INFLATION IN POST-INDEPENDENCE GUYANA
A QUANTITATIVE ANALYSIS

by

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I. Introduction

Inflation is said to exist where the general price level is continually rising. It may be measured as the rate of change of some general index of prices over time.

Inflation has been characteristic of many if not most economies of the world for some time now. Albrecht (1974) notes that inflation has been characteristic of the American economy since the late 1930s. Up until 1974 a basically mild inflationary situation prevailed in most of the economies of the Commonwealth Caribbean. However, following an upward movement in the rate of price increases in 1974, inflation in these economies assumed unaccustomed proportions, ranging from 20 to 30 percent in some countries. Bourne (1977).

In Guyana, inflation has been clearly discernible, especially in the years following that country's move to political independence. The inflation rate in Guyana moved from 2.1 percent in 1966 to 17.5 percent in 1974. It then moved to 24.2 percent in 1981 and to 105 percent in 1989.

The object of this study is to generate a clearer understanding of the nature of the inflationary process in Guyana. More specifically the study seeks to determine whether inflation in Guyana conforms more to the monetarist, Keynesian or Structuralist hypothesis, i.e. whether inflation in Guyana is more of the demand-

ull or cost-push type. The study also seeks to determine the extent to which the world inflation rate (increases in foreign or import prices) influence Guyana's inflation rate.

Using annual data for the period 1965-1990, we specify and estimate an econometric model of inflation in post independence Guyana. On the basis of the results obtained from the estimation of the model we seek to determine the policies that may be adopted by the government of Guyana in its efforts to combat domestic inflation. More specifically we use these "implied" policy options as a basis for assessing the appropriateness of the recent measures actually taken by Government to control domestic inflation.

II. Theoretical Specification Of The Model

Both monetarist and Keynesian theories of inflation may be classified as demand-pull theories. These theories contend that inflation occurs when aggregate demands for goods and services exceed the aggregate supply so that there is a situation of "too much money chasing too few goods".

The monetarist theory regard an excess demand for money as the main cause of inflation. This explanation is directly derived from the quantity theory of money which relates the price level to a given stock of money. The main foundations of the monetary approach are a neoclassical supply function and a stable demand function for money. The demand for real money balances depends on

real income (or wealth) and on the nominal rate of interest, i, (bank lending rate). A popular functional form for the demand for money is

$$(M/P)^D = i^{\alpha} Y^{\beta} \quad \text{.....(1)}$$

or in nominal terms

$$M^D = Pi^{\alpha} Y^{\beta} \quad \text{.....(1a)}$$

If the money market is to be in equilibrium then the stock of money Ms must be equal to the demand for it.

$$M^S = M^D = Pi^{\alpha} Y^{\beta} \quad \text{.....(2)}$$

The relationship between growth in the money stock and the price level can be derived by assuming the nominal interest rate to be constant and differentiating equation (2) with respect to time, employing the product rule and the power functional rule:

$$dM^S/dt = dP/dt\ i^{\alpha} Y^{\beta} + Pi^{\alpha} B Y^{\beta-1} \quad dy/dt \quad \text{.....(3)}$$

Dividing both sides of equation (3) by M^S gives

$$1/M^S\ dM^S/dt = 1/P\ dP/dt + B\ 1/Y\ dY/dt \quad \text{.....(4)}$$

Hence

$$1/P\ dP/dt = 1/M^S\ dM^S/dt - B\ 1/Y\ dY/dt \quad \text{.....(5)}$$

hat is, the rate of inflation is equal to the rate of growth of he money supply minus the growth of the demand for money balances hat is due to the growth in real income.

Assuming, for simplicity, that the relationship between the ate of inflation, the rate of growth of the money supply, and the ate of growth in real income is linear, and dropping the ssumption of a constant rate of interest, we may rewrite equation 5) as

$$\ln \dot{P} = a + B_1 \ln \dot{M}^S + B_2 \ln \dot{I} + B_3 \ln \dot{Y} \quad \ldots\ldots\ldots\ldots (6)$$

here $\dot{P}$, $\dot{M}^S$, $\dot{I}$ and $\dot{Y}$ are the rate of inflation, the rate of growth f the money stock, the rate of growth of the nominal interest ate, and the rate of growth of real income respectively.

Monetarist analysis of open economies typically draws a sharp istinction between tradable goods and non tradables. The lasticity of substitution in consumption between domestically roduced tradables and foreign produced tradables is extremely high nd is regarded as perfectly elastic in the long run. Hence the omestic currency price of tradables is the world price multiplied y the exchange rate.

$$P^T_d = P^T_f \, e$$

where P^T_d = price of tradables in domestic currency.

P^T_f = price of tradables in terms of foreign currency.

e = exchange rate expressed as the number of units of domestic currency exchanged for a unit of foreign currency.

The domestic price of non tradables is affected by tradables to the extent that consumers and producers are induced to switch between the two in response to relative price differences. Hence in the case of a small open economy like Guyana we may assume that all goods are tradables so that the domestic price level is given by:

$$P_d = P_f \, e \qquad \text{.....(8)}$$

where P_d is the domestic price level and P_f is the foreign price level.

Assuming e is constant, differentiating equation (8) with respect to time and dividing both sides by P_d gives:

$$1/P_d \; dP_d/dt = 1/P_f \; dP_f/dt \qquad \text{.....(9)}$$

That is the rate of growth of domestic prices is dependent on the rate of growth of foreign prices. Again for simplicity we assume that the relation between domestic prices and foreign prices

s linear, and we drop the assumption of a constant e so that we ay account for the influence of foreign inflation on domestic nflation by amending equation (6) as follows:

$$\dot{P} = a+B_1 \ln \dot{M}^s+B_2 \ln \dot{I}+B_3 \ln \dot{Y}+B_4 \ln \dot{P}_f+B_5 \ln \dot{e} \quad \ldots\ldots\ldots(10)$$

here $\dot{P}_f$ is the rate of growth of foreign prices and $\dot{e}$ is the rate f growth of the exchange rate.

As mentioned above Keynesian economists regard inflation as a roblem that would only arise if demand exceeded full-employment utput. But unlike the monetarists who attribute excess demand to n excess supply of money, Keynesians, attribute excess demand to he combined total of government, private and foreign sector demand xceeding the full employment supply of output. This is just nother way of saying that for Keynesian's inflation directly epends on the GNP computed by the expenditure method. And since NP (expenditure) is normally equal to GNP (income) we may conclude hat in terms of equation (10) inflation in Guyana conforms more to he Keynesian hypothesis if B_3 is positive, and to the monetarist ypothesis if B_3 is negative.

The structuralist hypothesis holds that the price of a nufactured article or service, unlike that of a primary product, not greatly influenced by the competitive forces of demand and pply. According to the markup view of price determination, prices

are set by adding to average variable costs, a gross profit margin markup which is more or less invariant with respect to demand (fixed). Thus

$$P = W/APL + IC + PM \quad \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

where

P = price of final product

W = money wage

APL = average product of labour

IC = average cost of material inputs

PM = gross profit margin per unit of final product.

Equation (11) may be treated as a single price equation or as an aggregate price level expression. A rise in price is therefore attributed to a rise in the money wage rate or other elements of variable cost, or the gross profit margin. For our purposes equation 11 is regarded as an aggregate price level expression so that IC and PM may be suppressed.

Assuming a constant APL, differentiating an amended equation (11) with respect to time and dividing both sides by P, gives:

$$1/P \; dP/dt = 1/W \; dW/dt \quad \ldots\ldots\ldots\ldots\ldots\ldots (12)$$

That is, the rate of growth of the price level (domestic) depend on the rate of growth of the money wage. Assuming once again that the relationship between the domestic price level and money wages is

linear, we may account for the influence of money wage growth on domestic inflation by amending equation (10) as follows:

$$\ln \dot{P} = a+B_1 \ln \dot{M}^S+B_2 \ln \dot{I}+B_3 \ln \dot{Y}+B_4 \ln \dot{P}_f+B_5 \ln \dot{e} + B_6 \ln \dot{W} \quad \ldots\ldots(13)$$

where $\dot{W}$ is the rate of growth of domestic money wages. Again inflation in Guyana may be seen as conforming more to the structuralist hypothesis if B_6 is more significant than B_1 and B_3.

III Estimation Method & Econometric Techniques

A: Estimation Method

Three possible methods of estimating the parameters (a and Bs) in equation (13) above are:

(a) the method of moments

(b) the method of least squares

(c) the method of maximum likelihood

In the case of a simple regression model all three methods give identical estimates. However, when it comes to multiple regression analysis as in the model specified above, the methods give different estimates so that a choice must be made.

The method of moments is weak in the sense that there is no certainty in the predictions implied by the coefficients obtained by this method. In addition, it is not appropriate to obtain predictions too far from the range of observations.

Under certain assumptions the method of least square has some very attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis. The estimates derived from the least squares principle are expressed solely in terms of the observable sample quantities. They are point estimates i.e. given the sample, each estimation will provide only a single point value of the relevant population parameter.

Once the least squares estimates are obtained from the data at hand, the sample regression line can be easily fitted. The regression line thus obtained has the following properties:

(a) it passes through the sample means of Y and X_i.

(b) the mean value of the estimated Y ($\hat{Y}_i$) is equal to the mean value of the actual Y.

(c) the mean value of the residuals, e_i, is zero.

(d) the residuals e_i, are uncorrelated with the predicted Y.

(e) the residuals e_i are uncorrelaated with X_i.

The method of maximum likelihood (ML) is a method of point estimation with some stronger theoretical properties, then the method of ordinary least squares (OLS), but is slightly more mathematically complex. This method, as the name indicates, consists in estimating the unknown parameters in such a manner that the probability of observing the given Ys is as high (or maximum) as possible. If the U_i are assumed to be normally distributed the ML and OLS estimators of regression coefficients are identical in a single model whether the model is of the simple or multiple regression type. The ML estimates of the variance is biased in small samples whereas the OLS estimators of the variance is unbiased. However, as the sample size increases both the ML and OLS estimators of the variance tend to be equal.

Since the method of least squares with the added assumption of normality of the U_i provides us with all the tools necessary for estimation and hypothesis testing of the linear regression model, we adopt this method thereby avoiding the added mathematical complexity of the ML method and the possibility of obtaining biased variances.

B: Econometric Techniques

In this section we present a brief description of the econometric techniques employed in the process of estimating our model.

We begin by addressing the problem of heteroscedasticity - Amemiya (1977). This refers to a situation in which the errors of a model do not have a constant variance. In the presence of heteroscedasticity OLS estimators are still unbiased but they are inefficient. The estimates of the variance are also biased thus invalidating the tests of significance. There are many ways of detecting the presence of heteroscedasticity, but no universally accepted one. Some of the more well known tests for heteroscedasticity are those by Anscombe (1961), White (1960) Ramsay (1969), Glesger (1969), Goldfield & Quandt (1972) and Breusch & Pegan (1979). The implicit assumption underlying most of these tests is that var $(U_i) = \sigma_i^2 = \sigma^2 f(Z_i)$ where Z_i is an unknown variable, and the different tests use different proxies or surrogates for the unknown function $f(Z_i)$.

In this exercise we choose the square of the fitted values, $\hat{Y}^2_i$ as a proxy for Z_i and regress them on U^2_i Both the X^2 and F values obtained from this regression (see Appendix C) suggest that we should not reject the hypothesis of homoscedasticity, i.e. we could conclude that our model is not seriously affected by heteroscedasticity.

Another view of heteroscedasticity - Engle (1982), that is more appropriate when time series data is used, is that the variance of the disturbance term could follow a pattern similar to the bilinear model described by Granger and Anderson (1978). Engle proposed a new class of stochastic processes called autoregressive conditional heteroscedasticity (ARCH) processes. Here the variance of the disturbance term is influenced not by the explanatory variables, but by past disturbances

$$\text{var } U_t = C_0 + C_1 U^2_{t-1} \qquad \ldots\ldots\ldots\ldots (13)$$

In this exercise the data set is tested for ARCH. Since the computed $\chi^2_{(1)}$ value (0.2059) Appendix C, is less than the critical $\chi^2_{(1)}$ value (6.63), at the 1% level of significance, we do not reject the hypothesis of no ARCH i.e. we conclude that our model is not affected by ARCH.

We have also addressed the issue of autocorrelation which is a condition where the error terms of the regression model are not

The residuals from the regression of our model were tested for first, second, and third order autocorrelation. The tests all indicate (Appendix C) that autocorrelation need not be a cause for concern in our model.

Another assumption of the classical model is that there is no exact relationship between any two of the explanatory variables. This is the problem of multicollinearity - Feldstein (1973). Except in the case of extreme multicollinearity, this condition does not violate any of the assumptions of the classical model. The OLS estimates will still possess their BLUE properties.

One consequence of multicollinearity is that very small changes in the variances produce drastic changes in the estimates of the regression parameters, i.e. the parameter estimates are very sensitive to the addition or deletion of observations. Generally if the estimated coefficients have low standard errors (as was the case in this exercise), we need not be overly concerned about any multicollinearity that is present. Complete multicollinearity or an exact linear relationship was not observed between any of the variables in our model.

Nevertheless, to be assured of the absence of multicollinearity the sensitivity of the parameter estimates to changes in the number of observations was checked by varying the sample size. We also utilized Klein's (1962) rule whereby

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supply, when there is a sudden change in the level of government spending, when exchange rates, interest rates, and wage rates change, or when foreign or import prices change drastically.

In Guyana there have been a number of each of these changes during the period under review (Appendix B). Significant changes in the level of money supply occurred in 1969 when a 13% growth over the previous year occurred. In 1975 the growth in the money supply was 29.3%. It was 24.3% in 1978, 25.8% in 1983 and 47.3% in 1989.

Real GNP grew by 8.7% in 1967, by 9.7% in 1975, declined by 3% in 1977, declined by 10.4% in 1982 and by a further 9.3% the following year. It grew by 0.6% in 1987 and declined by 6.2% in 1990.

Throughout the period under review Guyana operated a fixed exchange rate for official transactions. A parallel foreign currency market existed side by side with the official market for the greater part of the period under review. The exchange rate on the parallel market was significantly higher than the official rate until the alignment of the two rates in 1991, following the legalising of the parallel market by the licensing of cambios the previous year. However, in the absence of statistics on the volume of transactions financed by the parallel market and since, these, from all appearances, were negligible relative to official

ransactions, their effect on inflation in Guyana is disregarded in his study. The official exchange rate grew (was devalued) by 1.8% in 1967 (moving from G$1.7 to G$1.9 = US$1), by 5.3% in 1968, y 10% in 1972 and by 18.2% in 1975 when it changed from G$2.2 to $2.6 = US$1. In 1981 the exchange rate was devalued by 15.4%, by 0% in 1984, 2.4% in 1985, 2.3% in 1986, 137.3% in 1987, 230% in 989, and 36.4% in 1990. Though outside the period of review it ay be useful to note that in March 1991 there was a 126.1% evaluation as the exchange rate changed from G$45 to G$101.75 = S$1. The exchange rate has since been flexible and currently tands at approximately G$120 = US$1.

Like the exchange rate, the domestic interest rate (i.e. the commercial bank lending rate), was fixed for the greater part of the period under review. In 1966 there was a 7.1% increase in the rate as it moved from 7.0% per annum to 7.5% per annum. The rate remained fixed at that level until 1978 when a 26.7% increase took it to 9.5% per annum. Following a 21.1% increase in 1979, 17.4% in 1980 and 11% in 1982 the rate remained fixed at 15% per annum until 1989 when it increased by 150% to 37.5% per annum. 1990 saw a 17.3% decline as the lending rate fall to 31.0% per annum.

Although wages have displayed more flexibility than both the exchange rate and the interest rate during the period under review, it too has tended to grow relatively unevenly over time. From 1966-1971 wages grew constantly at an average rate of

roximately 3.0% per annum, from a rate of G$3.65 per day in 1936 G$4.54 per day in 1971. In 1974 there was an 11.6% increase r the previous year as wages reached G$6.14 per day. Following 3.5% increase in 1978 and a 15.5% increase in 1980 wages settled the rate of G$12.71 per day until 1984 when there was a 18.8% rease. Other significant increases in the wage rate took place 1987(41.4%), 1989 (44.0%), 1990 (19.8%) and 1991 (50%).

Foreign or import prices have remained flexible with a dency to rise, throughout the period under review. Significant reases in these prices occurred in 1969 (6.1%), 1974 (13.2%), 9 (15.4%) 1983 (13.7%) and 1989 (21.8%). Given that Guyana orts much of what it consumes these increases in import price ld undoubtedly have impacted on domestic inflation in Guyana. cover, the changes in the variables as outlined above would te possibly have impacted on the stability of our model.

The usual procedure to ascertain stability in any model is to roduce a time trend at the point where the shift is suspected to e occurred . The data set is then split in two, regressed arately and the results compared. The test proposed by Chow 60) is then used to determine whether the changes in the ameter estimates are significant. Because our relatively small a set would not allow us to take account of all the shocks tioned above, we have opted to split our data set at 1975, the that most closely coincides with the highest number of shocks.

Application of the Chow test following the splitting of the data in this way (Appendix C) indicates that our model is reasonably stable.

Another test performed on our model is the goodness of fit test. Essentially it is the regression of the actual values of the dependent variable on the predicted value of the same variable. When the predicted value closely tracks the actual values, then the correlation coefficient will be close to unity. Generally speaking the predictive power of our model, using OLS, is reasonably good. Our R^2 value (0.7640) is fairly high. This result seems to justify our choice of model and technique of estimation. We may therefore move to an analysis of the results obtained from the regression of our model.

IV Estimation Results

In this section we present an interpretation of the results obtained from the estimation of our model. A summary of these results is as follows:

Ordinary Least Squares Estimation

Dependent variable is Inflation.
25 Observations used for estimation from 1966 to 1990.

Regressor	Coefficient	Standard Error	T-Ratio
Money Supply	.0483	.2880	.1678
Real Income/ Expenditure	-.0794	.1271	-.6247
Import Prices	1.1621	.3354	3.4647
Wages	.0175	.1433	.1223
Exchange Rate	.1812	.0932	1.9445
Interest Rate	.2067	.1006	2.0549
Constant	-.7101	.5240	-1.3550

R-Squared	.7640	F-statistic F(6, 18)	9.7145
R-Bar-Squared	.6854	S.E. of Regression	.6383
Residual Sum of Squares	7.3344	Mean of Dependent Variable	2.2421
S.D. of Dependent Variable	1.1381	Maximum of Log-Likelihood	20.1447
D.W. Statistic	1.6563		

To begin with, our results suggest that if there were no changes in any of the explanatory variables in our model then domestic inflation in Guyana would decline by approximately 0.7% per annum. The implication here is that one approach available to the relevant authorities in Guyana in their effort to control inflation, is to hold the money supply, aggregate expenditure, exchange rate, interest rate, wages and import prices, constant.

This is no doubt a tall order if not an outright impossibility. While governments can usually determine the money supply, interest rates and exchange rate, they tend to have only limited control over aggregate expenditure and wages, and in most instances no control at all over import prices.

The money supply and wages elasticities of inflation have both emerged with the expected signs while the real income/expenditure elasticity of inflation emerged with a negative sign. Our results suggest that a 10% increase in the money supply will result in an approximate increase of 0.5% in inflation and vice versa. A similar increase in real aggregate expenditure would result in an approximate decline of 0.8% in the rate of inflation. Yet a similar increase in wages would result in a 0.1% increase in inflation and vice versa.

These elasticities seem to suggest that of the three variables real income/expenditure has the greatest impact on domestic inflation in Guyana but given the criteria established above for determining whether this inflation conforms more to the monetarist, Keynesian or structuralist hypothesis, the conclusion would easily favour the monetarist hypothesis. Consideration of the "t" values further strengthens this proposition. With 't' values of 0.1678, -0.6247, and 0.1223 respectively, it is clear that the real income/expenditure elasticity is the most significant of the three and the wages elasticity the least significant, even though none of

the three elasticities is statistically significant even at the 10% level of significance. We may, for these reasons, conclude that while the Keynesian and structuralist variables do have some impact, inflation in Guyana conforms more to the monetarist hypothesis than to the Keynesian or structuralist hypotheses.

When we take the interest rate into account the case for the monetarist hypothesis is strengthened even further. A 10% increase in the interest rate seems to result in an approximate increase of 2.1% in the inflation rate and vice versa. Moreover, with a "t" value of 2.0549, this elasticity is not only statistically significant at the 10% level of significance, but is the most significant of the elasticities considered so far. Since the interest rate forms part of the monetarist model, this model seems to be the one which best explains inflation in Guyana.

If any doubts still exist regarding the dominant hypothesis when Guyana is seen as a closed economy, these are quickly dispelled when that country is viewed as an open economy. The import price and exchange rate elasticities of inflation with "t" values of 3.4647 and 1.9445 respectively are two of the most statistically significant coefficients in the model. A 10% increase in import prices is likely to result in an approximate increase of 11.6% in the level of inflation while a similar increase in the exchange rate (devaluation) will result in an approximate increase of 1.8% in the rate of inflation.

While the relatively large size of the import price elasticity implies that import price is the single most important factor in explaining inflation in Guyana, the fact that the import price elasticity is greater than unity implies that a small change in import prices will bring about a more than proportionate change in domestic prices, which further implies that growth in import prices seems solely responsible for growth in Guyana's domestic inflation rate. Given the relative importance of these two elasticities in explaining Guyana's domestic inflation, and given that these variables also form an integral part of the monetarist hypothesis on inflation in an open economy, there can be little doubt that in the small open economy that is Guyana, inflation is best explained by the monetarist hypothesis.

That the real scourge of domestic inflation in Guyana seems to be import prices, must no doubt, be a cause for real concern for policy makers and citizens alike in a country that on average imports a variety of goods but mainly foodstuff, petroleum products, machinery and transport equipment, to the value of more than 90% of that of its current exports; a country which exports essentially primary products with a relatively high import content; and a country whose dependence on particularly the industrialized countries of Europe and North America for the abovementioned imports, is not only great but increasing. In 1980 imports was G$2156 or 85.1% of exports. By 1989 imports had grown to G$7012 or 112.5% of exports. We have stressed elsewhere - Syfox (1990), the

need for Guyana to increase the domestic content of her exports, consume more of what is produced domestically, and seek to develop alternative sources of energy in order to reduce this dependence. To this might be added the need for Guyana to upgrade her domestic technological capability.

Of equal concern to Guyanese policy-makers and citizens should be the implication of the results that the impact of changes in the country's money supply, exchange rate, interest rate, and wages on inflation is relatively small as this brings into question the appropriateness of recent efforts by Guyana as part of its Economic Recovery Programme (ERP) to fight inflation.

In 1988, the government of Guyana in an effort to improve its negative foreign exchange reserves and stabilise an economy characterised by internally declining real income, poor standard of living, deteriorating physical infrastructure, exodus of skilled, unskilled and managerial personnel, unstable economic climate, industrial unrest, lack of confidence in the political regime, uncertainty and hopelessness about the future, decided to follow a three-year ERP monitored by the International Monetary Fund (IMF).

In order to monitor the performance of the economy under the ERP the IMF set a number of targets for the economy to achieve for the duration of the programme. One of these targets is the reduction of the annual rate of inflation to 10 percent by 1991.

The Government in turn instituted a number of measures in an effort to achieve these targets.

To stablise the money supply which had been increasing sharply since the mid 1970s, (Appendix A), as a result of the accummulation of debt payment arrears and large public sector deficits among other things, the government approved the Minimum Holding of Liquid Assets by Banks Bill. The Bill aimed at stabilising excess liquidity in the banking system by restricting the lending policies of commercial banks and by the compulsory conversion of commercial banks excess reserves into medium term debentures. In addition the prime rate was increased from 15 percent to 37.5 percent in 1989, reduced to 31 percent in 1990 and increased again to 32.5 percent in 1991.

To stabilise export growth steps were taken to unify the exchange rates on the parallel and official foreign exchange markets and maintain a flexible exchange rate system. The official exchange rate moved from G$33 to G$45 for US$1. in 1990, having moved from G$10 to G$33 for US$1. the previous year. Also in 1990 a Cambio system was introduced to develop a market determined exchange rate system. By the end of 1990 the Cambio exchange rate had moved from G$55 to G$100 for US$1. In 1991 the official exchange rate was devalued by 126.1 percent from G$45 to G$101.75 for US$1. with provision for periodic reviews and adjustment of this rate to keep it in line with movements in the Cambio rate. By

March 1991 the official rate had reached G$130 for US$1. It has since been fluctuating and more recently it has appeared to stabilise at approximately G$120 for US$1.

To increase employment, and protect external competitiveness government has sought to keep general public sector wage increases below the projected rate of inflation in 1988-89 and also in 1990-91. Merit increases were to depend on productivity increases and the overall financial situation of the public sector. Wages in the private sector, on the other hand, were to be freely determined.

To improve incentives and resource allocation and promote growth, government took steps to fully liberalise no-foreign exchange import licences, reduce import prohibitions to some categories of food products, issue general import licences automatically and liberalise payments for services and transfers.

Measures taken to increase economic efficiency and enhance the contribution of the private sector to Guyana's economic development included the abolition of existing restrictions to private activity in some areas of domestic and foreign trade e.g. a number of restrictions on the domestic and foreign marketing of rice were removed.

To reduce its overall deficit Central Government took steps to reduce current expenditure relative to GDP (including the restructuring of Central Administration into eleven Ministries instead of the eighteen that previously existed) and broadening of the tax base.

To improve the efficiency and financial performance of public enterprises and rationalise their operations government was expected to charge appropriate prices/tariffs for public sector goods, limit the expansion of public enterprises to cases justified by efficiency, rationalise expenditure, cease transfers from Central Government budget to public enterprises, develop a clear corporate strategy, rehabilitate some enterprises, enforce payment of dividends, establish credit ceilings for each enterprise, capture surpluses of public enterprises, and completely restructure and reform the organisation of, including closing/divesting, money losing enterprises. Efforts to achieve some of these objectives including the closing/divesting (privatisation) of money losing enterprises are already underway.

Finally under the ERP Government is expected to and in some cases has, instituted policies aimed at reducing cost and increasing production in the agriculture, forestry, fishery, mining and manufacturing industries; and improving product incentives and resource allocation through appropriate domestic pricing.

Although the ERP has not been in operation long enough for its impact on the economy to be satisfactorily assessed, some insight into its likely impact could be gained from an examination of the performance of the economy since its adoption.

Although the Government abandoned the publication of the Consumer Price Index in June 1989 preliminary estimates of inflation in Guyana by the IMF, among others, were as high as 105 percent in 1989 and 61 percent in 1990. Much more substantial in both cases than the 10 percent target set by the IMF.

So far the measures introduced to stabilisie the money supply were largely unsuccessful. In 1989 and 1990 the money supply grew by 47.3 percent and 39.8 percent respectively. Despite the relatively sharp increases in the interest rate discussed above domestic credit increased by 51.8 percent in 1989 and up to September 1990 it had increased by 206.4 percent over the 1989 value. However, the proportion of total domestic credit received by the public sector decreased from 21.9 percent in 1989 to 18.7 percent in 1990, so that the private sector accounted for a significant and increasing portion of total domestic credit.

Just as efforts to stabilisie the money supply have so far een unsuccessful, so have been efforts to stimulate export growth. n 1988 total exports by Guyana stood at US$[illegible]3m. In 1989 xports declined by 25.4 percent to US$ [illegible].9. At the end of the

third quarter of 1990 only 74.5 percent of the 1989 level had been achieved so that it seemed very unlikely that the 1988 level would be achieved.

The level of imports also declined in the first year of the ERP despite the liberalisation measures discussed above. In 1988 the level of imports by Guyana was US$215.6. In 1989 imports declined by 1.4 percent to US$212.5. But while imports declined in nominal terms, imports as a proportion of exports increased from 85.1 percent in 1988 to 112.5 percent in 1989 so that contrary to expectations (based on the exchange rate adjustments discussed above) the country showed an increased propensity to import following the implementation of the ERP.

Measures to reduce the Central Government's deficit have also failed so far. In 1988 the deficit stood at G$426.1m. In 1989 this deficit increased to G$725.3 and by September 1990 it had reached G$833.4m. Hence instead of declining the Central Government deficit has been increasing at a rate of approximately 80 percent per annum.

Whatever measures have been instituted to reduce cost and increase production in the various sectors have so far all failed. GDP at constant prices declined from G$811 in 1988 to G$772 in 1989 and declined further to G$724 in 1990. This declining trend in overall GDP merely reflected similar trends in agriculture,

forestry and fishing, mining and quarrying, manufacturing, construction, and services. Thus not only measures to reduce inflation, but the whole ERP seems not to be achieving the expected and desired impact so far.

The results of our model discussed above suggest that a certain set of policies should be instituted in any fight against inflation in Guyana. A comparison of this suggested set of policies with those actually instituted by Government in its ERP should help to identify the reasons for the poor impact of the ERP so far.

Measures suggested by our model for controlling inflation in Guyana are as follows:

- Reduce the money supply
- Reduce the interest rate
- Revalue the domestic currency
- Increase production
- Restrict wage increases
- Restrict Imports

On the other hand the related measures instituted by Government as part of its ERP are as follows:

- Reduce the money supply
- Increase the interest rate
- Devalue the domestic currency

- Increase production
- Restrict wage increases
- Liberalise imports

The results of our model therefore suggest that while the ERP measures relating to the money supply, wages and production seem appropriate, those relating to the interest rate, exchange rate and imports seem inappropriate.

V. Summary and Conclusions

In this exercise we set ourselves three basic objectives. We sought to determine first of all whether inflation in Guyana conforms more to, or is better explained by, the monetarist, Keynesian or structuralist hypothesis, i.e. whether inflation in Guyana is more of the demand-pull or cost-push type. Secondly, we sought to determine the extent to which the world inflation rate influenced Guyana's domestic inflation rate. Finally we sought to assess the appropriateness of recent measures by the Government to control inflation in Guyana.

We have found, from the specification and estimation of our econometric model that domestic inflation in Guyana seems to be of the demand-pull type and seems to be best explained by the monetarist hypothesis.

We have also found that the main scourge of domestic inflation in Guyana seems to be foreign (import) prices i.e. the bulk of Guyana's domestic inflation seems to be imported. Not only do foreign prices, more than any other factor account for Guyana's current domestic inflation, but growth in the country's inflation rate seems almost solely due to import prices.

With respect to the appropriateness of the measures recently introduced by government to control domestic inflation we have found that while the government measures relating to the money supply, wages and production were in keeping with those suggested by our model, the government measures relating to the interest rate, the exchange rate and imports were not in keeping with the suggestions of our model.

Moreover given the relative size and significance of the nterest rate, exchange rate, and import prices elasticities it eems reasonable to conclude that one reason for the apparent ailure of the ERP measures to control inflation in Guyana is that ıy positive effects of the appropriate money supply, wages, and oduction measures are more than offset by the negative effects of ıe inappropriate interest rate, exchange rate, and import asures. It seems, therefore, that the need for government to vise its policies relating to the interest rate, the exchange te, and imports, is imperative if success in controlling domestic flation is to be achieved.

APPENDIX A

DATA SET

	GPI	MS	RY	Pf	W	IR	ER
1966	34.1	109.2	691	29.5	3.65	7.5	1.7
1967	35.1	122.3	751	30.7	3.76	7.5	1.9
1968	36.2	132.8	753	32.0	3.88	7.5	2.0
1969	36.6	162.2	788	33.7	4.00	7.5	2.0
1970	37.9	164.0	854	35.7	4.26	7.5	2.0
1971	38.3	190.9	884	37.8	4.54	7.5	2.0
1972	40.2	233.8	852	39.9	4.54	7.5	2.2
1973	43.2	274.7	872	43.7	5.50	7.5	2.2
1974	50.8	317.5	941	50.2	6.14	7.5	2.2
1975	54.7	447.7	1032	58.8	6.61	7.5	2.6
1976	59.7	488.7	1050	63.1	7.80	7.5	2.6
1977	64.6	601.3	1018	70.2	9.32	7.5	2.6
1978	74.4	663.3	990	76.9	11.51	9.5	2.6
1979	87.7	712.7	976	86.5	11.69	11.5	2.6
1980	100	848.4	992	100	12.71	13.5	2.6
1981	124.7	990.6	989	114.3	12.71	13.5	3.0
1982	150.0	1267.3	888	128.6	12.71	15.0	3.0
1983	169.9	1517.2	804	144.9	12.71	15.0	3.0
1984	212.7	1794.9	821	164.8	15.10	15.0	4.2
1985	244.7	2139.5	829	187.0	16.00	15.0	4.3
1986	263.9	2488.6	831	203.0	18.80	15.0	4.4
1987	339.7	3820.2	838	150.9	23.75	15.0	10.0
1988	475.4	5407.3	811	188.8	24.94	15.0	10.0
1989	957.7	8030.1	772	205.4	35.92	37.5	33.0
1990	1542.9	12292.5	724	220.2	43.04	31.0	45.0

SOURCE: BANK OF GUYANA - ANNUAL REPORTS
IMF - INTERNATIONAL FINANCIAL STATISTICS

KEY: 1. GPI - Guyana Consumer Price Index (1980 = 100)
2. Ms - Guyana's Money Supply (G$M)
3. RY - Guyana's GNP at 1972 prices.
4. Pf - World consumer price index (1980 = 100).
5. W - Guyana's public sector minimum wage (per day)
6. IR - Guyana's commercial bank lending interest rate (
7. ER - Exchange rate - number of G$s for US$1.

APPENDIX 8

GROWTH RATES

	$\dot{P}$	$\dot{M}s$	$\dot{RY}$	$\dot{P}f$	$\dot{W}$	$\dot{IR}$	$\dot{ER}$
1966	2.1	7.7	0.0	5.0	3.0	7.1	0.0
1967	3.0	9.8	8.7	4.1	3.0	0.0	11.8
1968	3.0	12.0	0.3	4.4	3.0	0.0	5.3
1969	1.4	13.1	4.7	5.1	3.0	0.0	0.0
1970	3.4	9.3	8.4	6.1	3.4	0.0	0.0
1971	1.0	11.8	3.5	5.9	8.4	0.0	0.0
1972	5.0	19.9	-3.6	5.6	0.0	0.0	10.0
1973	7.5	17.3	2.4	9.3	5.2	0.0	0.0
1974	17.5	15.5	7.9	15.0	11.6	0.0	0.0
1975	7.8	29.3	9.7	13.2	7.7	0.0	18.2
1976	9.0	21.4	1.7	11.0	18.0	0.0	0.0
1977	8.3	15.2	-3.0	11.3	19.5	0.0	0.0
1978	15.2	24.3	-2.0	9.6	23.5	28.7	0.0
1979	17.8	4.3	-1.4	12.4	1.8	21.1	0.0
1980	14.1	13.3	1.6	15.8	15.5	17.4	0.0
1981	24.7	17.0	-0.3	14.3	0.0	0.0	15.4
1982	20.2	21.8	-10.4	12.8	0.0	11.1	0.0
1983	13.3	25.8	-9.3	12.7	0.0	0.0	0.0
1984	25.2	19.9	2.1	13.7	18.8	0.0	40.0
1985	15.0	18.4	1.0	13.5	6.0	0.0	2.4
1986	7.9	21.8	0.2	8.5	5.0	0.0	2.3
1987	28.7	35.3	0.8	9.1	41.4	0.0	127.3
1988	39.9	40.9	-3.0	13.0	5.0	0.0	0.0
1989	101.5	47.3	-4.8	18.8	44.0	150.0	230.0
1990	61.1	39.8	-8.2	21.8	19.8	-17.3	36.4

SOURCE: Computed from Appendix A.

KEY:
- $\dot{P}$ - Rate of domestic inflation in Guyana
- $\dot{M}s$ - Rate of growth of Guyana's money supply
- $\dot{RY}$ - Rate of growth of real income/expenditure in Guyana
- $\dot{P}f$ - World inflation rate.
- $\dot{W}$ - Rate of growth of the wage rate in Guyana
- $\dot{IR}$ - Rate of growth of the interest rate in Guyana
- $\dot{ER}$ - Annual devaluation rate in Guyana

APPENDIX C

RESULTS OF ECONOMETRIC TESTS

I. TEST FOR HETEROSCEDASTICITY

$\chi^2_{(1)}$ Value	$\chi^2_{(1)}$ Critical	$F_{(1,33)}$ Value	$F_{(1,33)}$ Critical	Hetero Yes	Hetero No
0.9939	6.63	0.9572	7.88		x

Based on the regression of squared residuals on squared fitted values.

II. TEST FOR ARCH

$\chi_{2(1)}$ Value	$\chi^2_{(1)}$ Critical	Arch Yes	Arch No
0.2059	6.63		x

III. TEST FOR AUTO-CORRELATION

Regressor	Coefficient	Standard Error	t-Ratio
U_{t-1}	-0.2268	0.3987	0.5688
U_{t-2}	0.1282	0.3480	0.3684
U_{t-3}	0.0748	0.4198	0.1781

$\chi^2_{(3)}$ Value	$\chi^2_{(3)}$ Critical	$F_{(3,16)}$ Value	$F_{(3,16)}$ Critical	Auto Yes	Auto No
1.2280	11.34	0.2583	5.29		x

IV. DIAGNOSTIC PROCEDURES FOR MULTICOLLINEARITY

Regressor	Coefficient (25 obs.)	Coefficient (24 obs.)	Standard Error (25 obs.)	R^2_i	R^2_y
Ms	0.0483	0.0487	0.2880	0.6628	0.7640
RY	-0.0794	-0.0759	0.1271	0.4220	
Pf	1.1621	1.1393	0.3354	0.6174	
W	-0.0175	-0.0131	0.1433	0.4488	
IR	0.2067	0.2059			

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V. TEST FOR MISSPECIFICATION

$\chi^2_{(1)}$ Value	$\chi^2_{(1)}$ Critical	$F_{(1,12)}$ Value	$F_{(1,12)}$ Critical	Misspecified Yes	Misspecified No
0.9114	6.63	0.6432	8.40		x

Based on Ramsey's RESET test using the square of the fitted values as a proxy for Z in the repression

$$Y_t = a + BX_t + CZ_t + U_t$$

VI. TEST FOR STABILITY

$\chi^2_{(1)}$ Value	$\chi^2_{(1)}$ Critical	$F_{(1,12)}$ Value	$F_{(1,12)}$ Critical	Stable Yes	Stable No
14.8542	18.48	2.1220	4.46	x	

Based on Chow (1960) test of stability of the regression coefficients.

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