A Model for Economic Forecasting in the Caribbean

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JUNE 1984

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This paper suggests a model for analysing stabilisation questions in small open economies. We present a system of equations to deal with economic reactions to changes in international trade and financial markets, and to varying official policies. We are specifically concerned with the short-run, effects which work themselves out during the course of a year. A rather different system may be needed to address long-lasting consequences.

The model has been derived from observations of the economies of small Caribbean island states, and it will be tested in the Caribbean context. Among its distinguishing characteristics are a prominent tradable goods sector, where price elasticities of demand are infinitely large. Domestic production capacity is infinitesimal in relation to the export markets on which tradables may be sold. There is also a non-tradable goods sector, where domestic market circumstances define equilibrium. The banking sector comprises a monetary authority and a few commercial banks, each quite large in comparison with the size of the economy. Other financial institutions exist, but their contribution is quite small. There is a single economy-wide market in domestic factors of production.

Modelling and Forecasting in the Caribbean

Formal economic models for policy use or policy evaluation in the Caribbean very few indeed, perhaps because the notion of economic management is relatively new to the area. Systems that can be listed may be divided into three categories: planning models, estimated statistical models and judgemental models. Planning models are based on input-output relationships, using linear programming techniques to establish feasible long-term growth paths for the economy. Their lineage traces back to the work of Tinbergen, the early Indian plans and the efforts of Chenery and his many collaborators. The sole Caribbean example of a model of this type is to be found at the Government of Jamaica's National Planning Agency. It has survived in various guises since the 1960's, although it may only recently have been incorporated fully into the planning process and it is as yet unpublished. Lloyd Best and Kari Levitt [1969] developed a detailed input-output framework informed by a study of socio-economic characteristics and institutions in the Caribbean. It was intended for use in planning exercises, but its data requirements proved far too demanding, and it was never used for policy making.

The statistical models which have been applied to Caribbean countries have all used annual observations to analyse economic fluctuations and the reaction to economic disturbances. They can be used to explore what happens to trends in income, prices, employment and the balance of payments when policies or circumstances change. Several independent systems can be cited, but none has yet been adopted for forecasting.

The earliest efforts were based on the Keynesian systems which brought econometric models to prominence. They incorporated consumption functions and attempted to estimate income multipliers. The main concession to Caribbean reality was the prominence given to the import demand functions. Three models of this kind were estimated, all for Jamaica (Manhertz [1971], Harris [1970], Carter [1970]). A later effort by St. Cyr [1978] for Trinidad and Tobago modified the Keynesian framework to link investment to the export sector. Joefield-Napier [1979] attempted to incorporate a richer monetary system into the Keynesian framework, which came under increasing attack in the 1960's and 1970's for its practitioners' neglect of money. An early estimate of money demand for Jamaica by Taylor [1968] used the overly simplistic and not very enlightening first version of the Polak model. Boamah [1982] has most recently presented a model incorporating separate monetary and production systems for

Barbados; his work is currently being developed alongside our own. McClean [1979] is also currently working a testable model.

Apart from the two last mentioned, all these models were abandoned by their authors before they had captured sufficient interest to suggest adoption by policy-makers and/or their critics. In part, their fate reflects their pioneering status; they came at a time when economic policy making in the Caribbean was in its infancy and there were few technicians in Government to build on their efforts. Moreover, the data bases for statistical estimation were very weak, and it was hard to come by a sufficiently long time series for reliable inference. Nevertheless, the models in general did not yield sufficient insight into policy issues of most vital interest to decision-makers: exchange rates, fiscal policy, interest rates, central bank reserve requirements and exchange controls.

The two formal models which have been used for forecasting in the Caribbean may both be classified as judgemental. The IMF has prepared forecasts for all countries who have borrowed under their standby or extended facilities, using their familiar monetary model. Output and prices are determined by monetary balances. The supply of money is the sum of foreign asset accumulation and credit advanced by the monetary authority. Foreign asset gains or losses depend on

the exchange rate, and perhaps also the interest rate. Central Bank advances are a policy variable, heavily influenced by the size of the fiscal deficit, interest rate stipulations and credit restrictions. Expenditures are modified so as to ensure that the demand for money matches the supply. How this is supposed to take place is in dispute; the earliest arguments held that the owners of financial assets in LDC's had little opportunity for earning income on these assets, so they converted increases immediately into goods whose value might appreciate. Alternatively, it has been argued that wealth holders switch between financial and tangible assets depending on the relation between interest rates and the expected rate of inflation. In some interpretations of the model the supply of money (given the exchange rate) is endogenous, apart from fiscal stimuli. A change in the fiscal balance alters the supply of money and produces a new combination of output, prices and real money balances. The particular combination that results is a matter of the forecaster's judgement, at least in the Caribbean applications. The IMF provides an accounting framework to ensure the consistency of fiscal, financial and balance of payments projections, but the Fund has made no estimates for the Caribbean of the implicit behavioural relationships of the model.

The IMF model has been criticised for neglecting factors affecting the supply of goods and services. This

neglect has not been remedied, though Fund apologists have incorporated "supply conditions" into their standard vocabulary. They postulate that investment depends on interest rates, and the rate of investment determines actual output. To this they usually append some observations about energy prices and public utility charges. The determination of output in the formal IMF model fails to take explicit account of the prices of factors of production, the sources of inputs, product and factor market conditions and production techniques. These factors are by no means ignored in sensible IMF programmes, but the model summarised in the accounting tables at the end of the standard IMF country report has no means of testing the consistency of recommendations in these areas, in the same way that it establishes the consistency of fiscal, monetary and external balances.

The second judgemental model in current use in the Caribbean is summarised in the Central Bank of Barbados' quarterly Economic Outlook. The Central Bank begins by projecting real output sector by sector, using independent information on the market prospects for tradable goods. The output of non-tradables is deduced via an implicit derived demand, based on the tradable sector as the engine of growth. The nature of this relationship is not yet clearly specified. Prices are derived by comparing expected foreign price trends with the relationship between local and foreign prices observed in the recent past. The estimates of output and

prices yield income, from which expected imports, government revenue, monetary accumulation and credit demand are derived. Once Government expenditure policies are hypothesised, the balance of payments implications of the projected output path can be derived. The econometric model described in the remainder of this paper uses this framework as a point of departure, but is much more specific on the nature of product and financial markets. An algebriac description of the underlying model of the Economic Outlook appears in Exhibit A.

The Model

Our model describes the reaction to policy changes and foreign economic conditions of domestic output, prices and the balance of payments. The policy variables included are Government expenditure(G), the Central Bank's discount rate (r_b) and the reserve requirement stipulated for commercial banks (q); foreign influences arrive via interest rates in international financial markets (r_f), the prices of tradable goods (P_t) and the availabilty of foreign capital (K). The model is structured around one-period market clearing relationships for output, bank finance and foreign exchange; these markets are influenced by fiscal policy and wage behaviour. The full system can be broken down into sub-sectors for output determination, finance, the balance of payments, government finance and wage determination. The model is static, with a few lagged relationships from the previous period built in.

The production relationships are in the neoclassical tradition, using the now familiar distinction between tradable and non-tradable goods. No a priori stipulations are made about the nature of production functions; the model concentrates on the structure of markets. The segment of the model which describes bank finance is designed specifically to reflect the behaviour of a system comprising mainly branches of multinational firms, operating in collusion in a small financial market which cannot be fully isolated from international financial centres. There is an equation resembling a conventional demand for money, but the supply and demand behaviour derived from the system is novel. This is inevitable, because the peculiarities of bank behaviour in small open economies have not yet been explored in any depth; we have only the insights of Fry [1982], Khatkhate [1980], McClean [1975] and Thomas [1965]. The balance of payments adjusts through the trade account; relative price changes have market-specific effects on exports and imports. The model also allows for short-run indirect effects operating via price-induced changes in income, but wealth effects are presumed negligible in the short-run. Some short-term effect on capital inflow might be expected from interest rate changes, but ongoing work has so far failed to provide us with an enlightening pattern of behaviour in this respect.

The neoclassical production system may be presented alternatively in terms of production functions, product market

conditions or factor market conditions ([Klein [1982] p. 30); our short-run macroeconomic focus suggests product markets are most appropriate for our purposes. For small open economies there is an obvious contrast between the markets for tradables and non-tradables - for tradables the level of domestic production will have no effects on the price of the product. Our production system therefore consists of tradable goods output which depends on supply conditions, and non-tradables, resulting from the interplay of demand and supply.

The demand for tradable goods in a given period (t=o) is represented by the horizontal line in Diagram 1. The supply increases with the product price (P_t) and shifts with the costs of factor supplies and raw materials as shown in Equation (1) of Exhibit B. Raw materials are all imported at the ruling price for tradables (P_t) for the Caribbean; this approximation corresponds closely to observed input patterns. Dependence on imports reduces the supply price elasticity, but it should remain positive so long as there is significant domestic value added. Of couse, we are ignoring the problems created by aggregating all tradable goods; the prices of a given firm's output may not bear a close relationship to its particular inputs. The extent of misrepresentation can only be estimated when we eventually reach the stage of disaggregating the production sector.

Observation of firm behaviour in the Caribbean suggests that the variable factors whose costs determine supply in the short-run are labour and finance. To take

account of changes in labour quality and production technologies in a rough and ready way, we have modified the wages index by a measure of the changes in output per worker to give an adjusted index of wage cost(s). The cost of financing inventory, customer credit and, sometimes, tax liability is the other important constraint on the firm's level of operation in the short-run. The banking system is the source of this financing, at a cost to the firm of r_1.

Because the demand for tradable goods is infinite all actual observations lie on the supply curve, which can be directly estimated. Each year the static supply curve shown in the price-output space will shift; we hypothesize that the underlying price-output supply relationship is unchanged, and regard the annual data as observations on the other variables in the supply function (i.e. s and r_1). The shifting curves are therefore a way of presenting a four-dimensional relationship in two-dimensional space. The longer the period of observation, the less plausible is the hypothesis of an unchanged supply curve. New products, new processes and a changing output mix all combine to move the supply curve around. This is another loose end, to be addressed in more detailed study at a later stage of this project.

Because the output of non-traded goods is affected both by demand and supply we face a problem of simultaneity; we cannot distinguish between the reactions of suppliers and consumers unless we make further assumptions about market

behaviour. We impose the following pattern of adjustment, which we think plausible. Producers estimate the demand curve facing them at the beginning of the period and determine their output for the year to close some part of the gap (perhaps all of it) between estimated demand and last year's production. The result is Equation (2) of Exhibit B; the volume of non-tradables (Q_n) depends on factors which determine demand - national income levels (y), the relative prices of non-tradables and tradables (P_n/P_t) and the cost of consumer credit (r_1) - and on the level of production in the previous year. We can only estimate this equation directly from observations if we believe that producers stick to their plans, more or less, so we retain this as a working assumption. The price at which this output will be offered for sale is given by an implicit supply curve which gives the relationship between product price and input prices for each level of production (Equation (3)). The equilibrium for non-tradables is illustrated in Diagram 2. The factors of production, and their prices, are the same as for the production of tradable goods.

Our assumption of unified factor markets (particularly for labour) may seem unusual for an LDC; much of the development literature has stressed dualism in the labour market. The substantial intersectoral wage differentials to be found in the Caribbean do not match the tradable/non-tradable distinction; relatively high wage

activities are distributed through both categories. Moreover, all wages tend to move together as a result of demonstration effects, trade union activity and changing social norms.

The monetary system in our model provides channels through which fiscal and external payments disequilibria may affect output via the cost of finance. We distinguish between bank lending to government (Lg) and credit for the private sector (Crp). Growing money national income (Y), whether the result of prices or output, stimulates additional credit demand, subject to the level of interest rates (Equation (4)). The cost of credit serves as the rationing device in this model; we do not adopt the suggestion that non-price rationing is the prevailing method of credit allocation. Credit rationing is widespread but it is an institutional feature which does not vary with the availability of finance. Banks do not set up a hierarchy of potential clients and then go down the list until they exhaust the supply of funds to lend. Rather, applicants are divided into the credit-worthy, whose needs are to be accomodated, if necessary by discounting, and the non-credit-worthy, who get loans only as a result of official pressure on the banks or as an aspect of a bank's public relations programme. The observed level of credit depends on (credit-worthy) customers' willingness to borrow at prevailing interest rates, not on the supply of funds.

Banks react to the demand for credit by altering the loan offer rate in accordance with their liquidity, the cost of their deposit liabilities and the costs of borrowing. Equation (5) lists the banks' potential resources - Central Bank advances (Ad), excess reserves (XR) and borrowing from abroad (FB) - and the associated costs - the discount rate (r_b), the deposit interest rate (r_d) and the interest rate on foreign loans (r_f). Reserves depend on the accumulation of deposits (D), which grow with income. Deposits may be also be affected by international financial flows, depending on the differential between domestic deposit rates and interest rates on international financial markets (Equation (6)). This link determines domestic deposit rates within some range around the prevailing international rates, but the adjustment to foreign rates is seldom instantaneous or exactly equal to the changes in foreign rates. The speed of local-foreign rate adjustment is shown in Equation (7) as a function of the level of excess reserves. Bank reserves may be augmented by discounts with the Central Bank, as shown in Equation (8); the choice between the Central Bank and foreign markets as sources of supplementary funds should depend on the relative interest costs. A similar equation should serve to explain foreign borrowing, but for the three countries so far tested we failed to explain any significant portion of the variance of foreign borrowing with this specification. That variable has been made exogenous pending further work on its determinants. It appears that local bank branches have often been strongly discouraged from

seeking overseas head office accomodation, even when such loans are available more cheaply than discounts, except when the foreign borrowing is extended to finance a particular clearly identified project.

In the fiscal section Government expenditure is an exogenous policy variable and revenue (Rv) changes with national income (Equation (9)). Government borrows from commercial banks (Lg) and from the Central Bank (Ag). Finance from banks varies with the differential between banks' earnings on credit to the private sector and to government (r_l/r_g) and on the size of government's borrowing requirements (Crg) - the larger government's needs, the greater the volume of securities floated (Equation (10)). The Central Bank always finances the difference between government's needs and the financing made available by banks. Equation (10) cannot be estimated for periods when lending to government was maintained at levels stipulated by the Central Bank; however, Central Banks stipulations may be ignored in estimation if banks exceeded the required lending.

The supply of foreign exchange is provided by exports, which consist of all tradable goods produced but not consumed at home. We already have an explanation for the output of tradables; we now provide, in Equation (11), a demand function which determines home consumption of home-produced tradables. That consumption never comes close

to the output of tradables, which remain at levels set by supply conditions; in fact, home consumption of such tradables is negligible for some Caribbean countries, and Equation (11) vanishes altogether. The demand for foreign exchange - for imports (m) - depends on output and relative prices (Equation (12)).

Wages are the result of a bargain between employers and workers; workers are determined to maintain real wages in the face of expected price changes and employers are concerned with projected levels of profit. Both parties are assumed to forecast naively, using only the previous period's changes. Profit projections are based on output trends and wage trends. The whole exercise is thought to produce a wage determination function of the form suggested in Equation (13).

The model may be summarised in the presentation of Diagram (3). We solve the output-determination group of equations to provide a locus of equilibrium combinations of relative prices and output. This is the 'internal balance' line, labelled Q. It assumes given levels of loan interest rates (and hence of all other interest rates, required reserves and target liquidity levels which affect loan rates) a fixed level of government expenditure (which also could affect loan rates) and constant wages. Changes in any one of these factors may be represented as a shift in the schedule. We have drawn the curve in two positions in the diagrams because its slope cannot be established a priori; it depends

on relationships between the price elasticity of supply for tradables and the income and price elasticities of demand for non-tradables.

External balance can be determined by solving the balance of payments equations and is represented by the X-schedule. Here the variables held constant are interest rates, wages and foreign capital flows. So long as the marginal propensity to import is less than unity the X-schedule should slope upwards to the right. Higher levels of income produce greater demand for imports, which can be financed by greater exports, provided tradable goods prices rise sufficiently to induce the additional supply.

The diagram illustrates the general equilibrium, with internal and external balance. It may be used to show possible patterns of economic adjustment. For example, should wages outpace productivity increases and raise s both curves shift to the left. Output falls and relative prices may change in either direction, except the displacement of internal balance is very tiny in comparison with the movement in external balance. In this case output may rise somewhat, accompanied by a substantial relative price increase. It will evidently be difficult to compensate for domestic factor price increases by engineering changes in relative product prices. Factor price increases must be countermanded by policies which reduce costs, if national output is not to contract.

Estimation

We have so far obtained results only for Barbados, using two-stage least squares techniques on annual data for 1960 to 1982. The estimates seem to provide us with a reasonable description of the economy, with only one equation where we failed to explain as much as 70% of the variance of its dependent variable. Serial correlation of residuals is successfully modelled by the Cochrane-Orcutt procedure in six of the twelve equations (home consumption of locally produced tradables turned out to be negligible, and that equation therefore disappears); for the remaining equations the Durbin-Watson test gives ambiguous results. No equation threw up coefficients which we judged unacceptable a priori - for example, signs which suggested influences in directions opposed to those of our maintained hypothesis. However, two equations, for Central Bank advances and wages, failed to provide us with any variable with a significant effect, using a 10% confidence interval. The results appear in Table 1.

The output of tradable goods is sensitive to prices, with an elasticity which is low to moderate. (Elasticities which are estimated to be significantly different from zero at the 10% level are listed in Table 2, which gives interval estimates at that level of significance). The equation for the supply of tradables explains most of the variance and the first-order auto-correlation process seems to provide an acceptable description of the links between residuals. There

is no measurable reaction to wage changes which are not offset by productivity changes, or to variations in the cost of finance. If these cost factors are important it seems their effects will appear only in the long-run, which suggests that cost inflation must be persistent if it is to inhibit output. This proposition has not yet been tested.

The demand for non-tradable goods responds very strongly to income - the elasticity is in the vicinity of unity - but it is not affected by relative prices or the cost of borrowing. The insensitivity to relative prices limits the scope for expenditure switching policies; changes in relative prices will affect imports (as we will see in a moment) but they will not produce any additional domestic output and real income will decline. Monetary policies to restrain spending will also be ineffectual, because interest rate changes have no measurable impact on spending. The price of non-tradables depends on the prices of imported inputs. The elasticity of response has a very wide range, within the 10% confidence limit, from low values to a value close to one. Wages and interest rates have no impact in the short-run.

The demand for loans reacts to income changes but not to interest rate movements; elasticity with respect to income ranges from moderate to values in excess of unity. Banks make no significant adjustment to their loan offer rates in response to their excess liquidity levels; the Central Bank

discount rate is the only factor which significantly affects loan rates. Perhaps bankers correctly perceive that loan demand is not particularly sensitive to interest rates, thereby removing a large part of the motive for changing the rates. Because neither the public demand for credit nor bank's implicit supply are affected by the loan interest rate, that rate becomes indeterminate; any rate may persist in the market with no tendency to change. This surprising result probably does not hold for any interest rate change whatever, but it is quite plausible for interest rate changes in the neighbourhood of the observed values.

The adjustments which takes place in the monetary sector are fragmented, and will not suffice to determine the market equilibrium. The volume of Central Bank advances to commercial banks rises, perversely, when the bank's discount rate increases relative to foreign interest rates. It is hard to understand why banks would follow a deliberate policy of this kind, although they might not actively seek to avoid high-cost Central Bank discounts, since the cost may be passed on to customers. One scenario that might produce the observed result would follow if banks were determined to avoid foreign borrowing at all costs while the Central Bank raised the discount rate in an effort to force their hand. This has happened in Barbados, particularly in 1982/83, but these circumstances did not persist long enough to produce the observed results. Deposit interest rates are quite strongly

affected by foreign rates, but they do not affect deposits themselves. Deposits react to income, with elasticities which are somewhat shy of unity.

This behaviour of the financial system may be an illustration of economic realities which are not sufficiently recognised in theorising. In practice, there is usually a fuzziness about economic interrelationships which allows a number of somewhat different combinations of circumstance to qualify as equilibrium, in the sense that they will persist with no in-built tendency to change. The economy resembles a machine whose linkages are built to loosely specified tolerances, allowing considerable 'play' in relationships. Equilibrium in economics is not a single state, but a range of outcomes in a particular neighbourhood. Some of these outcomes may change without creating any overall disturbances, within bounds, and changing interrelationships within sub-sets may not disturb the whole.

Government revenues seem to rise just as quickly as income. Given expenditure (a policy variable) we may derive the size of the deficit. It is not clear what determines the proportion of that deficit absorbed by banks. Neither of the two arguments tested is significant, and the equation explains little more than half the variance of lending to Government, which seems mainly related to the previous year's level.

Whatever remains of the deficit after commercial bank financing is taken up by the Central Bank and adds to the monetary base, but it has little impact on the cost of finance, output or expenditure, thanks to the sluggishness of financial sector responses.

The supply of foreign exchange may be deduced from the output of tradables (sold at exogeneous world prices), since we have found domestic consumption of these items to be negligible. The demand for foreign exchange, due to imports, rises very sharply with real income - three to five times as fast. Increases in the relative price of tradable goods depress the demand for tradables.

The wages equation evidently suffers from multicollinearity. It explains the variance in wages quite well, but the coefficient of none of the variables is significant and the estimated autoregressive coefficient is small.

Conclusion

The results present a picture of an economy which suffers a considerable impact of international trade markets. The (world) price of tradable goods influences the domestic output of tradables, the price of non-tradables and imports; thence it affects income, prices and the point of internal and

external balance. On the other hand the effect of international interest rates on local deposit rates does not produce any strong repercussions. Domestic cost factors - wages and finance - have little power to determine prices and output. The size of the government deficit and the way it is financed have little effect on price, income or payments outcomes. Government will have impact only if it expands its contribution to real output. Monetary policies are largely irrelevant; the discount rate influences the loan rate, but not the demand for credit, and there is no adjustment of income. The reserve requirement has no effect.

Except for the first, these results will seem surprising. In evaluating them we must bear in mind the following. First, the hypothesis that the economy is a loosely structured entity. Changes during the period of observation may have been too small or too gradual to provoke expected reactions. We cannot be sure that larger shifts would be so innocuous. Secondly, the model deals with macroeconomic effects; policies which shift resources within sectors - selective credit controls, for instance - do not appear. Thirdly, our tests are confined to reactions in a single period. Further dynamics may be necessary to elicit some of the effects of policy shifts. Fourthly, we will need to marry our quantitive results with qualitative assessment to take account of discontinuities, changes in the adminstration

of economic policy, disturbed expectations and structural shifts. Finally, we need to complete our tests on neighbouring countries to provide comparison and contrast.

Exhibit A

Underlying Relationships of Central Bank of Barbados Economic Outlook

$$(1) \quad \Delta Tml = a_1 Y$$

$$(2) \quad \Delta Crp = a_2 Y$$

$$(3) \quad M = a_2 Y$$

$$(4) \quad Rv = a_4 Y$$

$$(5) \quad Q_n = f(Q_t)$$

$$(6) \quad \Delta Crg = Tml - \Delta R - \Delta Crp$$

$$(7) \quad \Delta R = X - M + \Delta Lgf$$

$$(8) \quad G = Rv + \Delta Crg + \Delta Lgf$$

$$(9) \quad Y = P(Q_t + Q_n)$$

Note

The first four relationships give values for monetary liabilities of the banking system, credit to the private sector, imports and government revenue, all based on their ratios to GDP, based on recent observation. Equation (5) represents the forecasters' intuition about the relationship of the expected balance of non-tradable and tradable output. The next three equations are identities for the monetary sector, the balance of payments and government finance. The final relation gives the value of output.

Variable Names

Crg	Domestic lending to Government
Crp	Domestic lending to private sector
G	Government expenditure
Lgf	Government foreign loans outstanding
M	Imports
P	GDP deflator
Q_n	Output of non-tradables
Q_t	Output of tradables
R	Foreign exchange reserves
Rv	Government revenue
Tml	Total monetary liabilities
X	Exports
Y	GDP

Exhibit B

The Model

Output Determination

(1) $Q_t = f_1(\overset{+}{p_t}, \bar{s}, \bar{r}_1)$

(2) $Q_n = f_2(\overset{+}{y}, p_n/\bar{p}_t, \bar{r}_1, \overset{+}{Q_n}(-1))$

(3) $P_n = f_3(\overset{+}{Q_n}, \overset{+}{p_t}, \overset{+}{s}, r_1)$

Monetary Sector

(4) $Crp = f_4(\overset{+}{Y}, \overset{-}{r_1})$

(5) $r_1 = f_5(\overset{+}{r_{bAD}}, \overset{-}{r_d XR}, \overset{+}{r_f FB})$

(6) $\Delta D = f_6(\overset{+}{\dot{y}}, \dot{r}_d/r_f)$

(7) $r_d = f_7(\overset{+}{r_f}, \bar{XR})$

(8) $Ad = f_8(\bar{BR}/D, \overset{+}{r_f}/r_b)$

$XR = BR - qD + \Delta d$

$BR = D - Crp - Lg - FB - OAB$

The Government Sector

(9) $Rv = f_9(\overset{+}{y})$

(10) $Lg/Crg = f_{10}(\bar{r_g}/r, Crg/\overset{+}{Cr})$

$\Delta Crg = G - Rv$

$\Delta Ag = Crg - \Delta Lg$

The Balance of Payments

(11) $m = f_{12}(\overset{+}{y}, \overset{+}{P_t}/\overset{-}{P_n})$

$R = Q_1 P_t - mP_t + K$

Wages

(12) $W = f_{13}(\overset{+}{P_{-1}}, \overset{+}{y_{-1}}, \overset{+}{W_{-1}})$

$s = WN/y$

Variable Names

Ad	Central Bank advances to banks
Ag	Central Bank advances to Government
BR	Commercial Banks reserves
Crg	Credit to Government
Crp	Credit to the private sector
C_{tn}	Domestic consumption of home produced tradables
D	Deposits with banks
FB	Commercial Banks net foreign liabilities
G	Government expenditure
K	Net capital inflows
Lg	Bank loans to Government
m	Real Imports
N	Employment
OAB	Banks' other assets, net
P_n	Price index for non-tradables
P_t	Price index for tradables
q	Required reserve ratio
Q_n	Output of non-tradables
r_b	Central Bank discount rate
r_d	Deposit interest rate
r_f	Foreign interest rate
r_g	Rate on Government securities

Table 1

(1) $LQt = 3.90 + 0.281\ LPt - 0.257\ L(S) - 0.17\ Lr_1$
(6.58) (1.97) (-1.14) (0.52)
$R^2 = 0.86$ D.W. = 1.74 F(3,16) = 33.6 Rho = 0.69

(2) $LQn = -0.87 + 0.986\ Ly - 0.111\ L(\frac{Pn}{Pt}) + 0.020\ r_1 - 0.19\ LQn$
(-0.73) (6.28) (-0.73) (0.06) (-0.74)
$R^2 = 0.88$ D.W. = 1.44 F(4,15) = 28.5 Rho = 0.74

(3) $LPn = 3.04 - 0.073\ LQn + 0.584\ LPt + 0.032\ L(S) + 0.16\ L$
(1.28) (-0.14) (2.97) (0.19) (0.80)
$R^2 = 0.99$ D.W. = 1.83 F(4,15) = 590.5 Rho =

(4) $Lr_1 = 2.17 + 0.057\ L(r_b\ Ad) - 0.038\ L\ (r_d XR) + 0.013\ L(r_f\ NFL$
(15.85) (2.19) (-1.43) (1.29)
$R^2 = 0.73$ D.W. = 1.44 F(3,16) = 14.34 Rho = 0.70

(5) $LAD = 5.89 + 0.063\ L(\frac{BR}{D}) - 0.406\ L(rf-rb)$
(2.93) (0.32) (-2.65)
$R^2 = 0.95$ D.W. = 2.45 F(2,17) = 158.3 Rho = 0.96

(6) $L(r_d) = 0.307 + 0.749\ Lrf - 0.038\ XR$
(0.70) (4.21) (-0.87)
$R^2 = 0.74$ D.W. = 1.26 F(2,17) = 24.57
Rho = 0.74

(7) $L\Delta D = \underset{(-2.61)}{-2.35} + \underset{(6.07)}{0.891}\ LY + \underset{(0.97)}{0.074}\ LD(rd-rf) + \underset{(1.47)}{0.070}\ LMX$

$R^2 = 0.74$ D.W. = 1.67 F(3,17) = 16.30

(8) $LLG/CRG = \underset{(-0.83)}{-0.17} + \underset{(1.12)}{0.19}\ LRG/r_1 + \underset{(-0.51)}{-0.03}\ LCRG/CR$

$R^2 = 0.54$ D.W. = 2.52 F(2,19) = 11.02 Rho = 0.87

(9) $LRV = \underset{(-1.54)}{-0.776} + \underset{(11.76)}{0.922}\ LY$

$R^2 = 0.98$ D.W. = 2.02 F(1,18) = 1120.02 Rho = 0.65

(10) $Lm = \underset{(-4.87)}{-17.71} + \underset{(6.47)}{3.640}\ Ly - \underset{(4.97)}{1.199}\ L\left(\frac{Pt}{Pn}\right)$

R^2 0.98 D.W. = 1.72 F(2,17) = 379.03 Rho = 0.52

(11) $L(w) = \underset{(-0.70)}{1.46} + \underset{(0.169)}{0.012}\ L(P-1) + \underset{(1.60)}{0.71}\ (L_{Y-1}) + \underset{(1.25)}{0.318}\ LW_{-1}$

$R^2 = 0.76$ D.W. = 1.89 F(3,16) = 17.04
Rho = 0.012

(12) $LCRP = \underset{(1.46)}{1.81} + \underset{(3.91)}{0.917}\ Ly - \underset{(-1.36)}{0.91}\ Lr_1$

$R^2 = 0.95$ D.W. = 1.71 F(2,17) = 146.4
Rho = 0.75

Table 2

Significant elasticities (10% Confidence intervals)

Dependent Variables	Explanatory Variables
Q_t	P_t 0.029 → 0.533
Q_n	Y 0.706 → 1.266
P_n	P_t 0.231 → 0.901
r_1	$r_b Ad$ 0.011 → 0.102
Ad	r_f/r_b -0.675 → -0.137
r_d	r_f 0.437 → 1.061
D	Y 0.633 → 1.149
LG/CRG	-
RV	Y 0.786 → 1.058

	y	P_t/P_n
m	2.654 → 4.626	1.622 → -0.776
w	-	
	Y	
CRP	0.506 → 1.328	

Trinidad Results

1. $LQ_t = \underset{(4.01)}{3.99} + \underset{(0.13)}{0.03LP_t} + \underset{(0.76)}{0.462\ LS} + \underset{(1.19)}{0.337\ Lr_1}$

   $R^2 = 0.83$ D-W = 1.60 SER = 0.170 Rho = 0.743

2. $LQ_n = \underset{(0.97)}{2.69} + \underset{(0.99)}{0.104\ Ly} - \underset{(-0.17)}{0.0196\ L\frac{Pn}{Pt}} + \underset{(0.79)}{0.104\ Lr_1} + \underset{(0.24)}{0.183\ LQ_{n-1}}$

   $R^2 = 0.91$ D-W = 1.83 SER = 0.06 Rho = 0.32

3. $LP_n = \underset{(-0.21)}{-0.481} + \underset{(1.76)}{0.961\ LQ_n} + \underset{(1.98)}{0.146\ LP_t} + \underset{(1.39)}{0.321\ Ls} + \underset{(0.38)}{0.03\ Lr_1}$

   $R^2 = 0.99$ D-W = 2.18 SER = 0.051 Rho = 0.52

4. $Lr_1 = \underset{(4.43)}{3.70} - \underset{(-2.77)}{0.16\ LrdXR} + \underset{(0.96)}{0.024\ Lr_{f\ FB}}$

   $R^2 = 0.82$ D-W = 2.5 SER = 0.376 Rho = 0.88

5. $Lrd = \underset{(22.6)}{1.58} + \underset{(6.41)}{0.236\ Lrf} + \underset{(4.58)}{0.028\ LXR}$

   $R^2 = 0.81$ D-W = 1.80 SER = 0.06 Rho = 0.22

6. $L\Delta D = \underset{(-6.64)}{-50.506} + \underset{(7.27)}{6.621\ LY} - \underset{(-6.91)}{0.958\ L(rd-rf)} + \underset{(0.44)}{0.041\ LMX}$

   $R^2 = 0.93$ D-W = 1.57 SER = 0.51 Rho = 0.34

7. $L(Lg/CRG) = -0.158 - 0.01\ L(rg/r) - 0.847\ L(\frac{CRG}{CR})$

(-0.805) -(0.05 (7.98)

$R^2 = 0.91$ D-W = 1.99 Rho = -0.01 SER = 0.208

8. $LREV = -44.07 + 6.08\ LY$

(-6.68) (7.71)

$R^2 = 0.96$ D-W = 1.35 Rho = 0.63 SER = 0.266

9. $Lm = 1.09 + 0.83\ Ly + 0.28\ L\frac{Pt}{Pn}$

(0.55) (3.56) (0.79)

R^2 0.95 D-W = 2.4 Rho 0.45 SER = 0.205

10. $Lw = 0.537 + 0.440\ LP_{-1} - 0.181\ Ly_{-1} + 0.801\ Lw_{-1}$

(1.80) (4.47) (-1.21) (4.47)

$R^2 = 0.99$ D-W = 1.95 Rho = -0.12 SER = 0.044

11. $LCRP = 62.75 + 8.41LY - 0.439\ Lr_1$

(-6.60) (7.22) (-1.56)

$R^2 = 0.96$ D-W = 1.28 Rho = 0.63 SER = 0.36

Jamaican Results

1. $LQ_t = 3.133 - 0.474\ LPt + 0.339\ LW + 0.873\ Lr_1$

(7.73) (3.02) (2.05) (2.54)

$R^2 = 0.83$ D-W = 2.11 Rho = 0.39 SER = 0.074

2. $LQn = -1.31 + 0.337\ LY - 0.879\ L\frac{Pn}{Pt} - 1.83\ Lr_1 + 1.616$

(-0.32) (0.48) (-0.45) (-0.53) (1.15)

$R^2 = -0.23$ D-W = 1.88 Rho = -0.02 SER = 0.164

3. $LPn = 1.77 - 0.336\ LQn + 0.451\ LPt + 0.558\ LW - 0.139\ Lr_1$

(1.16) (-0.87) (1.95) (2.72) (-0.49)

R^2 0.995 D-W = 1.84 SER = 0.051

4. $Lr_1 = 1.89 + 0.042\ L(rbAd) + 0.002\ L(rdXR) - 0.0009\ L(rfFB)$

(13.04) (1.49) (0.45) (-0.05)

$R^2 = 0.79$ D-W = 1.76 Rho = 0.44 SER = 0.103

5. $LAD = 5.860 + 2.55\ L(BR/D) + 1.61\ L(rf/rb)$

(3.85) (2.61) (2.91)

$R^2 = 0.85$ D-W = 2.01 SER = 0.863

6. $Lrd = 2.24 + 0.006\ Lrf - 0.0006\ LXR$

(2.60) (0.08) (-0.009)

$R^2 = 0.80$ D-W = 1.56 SER = 0.158

7. $L\ D = -22.13 + 3.42\ LY - 0.043\ L(rd-rf) + 0.086\ LMX$

(-1.61) (1.86) (-0.58) (0.97)

$R^2 = 0.65$ D-W = 1.74 Rho = 0.40 SER = 0.63

8. $L(L_g/CRG) = \underset{(-1.73)}{-1.745} + \underset{(0.079)}{0.220}\ L(r_g/r_l) - \underset{(-3.59)}{1.99}\ L(\frac{CRG}{CR})$

$R^2 = 0.73$ D-W = 1.99 Rho = 0.32 SER = 1.24

9. $LREV = \underset{(-1.87)}{-5.975} + \underset{(3.16)}{1.376}\ LY$

$R^2 = 0.99$ D-W = 1.79 Rho = 1.03 SER = 0.009

10. $LM = \underset{(-2.759)}{-1.622} + \underset{(13.70)}{1.078}\ LY + \underset{(0.476)}{0.225}\ L(\frac{P_t}{P_n})$

$R^2 = 0.98$ D-W = 1.40 Rho = 0.528 SER = 0.114

11. $LW = \underset{(-6.78)}{-2.87} - \underset{(5.7)}{0.318}\ LP_{-1} + \underset{(7.00)}{1.06}\ LY_{-1} + \underset{(1.67)}{0.218}\ LW_{-1}$

$R^2 = 0.9979$ D-W = 1.84 Rho = -0.34 SER = 0.036

12. $LCRP = \underset{(2.78)}{-11.829} + \underset{(2.15)}{1.442}\ LY + \underset{(5.55)}{3.15}\ L_{rl}$

$R^2 = 0.83$ D-W = 1.70 Rho = -1.21 SER = 0.356

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Diagram 1

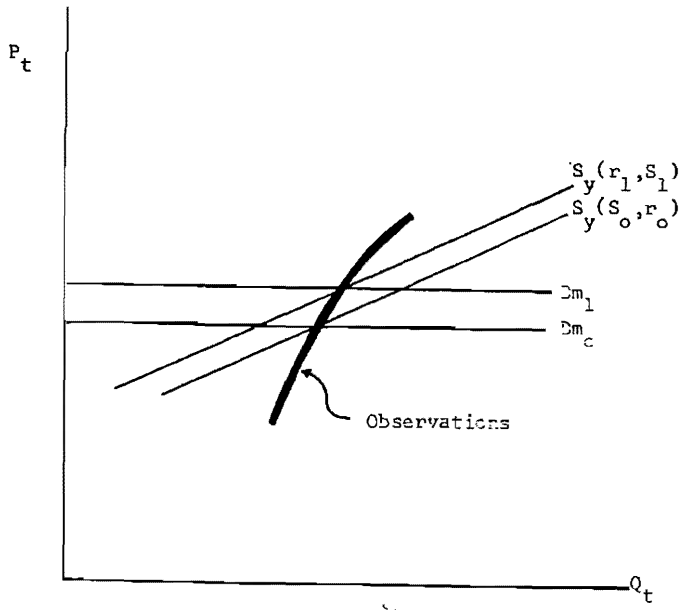


Diagram 2

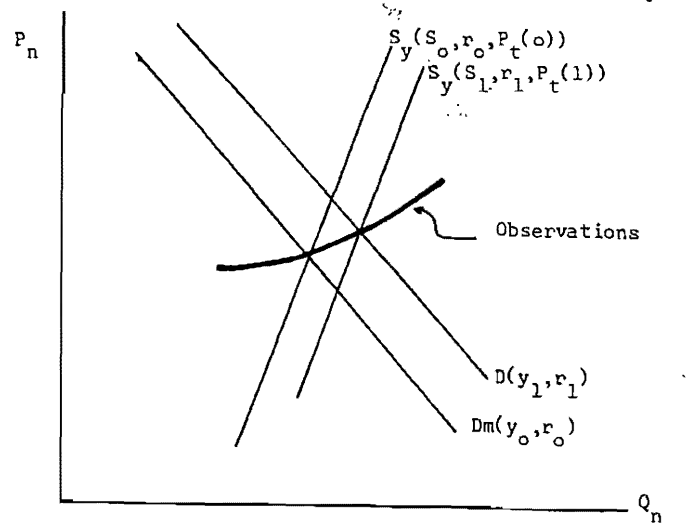
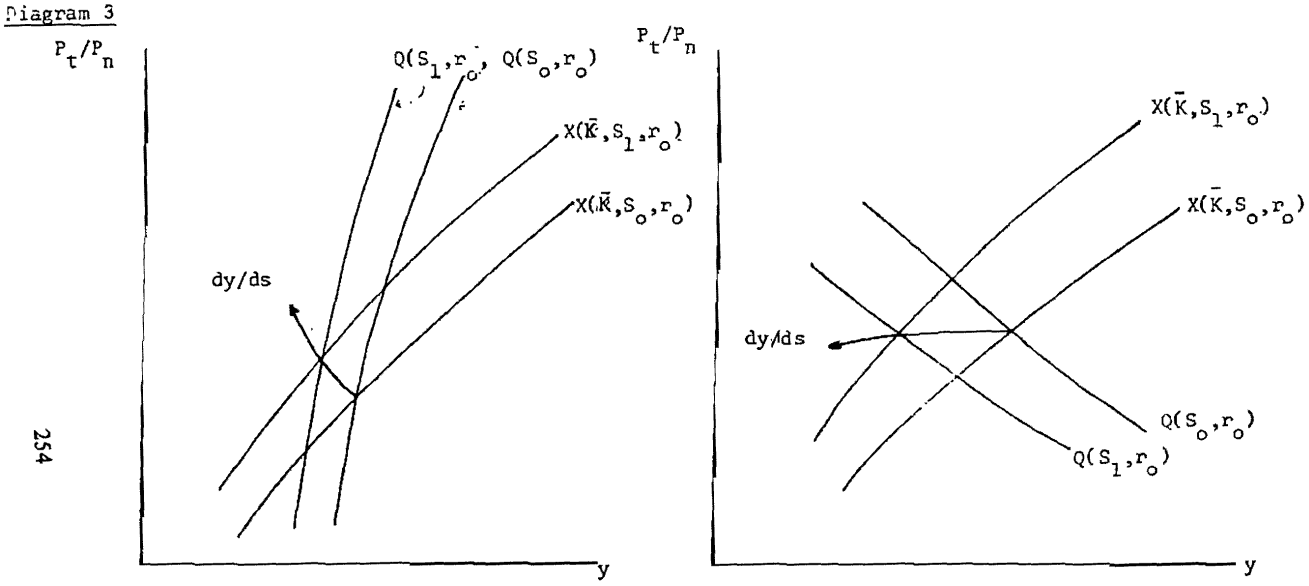


Diagram 3


(A)
(B)
P_t/P_n
$Q(S_1,r_o)$, $Q(S_o,r_o)$
$X(\bar{K},S_1,r_o)$
$X(\bar{K},S_o,r_o)$
dy/ds
y
P_t/P_n
$X(\bar{K},S_1,r_o)$
$X(\bar{K},S_o,r_o)$
dy/ds
$Q(S_o,r_o)$
$Q(S_1,r_o)$
y