. The results (Table III.2) show clearly that the price control variables cf and cs are significant only in the inflation equations for the low-income population (Equation III.2.1), but are completely insignificant in the high income inflation equation (Equation III.2.3 and III.2.4).

Figure III.3

Inflation In

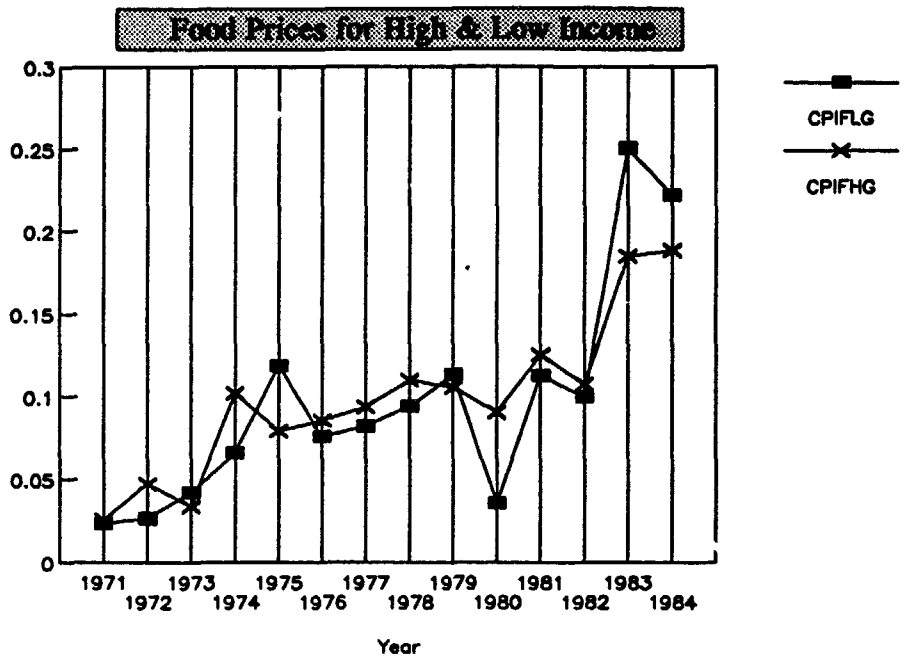
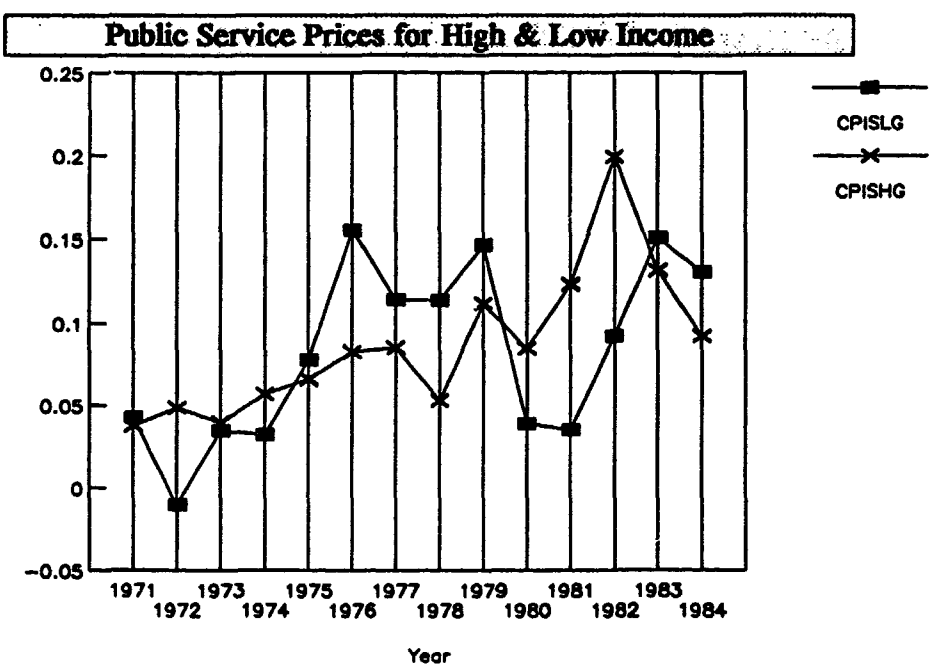


Figure III.4

Inflation In



Wage-induced inflation does not appear to affect the low income CPI as much as the high income CPI. Its coefficient is insignificant in the inflation equation for low-income households. This is to be expected since wage-goods prices, namely food and basic service are controlled by the government. An increase in wages which is greater than productivity has little effect on the low-income CPI because a large component of the latter is administered.

To recapitulate, inflation in Zimbabwe can be characterized in terms of a modified mark-up model, with excess demand determining the degree of mark-up. The excess demand can be captured by excess money supply because quantitatively the major substitution is between money and goods rather than between money and other financial assets as one would expect in a developing country. Import prices, price controls on basic items such as food and public services and changes in unit labour costs measured as changes in real wages over labor productivity are also important and significant explanatory variables.

B. Monetary-Fiscal Block

The monetary system is modelled in a standard way. Money growth is a function of the money multiplier and the growth of reserve money, which in turn is affected by the size of the fiscal deficit and the manner in which it is financed. The fiscal block is included in the model to incorporate the effect of price changes on various elements of public expenditure and revenue. On the revenue side customs duties are a function of the exchange rate. On the expenditure side the model distinguishes between subsidies (a function of price controls on food and public services (cf and cs)), interest payments--foreign and domestic, wage bill (a function of a wage indexation

rule), public investment and other government expenditure. Price controls in turn affect either the governments subsidy bill and/or they may lower the profitability of the private sector and thereby affect private investment and output. Wage indexation is made a policy variable whose historical value can be determined econometrically. The size of the fiscal deficit is therefore the endogenous outcome of policy variables, and of the government's decisions on price policy.

(i) Money Supply

The growth of broad money supply[16] ($\dot{M}$) is the sum of the growth of reserve money ($\dot{R}$) and changes in the money multiplier ($\dot{m}$).

$$\dot{M} = \dot{m} + \dot{R} \qquad \ldots(21)$$

The money multiplier, defined as the ratio of M to R, is plotted in Figure III.5, it can be written as:

$$m = M/R \qquad \ldots(22)$$

which can be written as:

$$m = (C+D)/(C+RR+ER) \qquad \ldots(23)$$

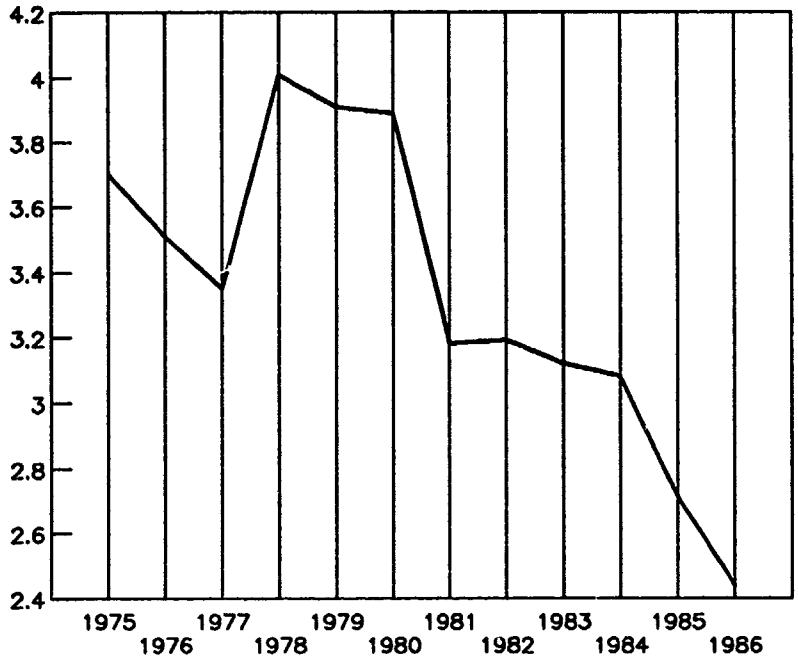
$$m = (1+c)/(c+r+e) \qquad \ldots(24)$$

where c is the ratio of currency (C) to deposits (D), r the ratio of reserves (RR) to deposits and e the ratio of excess reserves (ER) to deposits. The money multiplier can therefore change if any of these ratios change. The government can affect the size of the money multiplier through changes in the required reserve ratios. The money multiplier can also vary with the currency

16/ Includes time deposits up to 30 days maturity.

Figure III.5

ZIMBABWE
Money Multiplier



to deposit ratio (c). As discussed in Section II, c has been rising in Zimbabwe, so m has been falling.[17] There is a sharp jump in the value of m in 1978 due to a decline in the required reserve ratio followed by an equally sharp drop in 1981 when the required reserve ratio was raised. The long-run decline in the value of the money multiplier m can be verified statistically by the following equation:

$$\log(m) = \underset{(54.57)}{3.6626} - \underset{(7.98)}{0.067}\, t + \underset{(9.07)}{0.6073}\, DR$$

$$\bar{R}^2 = .95$$
$$D.W. = 2.48$$

17/ $dm/dc = (r+e-1)/(c+r+e) < 0$:

where t is time and DR is a dummy for the period when the required reserve ratio was lowered 1978-1980.

Reserve money is by definition the sum of net foreign assets (NFA), government borrowing from the Reserve Bank (COG), central bank credit to banks and other net assets. The last two are called other assets (OA) in our model.

$$R = COG + NFA + OA \qquad ...(25)$$

Government borrowing from the Reserve Bank is last year's outstanding debt with the Reserve Bank (COG_{-1}) plus new borrowing from this source (GBB).

$$COG = COG_{-1} + GBB \qquad ...(26)$$

Borrowing from the Reserve Bank is treated as a residual financing item, after net foreign borrowing (GFB) and non-bank domestic borrowing by the government (GDB).

$$GBB = GDEF - GFB - GDB \qquad ...(27)$$

(ii) <u>The Fiscal Deficit and Its Components</u>

As noted above, the deficit (GDEF) is endogenised in the model. On the revenue side (GREV), the model distinguishes between customs duty (CUDT), export taxes (EXPT) and other revenue (GOREV).

$$GDEF = GEXP - GREV \qquad ...(28)$$

$$GREV = CUDT + EXPT + GOREV \qquad ...(29)$$

Customs duty (CUDT) is a function of import levels (IMPQ), foreign prices, tariffs (t_m) and the exchange rate (e). Export taxes are similarly a function of export levels (EXPQ), the foreign price for exports Px, the exchange rate and the export tax rate (tx).

$$CUDT = IMPQ.\ P_f.\ e.\ t_m \qquad ...(30)$$

$$EXPT = EXPQ.\ P_x.\ e.\ t_x \qquad ...(31)$$

Other government revenue is treated as a function of nominal GNP. An adjustment coefficient is introduced to test if revenues adjust with a lag.[18]

Government expenditure is decomposed into the wage bill (WBILL), subsidies and transfers to enterprises (SUBS) interest on foreign (INTF) and domestic debt (INTD), public investment (GI) and other government expenditure (GOEXP).

$$GEXP = WBILL + SUBS + INTD + INTF + GI + GOEXP \quad ...(32)$$

The wage bill is a function of average nominal wages (wg) paid by the government. These are linked to economy wide wages (Equation 17) and government employment (Lg).

$$WBILL = wg.\ Lg \quad ...(33)$$

The interest on foreign debt is a function of the stock of debt (FDEBT), interest rates (if) and the exchange rate.

$$INTF = FDEBT.\ if.\ e \quad ...(34)$$

The stock of foreign debt owed by the government increases by the extent of new foreign borrowing.[19]

$$FDEBT = FDEBT_{-1} + GFB/e \quad ...(35)$$

18/ See Tanzi (1977) for introducing this concept and Aghelvi and Khan (1978) for its empirical verification. The test involves comparing the relative magnitude of the adjustment coefficients in the two equations. If the adjustment coefficient is larger in the expenditure equation the Tanzi effect holds because it implies expenditures adjust faster than revenues to inflation. This is verified in Zimbabwe later.

19/ In the African context, the public sectors foreign borrowing accounts for the bulk of total foreign borrowing.

Interest payments on domestic debt are a function of the stock of domestic debt (DDEBT) and the domestic interest rate (i).

$$INTD = i.\ DDEBT \qquad ...(36)$$

$$DDEBT = DDEBT_{-1} + GDB \qquad ...(37)$$

Note that unless the country has an open capital account domestic borrowing increases the domestic interest rate. If interest rates are controlled and credit is allocated increased government borrowing reduces credit available for the private sector. Government investment is a policy variable.

Subsidies (in real terms) are a function of the differential between the growth of prices in the controlled sectors and overall inflation. The more price controls, the higher the subsidy.[20]

$$SUBS/p = f[(SUBS/p)_{-1},\ (\dot{p}c-\dot{p})] \qquad ...(38)$$

Again following Aghelvi and Khan (1978) government expenditure (in real terms) is treated as a function of the trend in real GNP, real import prices and an adjustment lag.

$$GOEXP/P = f(Y,\ (GOEXP/P)_{-1},\ MPI/P) \qquad ...(39)$$

The estimated equations for subsidies , other revenues and other government expenditures are shown in Table III.4. The results confirm the existence of the Tanzi effect which states that with higher inflation the deficit will rise endogenously, because revenues will adjust slower than expenditures to inflation. The adjustment coefficient in the other expenditure equation has a value of 0.77 as against the revenue adjustment coefficient

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20/ There is a practical problem here because of the need to distinguish between implicit and explicit subsidies; this will be dealt with in further work.

Table III.4: Equation for Real Subsidy, Other Government Expenditure & Revenue

1973-86

1. $$\log(SUBS/GDP) = \underset{(1.76)}{-0.8322} + \underset{(4.02)}{0.6724} \log(SUBS/GDP)_{-1} + \underset{(0.98)}{1.75} \log(IPCFCS) + \underset{(1.28)}{0.1946} DS$$

$\bar{R}^2 = 0.81$
D.W. = 1.84

2. $$\log(GOEXP/P) = \underset{(0.30)}{0.77} + \underset{(6.1)}{0.7651} \log(GOEXP/P)_{-1} + \underset{(0.22)}{0.0845} \log(QGDP) + \underset{(1.74)}{0.4007} \log(MPI/P) + \underset{(2.78)}{0.2186} D$$

$\bar{R}^2 = 0.94$
D.W. = 3.24

3. $$\log(GOREV) = \underset{(2.2)}{-1.24} + \underset{(2.7)}{0.48} \log(GDP) + \underset{(4.2)}{0.61} \log(GOREV)_{-1}$$

$\bar{R}^2 = 0.99$
D.W. = 1.4

SUBS = Subsidy
GOEXP = Other Government Expenditures
GOREV = Government Revenue
QGDP = GDP in constant prices
D = Dummy equal to 1 for years 1982 and 1983
DS = Dummy equal to 0 upto 1980 and 1 subsequently for new regime
IPCFCS = Ratio of Food and Service CPI High Income to Low Income weighted by their shares in low income CPI. It measures an index of price controls

whose value is only 0.61. These results show that other expenditures adjust to inflation by 77% within the year, whereas revenues adjust by only about 61% within the year, so that in the short run the fiscal deficit will increase with higher inflation.

C. <u>The Real Side</u>:

The proposed framework includes a few key real macroeconomic relationships in order to allow for the examination of the important trade-offs that are linked to the variables in the pricing side of the model. These are incorporated in an admittedly aggregative fashion by including an export and private investment function in the model.

Export (EXPQ) are made a function of the real exchange rate ($e \cdot P_f/P$) and demand in the rest of the world (Y_w)[21]

$$EXPQ = f(e. \frac{P_f}{P}, Y_w) \qquad \ldots(40)$$

Import capacity (IMPQ) is the sum of exports and net foreign inflows minus the change in net foreign assets. An alternative formulation would be to estimate an import demand function and let the exchange rate adjust to equate imports and exports subject to foreign borrowing constraints. But in Zimbabwe the former is a more accurate representation of closure (see Section II).

21/ For the purpose of the simulation exercise in this paper we assume a short-run elasticity of 0.1 and along ran run elasticity of 1. In order to examine the implications of a higher supply response we also run simulations with a short run elasticity of 0.3. The actual estimation (to be carried out) will distinguish between export destination e.g. for Zimbabwe - South Africa and the rest of the world.

Capacity output (y^{cap}) is a function of government (GI) and private investment (PI) and the incremental capital-output ratio.

$$y^{cap} = k^{-1} ((PI+GI)/Y)_{-1} \qquad ...(41)$$

where k represents the incremental capital-output ratio (ICOR). The average ratio for the 1967-86 period is k=4.7.

We assume that real income is entirely determined by supply conditions. The major constraint to investment and capacity utilization comes not from a lack of demand but from shortages of foreign exchange for reasons elaborated upon in Section II. Cyclical increases in output generally result lower inflation and vice versa suggesting that changes in the level of economic activity are mostly due to shifts in the aggregate supply schedule, while aggregate demand determines inflation.

Deviations from potential output occur, but not as a result of changes in effective demand, as in Keynesian models.

The ratio between actual output (y) and capacity output--the capacity utilization rate--is a function of the country's importing capacity.

$$y/y^{cap} = f(IMPQ/y^{cap}) \qquad ...(42)$$

Changes in imported inputs alone account for 56 percent of the variations in the gap between potential and actual output.

$$\log(y/ycap) = \underset{(4.2)}{-2.48} + \underset{(4.2)}{0.40}. \log(qinp)$$

Sample 1970-83 $\qquad \bar{R}^2 = 0.56$

D.W. = 1.7

where qinp is the quantity of intermediate imports.

Private investment (PI) is a behavioral variable dependent on expected demand (y), the real interest rate (r) , the country's capacity utilization rate (y/y^{cap}) or its importing capacity since the latter is a key explanatory variable for capacity utilization.

In a country like Zimbabwe where a substantial component of its capital goods are imported the importing capacity constraint also has a direct effect on private investment besides its effect through the capacity utilization variable.

The following regression provides an acceptable explanation of the rate of investment:

$$(I/y)_t = \underset{(2.9)}{-0.15} + \underset{(7.4)}{0.79}(I/y)_{t-1} - \underset{(1.8)}{0.15}r_t + \underset{(3.8)}{0.55}(Q/y)_t$$

$$\bar{R}^2 = 0.92$$
$$D.W. = 1.87, \text{ 2SLS}$$

where I/y is the ratio of real investment to income, r_t is the real interest rate relevant for investment decisions[22] and Q/y is the aggregate import-output ratio. To account for potential simultaniety between investment and imports, even though it is quite clear in Zimbabwe that imports are constrained by foreign exchange availability, instrumental variables[23] were used on the import ratio.

D. <u>How the Model Works: Some Trade-offs</u>

The purpose of the model is to analyze the implications of alternative mixes of policies and exogenous assumptions on nominal prices, wages and the fiscal deficit. It involves a set of simultaneous equations with significant interactions between different parts of the model. A key

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22/ The commercial bank overdraft rate was used after deflating by the GDP deflator.

23/ The instrumental variables are $(I/y)_{t-1}$, r_t, Y_{t-1}, the export ratio $(X/y)_t$ and the log of the real price of investment goods.

question concerns the approach to closure in the model. At least two options can be explored. The first would have a stronger monetarist orientation, with the model essentially closing in the pace of change in uncontrolled prices. The second would give greater weight to cost-push influences on both controlled and uncontrolled prices and assume an accommodating monetary policy. Both general approaches would maintain the endogeneity of the fiscal deficit and the feedback from real variables into inflation. There are also alternative closure options within the different parts of the model. For example in the external equation in the real side of the model it may be plausible either to have the model close in imports (which would affect the model results via output) or in foreign borrowing (which would affect the results via the financing of deficit). Alternative approaches will apply to differing government practices and policy rules; it will also allow exploration of the robustness of the conclusions over policy tradeoffs.

The type of question the analysis will be used for in Section IV is first illustrated by exchange rate movement. There are three channels whereby the exchange rate influences inflation. First there is a direct short-run influence on the price level. Second, the exchange rate affects exports, which along with external borrowing targets determines the country's importing capacity, which affects private investment, output and thereby inflation. This is especially important for many African countries). Third, devaluation can increase or reduce the budget deficit depending on whether the Government (including its external debt service) is a net seller of foreign exchange in the economy. A related issue which can be examined within this framework is how a once off devaluation compares with a managed exchange rate adjustment

and the extent and timing of fiscal adjustment that needs to accompany both policies. The trade-off between higher subsidies to protect the poor from inflation and the budget has already been mentioned.

The financing of the deficit provides a second illustration. The size of the financable fiscal deficit depends on the way in which the fiscal deficit is financed and on the Government's expenditure policy. If the Government is able to borrow abroad or convince the public to hold Government bonds at a low interest rate a larger fiscal deficit is sustainable.[24] The trade-off is between higher inflation today versus higher inflation in the future or higher taxes. What the Government spends on is also important. Higher wages to public sector employees can be inflationary if they exceed productivity growth. A larger public investment program need not be if project selection is based on sound economic criteria that relax output constraints.[25]

To summarize, the framework attempts to go beyond the simple uni-directional model of monetary growth on inflation. Money supply and the size of the fiscal deficit are endogenous variables affected by the Government's policies. In the short and medium term the possibility that cost-push factors, such as taxes, public enterprise pricing and import prices can suppress or accelerate inflation and affect relative prices in a significant manner is also recognized. Output fluctuations arising from import

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24/ For a given level of monetary growth and inflation.

25/ See Anand, Chhibber and van Wijnbergen (1988) for an illustration of these issues.

constraints and the possibility of Government policies affecting private investment and capacity output is explicitly incorporated in the model. Finally, the impact of alternative ways of financing the fiscal deficit and Government expenditure patterns on inflation are brought in as a central feature of the framework. The gains of this approach lie in the integration of well-established relationships within a single framework, rather than new approaches within the different parts of the modeling approach. This framework is used to look at certain policy issues to which we now turn in Section IV.

IV: POLICY SIMULATIONS

In this section we present three sets of simulations that are designed to illustrate the implications of the analysis of inflation for the relationship between policy and future inflation. These utilize the model described in Chapter III to assess the consequences of exchange rate movement, reductions in food subsidies and a shock to wage and prices, due for example to allowing a swift unwinding of a price freeze. It should be emphasized that there are two different types of issue of importance in Zimbabwe (that are implicit in the questions raised at the end of Chapter II). First, there are the consequences of changes within the system as it works now--the exchange rate and food subsidy are good examples of this. A model firmly based on historical analysis is well-suited to explore this. Then there are questions of the implications of a change in policy regime, in particular one that both leads to a stronger linkage between domestic tradeable and foreign prices and reduced control over domestic prices. An econometric model has to be used with much more caution here: with a regime shift it would be expected that many coefficients would change. This does not mean the model has no value, however. In particular, the principal transmission mechanisms for inflation are likely to remain broadly similar, in the case of Zimbabwe. But the incorporation of these channels into a consistent model becomes much more significant, i.e. the structural aspects of the model become more important than the value of individual coefficients. This means that we would have less confidence over the specific size of effects but can still systematically explore the nature of interactions and tradeoffs. The price decontrol simulation is one example of this. The simulations developed for this paper are selective, of course, and further issues will be taken up in the future.

A. Exchange Rates, Fiscal Deficits and Inflation

One of the most common concerns expressed by policy makers over devaluation are its inflationary consequences. This section presents the results of simulations carried out with the model described in Section III to study the overall impact and the different channels by which changes in the exchange rate affect inflation.

Three main channels are highlighted in these simulations:

1. Direct Cost-Push: this is the direct impact of increases in the domestic price of import prices on the overall price level. In the Zimbabwe inflation equation the coefficient of import price growth on CPI growth is about 0.08 i.e. a 1% devaluation has 0.08 point first-round impact on CPI inflation.
2. Budgetary Effect: exchange rate changes affect various components of the budget. Foreign debt service payments (in domestic currency) rise. At the same time revenues from customs duties also rise. Transfers and subsidies from the budget can rise or fall depending on how much of the higher cost of importing is passed on to the public enterprises. Finally, the initial rise in overall prices affects the deficit if Government spending and revenues do not adjust proportionately (Tanzi Effect). If expenditures (as in the case of Zimbabwe) adjust faster than revenues, the initial impact is an increase in the budget deficit.
3. Real Side Effects: if price adjustments to exchange rate changes are lagged, the real exchange rate would depreciate, providing an incentive to exporters. The short-run elasticity of real exports to the real exchange rate is assumed to be 0.3 and the long-run

Devaluation, Inflation and Real Exchange Rate (RER) Under Alternative Assumptions

Simulation		Cumulative Devaluation of 27.5% at the rate of 5% per annum	
		Inflation	RER Depreciation
SI:	Real Exports to RER s-run Elasticity 0.3 l-run Elasticity 1.0	9%	18.5%
SII:	Real Exports to RER s-run Elasticity 0.1 l-run Elasticity 1.0	10%	17.5%
SIII:	Real Exports to RER s-run Elasticity 0.1 l-run Elasticity 1.0 50% of budget deficit financed by borrowing frcm Central Bank (instead of about 25% in (i) and (ii))	16%	11.5%
SIV:	Real Exports to RER s-run Elasticity 0.1 l-run Elasticity 1.0 50% of budget deficit financed by borrowing from Central Bank (instead of about 25% in (i) and (ii)) Slower revenue adjustment to inflation	27.5%	0%

elasticity is 1.0 with an adjustment lag of about 3 years. If the economy is import constrained (as is the case in Zimbabwe) the higher export earnings would increase importing capacity (assuming the same level of the current account deficit), thereby leading to higher growth in the economy which feeds back into lower inflation for the same level of monetary expansion. The elasticity of capacity utilization to real intermediate[26] imports is estimated to be 0.4.

SI Gradual Devaluation: Crawling Peg: High Export Response

In the first simulation the nominal exchange rate is devalued by 5% per year over 5 years amounting to a total devaluation of 27.5%. The following results are observed.

- The overall price level is higher by only 9% at the end of the fifth year resulting in a real depreciation of about 18%.
- The budget deficit is higher than in the Base Run although by a lower proportion in the fourth and fifth year. The budget deficit is higher because the nominal increases in expenditure are greater than the nominal increases in revenue. The expenditure components that increase significantly are interest payments on foreign debt (up by 33%), wage bill of the government (up by 9%), subsidies and transfers (up by 9%) and other government expenditure (up by 30%). This component increases both because of nominal CPI import price growth as well as real output growth.

26/ Any increase in importing capacity is attributed proportionally (based on averages for 1981-85) to intermediate, capital and consumer imports.

- On the revenue side customs duties increase sharply (up by 48%) both because the tariff rates are applied by a revalued import base and because imports rise in response to higher exports. However, the initial level of customs duties is low so that the absolute increase in customs duties is insufficient to match expenditure increases. Other revenues also rise (up by 10%) but not as rapidly as other expenditure (Tanzi Effect).[27]
- Real exports are higher by about 15% by the fifth year in response to a real exchange rate change of 21%. (This is an average effect of a short run (one year) elasticity of 0.3 and a long run elasticity of one.
- As a result real imports increased by about the same percent (16%) leading to an increase in output by 6% by the fifth year, which feeds back into lower inflation. This translates into higher growth by over 1% per annum. Notice that the assumption made here is of a constant current account deficit (net foreign borrowing remains unchanged). Alternatively, the level of foreign borrowing could be reduced.
- In summary a 27.5% nominal devaluation, spread over five years leads to a 9% increase in overall CPI, 18% real exchange rate depreciation, 15% increase in real exports (and in importing capacity) and 6% increase in real output. The level of real subsidies and transfers is kept unchanged.

27/ This can be corrected by switching to ad valorem taxes, or by more periodic revisions of non-ad valorem taxes, duties and fees.

SII <u>Gradual Devaluation: Crawling Peg: Slow Export Response</u>

- In SI we assumed that the short run export elasticity was 0.3 and the long run elasticity was around 1.0. The adjustment period is therefore a little over 3 years. In SII we lower the short run export elasticity to 0.1, leave the long run elasticity at 1.0, but assume an adjustment period of 10 years.
- The outcome is qualitatively the same as in SI. However inflation is higher by about 1% point i.e. 10% increase compared to 9% in SI. Real output increase is lower 4.5% increase (compared to 6% in SI). Real exports rise by only 9% by the fifth year (compared to 15% in SI) and the fiscal deficit is even higher.
- This run should be regarded as a conservative estimate of the impact of a devaluation of 5% per annum. Yet the benefits are quite significant, with growth higher by about 0.9% per annum at the cost of about 2% higher inflation per annum. Note that the first round cost push impact of a devaluation of 5% per annum is only about 1% per annum. An additional 1% per annum inflation gets added on as other prices adjust upwards and monetary accommodation takes place.

SIII <u>Crawling Peg: Slow Export Response: Higher Inflationary Financing</u>

In SI and SII we assumed that the higher fiscal deficit would be financed through foreign borrowing, domestic borrowing and borrowing from the central bank (only the latter is inflationary in the short run) in the same proportion as was observed historically in the period 1981-85. Borrowing from the central bank was on average about 25% of the fiscal deficit. This in large part explains the successful outcome of devaluations in SI and SII: despite SII having a low export response.

In this simulation the financing rules were changed so that 50% (instead of 25%) of the higher budget deficit was financed by borrowing from the central bank. This is a more realistic characterization of the financing choices available in other African countries and probably more realistic of the choice the government of Zimbabwe is likely to face in the future.

The results change quite dramatically. Inflation is higher; for a 5% nominal devaluation over 5 years inflation is higher by 3% per annum, with a real devaluation of only 2% per annum. Sixty percent of the nominal devaluation gets eroded by the end of five years.

SIV <u>Crawling Peg: Slow Export Response: Higher Inflationary Financing: Slower Revenue Adjustment</u>

In the previous simulation SIII we saw the importance of the deficit financing rule in determining how a nominal devaluation would translate into a real devaluation and inflation. The speed with which adjustment occurs in fiscal revenues is another key factor. In particular it is critical that import taxes adjust to fully reflect the more depreciated exchange rate changes. This is necessary because foreign debt service payments and government import costs have increased in direct proportion to the nominal devaluation. The importance of these revenue adjustments is evident from this simulation, where customs duties continue at the old pre-devaluation base, with 50% of the deficit financed by borrowing from the Central Bank.

The nominal devaluation is now completely eroded by inflation. By the end of year 5, there is no real devaluation and inflation accelerates by 5% per annum in response to 5% nominal devaluation.

SIV represents a somewhat extreme case of insufficient fiscal adjustment but it demonstrates the importance of consistency between exchange rate changes and fiscal adjustments. This coordination is not automatic and requires wide ranging fiscal policy and price changes.

B. Macro Effects of Reduced Food Subsidy

The food subsidy run simulates the impact of a 10% increase in food prices to the low income population. A more detailed analysis of the subsidy issue is provided in a planned accompanying paper (Chhibber and Walton, 1989). This is the estimated price increase necessary to eliminate the food subsidy. The increase is spread over five years leading to a catch-up of food prices for the low income population with the high income population. Full wage pass through is assumed with respect to the overall rate of inflation. Therefore real wages (measured as nominal wages deflated by the overall CPI) remains the same as in the Base Case. However real wages of the low income population fall as the low income CPI increases faster than the overall CPI.

There are two opposing influences on the overall price level. On the one hand since higher food prices (low income) are a component of the overall CPI, the latter rises. However, high food prices reduce budgetary subsidies. Other expenditures remaining the same, the budget deficit is reduced. The impact of the lower budget deficit on various macro-targets depends very much on which financing item is reduced. If the cuts are made from borrowing from external and domestic non-bank sources, the positive effect of budgetary reduction is felt on external and domestic debt. If the cut is made through lower borrowing from the central bank the effect is deflationary. For the

simulation run presented here 25% of the reduction in the budget deficit from lower subsidies is assumed to come from reduced borrowing from the central bank. The remainder comes from reduced external and domestic non-bank borrowing.

The simulation results show the following:

- Inflation is initially higher but as the budget deficit falls inflation in the fourth and fifth year is lower than in the base run. In fact by the end of the fifth year the overall CPI is lower than in the Base Run.
- The reduction in the budget deficit comes from a fall in food subsidies. Food subsidies are eliminated by an increase in food prices by 10% for the low income population. By the fifth year the reduction in the budget deficit amounts to about 22%.
- As only 25% of the reduction in the budget deficit comes from lower borrowing from the central bank--the remainder comes from reduced external and domestic debt. The cut in both amounts to a fall in each of about 10% by the fifth year. The cut in the level of reserve money also amounts to a little over 10% by the fifth year.
- As mentioned earlier real wages defined as nominal wages deflated by the overall CPI are kept constant. However, real wages of the low income population fall as low income CPI increases faster than the overall CPI. The fall in real wages (low incomes) amounts to about 5% by the fifth year.
- Transfers to consumers also fall as the real subsidy declines. This falls also amounts to about 5% of the real subsidy level by the fifth year.

These simulations show the trade-offs the Government faces. Higher food subsidies contribute to the budget deficit but on the whole are not inflationary because of the manner in which the deficit is financed. Since, on average, about 75% of the budget deficit is financed through external and domestic non-bank borrowing, the cost of higher subsidies is paid through larger debt accumulation. This in effect postpones inflation. If this borrowing were not feasible, the impact of food subsidies would be highly inflationary, contrary to the general belief that food subsidies help keep inflation low. This outcome only comes about because of the manner in which the deficit is financed.

The benefits of the food subsidy program of course come from higher real wages and higher real transfers to the low income population, which are not inconsequential, but have a high macro-economic cost.

C. Wage-Price Decontrol with Devaluation

(i) Without Fiscal Adjustment

The last simulation looks at the likely impact of wage-price decontrol. As shown in the previous section, Zimbabwe has used wage and price controls to keep inflation in check. The cost of this form of inflation control in terms of efficiency losses is of course difficult to assess. Moreover, as shown by the experience of Latin American countries such policies are difficult to keep in place for long periods of time. The question that worries policy makers in Zimbabwe is the likely inflationary consequences of a program of wage and price decontrol.

In this simulation we allow for a 12.5% increase in wages in the first year of the program. There is full monetary accommodation and the exchange rate adjusts to the higher level of domestic prices so as to maintain the real exchange rate at the same level as in the base run.

Real exports and consequently real imports remain at the same level. As a result real output at first is kept at the same level as in the base run. We later allow for efficiency improvements to accompany price and wage decontrol, leading to a decline in the import/GDP ratio. However, their precise magnitude is difficult to quantify.

The results show that wage-price decontrol will lead to high inflation, averaging 27 percent per annum compared to about 15 percent per annum in the base run. In the first year inflation will be about 35 percent per annum. These results suggest that the authorities must use fiscal-monetary policy to keep inflation in check during the transition phase when the price controls are unravelling. This will have to take the form of less than full monetary accommodation of the price changes, requiring cuts in the fiscal deficit.

The high inflation following wage-price decontrol is entirely due to the fact that we have assumed full monetary accomodation, no built-in inflationary destabilizers, and a change in the nominal exchange rate based on a PPP formula to maintain competitiveness, as well as no changes in the level of efficiency of the system. One feature of price controls is a reduction in the rate of profitability leading to reduced efficiency in the system. With liberalization the profit rate rises back to its equilibrium level. To explore possible output consequences a relationship between the profit rate and output is postulated, though it should be emphasized that this is illustrative.

In this simulation we allow for a supply elasticity of 0.5 to the change in the rate of profit in the output equation. The output equation is now modified in the following way:

$$\log q - \log qcap = a0 + a1 \log(qinp) + a2\ (\pi)$$

where a0 and a1 are from Equation 42, a2 is the value of the elasticity of output to changes in the rate of profit (π), and takes a value of 0.5.

In this case the increase in output dampens the inflationary pressures. Average inflation is now only 19 percent per annum compared with 27 percent per annum in the previous simulation. Inflation in the first year however continues to be high at around 34 percent, because the increase in output and its subsequent deflationary effect takes time.

This run indicates that if the governments price liberalisation is not credible then the increased output effects we have just described will be delayed as private producers develop confidence in the liberalisation. In the interim inflation will rise to historically very high levels and may force a reversal of the program.

(ii) <u>Fiscal Reduction with Price Decontrol: The Output-Inflation Trade-off</u>

One way around the inflationary spiral that accompanies price liberalization is a reduction in the fiscal deficit. However, here again some difficult choices have to be faced. Some expenditures such as interest payments cannot be cut unless one defaults or renegotiates. The wage bill and subsidies often cannot be cut for welfare or socio-political reasons. The cuts often fall on public investment (Chhibber and Khalilzadeh-Shirazi, 1988).

This has growth implications. We simulate wage and price decontrol with a cut in the public investment program which reduces the budget deficit just enough to leave inflation at the same level as in the base run.

The cut in public investment leads to a decline in actual output. The simulation shows a cumulative cut in output equal to 15% of its base run value by year 5 i.e. an average of 3% per annum. This is a substantial loss in output and shows a significant inflation-output trade-off. The simulation described above may be too stark. Cuts in uneconomic public investments may be possible without output losses. Private investment may recover to make-up for the shortfall in public investment. Nevertheless, policy design should take into account these potential trade-offs, especially in the early stages of adjustment when a moderate degree of inflation (10-20% range) may have to be endured to meet growth objectives.

V. CONCLUSIONS

This analysis of the determinants of the inflationary process has potentially important implications for economic management in Zimbabwe. This is a major issue in 1989 over the question of how to unwind the price freeze and deal with the expected burst in inflation. It is also clearly recognized to be central to two other issues that will continue to be of importance in the next few years: the short and medium implications of running a budget deficit of around 10 percent of GDP for a decade; and the implications of a possible change in policy regime away from the complementary systems of foreign exchange allocation and price controls. Many in Zimbabwe are (rightly) concerned that attempts to undertake growth-oriented reforms will be frustrated by the development of a unmanageable acceleration in inflation with wide reaching consequences for the economy. We conclude by summarizing what we have learned in the three areas of what matters for inflation in Zimbabwe, what are the likely prospects for inflation under alternative scenarios and what are the key ingredients of an approach to managing inflation in the next few years.

What matters. We have found that quite a few things matter--the management of the indexation process, including wage and regulated price policy, the level and composition of finance of the fiscal deficits, and the supply conditions in the economy are all important and there are a strong interactions between the various factors. It is clearly necessary to go beyond a simple monetary account of the inflationary process, even if inflation will always have a monetary dimension. The situation is best characterized in terms of three main transmission mechanisms for inflationary impulses in the economy.

First, there is the direct transmission of exogenous increases in cost-push factors. This could be purely exogenous, as in the case of increased foreign prices of imports, a function of government policies, such as exchange rate, wage or utility pricing, or due to supply problems in a specific market. These have been found to be important in Zimbabwe in three areas--the impact of nominal wage changes, the passthrough effects of import prices (though this is heavily moderated by indexation policy--in effect no consumer prices are fully determined by import prices) and Government policy on fixed prices of food and services. These have had positive and negative influences in different years.

Second, there is the spillover effects of excess money supply i.e. growth in money supply in excess of the underlying growth in money demand (including any growth in money necessary to meet any exogenous price increases without disrupting real economic activity). The interactions with the fiscal deficit, and its mode of finance are of particular importance here.

Third, there is the impact of relatively favorable or unfavorable aggregate supply conditions in what is an essentially supply-constrained economy. In the short run this is largely determined by import availabilities for current inputs and in the medium term by the level of investment.

Prospects for Inflation. The analysis shows that the current concerns over inflation are well-founded. A rise in inflation is expected in 1989 as a consequence of the unravelling of the price freeze. The decision to impose a price freeze in mid-1987--involving a shift from a partially to fully controlled price regime--has now left the Government with a difficult economic management problem. The freeze has genuinely suppressed some prices and led to an accumulation of inflationary pressures that is either already spilling

over into "uncontrolled" prices or awaiting the opportunity for a sharp catch up. It has also left inflationary expectations in an uncertain state and this will provide an additional impulse for a surge in prices.

There are two reasons why this could become particularly difficult--and could lead to a sustained rise in inflation. First, the underlying fiscal imbalance remains a continuing potential source of inflationary pressures. As we have seen, the transmission of excess demand pressures from the fiscal deficit via the fiscal-monetary channel has not been strong in the past because of an unusually large private savings surplus. This is fragile, however, as a consequence of the dynamics of rising interest payments on public debt and because of uncertainties over the sustainability of so large a private savings surplus. Any rise in private investment--that is essential to future output increases--will need to draw into use some of this surplus. Of equal importance is the possible adverse consequences of an initial rise in inflation, that both tends to increase the deficit (expenditures respond more quickly than revenues) and because there could be a decline in the willingness of the public to hold (via the financial system) substantial quantities of long-term public debt.

Second there is a high degree of de facto indexation in the economy, notably in the predominantly cost plus pattern of price-setting and the (quite appropriate) practice of managing the exchange rate to at least compensate for differentials between domestic and foreign inflation. Indexation is not comprehensive and the Government does have the option of holding down growth in nominal wages and fixed prices of major foods, energy products and utilities. However, the former leads to a decline in the real wage--and is generally not sustainable--while the latter both generates relative price distortions in the economy and tends to increase the losses (or reduce the

profits) of parastatals, adding to the fiscal deficit and increasing the pressure on inflation from that source. The last simulation illustrated the potential for a substantial, and sustained rise in inflation. This would of course make the Government's overall efforts at macroeconomic adjustment and policy reform more difficult.

Managing Inflation. What is an appropriate approach to managing inflation under these circumstances? The analysis suggests that the core of any approach should involve measures that provide an endogenous disinflationary impulse either from the supply side, through increases in output, or from reductions in the public sector deficit. Interventions in the indexation process can play a valuable complementary role but carry risks of adding to future problems. Because of the costs and difficulties in intervening effectively (i.e. with permanent effects) in this area, and because of the potentially adverse output effects of an excessive reduction in the fiscal deficit, a temporary rise in inflation will be inevitable in some circumstances. Thus, in 1989 it would be appropriate to let the price freeze unwind with a generalized expectation of a jump in prices. This should be largely accommodated (in the short run) by increased nominal wages, and monetary management, and the opportunity used to effect changes in relative prices, especially amongst administered prices. In other words, the short run focus here should be on managing inflation without increasing distortions (including any real exchange rate appreciation) or raising subsidies. The issue is not one of avoiding a rise in inflation but of managing a subsequent disinflationary process. Here, as noted, the analytic results suggest that a combination of supply improvement and a reduced fiscal deficit can be quite powerful in Zimbabwe. Since weather cannot be controlled, the former can be brought about most effectively by relaxation in the import constraint in the

short run and investment in new capacity in the medium term. The higher capital inflows can play an important role here, but, to the extent that prudent borrowing limits preclude this, much greater reliance has to be placed on measures to get exports up (including the exchange rate) and reduce the deficit. Both are at the core of the medium-term solution, since each can involve an additional cost-push influence (through higher import prices and higher fixed prices), leading to short-run inflation in order to get higher growth and lower inflation in the long run.

APPENDIX 1: Testing Alternative Specification of Expected Inflation

Two alternative hypothesis on expected inflation were tested. In the first we assume rational expectations. This leads to Equation 10 in Section III, with the estimated results presented in Table III.1.

The alternative hypothesis is that expected inflation is equal to lagged inflation $\dot{p}_{t-1}$. In this case we get the following reduced form equation:

$$\dot{p} = c_o + c_1(\dot{w}p) + c_2(\dot{e}+\dot{p}_f) + c_3 \log(m/p_{t-1}) + c_4 \log y$$
$$+ c_5 i + c_6 \dot{p}_{t-1}$$

This was estimated for the period 1969-86 using TSLS and gave the following result:

$$\dot{p} = \underset{(1.83)}{0.7435} + \underset{(2.59)}{0.3425}(\dot{w}p) + \underset{(2.43)}{0.1375}(\dot{e}+\dot{p}_f) + \underset{(1.46)}{0.0635} \log(m/p_{t-1})$$
$$- \underset{(2.27)}{0.1467} \log y + \underset{(3.32)}{0.7786}\, i + \underset{(1.31)}{0.1915}\, \dot{p}_{t-1}$$

$$\bar{R}^2 = 0.83$$
$$D.W. = 2.28$$

Since this is basically a test for the inclusion of an omitted variable $\dot{p}_{t-1}$ we used an F-test Kmenta (1971). The F-statistic is 1.59 which categorically rejects the inclusion of $\dot{p}_{t-1}$ as an additional explanatory variable in the model, as F1, 11 is 4.84.

For testing the adaptive expectations we first get a predicted value of $\dot{p}$ from the following equation:

$$\dot{p} = f\,(\dot{p}_1, \dot{p}_2, \dot{p}_3, \dot{p}_4)$$

We then use the predicted value as a proxy for $\dot{p}e$. The estimated inflation equation is:

$$\dot{p} = \underset{(2.30)}{0.9598} + \underset{(2.59)}{0.3235}(\dot{w}p) + \underset{(2.82)}{0.1514}(\dot{e}+\dot{p}_f) + \underset{(1.27)}{0.0532} \log(m/p_{t-1})$$
$$- \underset{(2.70)}{0.1682} \log y + \underset{(3.83)}{0.8528}\, i + \underset{(1.81)}{0.4416}\, (\dot{p}e)$$

$$\bar{R}^2 = 0.82$$
$$D.W. = 2.42$$

The F-statistic is 3.13 which again categorically rejects the inclusion of $\dot{p}e$ as an additional explanatory variable, as F1, 11 is 4.84.

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