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ESTIMATING A MONETARY MODEL OF INFLATION DETERMINATION IN JAMAICA

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This paper is an attempt to explore empirically some of the aspects of the inflationary process in a small open economy, using the case of Jamaica. Interest in this subject is fuelled by efforts to cope with economic instability of which high inflation is a principal symptom (see Taylor 1988 for a description of indicators of instability). Countries of the Caribbean present useful empirical cases of the experience of small open economies because of their small markets and high ratios of trade to GDP. For example, the sum of merchandise imports and exports typically exceeds 75 percent in Jamaica and there are, in addition, major tradable services.

The relevance of this type of work as an input to macroeconomic management is recognized in a large output of empirical analysis especially with respect to the Barbadian economy (see, for example, Coppin 1993, Downes 1985, Holder and Worrell 1985, Downes et al 1988, Downes et al. 1990, Downes et al. 1991) while there has been a relative absence of such application with respect to Jamaica. The present study attempts to complement and extend that analysis in two respects. Firstly, by focusing on Jamaica, it is taking the case of a country where economic instability has been persistent over a longer period, by comparison with Barbados, and where the manifestations have been more conspicuous. Jamaica has been in the grip of IMF sponsored stabilisation programmes since 1977 almost without interruption and a sense of serious economic instability is discernible since the early 1970s. Consequently, inflation has been high and has been subject to sharp fluctuations by contrast with Barbados where the indicators have been more stable. In addition, exchange rate instability has been endemic and other indicators such as employment and output have fluctuated noticeably. By contrast, Barbados has experienced relatively stable prices and a fixed exchange rate for the last two decades. Hence, Jamaica presents an opportunity to study the inflationary process under different circumstances and conditions. The conditions of fluctuating experience with respect to prices and exchange rates may be more typical of less developed countries.

Secondly, this paper follows a somewhat more monetary approach than the other studies mentioned above. It takes as its theoretical basis the identity that the components of the money supply include domestic credit and net foreign assets. In addition, it adopts the small-country assumption that the country is a price taker in the international market, i.e., $P = eP^*$. Combining these two relations gives rise to a model in which

$I = I(E, P^*, C, F)$. In the context of imperfections affecting financial markets, it is reasonable to account for the rate of interest separately. This model is adopted in preference to the models which emphasise factors such as wages and import prices within a cost-push framework (see, for example, Downes 1988 and 1990). It attempts to apply, with variation, an approach associated with Harberger 1963 (see also Hanson 1985).

Domestic demand is reflected by domestic credit which is assumed to capture both monetary demand and fiscal deficit expenditure. In addition, the analysis incorporates international cost factors in the form of exchange rates and world market prices. This is in line with the assumption of smallness.

This paper is motivated mainly by an interest in the impacts of policy shocks on the inflationary process in the case of a small open economy. The main policy shocks to be investigated here are changes in the exchange rate and net domestic credit. The latter variable is representative of changes in domestic policy conditions generally, reflecting both monetary and fiscal shifts and implying that the traditional assumption of independence between monetary and fiscal policies is not being upheld. Exchange-rate change is an important part of the policy arsenal which is often employed on the grounds that instability may be partly due to an 'overvalued' currency. Concern about its inflationary costs relative to uncertain positive benefits with respect to output and the balance of payments has made it a highly controversial tool which is employed with great reluctance.[1]

In addition to the policy variables mentioned, the model will include two exogenous variables, international price index and net foreign assets, which may have some relevance with respect to inflation in a small economy.

The econometric model will employ a hybrid methodology which combines a distributed-lags specification with an error-correction approach. The distributed-lags methodology is used to capture the dynamic character which is essential to a model of the short-run impacts of policy shocks in a parsimonious and tractable specification. Moreover, it is a way of getting around the problems of modelling a collection of lagged variables which will inevitably present problems of autoregression. From among the selection of distributed lags approaches that are available, it has been decided to adopt a polynomial lag (also referred to as an Almon lag after Almon (1965)) model for this study.

Cointegration tests and error-correction methodology are employed as a precaution against 'spurious' correlation and in order to ensure that stationarity conditions which are assumed to hold for purposes of sound estimation are met. In addition, the error-correction methodology is an effective way of incorporating information from the steady-state data generating process (DGP) into the dynamic analysis. Consequently, although the emphasis is on the dynamic changes, valuable information from the underlying long-run processes is not ignored. The acceptance of cointegration implies the existence of an error-correction representation.

The analysis will be based on monthly data. Other studies of this kind have tended to use quarterly or annual data. Apart from the fact that this will generate a large number of observations, monthly data may be particularly suited to the analysis of the inflationary process which, on casual observation, may be expected to have interesting dynamic features in the short run. The drawback has to be acknowledged that the monthly periodisation limits the availability of data relative to the situation with annual or quarterly data.

The complete list of variables used in the analysis is the percentage inflation rate (I), the exchange rate (E), net domestic credit (C), the treasury bill rate (T), the international price level, represented by the CPI of industrialised countries as a group

(W) and net foreign assets (F). In addition, some consideration was given to including the budget deficit (D). However, the latter variable was omitted from the final specification because it was felt that it was not independent of C. The source of all the data for this study is International Financial Statistics which is published by the IMF.

Theory and evidence

It is possible to identify two extremes in terms of theoretical models about the determination of inflation in an open economy. On the one hand, there are those models, essentially of a Keynesian type, which emphasise the domestic factors in the determination of inflation to the relative exclusion of external factors (see Stevenson et al. 1990). The main source of transmission between the international market and domestic prices is import prices, and imports may be assumed to be competitive with consumption and not with production. Even in the case of small countries it may be assumed that they are sufficiently specialised in export production to be price-setters in export markets. This analysis also makes the underlying assumption that imperfections are present in international markets. In this context, inflation is mainly dependent on domestic demand pressures in the short run with some role being played by exogenous import price effects.

On the other extreme is the monetary approach to the balance of payments which assumes the validity of the 'law of one price' and that perfectly competitive conditions prevail in international markets. The 'law of one price' may be summarised in the proposition that,

$P = eP^*$,

where P and P^* are indices of domestic and international prices, respectively, and e is the domestic currency value of foreign exchange. In other words, it is held that the domestic price level is linked to the exchange rate and the foreign price level, and this relationship is assured by the action of competition and arbitrage (see Isard 1977). Two other considerations are the smallness of countries and a high degree of homogeneity of traded goods. Hence, a direct link is held to exist between open economy conditions and domestic price inflation and external factors are emphasised in the determination of the price level.

An example of an essentially monetarist variation is the Harberger model (see Harberger 1963 and Hanson 1985). On the basis of a model with typically monetarist assumptions such as a supply function that is homogeneous of degree zero in prices and exogenous output, it is argued that the dominant influence on prices would be changes in the money supply. Under these assumptions, the main process of adjustment to monetary innovations are price adjustments. Hanson (1985) estimates a modified version of this model which specifies import prices explicitly and finds, not only that the latter variable is a significant influence, but also that inflation is a weighted average of imported inflation and monetary expansion.

The analysis of this paper incorporates both external and domestic factors but is mainly an application of the monetary approach in order to assess its applicability with respect to small economies. Even though markets are, indeed, characterised by imperfections and product differentiation, a strong theoretical case can be made for a direct transmission process between international market prices and domestic prices (see Thomas 1989). This case rests somewhat on the fact of the smallness and openness of the Jamaican economy, the latter factor being reflected in the high ratios of imports and exports combined to GDP which are typically in excess of 75 percent. The case is strengthened by the importance of traded services in Caribbean economies, a primary example of which is tourism. The underlying intuition is reflected in Thomas (1963) where it is stated that "the economy is likely to be largely a price-taker and hence domestic cost/price ratios are not likely for long to be out of line with the rest of the world." (p. 34). Accordingly, the model will emphasise the role of exchange rates and world market prices, among other variables. It will, however, not exclude consideration of domestic factors which are captured in net domestic assets.

A number of articles have pursued empirical investigations of the factors underlying the inflationary process. Holder and Worrell (1985) enquire into the importance of domestic inflationary pressures compared to external shocks which are assumed to be influential in small open economies. They adopt a tradables-nontradables dichotomy with domestic inflationary pressures being linked to the behaviour of the prices of nontradables. Domestic pressures are exerted by wages, exchange-rate change and monetary expansion while external pressures are attributed to international price shocks. The empirical analysis is conducted with respect to

Barbados, Jamaica and Trinidad and Tobago.

Holder and Worrell find varying results among these countries, underlining the importance of adopting country-specific policy designs. In general, the factors with the largest impact on domestic prices are foreign prices, exchange rate changes and trade controls, through their effects on the prices of traded goods. However, while interest rate changes are inflationary in Barbados, they are found to be deflationary in Jamaica and ambiguous in Trinidad and Tobago. Wage increases are ambiguous in Jamaica, displaying contrasting effects with respect to supplies of tradable and nontradable goods, they appear to have favourable effects in Trinidad and Tobago and are not significant in Barbados. In general, interest rates may have significant effects but not necessarily monetary expansion because the latter often does not impact on interest rates.

The authors caution that inflationary behaviour may be variable from period to period, depending on the prevailing conditions. For example, in Barbados where the exchange rate has been stable and inflation has been low, it is suggested that the banking sector tends to absorb short-term shocks.

Downes, Holder and Leon (1988), in an early application of the cointegration methodology, estimate a model of output, wages, prices and productivity in Barbados on the basis of annual data for the period 1958 to 1984. Their analysis generally confirms conventional theories about the behaviour of these variables. Inflation is found to be stimulated by wage increases and external prices and to decrease with productivity improvements. The analysis underlines the importance of according paramount importance to productivity increases. Downes, Holder and León (1990) substantially corroborate the results of their 1988 paper. The later paper also identifies the inflationary impact of changes in the loan rate, adding to the conclusion that cost-push factors in the form of labour and import components are significant factors in the determination of inflationary behaviour. Both of these papers build on Downes (1985) which pursues an econometric investigation of inflation in Barbados and underlines increases in import prices and the prime lending interest rate as the main determinants of inflation in Jamaica in 1960-77.

In all of these empirical exercises, it is significant that, while findings vary, the dominant influences in the determination of inflation are exchange rate change and import prices. There is less conviction about the role of domestic factors such as interest rates and monetary expansion. This is consistent with the intuition underlying the analysis of this paper concerning the behaviour of prices in small open economies.

Empirical analysis

This paper attempts to capture the dynamics of the inflationary process and the relationship with respect to selected policy shocks through the specification of a distributed-lags element and an error-correction model. The distributed-lags model provides a specification of the dynamic process where the current inflation rate reflects the influence of current as well as a possibly infinite series of past policy changes. The two most well-known distributed lags algorithms are the polynomial lag and the geometric lag models (also known as the Almon lag and Koyck lag, respectively: see Almon (1965), Maddala (1977) and Green (1990) for good descriptions of the available distributed-lags methods).

The geometric-lag model involves a relatively simple specification[2] but it suffers the disadvantage that it imposes a fixed pattern of monotonically declining lag weights. It is suitable where it can be hypothesised that the impact on the explanatory variable declines consistently with respect to the length of time that has elapsed since the initial shock. It is an infinite lag so that the troublesome task of determining the optimum lag length to use does not arise. The main drawback is the imposition of a fixed pattern of dynamic effects which may not reflect the true behaviour of the DGP.

By contrast, the polynomial lag process allows greater flexibility in terms of the pattern of the lag process depending on the degree of the polynomial and the coefficient of the model (see Pokorny 1987, ch. 5, for examples of polynomial lag patterns). However, the polynomial lag makes it necessary to make difficult choices about two key things, i.e., the appropriate degree of the polynomial and the number of lags to be employed. The choice of lag length is the more problematic task because once this is done, the decision about degree of polynomial reduces to the conventional tests of significance.

It was decided to use the polynomial lag method for the purpose of this paper mainly because of the flexibility it imparted in terms of the pattern of lag effects. It did not seem reasonable to impose a lag pattern of the type inherent in the geometric lag model. In addition, the geometric lag method presented problems of interpretation of the results when combined with the error-correction model which also involves a stock adjustment algorithm.

Consistent with recent developments in econometrics, techniques of co-integration and error-connections are also employed. The purpose of co-integration tests is to find statistical support for the idea that the relevant variables move together in the long run. This would suggest that they are indeed correlated and is essentially a precaution against spurious correlations (see Engle and Granger 1987 and Holden and Thompson 1992). Cointegration and error-correction procedures are useful techniques in arriving at a short-run specification which meets stationarity requirements for robust estimation even though the variables, in levels form, may be non-stationary. In addition, cointegration implies the existence of an error-corrections model which permits the incorporation of the valuable information from the long-run, steady-state relationships into the dynamic analysis. This may be achieved by a two-step process (associated with Engle and Granger (1987)) which allows lagged residuals from a long-run equation in levels to be included as an explanatory variable in the dynamic specification (it is also possible to use a one-step procedure, see Harvey (1990)).

The period used for the analysis is January 1978 to June 1990 generating up to 150 monthly observations. This period is interesting for our purposes, being characterized by noticeable changes in exchange-rates, inflation rates and the other variables of this study. The exchange rate used refers to the Jamaican dollar value of the US dollar. The monthly data attempt to capture a variety of experiences over the period, including regimes of fixed and flexible (officially) exchange rates, multiple exchange rates and the presence of blackmarkets. The net domestic credit variable relates to the banking sector rather than the wider financial sector. The former tends to be more accurate given the clear responsibility and supervision of the central bank with respect to the banking sector. For international prices, the variable used is the index of consumer prices of the industrial countries, presented in International Financial Statistics.

The full list of variables used in the analysis is as follows:

I - monthly inflation rates on an annualised basis

E - exchange rates (J$/US$)

C - net domestic credit (J$m.)

W - index of international consumer prices,

T - treasury bill rates (%)

F - net foreign assets (J$m.)

Estimation

All of the variables to be employed in the model were tested to determine their degrees of integration using the Augmented Dickey-Fuller test. Since the analysis was using monthly data the test was applied with 12 lags. In all cases, the statistics obtained were consistent with acceptance of the hypothesis of the existence of a unit root, implying that they were I(1). The ADF tests applied to the variables differenced one time confirmed that they were I(1).

The variables of the model were also tested in levels form for cointegration. The main test relied upon for this purpose was the Johansen maximum likelihood procedure. The version of the Johansen test that was applied allowed for a trend in the DGP. On the basis of this test, the variables that were found to be cointegrated are I, E, C, T, W, and F with one cointegrating vector being indicated. The relevant statistics for this study are presented below.[3]

Following these results, the steady-state equation that was estimated consisted of an OLS regression of I on a constant (K), E, C, T, W and F, yielding the following results:

$$I_t = 80.34 + 6.88E_t + 0.002C_t + 0.80T_t - 0.80W_t + 0.002F_t \quad (1)$$

't': (10.59) (4.09) (1.64) (2.07) (-7.48) (2.72)

R^2 = 0.52, R-bar^2 =0.50, D.W. = 0.15

The residuals that were generated are assigned the symbol, Û. The latter term (lagged) therefore forms an important part of the error-correction representation of the model.

In specifying the distributed lags model, the main problem that had to be faced was the determination of the optimum lag length. The main criterion used was the value of R-bar-squared which has the property of penalising losses of degrees of freedom. Once the lag length was decided upon, it was a relatively straightforward

JOHANSEN TEST FOR COINTEGRATING VECTORS

TABLE 1

Null Hypothesis	Alt.	Joh. Stat.	95% Critical Value	90% Critical Value
$r = 0$	$r = 1$	41.01	39.37	36.76
$r \leq 1$	$r = 2$	30.48	33.46	30.90
$r \leq 2$	$r = 3$	20.27	27.07	24.73
$r \leq 3$	$r = 4$	13.26	20.97	18.68
$r \leq 4$	$r = 5$	5.10	14.07	12.07
$r \leq 5$	$r = 6$	0.40	3.76	2.69

matter to determine the order of polynomial to use by reference to R-bar-squared and the standard errors of the estimates.

Consequently, the model which best satisfied the criteria was as follows:

$$\Delta I_t = K + \sum_{i=0}^{13} \alpha_i \Delta E_{t-i} + \sum_{i=0}^{7} \beta_i \Delta C_{t-i} + \sum_{i=0}^{8} \phi_i \Delta T_{t-i} + \sum_{i=0}^{4} \gamma_i \Delta W_{t-i} + \sum_{i=0}^{8} \delta_i \Delta F_{t-i} + \lambda \hat{U}_{t-1} \quad (2)$$

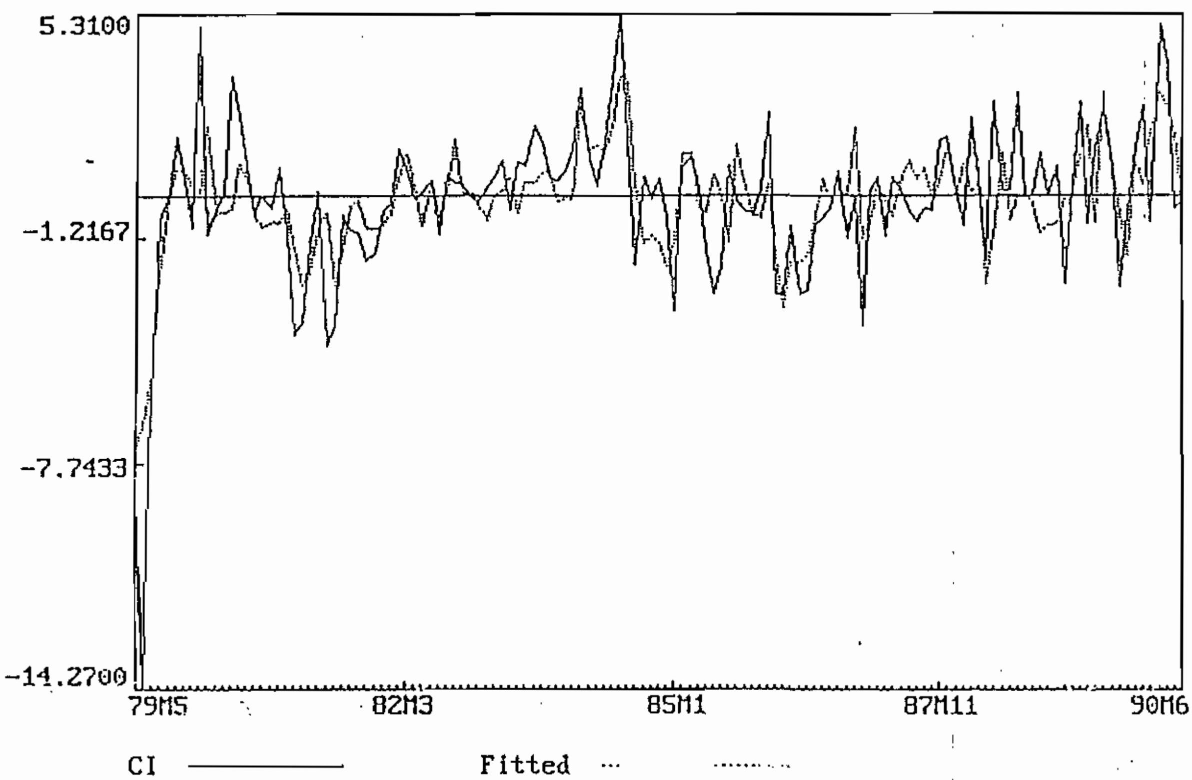
With respect to the degree of polynomial, the most satisfactory specification included a third-degree polynomial for ΔE and second-degree polynomials for ΔC, ΔT, ΔW and ΔF. This implied the following weights for the lag coefficients:

$$\left.\begin{aligned} \alpha_i &= a_0 + a_1 i + a_2 i^2 + a_3 i^3 \\ \beta_i &= b_0 + b_1 i + b_2 i^2 \\ \phi_i &= v_0 + v_1 i + v_2 i^2 \\ \gamma_i &= g_0 + g_1 i + g_2 i^2 \\ \delta_i &= d_0 + d_1 i + d_2 i^2 \end{aligned}\right\} \quad (3)$$

After substituting equations 3 into 2 and rearranging, we obtain the following expression of the model:

$$\Delta I_t = K + a_0 XE_{0t} + a_1 XE_{1t}\ a_2 XE_{2t} + a_3 XE_{3t} + b_0 XC_{0t} + b_1 XC_{1t} + b_2 XC_{2t} + v_0 XT_{0t} + v_1 XT_{1t} + v_2 XT_{2t} + g_0 XW_{0t} + g_1 XW_{1t} + g_2 XW_{2t} + d_0 XF_{0t} + d_1 XF_{1t} + d_2 XF_{2t} + \lambda \hat{U}_{t-} \quad (4)$$

Plot of Actual and Fitted Values



where,

$XE_{jt} = {}_{i=0}\sum^{13} i^j \Delta E_{t-i}$, $j = 0, .. 3.$

$XC_{st} = {}_{i=0}\sum^{7} i^s \Delta C_{t-i}$,

$XT_{st} = {}_{i=0}\sum^{6} i^s \Delta T_{t-i}$,

$XW_{st} = {}_{i=0}\sum^{4} i^s \Delta W_{t-i}$,

$XF_{st} = {}_{i=0}\sum^{6} i_s \Delta F_{t-i}$, $s = 0, .. 2.$

This transformed model, expressed by equation 4 is now estimated using an ML technique (exact AR (1) inverse interpolation method available in the MICROFIT package). The estimates obtained are as follows:

ΔI_t = -1.67 + 0.51XE_{0t} + 0.32XE_{1t} + 0.07XE_{2t} - 0.01XE_{3t} -

t st: (-1.28) (0.44) ((0.36) (0.43) (-1.04)

0.001XC_{0t} + 0.001XC_{1t} - 0.0001XC_{2t} + 0.184XT_{0t} - 0.029XT_{1t} -

((-1.61) (1.08) (-0.73) (0.89) (-0.18)

0.011XT_{2t} + 0.327XW_{0t} + 0.167XW_{1t} - 0.074XW_{2t} - 0.000XF_{0t} -

(-0.43) (0.89) (0.45) (-0.83) (-0.12)

0.000XF_{1t} + 0.000XF_{2t} - 0.385$\hat{U}_{t-1}$ (5)

(-0.03) (0.36) (-6.29)

R_2 = 0.52, R-bar^2 = 0.44 DW = 2.04

Plots of the actual and estimated values of ΔI_t over the sample period are presented in the chart above.

Using equations 3 and combining with the estimated coefficients, it is possible to obtain estimated values for α_i, β_i, ϕ_i, γ_i, δ_i. Obtaining estimates of the standard errors and hence the 't' statistics for these parameters is somewhat more involved, requiring information on the variance-covariance matrix of the estimates (see Pindyck and Rubinfeld 1976, section 7.4.3).

The complete list of coefficients pertaining to equation 2, along with the relevant t statistics, are presented below.

TABLE 2 POLYNOMIAL LAG COEFFICIENTS AND t STATISTICS

i	α_i	β_i	γ_i	ϕ_i	δ_i
0	0.51 (0.44)	-0.001 (-1.61)	0.33 (0.89)	0.18 (0.89)	-0.00004 (-0.12)
1	0.90 (0.84)	-0.001 (-0.65)	0.42 (1.05)	0.14 (0.88)	-0.00003 (-.09)
2	1.38 (1.17)	-0.0001 (-0.10)	0.37 (0.82)	0.08 (0.45)	0.00000 (0.01)
3	1.89 (1.50)	0.0002 (0.19)	0.17 (0.41)	-0.002 (0.008)	0.00007 (0.16)
4	2.39 (1.90)	0.0004 (0.37)	-0.18 (-0.48)	-0.11 (-0.59)	0.0002 (0.39)
5	2.81 (2.33)	0.001 (0.49)	na	-0.24 (-1.43)	0.00031 (0.83)
6	3.11 (2.64)	0.0005 (0.58)	na	-0.38 (-1.87)	0.0005 (1.40)
7	3.23 (2.67)	0.0004 (0.48)	na	na	na
8	3.11 (2.41)	na	na	na	na
9	2.69 (1.97)	na	na	na	na
10	1.93 (1.39)	na	na	na	na
11	0.76 (0.59)	na	na	na	na

i	α_i	β_i	γ_i	ϕ_i	δ_i
12	-0.86 (-0.86)	na	na	na	na
13	-3.00 (-2.56)	na	na	na	na
Σ	20.84 (1.78)	0.0003 (0.042)	1.10 (0.67)	-0.32 (-0.34)	0.001 (0.40)

Having regards to the summations of the lag coefficients, it is possible to express the model, to reflect the full impact of the changes, in the following form:

$$\Delta T_t = -1.67 + 20.84_{i=0}\sum^{13} \Delta E_{t-i} + 0.0003_{i=0}\sum^{7} \Delta C_{t-i}$$

t stats: (-1.28) (1.78) (0.042)

$$+ 1.10_{i=0}\sum^{4} \Delta W_{t-i} - 0.32_{i=0}\sum^{8} \Delta T_{t-i} + 0.001_{i=0}\sum^{8} \Delta F_{t-i}$$

(0.67) (-0.34) (0.40)

$$- 0.385\hat{U}_{t-1}. \qquad (6)$$

(-6.29)

Looking at the estimated equation 6, it can be observed that the error-correction term is significant at the 95 percent level and that the sign is negative as expected. This is further support for the existence of the error-correction representation and hence of cointegration. The estimated coefficient of 0.385 suggests the existence of a tangible adjustment process associated with the steady state condition.

Commenting on the statistical results, it is first of all worth noting that the signs of all of the summed coefficients of equation 6 are in line with expectations on the basis of the underlying theory. The only negative, apart from that of the error-correction term, is the coefficient of the interest rate which may be expected to be inversely related to the inflation rate. The t statistics of the estimates are, however, on the low side, in general, with some of those associated with exchange rate change being the only significant estimates. In addition, the values of R^2 and R-bar^2 are both at modest levels.

These statistical results are not very encouraging. They may be attributed to measurement errors which may be prevalent in the collection of monthly data. Another source of statistical problems may be the exchange rate data which attempt to be representative of conditions in foreign exchange markets during a period of continuous changes in that market. Exchange systems have fluctuated frequently over the period from single to multiple regimes and fixed to flexible regimes. In addition, market imperfections reflected in blackmarkets have been present. In these circumstances, it is not surprising to find that the statistical results are not very convincing.

The main conclusion suggested by the estimates is that the dominant influence in the determination of inflation is exchange-rate change. This conclusion is suggested both by the significance results, compared to those of the other variables, and by the values of the coefficient estimates. The coefficient of 20.84 means that a sustained monthly increase of J$1 in the exchange rate will be associated with a total increase in inflation of 21 percentage points. The pattern of the increase over 13 months indicates increasing effects for the first seven months and then a declining impact thereafter. Similar patterns of effects are generated by the other variables. However, the strength of the impact of the other variables is much weaker.

The result that exchange-rate change is a dominant factor is consistent with the findings of the other empirical studies of Caribbean cases cited earlier. The weak results for the other variables is however somewhat surprising. In general, it is usual to expect that exogenous world market price shocks would have similar effects to changes in the exchange rate. Two possible explanations may be advanced for these results. Firstly, Jamaica has experienced bouts of high inflation during the period under study due mainly to exchange-rate change while world market prices have been stable by comparison. In that context, it may be that international price fluctuations tend to be absorbed by local distributors who are more preoccupied with policy-engendered inflation. Secondly, it is possible that the data used to represent international prices do not adequately reflect their impact on the Jamaican economy. Most of the other studies have used indices of import prices and in those cases, the impact of international prices has been significant. Unfortunately, import prices were not available at the monthly level.

With respect to changes in domestic credit, the study suggests the absence of any significant effect on prices. It must be pointed out that this is not an isolated result but was a consistent result generated by a wide range of specifications explored in this study. This is a surprising result in that domestic credit changes may not be expected to be as important a factor as exchange-rate changes but they are certainly not expected to be insignificant. However, this result serves to underline the sense of the reduced role of domestic monetary policy in the context of the small open economy when there is access to foreign markets for imported goods.

The main conclusion of the study is that the overwhelming influence in the determination of domestic price levels in Jamaica is exchange rate change. This underlines the fundamental importance of the balance of payments to the stability of the economy. This is particularly the case in conditions of low holdings of net international reserves in the official financial system where expansionary pressures cannot be absorbed but impact relatively directly on the exchange rate. It is also evident that there is an indirect mechanism for the impact of monetary and fiscal policy to affect prices via the balance of payments and the exchange rate.

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NOTES

1. As an indication of this reluctance, some analyses have commented on the tendency for devaluation as part of a stabilisation package to be put off until absolutely unavoidable. See, for example, Alesina and Drazen 1991, Dornbusch 1991 and Seers 1964).

2. There are actually two ways of specifying the geometric lag model which are referred to as the moving average form and the autoregressive form. See Green (1990) for a careful description.

3. Johansen Maximum likelihood procedure (trended case, with trend in the data generating process): Test based upon maximal eigenvalue of the stochastic matrix. The alternative version based upon the trace of the stochastic matrix yielded one co-integrating vector at the 95% significance level also.

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