AN ECONOMIC MODEL OF THE MONETARY SECTOR OF THE BARBADOS ECONOMY

by

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Prepared for Presentation at the
Research Department, Central Bank of Barbados
Annual Review Seminar
July 14 - 15, 1995

July 1994

The objective of this paper is to construct an econometric model of the monetary sector of Barbados by decomposing the money supply into its various elements. The formulation and structure of this simultaneous model draws heavily from that done by Parikh and Starmer(1994) for Bangladesh's monetary sector. The underlying assumption here is that money supply and prices are closely related, running from prices to money. By modelling money supply endogenously we imply that it cannot be effectively controlled by the relevant monetary authorities as there are a number of influential external forces. Given the rather indeterminate nature of our small open economy we anticipate that this exercise will lend some insight as to the workings of the financial sector and thereby provide some basis for prediction of the sector and overall economic activity.

Section I of this paper looks at the eleven behavioural equations and the 6 basic identities and establishes the explicit links between money and prices. In Section II the model is estimated while Section III reports the results of the simulations exercises performed. This followed by the summary and conclusion .

SECTION I

THE MODEL

Instead of decomposing the financial sector into the three distinct economic units as did Ramkissoon and Watson (1984) and Ikhide (1988), simple accounting identities were used to break the money supply down into its various components .

The Demand and Supply of Money

Starting with the demand for money we assume that the desired demand for real cash balances in any given year is a function of real income (RGDP) and the expected rate of inflation

$$\left[\frac{M1}{PC}\right]^{d} = F\ (RGDP\ ,\ FINF) \qquad (1.1)$$
$$\qquad\qquad\qquad\qquad +\qquad\quad -$$

where M1 is narrow money (the sum of currency in circulation and demand deposits) and PC is the retail price index. The expected rate of inflation, FINF, is proxied using food price component of PC. This seems to be a more justifiable proxy of the opportunity cost of holding money relative to goods index as food is a basic requirement (constituting approximately 40% of the retail price index) and food prices tend to have sharper changes than PC. If we assume that the change in the public's real balances between two periods is some percentage of the difference between the current period's actual and the previous period's desired balance the actual real balances in logarithms is

$$Log\left[\frac{M1}{PC}\right] = a_o + a_1\lambda logRGDP_t + a_2\lambda logFINF_t + (1-\lambda)\log\left[\frac{M1}{PC}\right]_{t-1} \qquad (1.2)$$
$$(a_1\lambda>0\ ;\ 0\le(1-\lambda)\le1\ ;\ a_2\lambda<0)$$

here the income elasticity of demand for real money balances is expected to be positive.

Using a simple identity broad money (M2) can be defined as the sum of narrow money and time deposits

$$M2 = M1 + TD \qquad (2.1)$$

Alternatively, changes in money supply can result from actions taken by the monetary authorities which can result in changes in credit to the private sector, lending to the public sector and/or changes in the net foreign assets of the country. Thus the money supply can be written

$$M1 + TD = PRIV + NEWPUB + NFA \qquad (2.2)$$

By summing the credit variables to form the net domestic assets NDA the following identity can be derived

$$M2 = NDA + NFA \qquad (2.3)$$

Credit

Credit policy is a very important tool used by monetary authority. As Campbell (1993)points out, it influences economic activity by providing finance for consumption, working capital and fixed investment for future expansion of output. Credit policy sets out to restrict credit within the system and alter the direction of available funds. In keeping with the demand determined approach, the demand for credit by the private sector is presumed to be influenced by food prices, real income and non food prices.

$$\log PRIV_t = b_o + b_1 \log PF_t + b_2 logRGDP + b_3 logPNF \quad (1.3)$$
$$(b_1, b_2, b_3 > 0)$$

The distinction between food and non food prices here is important as we are trying to capture the effect of higher demands for credit as more money is required to settle increased wage bills. Assuming that there is no constraint on the supply of credit and that commercial banks normally accommodate the needs of the credit worthy customers then as national income rises, the level of spending also increases and therefore the demand for credit.

Credit to government[1] is expected to be a function of the level of the fiscal deficit, non food prices, food prices[2] and international reserves

$$NEWPUB = c_o + c_1 DEF_t + c_2 PF_t + c_3 PNF_t + c_4 IR_t \quad (1.4)$$
$$[c_1, c_2, c_3 > 0;\ c_4 < 0]$$

Due to the undeveloped nature of the capital and financial markets it is expected that any shortfall in government revenue would be financed, for the most part, via the banking system and foreign market and not the private sector. Increased levels of international reserves are also anticipated to impact negatively on deficit financing.

Government

In the Government expenditure equation we assume that total expenditure is influenced by past revenue, food prices and lagged expenditure

$$GOVE = d_0 + d_1 GOVR_{t-1} + d_2 PF_t + d_3 GOVE_{t-1} \quad (1.5)$$
$$(d_1, d_2 > 0;\ 0 < d_3 < 1)$$

Past revenue, a proxy for anticipated revenue, is expected to positively impact on planned government expenditure for the next period. Similarly, rising food prices will lower the real value of disposable income and create demands for higher nominal incomes thereby pushing up current expenditure on wages. Lagged government expenditure was included to model a partial adjustment mechanism.

1 The credit to Government variable includes net credit to other public sector organisations and net assets and liabilities.

2 In the estimating equation, PF was insignificant and was dropped from final equation.

Government revenue consists of mainly direct and indirect tax receipts. Although revenue can be influenced by a number of factors such as tax rates, inflation, the volume of trade and collection lags, it is primarily nominal income (GDP) which determines nominal revenue. Therefore, GDP is decomposed into real income and the retail price index such as to separate out the two effects. One can derive the following equation

$$GOVR_t = e_o + e_1 GOVR_{t-1} + e_2 RGDP + e_3 PC \quad (1.6)$$
$$(o \leq e_o \leq 1;\ e_2,\ e_3 > 0)$$

Foreign Assets

The foreign assets of a country is expected to be negatively influenced by the level of nominal imports and positively by domestic exports[3].

$$NFA = f_0 + f_1 M + f_2 X \quad (1.7)$$
$$(f_1 < 0;\ f_2 > 0)$$

Imports

Real imports (RM) is retained imports deflated by the import price index. Here the price of imports (as well as exports) have been treated as exogenous. This is acceptable given the openness and smallness of the Barbadian trade. Real imports is assumed to be determined by the price of imports, prices and lagged imports (as there may be some adjustment between actual and desired real imports)

$$\log\left[\frac{M}{PM}\right]_t = g_o + g_1 \log PM + g_2 \log FINF + g_3 \log RM_{t-1} \quad (1.8)$$
$$[g_1 < 0;\ g_2 > 0;\ 0 \leq g_3 \leq 1]$$

Prices of imports as proxied by the import price index and domestic prices are expected to move in opposite directions as they are substitutes.

Exports

Similarly, real exports[4] is domestic exports deflated by the price of exports. The capacity to export is proxied by the industrial production index and is considered to be a very important determinant or constraint on the supply of exports; if the capacity to export increases we would also anticipate a rise in real exports. On the other hand, an upward movement in export prices would impact negatively on the demand for real exports

$$\log RX_t = h_o + h_1 \log PX + h_2 \log PROD \quad (1.9)$$
$$(h_1 < 0;\ h_2 < 0)$$

Expenditure

[3] Dint was included in the estimated equation to represent the opportunity cost of holding money to spending on imported goods.

[4] In the estimating equations, the variables were lagged therefore suggesting the presence of some adjustment mechanism.

When nominal expenditure (E), the sum of public and private consumption and total investment is deflated by the GDP deflator (PY) we get real expenditure (RE). Real income,, the amount of excess cash held by the individual and past levels of expenditure are all assumed to exert a positive influence on the current level of real expenditure

$$Log\ RE = i_o + i_1 logRGDP + i_2\left[\frac{M2}{PC_t} - \frac{M2}{PC_{t-1}}\right] + i_3 logRE_{t-1} \qquad (1.10)$$
$$(i_1, i_2, i_3 > 0)$$

Real income (RGDP) has been defined as nominal GDP scaled by the GDP deflator. However by combining the previous three variables in a mathematical relationship we can also derive RGDP

$$\frac{GDP}{PY} = RE + RX - RM \qquad (2.4)$$

<u>Prices</u>

The retail price index can be derived using the identity

$$PC_t = 0.43PF_t + 0.57PNF_t \qquad (2.5)$$

The weights were determined from the actual retail price index. The retail price index has been decomposed into food and non-food prices as we believe that the food price components in particular, would pick up any exogenous shocks that would eventually transmit into increases in the money supply.

If we assume PF to be exogenous we can then obtain the non food price index

$$PNF_t = \frac{PC_t - 0.43PF_t}{0.57} \qquad (2.6$$

to support the underlying notion that prices and money have some sort of causal relationship we include the following equation

$$\log PC_t = j_0 + j_1 \log M2_t \qquad (1.11)$$
$$[j_1 > 0]$$

A statistical relationship is also assumed to exist between the GDP deflator (PY) and PF and PNF

$$PY_t = k_0 + k_1 PF_t + k_2 PNF_t \qquad (1.12)$$
$$[k_1, k_2 > 0]$$

SECTION 2

ESTIMATION AND RESULTS

Using PCTSP, the equations were estimated using the Two Stage Least Squares (2SLS) method. The data was on an annual basis spanning the twenty-four year period 1967 to 1991. In evaluating the 'goodness of fit' of each equation, the adjusted R-squared and the standard error of the regression have been used. However, as the model is primarily for forecasting purposes, the standard error is perhaps a better measure of the model's predictive power. Rubinfeld and Pindyck suggest that the standard error should be at most 15% of the mean of the dependent variables. In spite of low t ratios, some variables were retained on a priori grounds so as to avoid mis-specification while other variables were added to improve the quality of the results. Due mainly to time limitations, little experimentation with error correction models, cointegration and in depth fine tuning of the model was carried out. We however hope to do so in a later study. In general, most of the variables possessed the correct signs and the test statistics were fairly acceptable. The results can be found in the following table in which each estimated equation is accompanied by the usual test statistics, R squared, Durbin Watson (DW), Standard Error (SE) and the Mean of the dependent variable (MEAN). Variables in logarithms are preceded by an 'l', 'd' indicates first difference and the 't' values at the 5% significant level are in parentheses.

It appears that in equation 1 all the variables are significant, particularly food price inflation. However R^2 is not very high. All the variables in equation 2 possessed the correct signs although 't' statistics were insignificant. Private sector credit also appears to be income elastic while in the credit to Government equation, the non-food prices index has a high elasticity of 191.87. However, the level of the Government deficit is negatively related to Government.

Equations 4 and 5 also appear to have significant relationship with lagged Government revenue. While having large coefficients, the price variable is insignificant in the Government revenue equation but significant to expenditure. We find too, that real expenditure and imports are highly dependent on real income and the previous year's balance. When lagged, all the variables in the real exports equation becomes significant. However, LPROD, the proxy for export capacity has the incorrect sign therefore implying that the export market is more likely subject to the vagaries of demand than constrained by supply factors. Net Foreign assets is significantly related to the nominal level of imports but the DW and R^2 are poor. The same can be said for the GDP delator and food prices where the DW is quite poor although the R^2 is good.

TABLE 1

VARIABLE	NAME
MI	Narrow Money
RMI	Real Narrow Money
M2	Broad Money
RM2	Real Broad Money
TD	Time Deposits
RGDP	Real Gross Domestic Product (1975 Prices)
GDP	Nominal Gross Domestic Product
PC	Retail Price Index (1975 Prices)
PF	Food Price Index (1975 Prices)
PNF	Non Food Prices Index (1975 Prices)
PRIV	Credit to the Private Sector)
NEWPUB	Credit to Government (Net)
GOVE	Total Government Expenditure
GOVR	Total Government Revenue
DEF	Deficit (GOVR-GOVE)
NFA	Net Foreign Assets
M	Nominal Products
RM	Real Imports
X	Nominal Exports
RX	Real Exports
IR	International Reserves
FINF	Inflation Rate
PM	Import Price Index (1975 Prices) - Price of Imports

VARIABLE	NAME
PX	Export - Price of Exports
PROD	Index of Industrial Production
E	Nominal Expenditure
RE	Real Expenditure
PY	GDP Deflator
DINT	Time Deposit Interest Rate
BINT	Maximum Prime Lending Rate
FINT	Interbank Rate
RWAGE	General Wages Index (1975)
PW	Index of World Prices (1975)

TABLE OF RESULTS

LRM1 = 0.421 + 0.203 LRGDP - 0.007 FINF + 0.663 LRM1 (-1)
(1.195) (-2.941) (5.057)

R^2 = 0.7793 SE = 0.09267 DW = 2.0676 MEAN = 5.049 **(1)**

LPRIV = -5.104 + 0.018 LPF + 1.64 LRGDP + 0.922 LPNF
(0.063) (1.089) (1.881)

R^2 = 0.9161 SE = 0.2525 DW = 1.9837 MEAN = 6.119 **(2)**

NEWPUB = -74.05 - 0.184 DEF - 0.495 IR + 191.87 PNF
(-0.89) (-4.12) (10.5)

R^2 = 0.9232 SE = 39.78 DW = 0.8632 MEAN = 171.828 **(3)**

GOVE = -28.395 + 0.859 GOVR(-1) + 139.72 PF
(9.209) (4.02)

R^2 = 0.9927 SE = 31.1568 DW = 1.2172 MEAN = 482.053 **(4)**

GOVR = -215.551 + 0.786 GOVR(-1) + 0.318 RGDP + 50.86 PC
(6.746) (1.541) (1.111)

R^2 = 0.9037 SE = 40.018 DW = 2.5 MEAN = 407.494 **(5)**

NFA = 95.965 + 0.163 M + 0.195 x -24.108 DINT
(3.83) (1.746) (-3.78)

R^2 = 0.7998 SE = 49.4707 DW = 0.8088 MEAN = 132.317 **(6)**

LRM = -1.811 + 0.413 LRM(-1) + 0.831 LRDGP + -0.004 FINF
(3.018) (3.178) (-1.8)

R^2 = 0.9018 SE = 0.0819 DW = 1.8499 MEAN = 6.293 **(7)**

LRX = 0.8776 + 0.414 LPX(-1) - 0.968 LPROD(-1) + 0.836 LRX(-1)
(3.045) (-2.844) (7.794)

R^2 = 0.733 SE = 0.1916 DW = 1.564 MEAN = 5.439 **(8)**

LRE = 1.17 + 0.391 LRGDP + 0.355 dLRM2(-1) + 0.45 LRE(-1)
(2.357) (1.615) 2.417

R^2 = 0.507 SE = 0.0975 DW = 2.0223 MEAN = 6.901 **(9)**

LPC = -5.17 + 0.908 LM2
(33.833)

R^2 = 0.9795 SE = 0.104 DW = 0.7528 MEAN = 0.191 **(10)**

PY = -0.108 + 1.025PF + 0.171 PNF
(9.541) (1.763)

R^2 = 0.991 SE = 0.0894 DW = 0.553 MEAN = 1.582 **(11)**

SECTION 3

SIMULATIONS

Simulation is the mathematical solution of a simultaneous set of difference equations. Where a difference equation relates the current value of one variable to current and past values. Once give the initial values of the endogenous variables, the initial values of the exogenous variables and the estimated parameters, the model can be solved through some interactive. process to yield new estimated values of the endogenous variables. A model might be simulated for a number of reasons and its ability to replicate actual life is important in determining its usefulness especially for forecasting and policy analysis purposes. With this in mind, several simulation exercises, expost and ex ante were performed and the results tabulated.

In order to evaluate the simulation results, certain quantitative measures performance were used. These include the correlation coefficient (CC) and the root mean squared error (RMSE). While CC measures the degree to which the predicted series matches the actual, RMSE measures the deviation. Stekler (1991) points out however, that the RMSE itself has little meaning and therefore should be compared against some standard like the standard deviation (STD). Hence the ratio of RMSE to STD has been computed where a value of 0.2 is an indication of good performance. The mean error (ME) has also been included but it may not be as instructive as they may be close to zero if larger positive errors cancel out large negative values. The regression coefficient of the actual on the predicted (RC) is expected to be close to 1 for a perfect fit.

Theil's inequality coefficient (TH) is particularly interesting and useful for the evaluation of historical simulations. If TH = 0, there is a perfect fit but if TH = 1, then the predictive performance is poor. The Theil inequality coefficient can be decomposed into three proportions of inequality; the bias proportion (THB), the variance proportion (THV) and the covariance proportion (THC). These proportions break down the simulation error into its common sources. THB measures the systematic error while THV measures the ability of module to replicate the degree of variability. Thirdly, THV is an indication of unsystematic error, that is, the error that cannot be attributed after deviations from average values (THB) and average variabilities (THV) have been accounted for . Ideally THB = THV = 0 and THV =1.

A number of expost and ex ante simulation exercises have been performed and the above test statistics having been tabulated accordingly. Additionally, line graphs of key variables have been included so as to facilitate easy evaluation as to how well the model tracks the actual data, especially the turning points. Some forecasting has been attempted but further evaluation is required and will be done at a later date. At present, evaluation of the forecasts will remain at the level of visual inspection.

Firstly, an historical simulation was performed for the period 1967 to 1991. The correlation coefficient and Theil's inequality coefficient for most of the estimated variable indicate that the model is tracking fairly well. The retail price index (PC) and the GDP deflator (PY) in

particular, appear to be doing quite well with correlation coefficients very near to 1. While the CC for both Government revenue and expenditure are quite acceptable the Theil inequality coefficients hint at the presence of low productive ability. This is supported by the high ratios of RMSE to STD, 0.728 and 0.528 respectively. Despite a low overall TH, a high THV and a low THC in the exports variable suggests that the error is due to imperfect variation and covariation. A THV of 0.254 could also imply that the ability of the model to pick up accurately fluctuations in the credit to Government variable. By extension, the variables derived from the identities gave rather poor results. In fact, this is emphasized by the Graphs for RTD, RM2 and GDP in which there are obviously large differentials between the predicted and actual series.

In order to test the overall sensitivity of the model the initial estimation period was altered. The beginning year, 1973, was chosen as it makes the start of local central banking operations and therefore active monetary policy. Table 4 indicates that the 'problem variables' in the previous simulation have repeated themselves here. We note also that the correlation coefficient for Net Foreign Asset is lower and the RMSE/STD ratio is higher (0.624). The inequality ratio although a bit higher than the other variables is still acceptable.

An expost simulation was also performed for the period 1967-1988. We find too on table 5 that the test statistics are quite similar. The CC for real expenditure variable has dropped to 0.534 and the ratio RMSE/STD has increased to 0.828. One is inclined her to attribute this to possible date inaccuracies, particularly in the earlier years. In an effort to the forecasting accuracy of the model an ex post forecast was simulated forward starting at the end of the estimation period (1989) and extended as long as historical data is available (1991). From the graphs 5.1 and 5.8 we can see that the forecasts (as marked by 'f') did not track the variables very well, in particular, PC, PY and PRIV there were sharp jumps. However, one must remember that 1989-91 was a period of illiquidity and which marked the introduction of a stabilization programme in which credit was severely limited. The forecasts for narrow money RMI was thus unable to pick up the sharp fall in 1989.

Despite the problems associated with ex ante forecast, one was attempted for the period 1992 - 1995. Here it was assumed that the exogenous variables would follow a simple time trend into the future. Although it may have appeared (see graphs 3.1 to 3.8) acceptable for PC, PY and credit to Government the time trend for RMIF and PRIVF tented to be underestimated.

GRAPHICAL PRESENTATIONS AND SUMMARY

Overall the price variables, PC and PY, tracked very well in all the simulations. The credit variables especially the credit to private sector tended to follow the data quite well except in 1972 with the establishment of the Central Bank and in 1989 when the stabilization programme started. Credit to Government, supported by an average THV of 0.5 displays some inability in replicating the number of fluctuations/changes that have occurred over time. The same can also be said for NFA. For the most part, predicted values real money balances seemed to track the historical data fairly well. Clearly, as a result of poor test results in certain variables (mainly GOVR and GOVE) forecast for the money supply, real

TABLE 3 RESULTS FOR SIMULATION OVER PERIOD 1967–1991

	CC	RMSE	STD	RMSE/STD	ME	RC	TH	THB	THV	THC
LPRIV	0.963	0.231	0.872	0.265	3.81–D7	1.000	0.019	2.72–D12	0.019	0.981
LPC	0.990	0.099	0.725	0.137	(9.99–D7)	1.000	0.068	1.00–D10	0.005	0.995
LRE	0.681	0.099	0.139	0.712	(0.002)	0.940	0.007	0.000	0.139	0.861
LRX	0.733	0.260	0.371	0.701	0.052	1.290	0.024	0.040	0.366	0.593
LRM	0.947	0.083	0.261	0.318	0.003	1.010	0.007	0.002	0.032	0.966
GOVE	0.985	192.045	363.509	0.528	119.521	1.640	0.188	0.387	0.551	0.062
LRM1	0.960	0.055	0.197	0.279	(0.011)	1.000	0.006	0.040	0.025	0.935
GOVR	0.957	228.479	313.882	0.728	141.759	2.120	0.282	0.385	0.545	0.070
NFA	0.866	54.581	110.566	0.494	5.833	1.020	0.167	0.011	0.095	0.894
PY	0.996	0.087	0.964	0.090	(0.004)	0.980	0.024	0.002	0.036	0.962
NEWPUB	0.967	46.542	143.565	0.324	(8.539)	0.830	0.099	0.034	0.254	0.713
RGDP	(0.604)	220.884			141.125	(1.040)	0.148	0.408	0.050	0.541
RTD	0.235	258.990			(236.046)	0.050	0.475	0.831	0.113	0.057
GDP	0.992	512.270			363.557	1.560	0.178	0.504	0.461	0.036
RM2	0.669	260.82			–237.47	0.186	0.301	0.829	0.126	0.045

KEY
CC = Correlation Coefficient
RMSE = Root Mean Squared Error
STD = Standard Deviation
RMSE/STD = Root Mean Squared Error/Standard Deviation
ME = Mean Error
RC = Regression Coefficient of Actual on Predicted
TH = Theil's Inequality Coefficient
THB = Bias Proportion of Inequality
THV = Variance Proportion of Inequality
THC = Covariance Proportion of Inequality

time deposits and nominal GDP were grossly over estimated. Test statistics suggest presence of systematic bias.

CONCLUSION

It was first postulated that food prices are an important stimulus to the creation of money, however our initial results indicate that it is moreso non food prices which impacts on the money supply. We are also aware of the difficulties in estimating and forecasting government revenue and expenditure. However, it is clear that this paper is still in the preliminary stages and it is our intention to perform further tests and to experiment with the estimating equations, in particular respecification of the equations and cointegration, so as to improve the forecasting ability of the model.

TABLE 5 RESULTS FOR SIMULATION OVER PERIOD 1967 – 88

	CC	RMSE	STD	RMSE/STD	ME	RC	TH	THB	THV	THC
LPRIV	0.953	0.244	0.828	0.295	1.08-D6	1.000	0.020	1.975-D11	0.024	0.976
LPC	0.989	0.099	0.7	0.141	2.6-D7	1.000	0.073	6.574-D12	0.005	0.995
LRE	0.534	0.101	0.122	0.828	(0.001)	0.901	0.007	4.357-D5	0.228	0.772
LRX	0.818	0.230	0.379	0.607	0.036	1.348	0.021	0.025	0.401	0.573
LRM	0.943	0.081	0.249	0.325	0.004	1.020	0.006	0.003	0.452	0.946
GOVE	0.962	178.750	293.464	0.609	79.450	2.020	0.214	0.198	0.709	0.093
LRM1	0.961	0.055	0.176	0.313	(0.020)	0.896	0.006	0.147	0.052	0.801
GOVR	0.953	180.008	241.968	0.744	84.850	2.690	0.270	0.222	0.72	0.058
NFA	0.949	34.977	113.951	0.307	1.560	1.002	0.105	0.002	0.028	0.97
PY	0.996	0.079	0.86	0.092	(0.007)	0.960	0.024	0.008	0.153	0.839
NEWPUB	0.949	37.270	104.23	0.309	(5.545)	0.841	0.105	0.019	0.113	0.867
RGDP	(0.667)	196.360			110.830	(1.025)	0.133	0.319	0.037	0.645
RTD	(0.188)	1946.240			(1,163.830)	(0.003)	0.890	0.618	0.12	0.062
GDP	0.991	390.650			269.490	1.470	0.256	0.476	0.469	0.055
RM2	0.499	1950.140			(1,167.380)	0.010	0.795	0.814	0.137	0.049

KEY
CC = Correlation Coefficient
RMSE = Root Mean Squared Error
STD = Standard Deviation
RMSE/STD = Root Mean Squared Error/Standard Deviation
ME = Mean Error
RC = Regression Coefficient of Actual on Predicted
TH = Theil's Inequality Coefficient
THB = Bias Proportion of Inequality
THV = Variance Proportion of Inequality
THC = Covariance Proportion of Inequality

TABLE 4 RESULTS FOR SIMULATION OVER PERIOD 1973–1991

	CC	RMSE	STD	RMSE/STD	ME	RC	TH	THB	THV	THC
LPRIV	0.992	0.069	0.558	0.108	2.51-D8	1.000	0.005	1.3-D13	0.004	0.996
LPC	0.991	0.060	0.459	0.131	(3.05-D7)	1.000	0.044	2.58-D11	0.005	0.995
LRE	0.682	0.091	0.128	0.469	(0.001)	1.030	0.007	0.0003	0.212	0.787
LRX	0.738	0.297	0.406	0.732	0.078	1.570	0.028	0.056	0.498	0.434
LRM	0.911	0.091	0.227	0.401	0.005	1.000	0.007	0.003	0.047	0.95
GOVE	0.987	256.030	326.282	0.785	221.600	1.600	0.229	0.749	0.226	0.024
LRM1	0.982	0.059	0.223	0.265	(0.002)	0.990	0.006	0.0009	0.016	0.983
GOVR	0.989	321.665	289.000	1.117	279.150	2.130	0.379	0.753	0.226	0.021
NFA	0.770	62.109	99.506	0.624	8.639	0.999	0.166	0.019	0.126	0.855
PY	0.993	0.095	0.795	0.119	(0.012)	0.988	0.027	0.015	0.001	0.983
NEWPUB	0.948	53.570	132.771	0.403	(29.050)	0.870	0.099	0.263	0.056	0.681
RGDP	(0.567)	253.410			223.220	(1.390)	0.170	0.776	0.048	0.176
RTD	(0.345)	2,933.250			(2,213.130)	(0.002)	0.920	0.965	0.016	0.019
GDP	0.973	646.547			512.649	1.756	0.199	0.629	0.322	0.049
RM2	0.902	2,931.810			(2,213.060)	0.014	0.840	0.964	0.022	0.015

KEY
CC = Correlation Coefficient
RMSE = Root Mean Squared Error
STD = Standard Deviation
RMSE/STD = Root Mean Squared Error/Standard Deviation
ME = Mean Error
RC = Regression Coefficient of Actual on Predicted
TH = Theil's Inequality Coefficient
THB = Bias Proportion of Inequality
THV = Variance Proportion of Inequality
THC = Covariance Proportion of Inequality

FIGURE 3.5

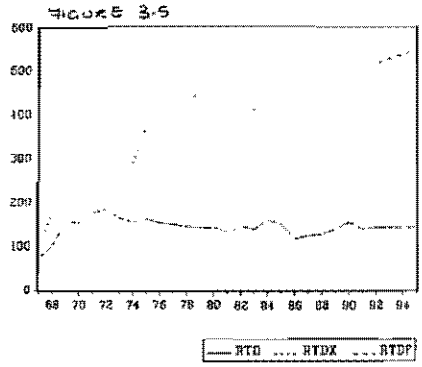


FIGURE 3.6

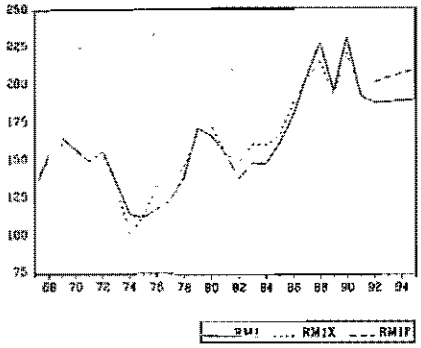


FIGURE 3.7

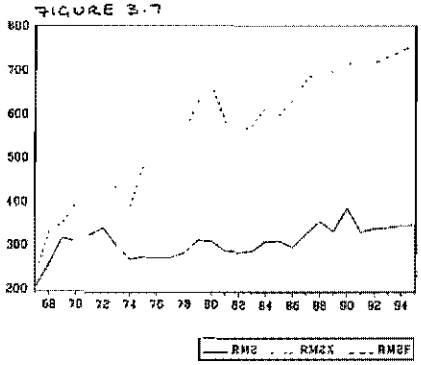


FIGURE 3.8

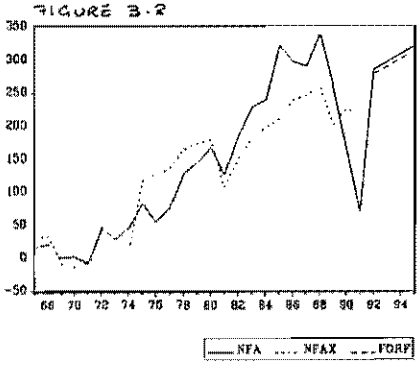


FIGURE 3.1

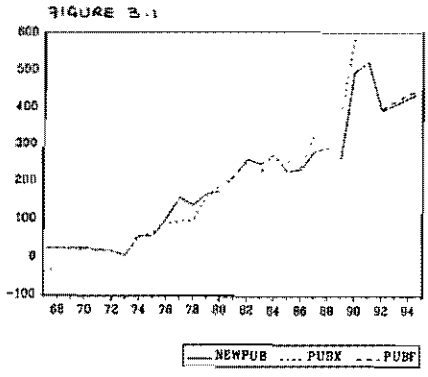


FIGURE 3.2

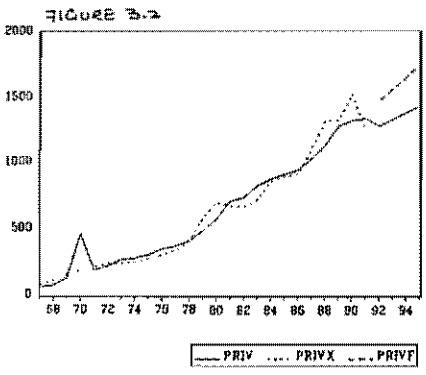


FIGURE 3.3

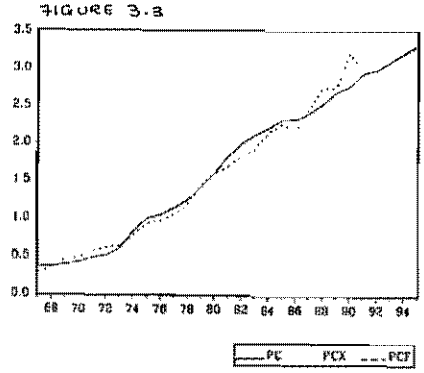


FIGURE 3.4

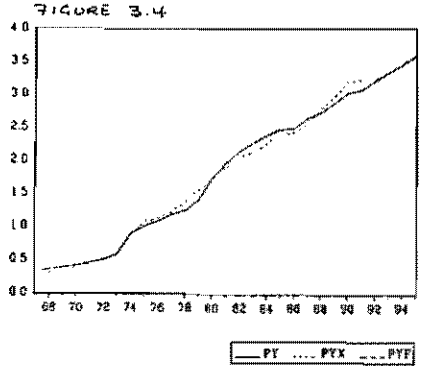


FIGURE 4.5

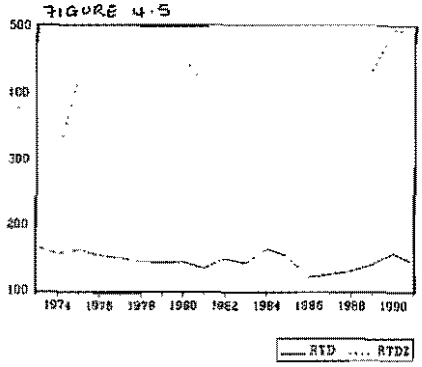


FIGURE 4.6

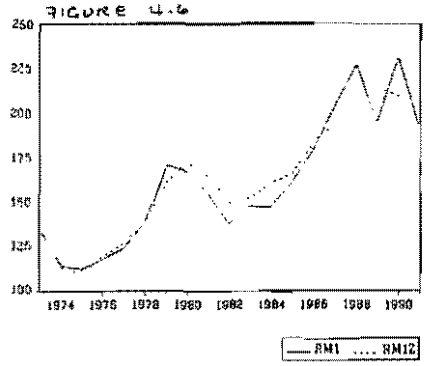


FIGURE 4.7

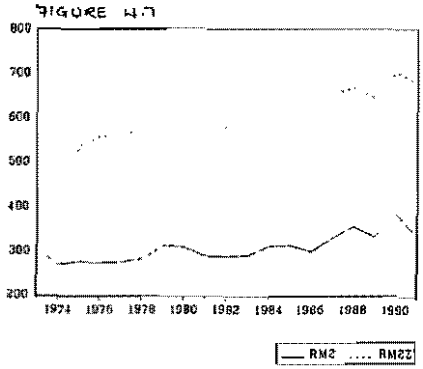


FIGURE 4.8

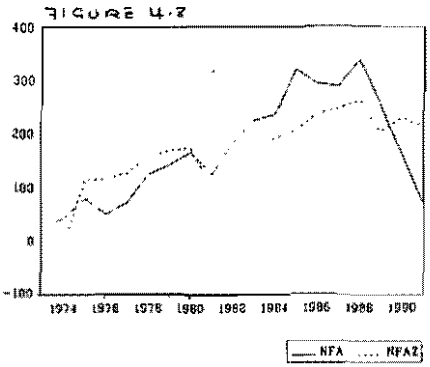


FIGURE 4.1

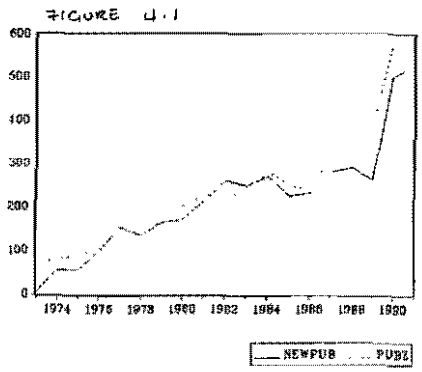


FIGURE 4.2

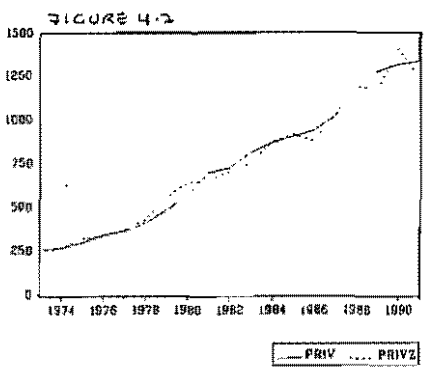


FIGURE 4.3

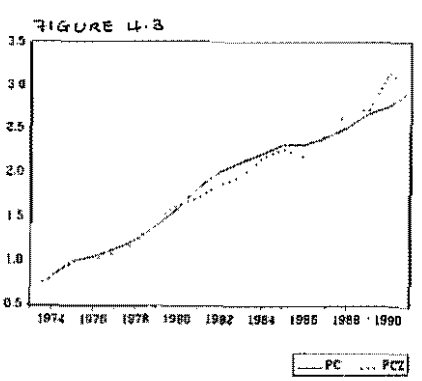


FIGURE 4.4

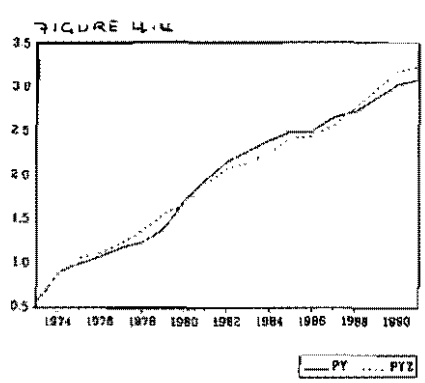


FIGURE 5.5

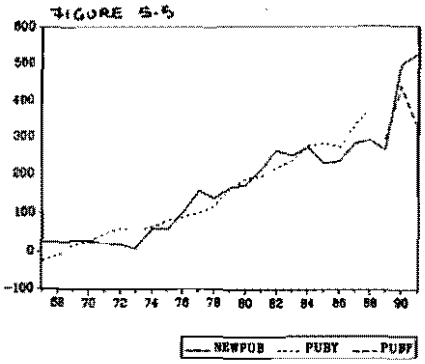


FIGURE 5.6

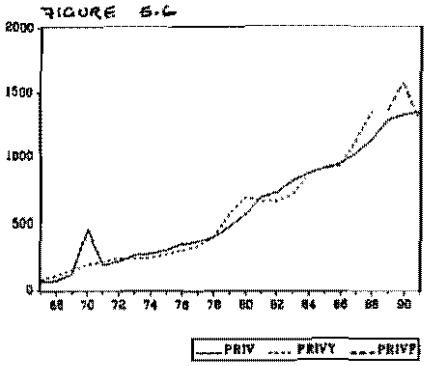


FIGURE 5.7

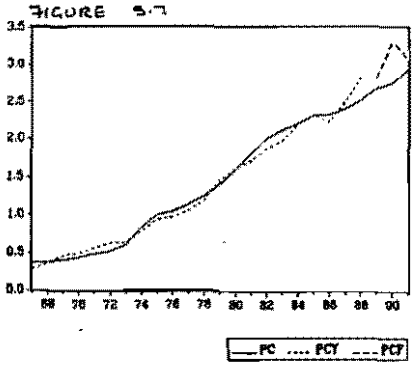


FIGURE 5.8

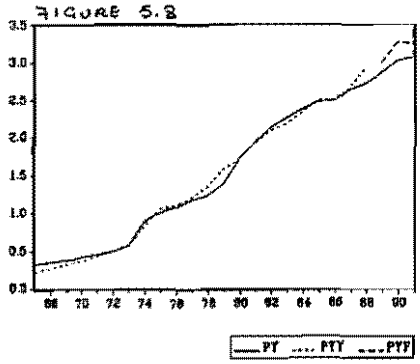


FIGURE 5.1

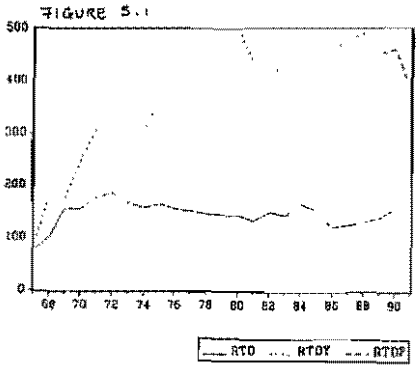


FIGURE 5.2

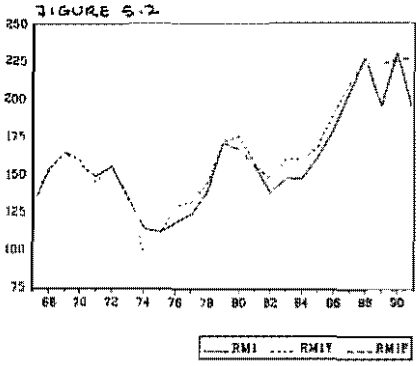
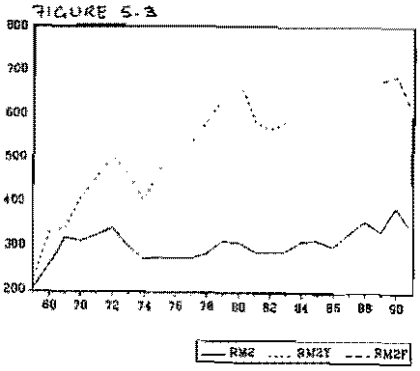


FIGURE 5.3



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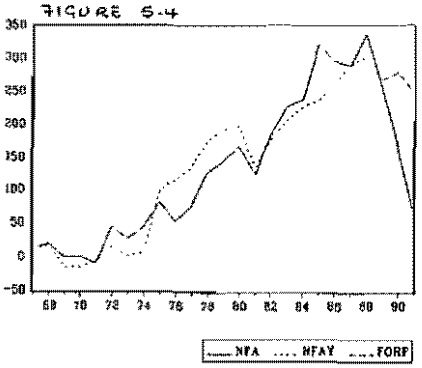


FIGURE 3.9

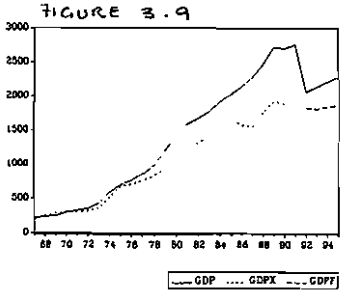


FIGURE 5.9

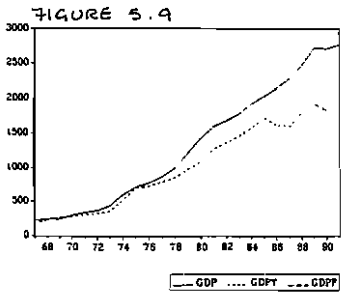
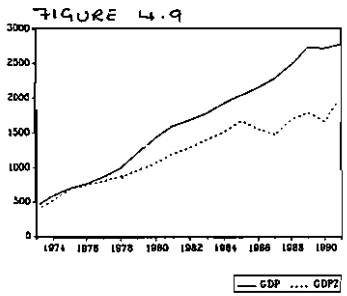


FIGURE 4.9



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