"AN ECONOMETRIC MODEL FOR BARBADOS"

by

DeLisle Worrell and Lindsay Holder
Central Bank of Barbados

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An econometric model for Barbados

Econometric models have been derived for use by policy-makers, businessmen and economists in a veriety of ways : to analyse economic history, to establish the consistency of an economic programme or to make guesses as to the pattern of future economic growth. Different models may be needed to suit these differing requirements; we should not assume that there is a single set of equations which 'correctly' describes the economy. The fact that a particular model specification seems adequate for a given purpose does not exclude the possibility that other equally 'correct' models may be constructed.

The present essay must therefore be seen, not as an attempt to describe comprehensively the way the Barbadian economy works, but as an exploration of central bank policy and its effects. Clearly, we must specify macro-economic adjustment mechanisms in a model of central bank policy, and our model deals with the balance of payments, GDP changes and money. However, it cannot claim to be comprehensive, since it neglects so many outcomes which are of crucial importance : employment, income distribution and investment determination, among others. Furthermore, even the balance of payments and GDP may be subject to influences exogenous to the model which are of greater impact than those which are endogenous.

It may seem strange that we should circumscribe the model's objectives so narrowly. We have done so because this is only the first stage of what we expect to be an ongoing quantitative exploration of the economy. Our aim at this stage has been to confine ourselves to the

simplest system which offered prospects of meaningful results. It should not be surprising that central bankers would choose to begin with a system which focusses on the instruments of monetary policy

The model we are presenting here is an experimental one. The results of our tests will guide us as to extensions, refinements and modifications which may be necessary. This paper will discuss some of the developments we have in mind, as well as the set of equations which have actually been tested. In what follows we first explore the theoretical background to the analysis, then describe the equations and discuss modifications; finally we give the results of our estimation and simulation.

A monetary model

The model to be presented below falls squarely within the recent monetary tradition[1]. The money supply process is described in some detail and, together with the demand for money, it affects expenditure and the balance of payments. However, it is only the experimental first-stage model which is so obviously monetarist. That first stage does not deal with real income determination or the price level. When we develop the system to accomodate these variables the exclusively monetarist aura fades. Real income depends on foreign capital inflows and domestic investment demand, factors which will not be much influenced by monetary movements, in our opinion. Domestic inflation, too, owes less to monetary factors than to the prices of imports and of non-traded goods, except when quantitative import controls are in force. The combination of real incomes and prices determines nominal income and

desired expenditures. Monetary mechanisms may then help to determine how expenditure is allocated between home production and imports, and even here it remains to be seen whether these mechanisms are more powerful than fiscal measures and direct controls.

The fact that we present a monetary model must not be taken as evidence that we subscribe to a monetarist view of the adjustment process. The model is monetarist because it does not pretend to be a full description of the economy. As it is expanded it will lose more and more of its strictly monetarist features. It seems inevitable that one starts with a monetarist prespective, if one begins by focussing on the instruments of central bank policy. The model should reveal whether central bank policy, and the monetary mechanisms through which it works, can match the effects of changes in the real economy.

The model

The model as tested comprises ten equations, five behavioural and five identities. We have behavioural functions for money demand, imports, loan demand, government revenues and currency, and identities for the central bank, the banking system, government finance, the balance of payments and gross domestic product. The system is summarised in the attached table and chart. We intend that equations for price and real income determination should also be part of the model, although we have not yet incorporated them into the quantitative tests. Nevertheless we indicate the kinds of functional relationship which we will add to the model to capture price and real income effects.

Do not currency demand form a part of money demand?

The equations of the basic model

1. $FA + CRG = CURP + RR + GSR + W + OTH$

2. $FA = FA_{-1} + X - M + K$

3. $CRG = CRG_{-1} + G - T \therefore KG$

4. $CURP = C\ (MO)$

5. $M = M_1\ (AE)$

6. $MO = M_2\ (AE, MO_{-1}, RD)$

7. $RR + GSR + W + L + NFA + OA = D$

8. $L = L\ (GDP, RL)$

9. $T = T\ (GDP)$

10. $GDP = AE + X - M$

Symbols used in table & text

AE : Total domestic expenditure

CRG : Central Bank credit to government

CURP : Currency with the public

D : Commercial bank deposits

FA : Foreign assets of the Central Bank

G : Government expenditure

GSR : Government security requirements imposed on commercial banks by Central Bank (a proportion of total deposits)

K : Net inflows on the capital account of the BOP

KG : Net official capital inflow on the BOP accounts

L : Commercial bank loans and advances

M : Imports of goods and services

MO : Money = total monetary liabilities

NFA : Net foreign assets of commercial banks

OA : Residual on commercial banks' balance sheet

OTH : Residual on Central Bank balance sheet

PM : Price of imports

PN : Price of non-traded goods

PV : Price of domestic services

QN : Output of non-traded goods

RD : Interest rate on deposits

RL : Interest rate on loans

RPI : Retail price index (a stipulated proporatin of total deposits)

RPIT: Retail prices of traded goods

RR : Central Bank reserve requirements for commercial banks

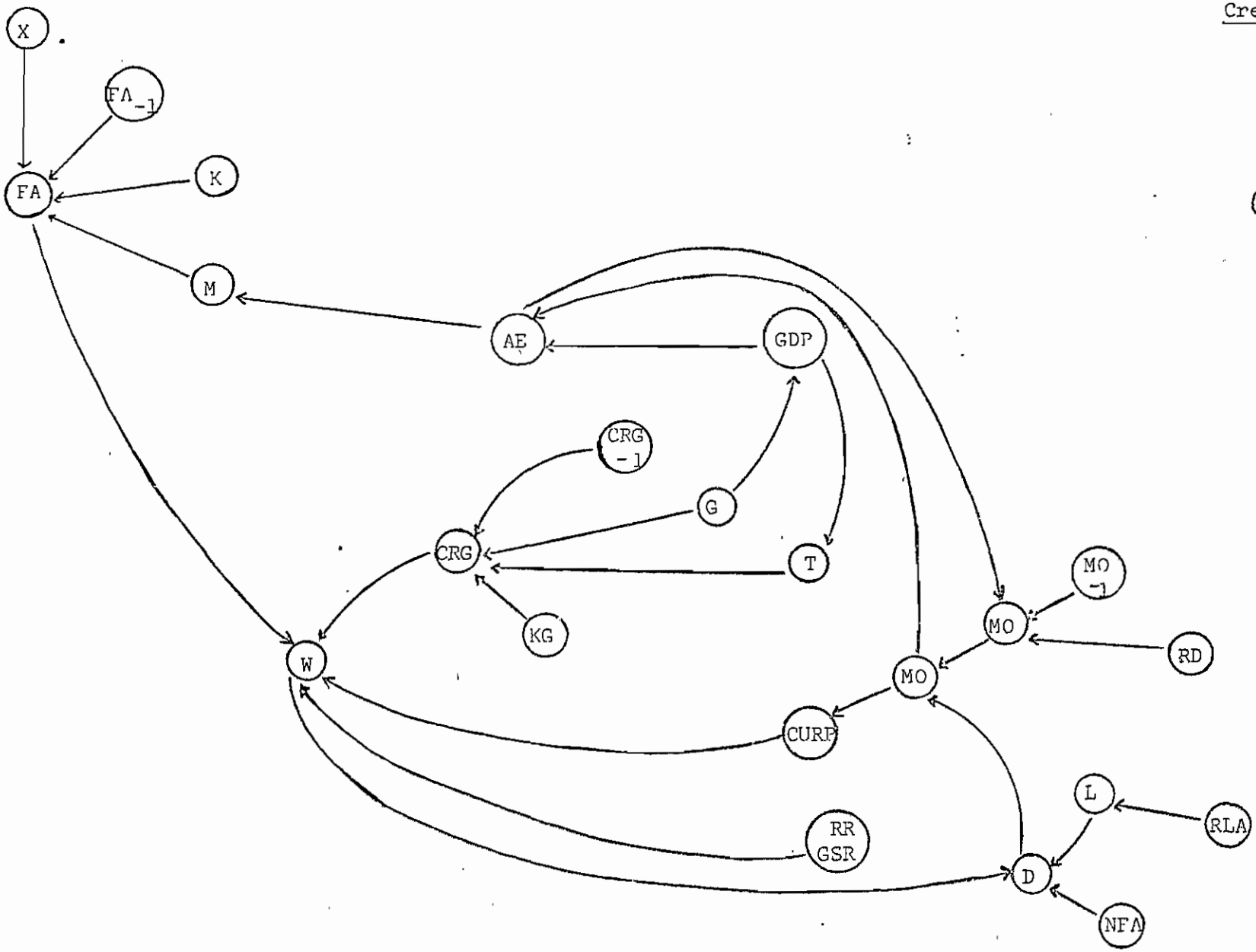
T : Government revenues

W : Excess liquidity = total reserves and Government securities minus borrowings from Central Bank

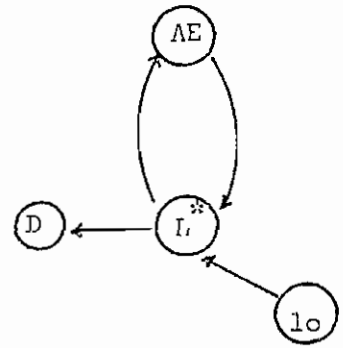
X : Exports of goods and services

Y : Real GDP

Direction of Causation : Phase I of Econometric Model for Barbados.



Credit modification



Our money demand function follows what has now become the accepted view of the behaviour of firms and households in developing countries. Invariably, in developing countries the only significant alternative to holding financial assets is expenditure on real goods and services[2]. An excess supply of money, a change in the rate of inflation or interest rate movements (if the demand for money is interest-sensitive) will all have direct effects on expenditure under these circumstances. We have therefore included expenditure and interest rates in the money demand function. We began by including the rate of inflation as an argument as well, but the results of preliminary estimation with the price variable were not encouraging, so we have omitted it until we can work out the price mechanism more fully.

Expenditure and interest rates therefore determine the demand for money, as shown in equation 6. If the supply of money is greater or less than the demand, expenditure will be adjusted, affecting both the demand for and supply of money. The demand for money responds directly, while the money supply is influenced via imports (equation 6), the balance of payments (equation 2) and the banking system (equations 1 & 7).

The demand for money function is experimental. Since this particular equation was formulated we have had second thoughts as to whether it is useful to model the demand for money in a behavioural sense at all (see Worrell (1979)). Even if individuals and firms do move from money into goods if their cash balances are too large, they may do so only after excess money supplies have been maintained at high levels for a period as long as three years. Conversely, expenditure

may be sustained in the face of declining money supplies by increased velocity of circulation and arrangements for spending to be made abroad directly out of foreign receipts. If there is this much 'play' in the relationship between money and expenditure, attempts to influence spending by controlling the money supply will be ineffective.

The money supply process is modelled in detail in the identities for the central bank (equation 1) and the commercial banks (equation 7). Currency is assumed to bear a fixed relationship to deposits (given by equation 4), so the supply of money depends on the growth of deposits. Deposits will increase with the expansion of loans and excess liquidity[3]. Loans depend on the demand for them (equation 8), and the factors influencing excess liquidity can be deduced from the central bank's balance sheet. Increases in foreign assets or credit to government by the central bank will augment commercial bank liquidity, as will credit to the banks by the central bank. (The latter is defined as part of W, the excess liquidity variable). The money supply therefore depends on the interaction of four determining factors - changes in foreign assets, central bank credit to banks and government and the demand for commercial bank credit from the private sector.

It may seem unusual to represent the money supply as a function of the demand for credit. A more conventional view might be that bank credit is determined by the interaction of demand and supply, with the supply of credit largely dependent on the supply of money. We think it is more faithful to the actual practices in Barbados to represent loan demand as always being fulfilled except where there are direct controls

on loans and advances. The monetary authorities are always willing (in Barbados, as elsewhere) to provide funds to support bank lending in the last resort. The standard means of discouraging unwanted bank advances is to raise interest rates. However, if the demand for credit is not very interest-sensitive this has little effect on loan volume. The total of lending remains more or less equal to the amount demanded.

The demand for bank loans is a function of the level of economic activity and of interest rates. The activity variable in equation 8 is GDP, but we might just as well have used expenditure; there is no a priori basis for choosing one or the other. It remains to be seen from our empirical tests whether interest rates have any discernible effect on loan demand. Although we rather suspect that their influence is minute, we decided to put this opinion to the test. The relationship between loans and interest rates might bear closer investigation. It is possible that interest rates influence sectoral loan allocation rather than overall lending.

The balance of payments is determined exogenously, except for imports, which depend on expenditure. This is the channel through which monetary policy influences the balance of payments; the balance of payments outcome, in turn, helps to fix the level of money, as we have seen from equation 1. It is immediately clear why the temptation to use import controls rather than monetary restriction to contain expenditure should be so strong. With a high ratio of imports to total expenditure, a balance of payments deterioration is the most serious result of excessive expenditure. Import controls act directly on the balance of

payments, while the monetary influences are indirect.

The only remaining equation, apart from the conventional GDP identity, represents government's financial position. The domestic financing needs are determined by the deficit and the availability of foreign financing. The only endogenous variable is government revenue, which is made to depend on GDP. This relationship is obviously a simplification, and we ought to relate personal income tax separately to personal disposable incomes, customs receipts to imports, etc., but these are issues which must first be explored separately[4]. We assume that government's domestic financing requirements will always be met, much as we did for the demand for bank loans. This has always been the case during the Central Bank era. In earlier years it may be that government was forced to curtail its spending for lack of domestic finance, but fiscal trends do not suggest this as a usual pattern. Up until the early 1970's government usually came close to balancing its budget.

A useful way to explore the workings of the model is to examine the consequences of monetary and fiscal policies on the balance of payments. This we can do with the aid of the flow chart which illustrates the directions of causation which have been built into the model. One of the most commonly used monetary instruments in developing countries is the reserve or liquid asset requirement. In Barbados the Central Bank stipulates limits both for reserve assets (deposits at the Bank and cash) and for holdings of government securities. An increase in either limit will reduce excess liquidity, but this may have little effect until the excess is virtually eliminated. Any theory of rational

banking behaviour would lead us to expect excess liquidity to be maintained at levels just high enough to cover the variance of transactions. In fact, the domestic capital market is so narrow that banks have often held considerable excess liquidity, mainly in relatively low yielding government securities, but also in non-interest earning reserves. Increases in the stipulated ratios have no effect under such circumstances.

Even if excess liquidity were reduced to the minimum required to insure for the variance of transactions the liquidity ratio might be ineffective unless it were supported by direct controls. Without excess liquidity the banks would be limited in their ability to make new loans; however, it would be profitable for them to borrow the funds they need from the Central Bank , so the liquidity restriction takes effect only if the Central Bank then limits its advances to banks. The alternative would be to raise the bank rate and/or the rediscount rate; but if, as we suspect, loan demand is not very interest-sensitive this will discourage lending only if the rate increase is dramatic.

Direct controls on lending have proved a more effective way to limit expenditure and protect the balance of payments. A curb on loans arrests the growth of money and of expenditure, holding down imports. Furthermore, so long as the credit restrictions remain effective, the increase in the money supply which results from the balance of payments improvement cannot stimulate new expenditure. The logic of the model suggests that credit controls may be reasonably effective, though we must always bear in mind that the limitations on administrative measures such as controls are not always obvious to

economists. The controls may be effective only if they are comparatively easy to administer, and pressures for their removal may become irresistable if the balance of payments improves substantially.

General interest rate policies do not seem to be very powerful monetary instruments in our system. An increase in deposit rates tends to reduce the demand for narrow money (broad money is unaffected) while an increase in loan rates may dampen loan demand. We cannot say a priori that the reduction in loans will be greater than the reduction in money or vice versa, so we do not know whether excess money will decline or not. In any case we are not expecting the interest rate effects to be substantial.

The model does not envisage any limitation by the Central Bank on its credit to government. Although in theory such a possibility exists, in practice the Bank has never limited government's borrowing once spending commitments have been made. It is therefore fiscal policy, represented by government expenditure and taxation policy, which determine the level of credit to government. Should such credit increase it causes expansion in bank deposits and liquidity, facilitating any increase in private sector expenditure which the government spending provokes. We are therefore likely to have pressure on imports both from the government and from the private sector. There is a partial self-correcting mechanism at work via the balance of payments, where the fall in reserves depresses the money supply and dampens the expenditure surge somewhat. Government expenditure can have a powerful effect on the balance of payments, stimulating expansion of money and private expenditures to reinforce

the initial impact. Conversely, restrictive fiscal policies are an important part of any policy for improving the balance of payments.

Import controls act directly on the balance of payments, and are an attractive policy for that reason. The desired saving in foreign exchange can be measured directly and the appropriate cut in imports programmed. However, if import controls are not reinforced by restrictions on government spending and credit, they will lead to domestic inflation. Faster domestic inflation may itself affect foreign exchange earnings, making nonsense of the projected foreign earnings on which the programmed import need was calculated. Should the balance of payments improve, the money supply rises and inflationary pressures grow more intense; at the same time, there are increasing calls for the liberalisation of import restrictions. Because they create such disequilibria, import controls can be disruptive even when successful, as their removal is invariably traumatic. More frequently, import controls are unsuccessful because they are so difficult to administer. The inefficiencies they create are damaging for production and exports to an extent that often outweights the intended foreign exchange saving.

We hope to use the model eventually to explore these issues in greater depth. We hope to establish a hierarchy of official policy measures, ranking them according to their effectiveness in containing balance of payments deficits. Hopefully, also, the estimates of the structure of the model will give us some guides as to why some policies are more effective than others.

The tests which are reported in the second half of this paper relate to the model so far described. It is a complete and consistent system, but it represents only part of our intuition about the macro-economic adjustment process in Barbados. Two specific deficiencies which we hope to address in the next phase of the experimentation concern price and real income formation. We are also considering modifications to the monetary sector which would focus on the link between credit and expenditure as the means by which monetary changes affect spending. The remainder of this section will be devoted to a discussion of these issues.

Let us consider separately the prices of traded and non-traded goods. The retail prices of imported traded goods are the sum of import prices and unit value added in distribution. If the distribution system were perfectly competitive and factor services were secured on competitive markets, we could deduce the retail price as the sum of the import price, the marginal productivities of labour and capital, and the unit cost of domestic services used in distribution. However, it is accepted that the distribution system in Barbados is predominantly oligopolistic[5], so we have to suggest other norms for price-setting. We assume that distributors set a mark-up on imported prices which varies with their expectations of future prices. Expectations in turn are based on historical price trends. This yields the equation

11.* $RPIT = P_1 (PM, (\Delta RPI/RPI)_{-1}, (\Delta RPI/RPI)_{-2}, \ldots)$

* The equation numbers follow those in the table which lists the equations of the basic model.

The prices of non-traded goods depend on demand and supply conditions, and, as a result, the equation explaining them will include some additional elements. For oligopolistic industries we again assume a markup on input costs, but these costs now include payments for domestic services (utilities, transport, finance) as well as imported costs. The supply price for any given output is therefore given by

12. $PN = P_2 (PM, PV, (\Delta RPI/RPI)_{-1}, (\Delta RPI/RPI)_{-2}, \ldots)$

and the overall supply price (which varies with output) by

13. $PN = P_3 (PM, PV, (\Delta RPI/RPI)_{-1}, (\Delta RPI/RPI)_{-2}, \ldots, QN)$

Under certain conditions this equation may be used to explain price formation in competitive industries as well. Here the price is made up of the unit cost of imported materials, the unit cost of domestic services and the marginal factor productivities. However, let us assume that there are only two factors of production, capital and labour, and that wage rates are bargained on the basis of anticipated inflation. The equation for competitive industries then reduces to the above, except that the return to capital would be included as an additional argument. We will probably be forced to assume this rate constant, for lack of data to estimate it.

Let us then accept the equation above as a reasonable representation of supply prices for both competitive and oligopolistic industries. We combine this with a demand equation of the form

14. $QN = Q (GDP, PN)$

to produce the equation for the ruling price of non-tradables

15. $PN = P_4 (PM, PV, (\Delta RPI/RPI)_{-1}, (\Delta RPI/RPI)_{-2}, \ldots, GDP)$.

The price of non-traded goods then becomes an input price for the distribution system, to be included in equation 11 along with the price of imports. The overall equation for retail prices is therefore

16. $RPI = P_5 (PM, PV, (\Delta RPI/RPI)_{-1}, (\Delta RPI/RPI)_{-2}, \ldots, GDP)$.

We would also like to investigate the impact of import restrictions on prices. The Barbadian economy is so open that a rapid increase in expenditures will cause balance of payments deterioration via the impetus it gives to imports. If however there are quantitative limits on imports, domestic prices will tend to rise instead. Import restrictions are a recent phenomenon, and for most of our period there were no quantitative limits. We can therefore estimate equation 5 as before for all those years when no restrictions were in force. We can then calculate the predicted import values from this equation for those years when restrictions were in force. The difference between the predicted and actual values will give us a measure of 'excess' imports, that is, desired imports in excess of what was allowed. These excess imports can then be introduced into the price formation equation as an additional argument.

In this first model we will make real output a function of investment. The desire to invest may be stimulated by a variety of factors, none of which has been carefully analysed in a Barbadian context. They may include the degree of confidence which businessmen have in the prospects for the economy, the rate of return on investment at home and

abroad, the 'snowfall effect' of successful innovation, government protection and support and many others. We will take them all as given.

The desire to invest may be frustrated by lack of finance and lack of skills. The deficiency of skill and organisation is probably the deciding limit in many cases, but that must be taken as given in an analysis which limits its attention to economic factors. The important limitations on the financial side have to do with foreign capital scarcity and the weakness of mechanisms for long-term domestic financing. The level of investment will therefore be determined to a significant extent by the available capital inflow on the balance of payments. Domestic financing is available mainly from the banking system, so we will use changes in loans and advances (preferably for the categories which relate to production rather than consumption) to measure the extent of domestic financing[6]. Our income-determining equation, derived from the financial factors influencing investment, is therefore

17. $y = y(K,\dot{L})$.

In the course of our development of the model we have become sceptical of the link between expenditures and money. It seems more reasonable to represent expenditure as bearing a stable relationship to the demand for credit, apart from any financial innovations or changes in economic habits which might cause a shift in the loan demand schedule[7]. The relationship of money to expenditure seems much more loose, with periods of excess money when no pressures for expenditure adjustment can be detected. The mechanism we have used until now to model the reaction of expenditure to money may therefore be off the mark.

We propose a modification which would omit the money demand function as inadequate (except perhaps in the long run, but we neglect this possibility). Loans could then be made a function of expenditure, with an allowance for exogenous factors which might cause the loan demand function to shift. These shifts would in turn affect the level of expenditure, which presumably will respond to increases or decreases in credit availability. The modification in the chain of causation is shown on the chart. Loans influence expenditure directly (rather than through the money supply), and expenditure influences loan demand, except for an autonomous element. The link between money and expenditure is removed, and excess money supplies will have little effect on the rest of the system.

The Estimation Results

The coefficients employed in the simulation were estimated on annual data for 1946-1978 using two-stage least squares. The results are presented below.

Two Stage Least Squares Estimates

1. $CURP = \underset{(-1.3260)}{-0.6533} + \underset{(39.5238)}{0.1060\ MO}$

$R^2 = 0.9818 \quad DW = 0.9941 \quad SER = 1.9649$

2. $M = \underset{(1.7395)}{3.5745} + \underset{(109.78)}{0.5523\ AE}$

$R^2 = 0.9976 \quad DW = 2.109 \quad SER = 7.9714$

3. $MO = \underset{(-1.8469)}{-15.3656} + \underset{(2.4966)}{0.1073\ AE} + \underset{(8.0347)}{0.8547\ MO_{-1}} + \underset{(1.7440)}{2.8425\ RD}$

$R^2 = 0.9957 \quad DW = 1.6643 \quad SER - 9.2065$

4. $LA = \underset{(-2.6686)}{-96.4206} + \underset{(20.5575)}{0.3940\ GDP} + \underset{(2.3870)}{11.8951\ RLA}$

$R^2 = 0.9675 \quad DW = 0.8363 \quad SER = 20.4774$

5. $T = \underset{(-2.1267)}{-3.1917} + \underset{(57.5403)}{0.2422\ GDP}$

$R^2 = 0.9913 \quad DW = 1.5471 \quad SER = 5.8597$

(Figures in brackets are t-statistics)

In equation 1 the coefficient of M0 is positive, as expected and is significantly different from zero at the one percent level. However, the presence of fairly severe positive serial correlation casts doubt on the accuracy of the results. In this respect we think that the results suggest an alternative specification or the omission of this equation since currency held with the public could be more accurately reflected as a proportion of the money supply. The estimated coefficients in equation 2 confirm that imports are strongly influenced by aggregate expenditure, whose coefficient is significant at the one percent level.

In the money demand function, which is specified using a broad definition of money, the coefficients are all positive as anticipated. Despite the high R^2 only the coefficient of the lagged money stock is significant at the one percent level. The expenditure coefficient, although significant at the five percent level tends to confirm our reservation about the behavioural specification whilst the insignificance of the interest rate coefficient emphasizes the unimportant role of interest rate consideration in the demand for money in Barbados.

The estimated coefficients for the demand for loans function are also positive, but the coefficient of the interest rate on loans does not validate our a priori expectations. It is only significant at the five percent level and the presence of strong serial correlation seems to be the result of this variable. The positive coefficient, when compared to our expected negative coefficient, suggests that the

interest rate on loans and advances is determined by the demand for loans.

In the tax revenue equation the coefficient of GDP is highly significant at the one percent level, and has a R^2 of 0.9913.

The simulation results

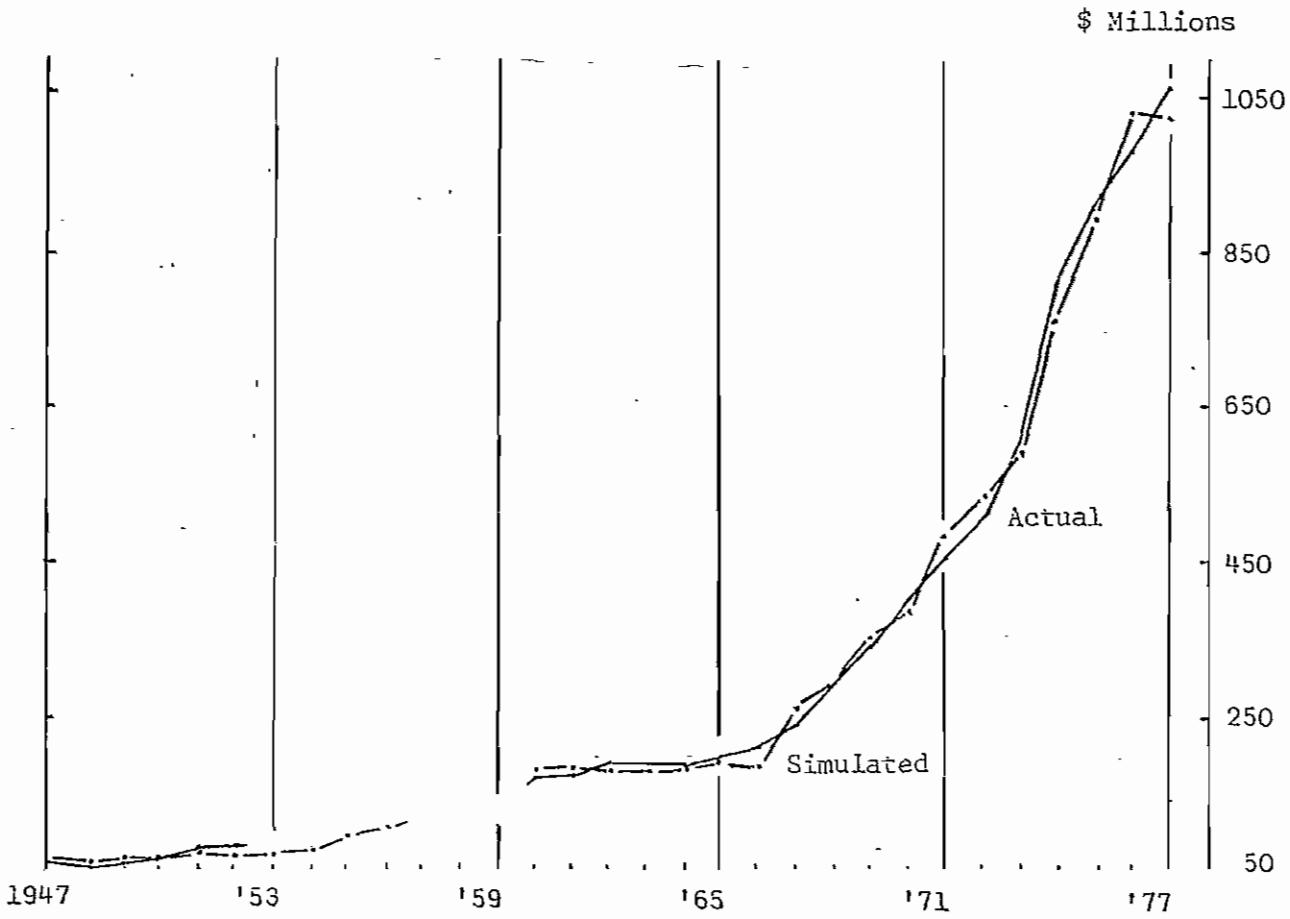
The results of our first simulations with this simple model have not been satisfactory. We have kept the behavioural equations to a minimum, and specified them as simply as we could. The parameters estimated for these equations have turned out acceptably, by and large. Despite all this, the model does not do well in tracking the performance of important endogenous variables like foreign assets, credit to government, liquidity and money. In this section we compare the simulations with actual outcomes, explore the reasons for discrepancies and discuss ways of improving the model's performance. (The simulation results are summarised in the accompanying charts and table).

The balance of payments simulations bear very little resemblance to the actual record. Between 1947 and 1964 officlal foreign asset movements were small, but the model indicates wide fluctuations. Actual changes after 1974 were much larger, but not so large or so erratic as the model suggests. The presence of the lagged value of FA in equation 2 contributes significantly to the model's difficulties. If the model begins to move off track, the error is compounded in each successive time period. (This problem occurs in the simulation of credit to government as well).

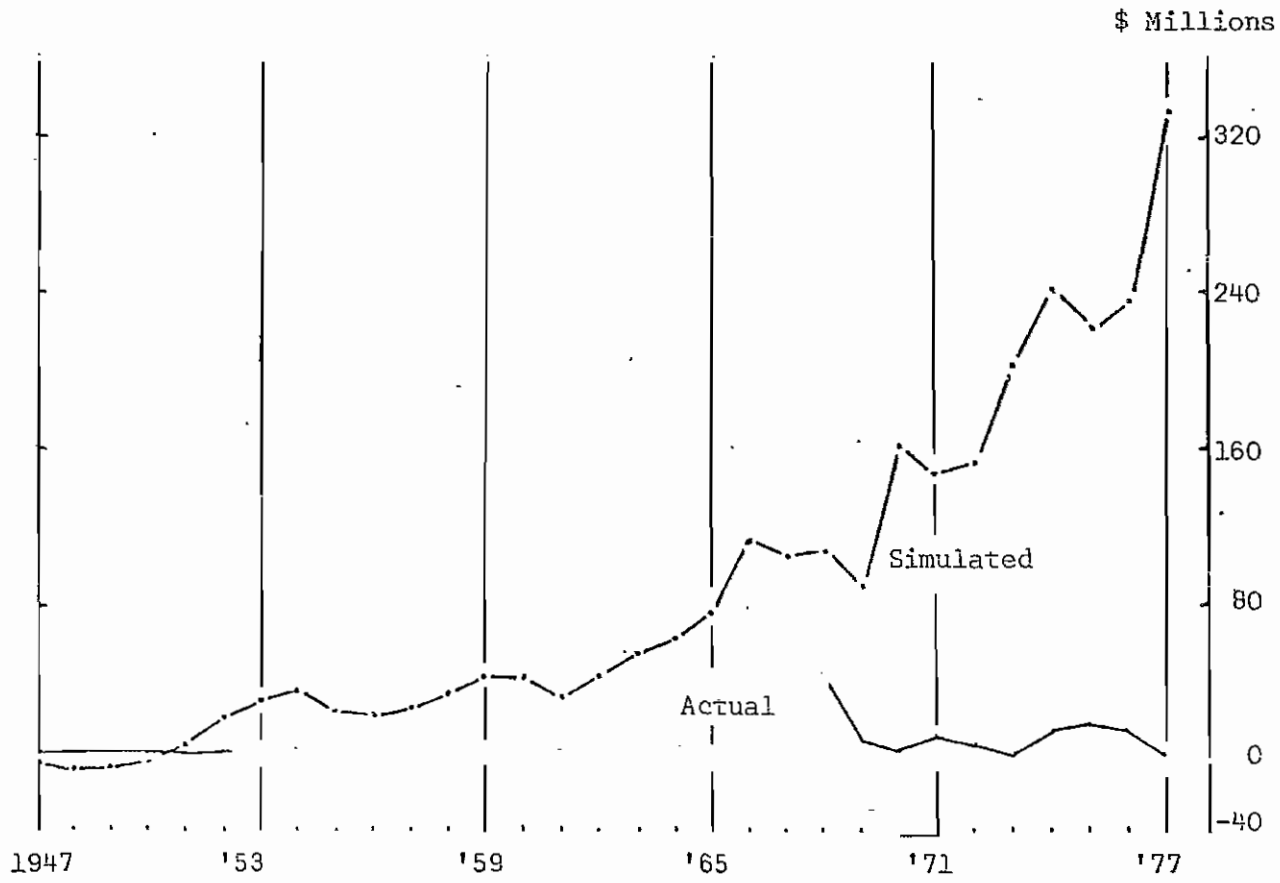
SIMULATION RESULTS

Variable (1)	Root mean Square error (2)	(2) - Mean (%)
W	117.2447	718.8696
FA	26.3587	158.1745
CRG	160.6212	487.4839
CURP	5.1150	37.0794
RR	14.2502	271.7617
M	51.2150	29.2572
MO	46.0598	34.1285
D	159.2476	118.4790
L	39.2751	38.8286
T	22.7663	36.5506
AE	89.3704	28.8560

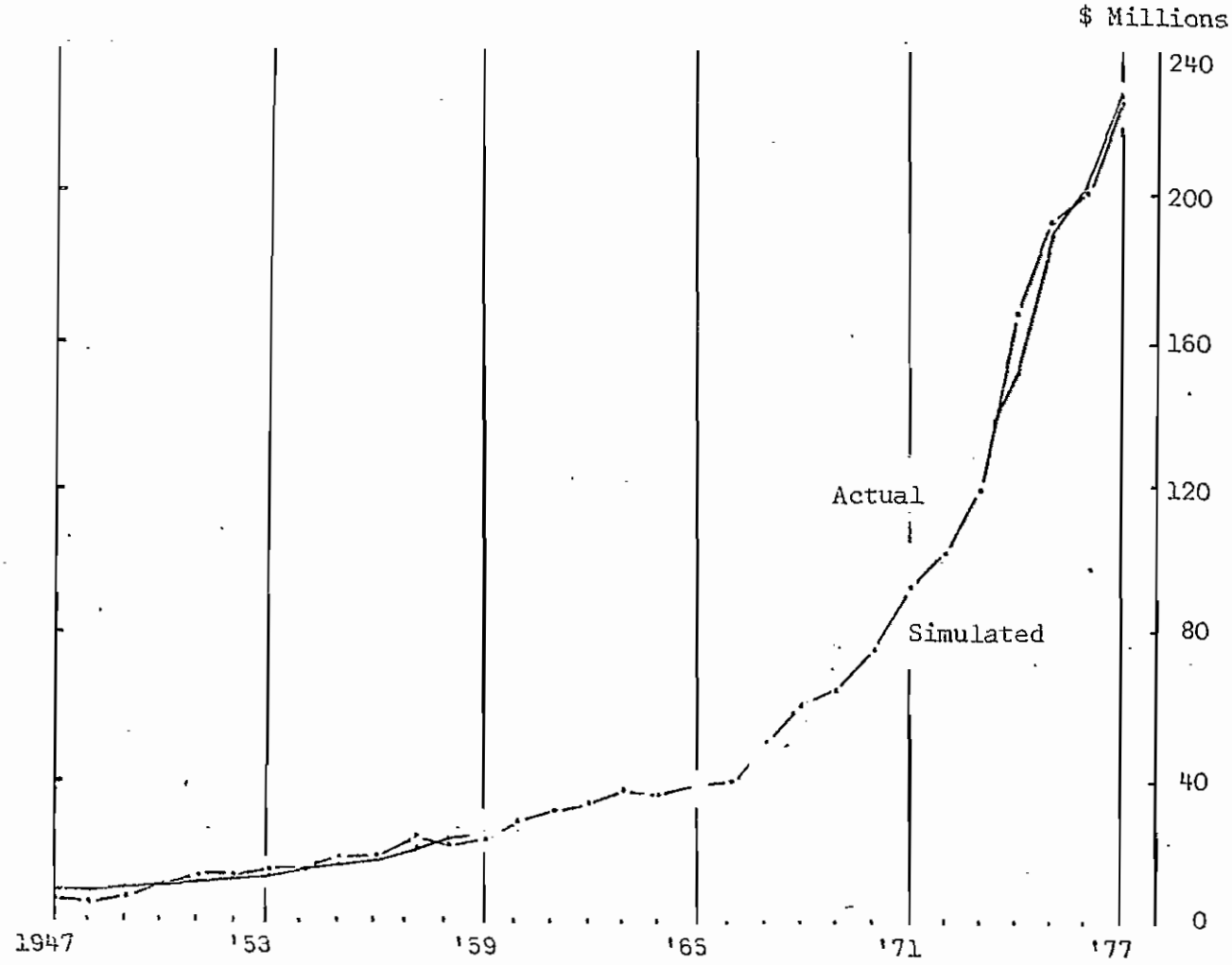
DOMESTIC EXPENDITURE



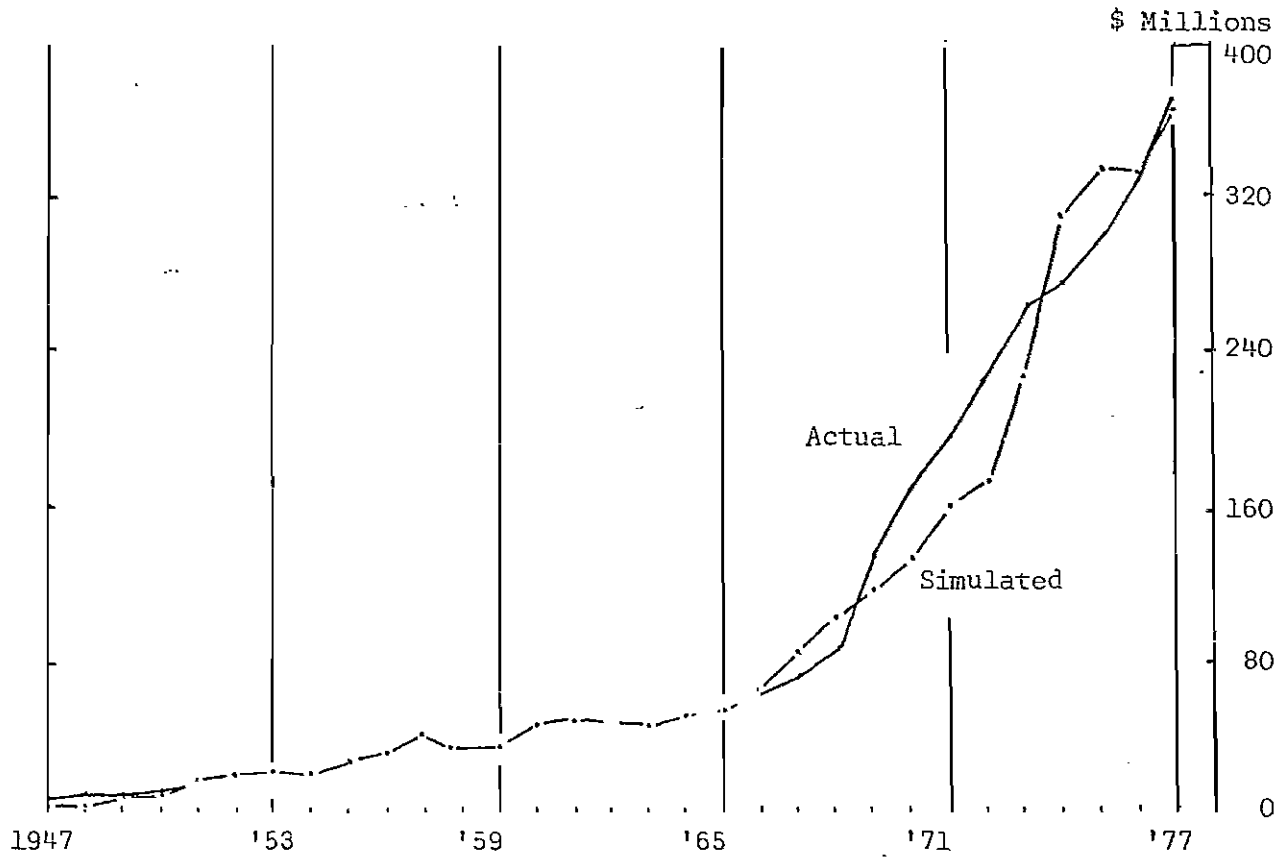
EXCESS BANK LIQUIDITY



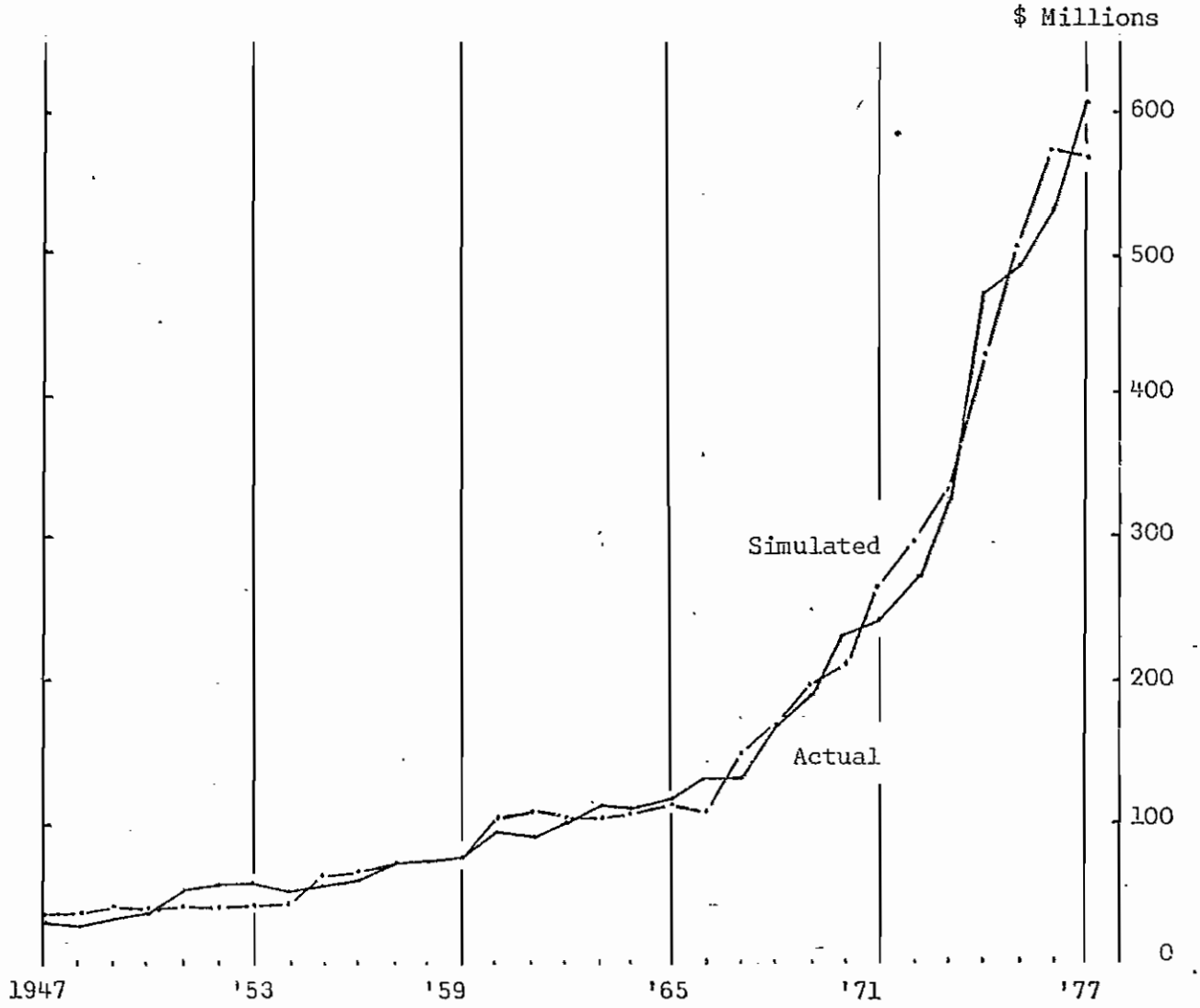
GOVERNMENT REVENUE



BANK LENDING



IMPORTS


$ Millions
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1947
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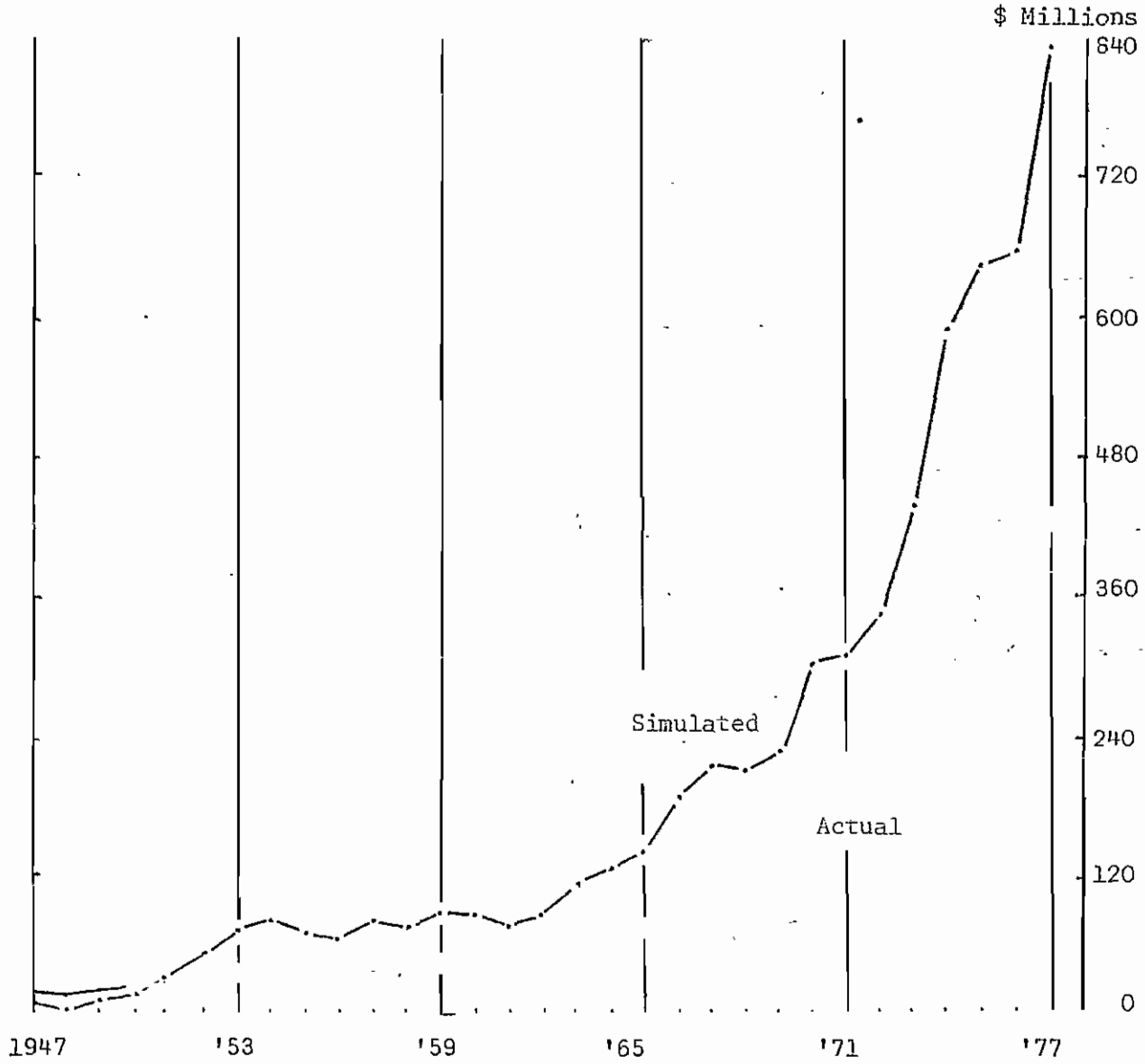
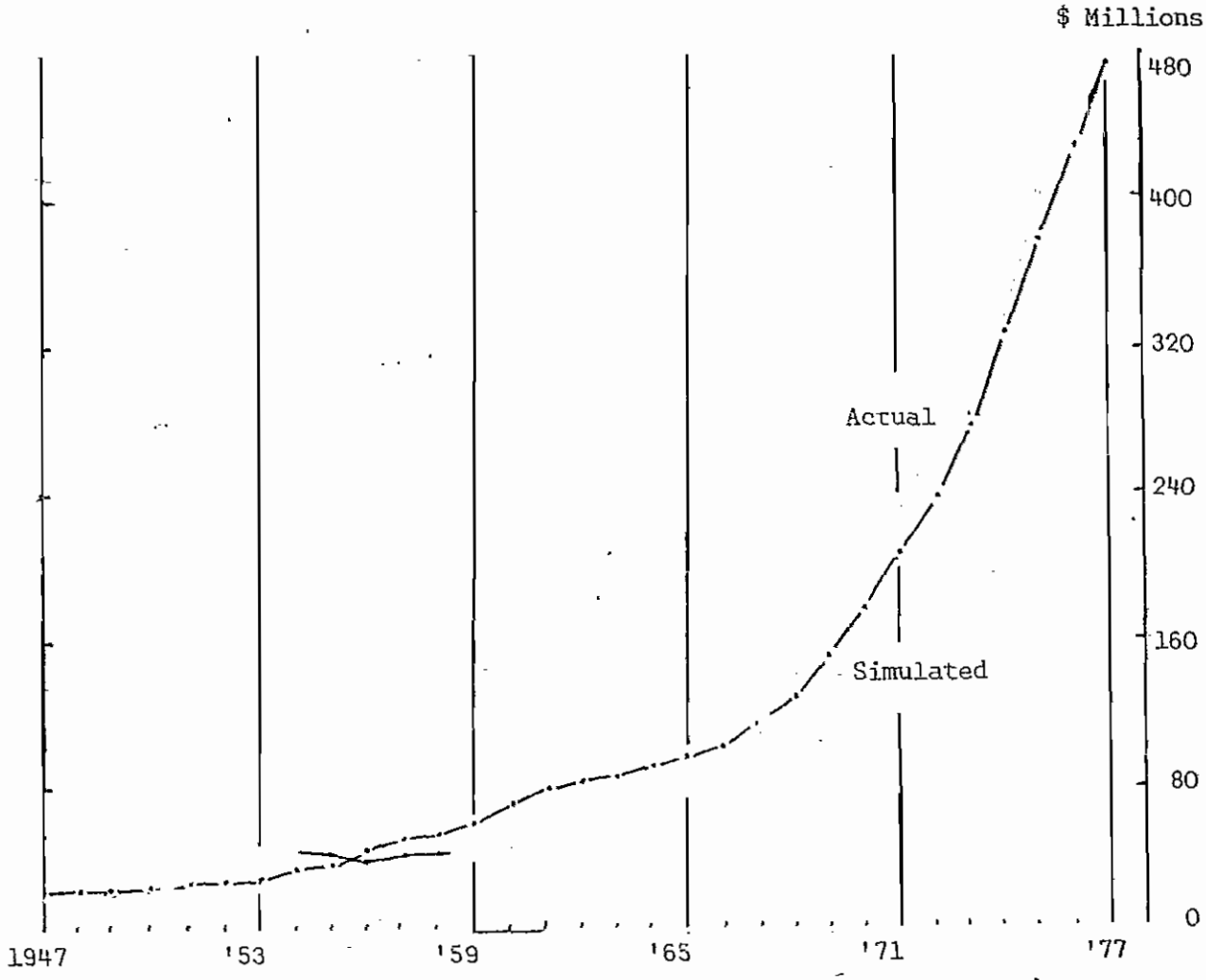
BANK DEPOSITS



MONEY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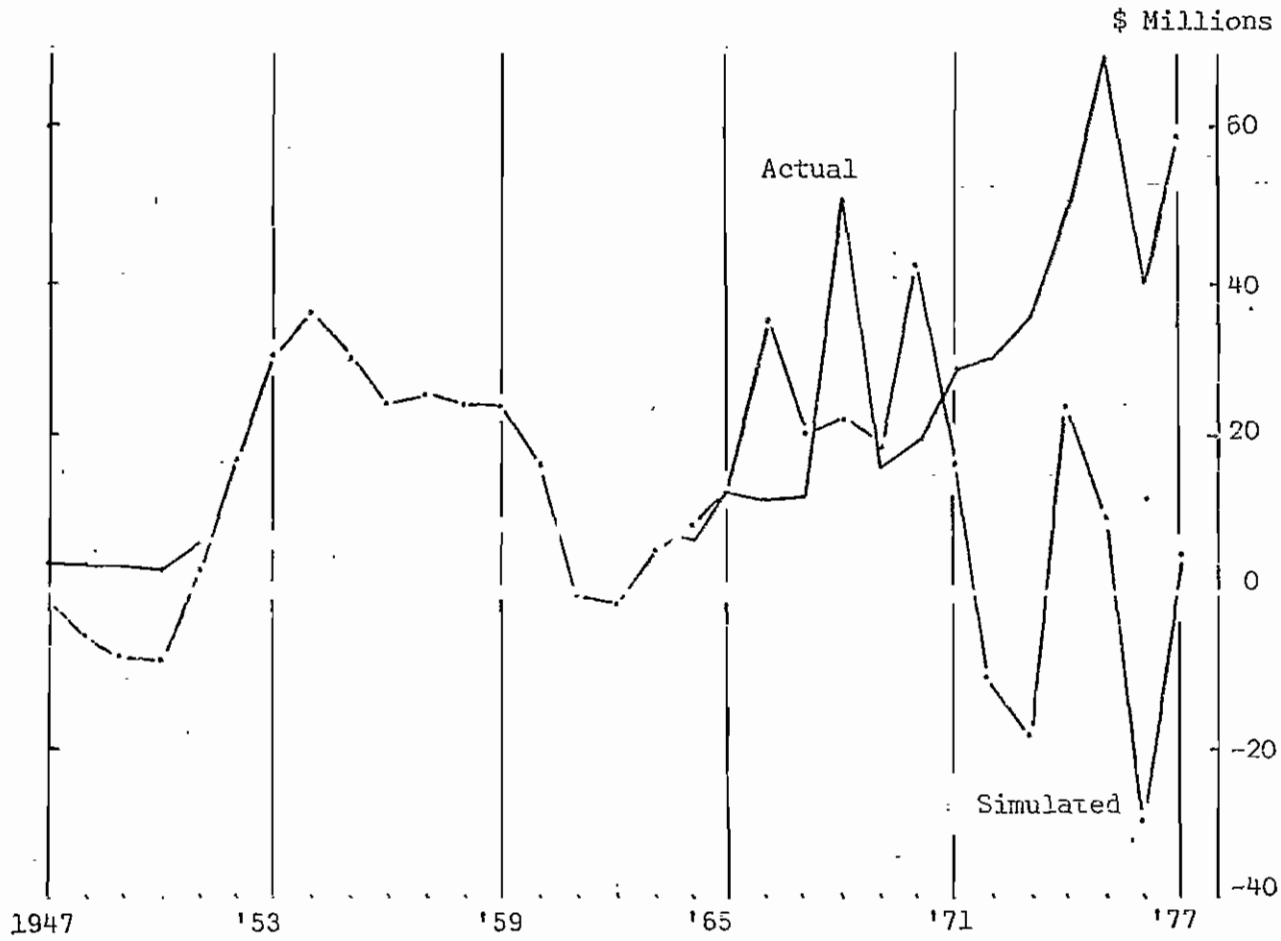
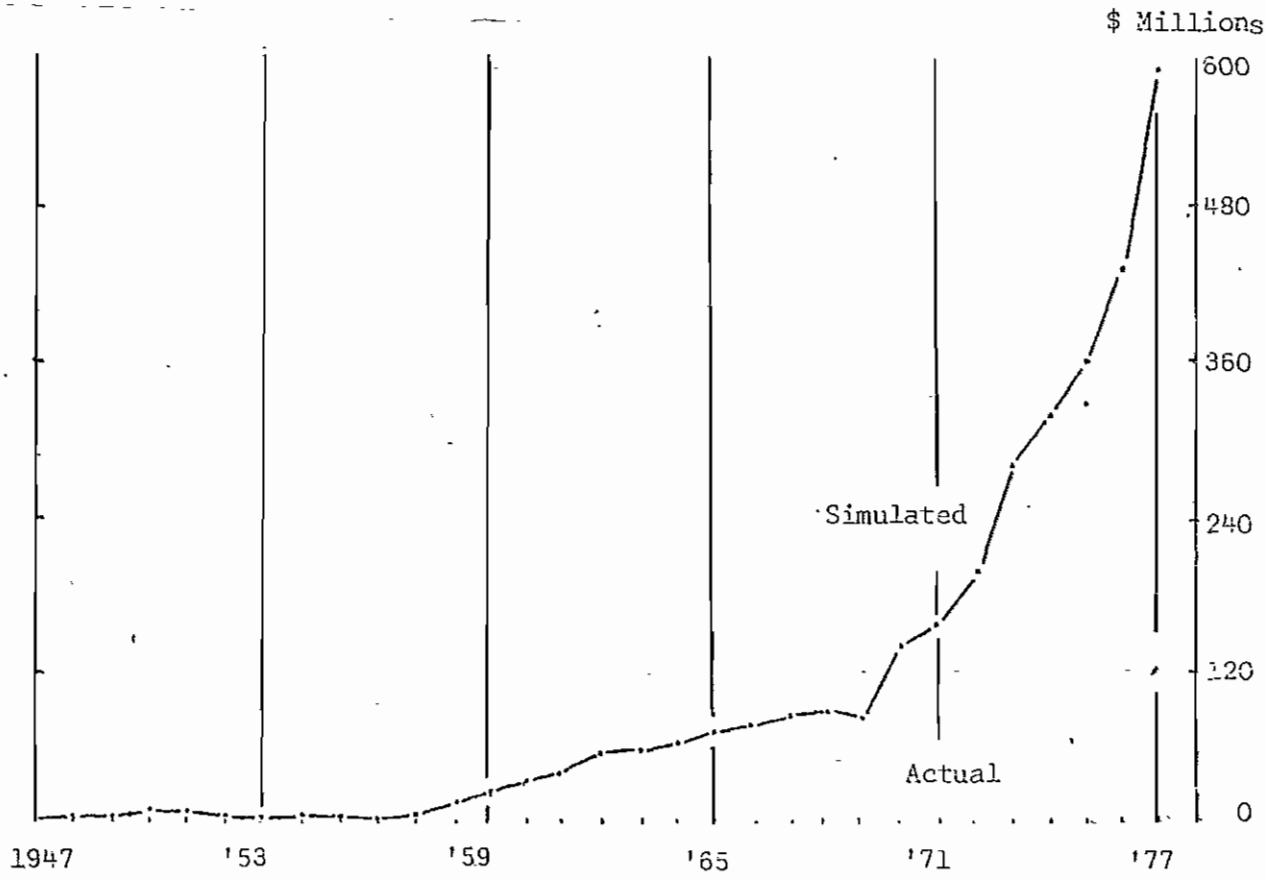
CENTRAL BANK NET FOREIGN ASSETS



BANK CREDIT TO GOVERNMENT



We still need to decide why the model goes off track in the first place. With exports and capital flows autonomous, errors in the estimate of FA can enter only through errors in the estimate of imports. The import equation seems satisfactory and the import simulation performs much better than does the foreign assets simulation. Despite this, errors in imports have been large enough to make nonsense of the foreign assets results. The explanation lies with the size of the import bill in relation to changes in imports. The estimating equation for imports does quite well in representing the way the level of imports has responded to expenditure. However, the changes in imports are not mirrorred so faithfully in the simulations; it seems that these changes may have been sufficiently large to affect foreign asset holdings significantly.

We may have to seek a more elaborate explanation for imports in order to improve the model's performance. It may be necessary to disaggregate imports into functional categories, or to specify separate equations for real imports and import prices, or, perhaps, to do both. Alternatively, some redefinitions may help. We could discuss the balance of payments in more detail, with separate equations for goods, services, factor income and transfers. We might also wish to disaggregate expenditures. We will first want to experiment with some of these outside the framework of the complete model, so as to avoid complication. In fact, work in this direction is already underway, concurrently with the model (see Cox & Worrell (1978)).

The simulation for credit to government also shows a large discrepancy in comparison with actual results. The compounding of

errors has played a significant role in generating this divergence. Up to 1966 there was no government borrowing from the banking system, but by that year the model had produced borrowings of $88 million, which were compounded in subsequent years. The revenue equation has to be the source of error in this case; the equation is a good fit but it is possibly autoregressive. Our options are much the same as for imports: disaggregation of revenue and separate identification of the GDP components which influence different kinds of revenue.

The simulations for commercial bank liquidity and for bank deposits have been thrown out by the poor results for credit to government. The overestimate of credit to government is matched by large overestimates of liquidity and deposits. These variables are also affected by the results we obtained for loans. The loan simulations captured the trend in actual lending reasonably well, but the changes from year to year are not well represented; the simulations seldom produce changes of the same magnitude as the actuals. In this case part of the reason is that the estimating equation for loans is not a good one.

An obvious line of investigation for the next stage is to pursue alternative specifications of loan demand. We feel that this ought to be supplemented by a study of the commercial banking firm in Barbados, with special regard to its liquidity management. We do not have a good understanding of how branches of multinational banks manage their portfolio when exchange controls force them to operate exclusively on the domestic market.

The simulation for money is on target only for the years after the Central Bank started operations in 1973. This raises the possibility that the money demand equation may be better at explaining recent market behaviour than it is at modelling earlier monetary arrangements. We may explore this further using dummy variables. The simulations are faithful to actual performance throughout the period insofar as they show steady growth with very little fluctuation. However, the simulated growth rates are off target for the earlier years; the simulations present a picture of rapid growth from 1968 to 1977 and modest growth from 1954 to 1961, while in fact there was one period of continuing rapid growth, from about 1964 onwards.

The simulations we have undertaken so far were designed only to test the model's viability, complementing the results of the regression analysis. If these tests were satisfactory we might have used the model to simulate the results of alternative policies. However, this exercise must now be postponed until we have improved the model's tracking record. There are several ways to proceed from here, and we will try one or two of them. We can develop separate sub-models for particular areas to inform the specification of the main model. We would probably not incorporate these sub-models wholesale, for fear of producing a system of unmanageable complexity. We hope that it will be possible to devise a more successful system which will not be much more complicated than the present effort. Therefore re-specification of the present model will go hand-in-hand with the development of sectoral models.

Footnotes

1. There are now two popular sources for description and discussion of the new monetarism: Frenkel & Johnson (1976) and IMF (1978).

2. Recent discussion of the demand for money in less developed countries is to be found in

3. We assume that net foreign assets of the commercial banks are intended to meet the needs of current foreign transactions and will not vary so much as to affect the banks' liquidity. To the extent that they do, they are an additional factor determining the money supply.

4. The Bank has a tax study currently under way; see Holder (1979)

5. For a discussion of the distributive trades in Barbados, see McClean (1977).

6. Banks are not heavily involved in long-term lending, though in some cases they operate overdrafts which are in the nature of a long-term loan. However, investment does require substantial working capital of the kind which the banks are anxious to provide.

7. The merits of the demand for money function are discussed in Worrell (1979); a quarterly model for Barbados which emphasises the credit/expenditure mechansim has been estimated in Zephirin and Cox (1979).

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