The Rate Of Expansion Of Belize's

Money Supply: Factors Affecting Growth

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I. General Introduction

Over the period 1976 - 1991, Belize's (M2) money supply growth rate has been consistently high as compared to other less developed countries (LDC's) in the Caribbean. As a result, interest has grown as to what have been the major factors affecting the growth of the money supply. This paper is an attempt to reveal the main factors affecting the abnormal growth of money balances.

II. Monetization

Leading economists in Belize have suggested monetization as a major reason for Belize's money growth rate. Monetization is defined as "the enlargement of the sphere of the monetary economy...It involves the extension through time and space of the use of money in all its aspects - namely, as a medium of exchange, a unit of account, and a store of value - to the nonmonetized (subsistence and barter) sector."[1] Empirical evidence has somewhat refuted the suggestion of monetization. Using the ratio of M1/GDP and M2/GDP as indicators of monetization and comparing them with other LDC's, in particular, the Organization of Eastern Caribbean States (OECS), as well as the USA, it was found that the ratio of M1/GDP was similar to those of the OECS countries and the USA ranging between 0.1 and 0.2. The ratio of M2/GDP for Belize seemed to fluctuate in the range of 0.4 - 0.5 absent of any noticeable

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[1] Chandavarkar,A.G. (1977)

trend. The same random fluctuation of the ratio was observed for other OECS countries although the range of fluctuation was much greater (0.35 - 0.75). On the other hand, between 1976 - 1991, USA's M2/GDP steadily increased from 0.4 in 1976 to 0.8 in 1991. These figures indicate a comparatively smaller monetized sector in Belize in regard to the OECS countries and the USA. In addition, given the fact that none of the ratios have shown any consistent rises, the figures also imply that monetization has not been a significant factor affecting the rate of expansion of the M2 money supply.

One must keep in mind, however, that use of the money supply/national income ratio as an indicator of monetization in an economy has met much debate since such a measurement does not separate financial deepening from financial widening of the monetized sector. For instance, it is very likely that the growth in the ratio of M2/GDP for the USA has mainly been due to financial deepening rather than monetization.

Given the inconclusive results obtained on the issue of monetization of the Belizean economy, alternative factors affecting the rate of expansion of the money supply were investigated. An econometric analysis of the major factors affecting the money supply was done utilizing a variant of the partial adjustment model used by Parikh, Booth, and Sundrum in their article, "An Econometric Model of the Monetary Sector in Indonesia (1985)."

Other models were examined[2], however, given limited data, the model used was kept as simple as possible, consistent with the available data, while at the same time most pertinent to the issue at hand - an investigation of the rate of expansion of Belize's money supply.

III. Discussion of the Model

In the partial adjustment model, the public adds a fraction Γ of the difference between the desired and actual supply of the previous period to its previous stock of real money balances. Mathematically,

$$\log(M2/P)_t - \log(M2/P)_{t-1} = \Gamma[\log(M2/P)_t^d - \log(M2/P)_{t-1}] \qquad (A)$$

$$\text{where } 0 < \Gamma < 1.$$

Milton Friedman's modern quantity theory of money is now adopted where demand for money is assumed to be a function of real income (Y_t), interest rate (r_t), and expected inflation rate. The price level lagged one period (P_{t-1}) is used as a proxy for the expected rate of inflation. In real terms:

$$(M2/P)_t^d = f(Y_t, r_t, P_{t-1}) \qquad (B)$$

In logarithmic form:

$$\log(M2/P)_t^d = a_0 + a_1 \log(Y_t) + a_2 \log(r_t) + a_3 \log(P_{t-1}) \qquad (C)$$

Substituting (C) into (A) yields

$$\log(M2/P)_t = a_0\Gamma + a_1\Gamma \log Y_t + a_2\Gamma \log P_{t-1} + a_3\Gamma \log r_t + (1-\Gamma)\log(M2/P)_{t-1} \quad 1)$$

In this model, a priori expectations are that income elasticity

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[2] See Khatkhate Deena R., Galbis, V.G., and Villanueva, D.P. (1974), pp. 740-7; Balino, Tomas J.T. (1977)

($a_1\Gamma$) will be positive while the price coefficient ($a_2\Gamma$) should be negative to reflect the opportunity cost of real money balances relative to real goods. Since M2 will be examined in the model, the sign of ($a_3\Gamma$) is indefinite depending on the importance of quasi-money relative to narrow money.

We now take a look at the components of the (M2) money supply.

$$M2_t = M2_{t-1} + DM_t \tag{D}$$

where DM_t is the change in M2 from period (t-1) to t. DM is decomposed into its components as defined by the identity:

$$DM_t = \delta M = \delta NFA + \delta NDC - \delta OIN \tag{E}$$

δOIN, change in other (net) items, is a residual variable which is assumed to be random in nature. Thus, no further examination of this variable is undertaken.

$\delta NFA = DF_t =$ increase in money supply due to increase in net foreign assets.

$$\delta NDC = DG_t + DI_t + DO_t, \tag{F}$$

where

$DG_t =$ increase in money supply due to domestic borrowing by central government,

$DI_t =$ increase in money supply due to private sector borrowing,

$DO_t =$ increase in money supply due to other public entities borrowing.

DO is not examined in this paper as it is treated as an exogenous factor irresponsive to any economic trend. DF is assumed to be a function of exports (X), imports (M), and domestic credit to both the private sector (DI) and central government (DG).

$$DF_t = b_0 + b_1 X_t + b_2 M_t + b_3 DI_t + b_4 DG_t \qquad (2)$$

Next, we have the following identity:

$$DG_t = (R_t - E_t) + FA_t = BDEF_t + FA_t \qquad (G)$$

R_t = total government revenues

E_t = total government expenditures

$BDEF_t$ = budget deficit/surplus

FA_t = financing from abroad

Unfortunately, FA was not available. Moreover, recurrent revenue and expenditure had to be used instead of total figures. DG was therefore made a function of the government budget deficit/surplus (BDEF), DI, DF, and the dummy variable PRIV which is included to account for the effect of privatization of Belize Telecommunications Limited (BTL).

$$DG_t = c_0 + c_1 BDEF_t + c_2 DI_t + c_3 DF_t + c_4 PRIV_t \qquad (3)$$

Financing from abroad (FA) is an expectedly important factor to DG. However, due to unavailable data, this variable could not be included in the DG model. Decomposing the budget deficit/surplus, we have:

$$R_t = d_0 + d_1 Y_t + d_2 M_t + d_3 S4_t, \text{ and} \qquad (4)$$

$S4_t$ = seasonal variable for Quarter IV

$$E_t = e_0 + e_1 R_t + e_2 EL_t \qquad (5)$$

EL_t = dummy variable for election time

In the private sector, we have:

$$DI_t = f_0 + f_1 Y_t + f_2 DF_t + f_3 PRIV_t + f_4 USP_t + f_5 USY_t \qquad (6)$$

USP_t = U.S. price level

USY_t = U.S. (real) national income

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IV. Data Usage

Although the period under examination was 1976 - 1991, quarterly data was only available starting 1983. Thus, most of the analysis is done using quarterly data beginning in 1983. For money supply (M2), national income (Y), price level (P), interest rates (R), exports (X), and imports (M), 36 observations (N) were available. Only 35 observations were available for DG, DI, and DF since one time period was lost due to differencing. Major problems arose with government data. Total revenues and expenditures (including capital revenues and expenditures) were not available therefore recurrent figures had to be used as a proxy for total figures. Quarterly data was only available for recurrent revenues and expenditures from 1987 leaving only 20 observations respectively for these two variables. In the case of financing from abroad (FA), only 8 quarterly figures were available forcing us to omit this ostensibly important variable. Concerning US data, quarterly figures were available only up to 1991.1 leaving 33 observations available for analysis.

Belize's price level (P) was measured using the CPI with 1983 as the base year. National income (Y) was measured in constant 1984 dollars using figures on Gross Domestic Product at factor cost. These figures were available only on an annual basis. As a result, the use of interpolation was necessary to convert these annual figures to quarterly figures. Both the US price level (USP) and the US national income (USY) were measured in 1982 prices.

All other data was measured in nominal terms.

Additionally, it must be pointed out that figures for the Belize CPI index, revenues, and expenditures, are highly questionable. The basket of goods used in calculating the CPI index is highly exclusive and may not reflect the actual change in Belize's price level. Figures for revenues and expenditures may also be distorted since disbursements, amortisation, and sinking fund, all components of financing, specifically - financing from abroad, were included at some period or the other between 1987 and 1991 in the recurrent revenues and expenditures figures.

V.   Empirical Results

Table 1

Variable Name	Reg-Coeff	t-statistic
log(M2/P)		
Intercept	2.698	1.911
log Y	0.233	1.902
log P[1]	-0.728	4.715
log(M2/P)[1]	0.458	4.698
time	0.058	7.970

Table 2

Variable Name	Reg-Coeff	t-statistic
DF		
Intercept	-6503.227	1.557
X	245.864	2.660
M	5.144	0.093
DI	-0.702	5.094
DG	-0.836	6.795

Table 3

Variable Name	Reg-Coeff	t-statistic
DG		
Intercept	1418.419	0.603
BDEF	0.215	1.540
DF	-0.529	4.915
PRIV	-20212.816	3.750
DI	-0.393	2.662

Table 4

Variable Name	Reg-Coeff	t-statistic
R		
Intercept	-13854.825	2.145
Y	0.095	3.845
M	128.055	1.787
S4	6605.365	3.950

Table 5

Variable Name	Reg-Coeff	t-statistic
E		
Intercept	19330.486	5.512
R	0.304	4.082
EL	3739.915	2.479

Table 6

Variable Name	Reg-Coeff	t-statistic
DI		
Intercept	-8683.222	0.239
Y	0.135	1.880
DF	-0.623	5.021
PRIV	15078.800	2.417
USP	-226075.736	2.422
USY	59.85	3.585

Table 7

Equation	F-value	critical t	R^2	DW	DOF
1	837.00 (2.47)	1.695	0.99	0.70*♥	31
2	27.27 (2.69)	1.697	0.78	1.47**	30
3	22.55 (3.06)	1.753	0.86	2.20*	15
4	50.58 (3.24)	1.746	0.90	2.03*	16
5	10.90 (3.59)	1.740	0.56	2.32*	17
6	12.69 (2.59)	1.706	0.66	2.04*	26

() indicates critical F-value
♥ indicates Durbin h statistic
* indicates no autocorrelation +/-
** indicates zone of indecision
DW Durbin Watson value
DOF degrees of freedom
R^2 coefficient of determination
Note: t-statistics are given in absolute values

The partial adjustment model shows that real money balances is a stable function of real income, expected prices, and lagged real money balances with a priori expectations affirmed. Furthermore, a time variable was included as an explanatory variable to account for any trend of technological development of the financial system. This variable proved to be highly significant indicating a 5.8% quarterly growth rate of the M2 money supply. The interest rate variable was not statistically significant and was eliminated from the model. Its exclusion from the model did not affect the other variable appreciably. Using the partial adjustment coefficient [r=1-0.4576=0.5424], the long run income elasticity turned out to be 0.4294. The short run income elasticity was 0.2329.

The DF equation of change in net foreign assets indicates that

DF is significantly affected by exports (X), DI, and DG. DF is positively related to X while it is negatively related to DI and DG. Imports (M) were not a statistically significant factor in the analysis, although its exclusion from the model caused notable changes in the values of the regression coefficients and the t-statistics.

For domestic credit to central government, DF, PRIV, and DI were all inversely related to DG while BDEF was positively related to DG. BDEF was not statistically significant, however. Unreliable and unavailable data (especially FA) may be major reasons for this unexpected result. Despite these results, an evaluation of government revenues and expenditures was still carried out. Government revenues proved to be dependent on real income and imports indicating the importance of income tax and duty to revenues. The statistical significance of the seasonal variable (S4) for Quarter IV shows that government revenues rises in the fourth quarter due to substantially increased imports. Government expenditures were not well explained by the variables, R and EL, although they were positively statistically significant.

Finally, in the case of domestic credit to the private sector, it was found that DI is positively related to real income, US real income, and PRIV, while it was inversely related to the US price level and change in net foreign assets (DF). All explanatory variables were individually significant at the 5% level.

VI. <u>Interpretation of Results</u>

The partial adjustment model indicates that income elasticity is rather low implying that the level of monetization is also low. Nevertheless, a bisection of the data into two equal periods and an analysis of both periods separately demonstrate that the short and long run income elasticities have risen. The interest rate variable, according to empirical results, has no effect on the dependent variable, real money balances. This may be because interest rates in Belize are partially fixed to the extent that the Central Bank of Belize sets minimum deposit and lending rates. A simple review of the interest rates will reveal that there is very little variation in interest rates from one period to the next. Additionally, before the time (t1) variable was included, most of the change in M2 was explained by real income with real income displaying a high t-statistic. After t1 was added to the model, the t-value for log Y fell considerably. This is due partly to the fact that real income along with real money has been exhibiting consistent growth. The time variable verifies the consistency of growth in M2 indicating a 5.8%/qtr. growth rate. On a whole, the partial adjustment model very closely explains any variation in real money balances. One other occurrence deserving mention, despite not being accounted for in the partial adjustment model, was the privatization of BTL in 1988 primarily during the second quarter. This oddity created an unusual jump in the growth rate of real money balances for the same time period (1988.2). In essence,

shares were bought through the use of foreign assets via the Central Bank. Although DG fell because of increased government deposits, the significant jump in DF and DI led to an abnormal rise in M2 for the relevant time period.

In the DF model of change in net foreign assets, exports proved to be positively related to DF. To better understand why, let us look at a hypothetical example. In an export transaction, the domestic producer sells to a foreign purchaser. The foreigner pays in foreign currency the producer's commercial bank. The bank pays the domestic producer in local Belizean currency while crediting its foreign assets (DF) account with the foreign currency it has received. Consequently, DF rises. Essentially, an increase in exports (X) will result in an increase in foreign assets. Domestic credit to central government and to the private sector is inversely related to foreign assets (DF). A possible explanation may be found by looking at import transactions and the overdraft facility. Primarily in the private sector, a company importing goods may utilize the overdraft facility should its deposits be insufficient. This procedure will lead to a rise in DI. At the same time, the imports will cause foreign assets to fall. Another proposed panacea is that domestic credit acts as a substitute to foreign assets where foreign assets serve as a proxy for income from abroad. For instance, when a farmer exports, his/her income essentially comes from abroad. If he/she should have a bad harvest one year and cannot export enough to sustain his/her operational expenses, he/she may be forced to make loans from the banking

system. Basically, then, a fall in exports (X) and thus a fall in foreign assets leads to a rise in domestic credit to the private sector. For reasons of simplicity, central government can be understood as a private company which will act rationally according to one of the explanations above with respect to change in foreign assets (DF).

Looking at the DG model, the budget deficit/surplus (BDEF) comprising of government revenues and expenditures is not statistically significant in the model. This leaves doubt as to the validity of the revenues and expenditures figures since DG should be equal to total revenues minus total expenditures plus financing from abroad given identity (G). We do find that DG is significantly inversely affected by DF, PRIV, and DI. When DF increases (decreases), exports are going up (down) or imports are going down (up). Since imports are a major source of government revenues (through duty) while exports are not, we will focus on imports. When imports go down, government revenues fall. Since expenditures are generally fixed in the short run, Government must turn to both domestic financing (DG) and financing from abroad (FA) to cover their expenditures. In general, most financing comes domestically (DG) and thus DG is expected to rise when R falls.

DI is related to DG through taxation. For example, when demand for imports goes up (down), DI goes up (down) so that the private sector can purchase more (less) imports. Government revenue rises (falls) through increased (decreased) duty payments and DG consequently falls (rises) due to increased (decreased)

government deposits.   For taxation on income, taxes act as a leakage which reduces the money balances through a fall in private sector deposits. DI remains unaffected however government deposits increase leading to a fall in DG.   Overall, DG will rise (fall) when DI fall (rises).

Concerning the privatization of BTL, DG was found to be statistically inversely affected by PRIV. The sale of BTL shares by central government meant much higher government revenues than normal. These increased revenues led to a huge jump in government deposits and a consequent drop in domestic credit to government.

In the R model of government revenues, we find that government revenue is a function of real income, imports, and the seasonal variable for Quarter IV. Import duty, as expected, has an enormous impact on government revenue. The effect of imports on revenue can also be seen through the seasonal variable since imports rise dramatically in the last quarter of every year (because of Christmas season). The importance of income tax to government revenue is also verified by this model.

The E model of government expenditure shows that government expenditure does depend to a certain extent on government revenues. It is also likely that E depends on financing from abroad. The EL variable signifying election time shows that government expenditure skyrockets when election time comes around. More importantly, we find that government expenditure has no specific trend, cycle, or seasonality. Clearly, although the independent variables R and EL were significant at the 5% level, government expenditure is not a

stable function of these variables. The R^2 value, as an indicator, is only 0.56. This is not at all unexpected as government expenditure seems to be more determined by social and political factors (discreet) rather than rational economic decision making.

In the DI model, we find that DI is negatively affected by DF. The relation between these two variables arises through international trade transactions. When exports go up, causing DF to go up, the domestic producer receives money which he/she can use to make loan repayments thereby pushing DI down. On the side of imports, as imports go down and DF resultingly goes up, the private entrepreneur can reduce his current level of borrowing to finance the imports. DI goes down and the inverse relationship is maintained. Belize's real income also significantly affects DI. As national income rises, people are more apt to make investments. In so doing, DI rises as Y rises. It is interesting to note that the privatization of BTL seems to have had a positive effect on Belize's financial system as DI did rise in relation to PRIV.

We now look at the effect of foreign economies on Belize's money supply. USP and USY are used as reliable proxies for the foreign price level and foreign real income since foreign intervention in Belize's economy is dominated by the U.S. Both variables are statistically significant in the DI model where USY is positively related to DI while USP is negatively related to DI. Interestingly, Belize's price level was initially included in this model, however, it seemed to have no appreciable effect on DI. A major reason why Belize's DI and economy, for that matter, is

determined by the performance of the US economy is the fact that Belize's currency remains tied to the US dollar. As the US economy enters an inflationary phase, so does Belize's economy. Specifically, when the US price level rises, the purchasing power of the Belize dollar falls. People will increase their demand for narrow money so as to convert their nominal money into real assets. As a consequence, banks have less money to use for loans mainly to the private sector thereby causing DI to fall. On the other hand, when US real income rises, the Belize M2 money supply rises. Investment concurrently rises through increased loans and advances (DI) that are made available by an increased M2.

In passing note, Belize's real income and price level proved to be stable functions of the US real income and the US price level respectively.

VII. Conclusion

In this paper, results show that Belize's money supply depends heavily on international trade and the performance of the US economy. This can be problematic since the Central Bank of Belize is left powerless in controlling the money supply especially in the case of contracting the money supply.[3] Any shock to the US economy will unavoidably have a major effect on Belize's economy as well. Despite suffering from such vulnerability, we should embrace the situation and encourage more international trade with the

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[3] Park,Y. Chul (1973)

assistance of the government through the reduction of barriers to entry.

In this investigation of the money supply, we also found that growth in net foreign assets was the major impetus in the growth of the money supply. This is a good indicator of economic development and growing strength in the economy. It implies that investment from abroad has risen which intrinsically implies that the real rate of return on investment in Belize has grown relative to other countries. Additionally, what seems to have been a stimulant or catalyst to money (as well as economic) growth through private investment has been government ventures of privatization. This hypothesis may appear to be premature and unfoundedsince we have only one legitmate example - namely, BTL - yet if we look at the recent undertakings of our Latin American brothers, we will notice that privatization has been a key to their economic resurgence.[4]

Another interesting, although expected, discovery was the unpredictability of government expenditures. Moreover, what proved to be even more intriguing was the fact that government expenditures grew tremendously in times of election. Having gained such knowledge, we are left to wonder what exactly does this mean.

Finally, in investigating the possibility of monetization in Belize, there seems to be an indication of a slow rate of monetization contributing to the rate of expansion of the money

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[4] Baker, S., Weiner, E., Smith, G., Charters, A., and Jacobson, K. (June 15, 1992), pp. 16-20.

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supply. It does not appear to be the major force behind the growth

of M2; instead, our empirical results have generally pointed us to

the factors mentioned above.

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