THE CENTRAL BANK OF THE BAHAMAS

# AN ECONOMETRIC STUDY OF COMMERCIAL BANK DEPOSIT LIABILITIES IN THE BAHAMAS 1973 - 1979

by

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## INTRODUCTION

Commercial banks are the most important financial institutions in the Bahamas in terms of the value and volume of financial intermediation. Indeed, banking and finance is the second largest industry and is estimated to contribute some 11% to the Gross Domestic Product. The commercial banks in the Bahamas are all branches of transnational banks. They are the dominant mobilizers of short and medium term savings and the prime suppliers of short term capital.

The capacity to grant credit is one of, if not the most important function of a bank and the extent to which it can effectively and efficiently do this depends on the ability to raise funds. Deposits are the most important source of funds and ultimately determine the size of a bank's portfolio. For monetary policy reasons, therefore, it is important to be able to determine the factors which influence the demand for bank deposits because of the implications for money supply analysis and commercial bank portfolio behaviour.

This is an exploratory study which estimates some demand functions for commercial bank deposit liabilities with a view to identifying the factors which affect the demand for these financial assets in The Bahamas. The paper will be organised as follows. Section one provides the theoretical framework for the analysis. In section two the orthodox model of demand for money is estimated and the results presented. In section three, the results are evaluated. Section four concludes with a discussion of the limitations of the study and offers some suggestions for future research.



## Framework of Analysis

There are at least two broad views prevailing in the literature on the determinants of national savings. One view which emanates from the classical and neoclassical schools emphasises the rate of interest. The other view expounded from Keynes and other contemporary economists, such as, Franco Modigliani and Milton Friedman focuses on income.

The main architects of the classical theory were David Ricardo, John Stuart Mill and Alfred Marshall. The classicals' argument is summed up in this quote from Alfred Marshall:

"The whole of man's income is expended in the purchase of services and of commodities. It is indeed commonly said that a man spends some portion of his income and save saves another. But it is a familiar economic axiom that a man purchases labour and commodities with that portion of his income which he saves just as much as he does with that he is said to spend...., He is said to save when he causes the labour and the commodities which he purchases to be devoted to the production of wealth from which he expects to derive the means of enjoyment in the future".[1]

According to the classicals, the amount that is saved will be determined by the rate of interest. As interest rates rise people will be inclined to save more and consume less.

The Keynesian revolution based on under-employment equilibrium made saving a function of income and income a function of investment as opposed to the classical and neoclassical view of saving as a determinant of investment. The notion of a consumption function

originated in macro-economic theory with Keynes 'General Theory'. stated an a priori relationship between consumption and income. In mulating this relationship he made several propositons; two of which were that real consumption is a stable function of real income and the marginal propensity to consume (MPC) is positive but less than unity. He also postulated that MPC is less than APC (which implies that APC declines as income rises) and that MPC falls as income rises.[2]

Keynes explicitly related saving to income through his psychological propensity to consume. Since saving is income minus consumption and since consumption is assumed to increase less than proportion to income (predicated on the proposition that MPC falls as income rise then saving should increase more than proportionately to income.

Other economists, such as J.S. Duesenberry, Ando and Modigliani and M. Friedman have argued that saving behaviour is determined not on by current income but also by past levels of income, the rate of incom growth and the age distribution of households. According to Duesenber saving depends on the level of current incomes relative to higher incc in previous years and also on the absolute level of income:

$$s_t = f(y_t, Y_t/Y_o)$$

where

$Y_t$ = current income

$Y_o$ = highest income attained previous to year t.

Duesenberry's Relative Income Hypothesis may be seen as an improvement over Keynes' Absolute Income Hypothesis in the sense that it introduces a new explanatory variable, lagged real income, into the analysis of saving behaviour.

The basic idea of Friedman's Permanent Income Hypothesis[4] and Ando/Modigliani's Life Cycle Hypothesis[5] is that a consumer plans his expenditure not on the basis of income received but rather on the basis of his long-run of lifetime income expectation. These theories are, therefore, based on the solution to the problem of consumer choice where the individual tries to maximize

$$U = U(C_o, \text{----}, C_t, \text{----}, C_T)$$

subject to the present value constraint.

In its simplest form, the linear equation in Friedman's analysis is:

$$S_t = a_o + a_1 Y_{P_t} + Y_{T_t}$$

where

$Y_{P_t}$ = permanent income

$Y_{T_t}$ = transitory income

Friedman theorizes that changes in transitory income will result directly in changes in the level of saving since consumers save more out of transitory income than permanent income. Most of the empirical studies on the Permanent Income Hypothesis support this hypothesis.[6]

The Ando/Modigliani Life Cycle Hypothesis assumes that individuals attempt to spread their lifetime consumption evenly over their lives by accumulating enough savings during their earning years to maintain

when consumption expands during retirement. Consequently, in a society with a growing population and/or growing per capita income aggregate net personal saving is positive because the working population tends to be larger than the retired population. The higher the level of current per capita income, the larger will be the amount of saving necessary to maintain an individual's consumption level in retirement. Therefore, an increase in income in a particular year will affect that year's consumption but will also increase savings since an individual seeks to equalize consumption over his remaining lifespan.

The strength of Friedman's and Ando/Modigliani's theories is related to the acceptance by many economists of the proposition that people base their current consumption/saving decisions on more than just current and past levels of income. Saving may also be influenced by other factors, such as inflation, the general investment climate, savings propensities, as well as certain non-economic factors. For instance, differences in the savings rate of different countries or regions may be due to sociological, political, institutional or cultural considerations.[7]

The foregoing discussion attempts to identify the various factors, economic and non-economic, that influence the growth of real savings. Real savings may be defined as savings devoted to capital accumulation that is Net National Product minus Consumption. Income-earners may save and invest their savings to earn interest either on the capital market or they may place them in financial institutions. Savers are different from investors and since we will hardly have a situation of equilibrium in the market, financial savings may exceed investment or investment may outstrip savings. In the first instance, interest will fall and investment may or may not increase depending, inter alia, on investors' profit expectations. In the second case, the growth in investment will ultimately result in growth in money income. Financial savings may grow if interest rates are sufficiently attracti otherwise the growth in money income will be reflected in a higher rate of inflation particularly in a relatively closed economic system.

Financial savings will normally move in line with real savings and since commercial banks are generally the most significant mobilize of financial savings, if these savings increase then deposits should increase pari passu. Furthermore, if the banks increase interest rates on deposits this will reinforce the increase in deposits through a net shift in the asset preference of wealthowners toward bank deposits, especially if non-bank financial intermediaries do not increase their rates correspondingly.

It is a widely held view among economists that inflation reduces savings.[8] Inflation results in a loss of real income to savers, thus reducing the capacity to save. If we assume that inflation causes the household sector to lose income to the business sector, then deposits will fall since the household sector generally holds more deposits than the business sector. However, as Bourne notes[(2)], the impact of inflation also depends on the extent to which individuals can protect the real value of their financial assets, as well as provide an additional source of income, by holding a greater proportion of those assets whose nominal yields are higher and/or tend to vary with the general level of prices. Such assets may include time deposits, equities, and unit trusts. But if capital markets are not sufficiently developed, then the choice open to most savers will be limited to time deposits. It is quite conceivable, therefore, that

in a period of inflation some income earners may save more out of co
for future security and this may take the form of a relatively secur
asset, such as, time deposits.

It has been suggested that since inflation redistributes income in favour of the investor class, then the decrease in savings that o would expect due to inflation would be offset to some extent by an increase in savings from this class of savers. But there is no a pr reason to expect that these individuals will have a higher propensit to save particularly since they are known to favour conspicuous cons tion.

As Worrell observes [27], a change in the propensity to save will normally affect the rate of accumulation of financial assets since fi cial institutions are initially the direct recepients of intended sa However, financial assets in the form of bank deposits will not neces sarily increase as it depends on which sector of the economy is accu lating financial assets more rapidly. If we assume that it is the ho hold sector, then deposits should increase. If we assume that the business sector is acquiring more financial assets than the household sector, then other forms of assets may be accumulated rather than dep However, if the choice of financial assets are limited due to undeve money and capital markets, then the business sector may find deposit attractive particularly time deposits.

Savings may also depend on certain institutional factors such the level of development of the banking sector which, in addition to the institutionalisation of the banking habit, will have an expansio effect on deposits. Individuals may prefer to hold deposits for man reasons, such as, liquidity or to earn interest. In all, there is l





risk involved in holding assets in the form of bank deposits. Although the income earned from saving in long-term securities is higher than that from deposits, the risk incurred in the former is far greater.

Finally, the growth of commercial bank deposit liabilities is due to supply as well as demand considerations. Deposits are also supply-determined owing to the fact that banks create deposits when they lend. Bank deposits may increase, therefore, as a result of an expansion in bank lending. Although the study focuses on demand, we should also be aware of the supply side because of the problem it poses for econometric analysis, namely, that of 'identification'. When we relate the demand for deposits to the different variables, we should bear in mind that we are measuring both a demand and supply function and not a demand function only.

## The Model

We will now estimate the demand functions for the four categories of bank deposits - total deposits, demand deposits, saving deposits and fixed deposits - for the period 1973 - 1982. The demand functions may be expressed in real terms as follows:

$$D = f(GDP, \dot{P}, r) \quad (1)$$

where D = real total deposits, demand deposits, savings deposits or time deposits

GDP = income in constant prices

$\dot{P}$ = rate of inflation

r = rate of interest on bank deposits

Owing to limited computer capacity, only two explanatory variables could be included in a particular model specification. Consequently, a number of different specifications were formulated. The functional form of the models were assumed to be linear. The demand functions that were estimated are shown below:

$$D = B_0 + B_1GDP + B_2\dot{P} \quad (2)$$

where D = total deposits

$$DD = B_0 + B_1GDP + B_2\dot{P} \quad (3)$$

where DD = demand deposits



where SD = savings deposits

$$FD = B_0 + B_1GDP + B_2\dot{P} \quad (5)$$

where FD = fixed deposits.

$$D = B_0 + B_1GDP + B_2RSD \quad (6)$$

where RSD = rate of interest on savings deposits

$$DD = B_0 + B_1GDP + B_2RSD \quad (7)$$

$$SD = B_0 + B_1GDP + B_2RSD \quad (8)$$

$$FD = B_0 + B_1GDP + B_2RSD \quad (9)$$

$$D = B_0 + B_1GDP + B_2RFD \quad (10)$$

where RFD = rate of interest on fixed deposits

$$DD = B_0 + B_1GDP + B_2RFD \quad (11)$$

$$SD = B_0 + B_1GDP + B_2RFD \quad (12)$$

$$FD = B_0 + B_1GDP + B_2RFD \quad (13)$$

## Empirical Results

This section presents some regression results and income elasticity estimates. The equations were estimated by the ordinary least squares technique. All the variables except interest rates are expressed in real terms with the retail price index (November/December 1971 = 100)

as the deflator, in the absence of a more appropriate deflator. Gross Domestic Product was used as a proxy for national income. The fixed deposits rate is that on deposits of three months maturity under the assumption that movements in this rate adequately proxy the rates on other maturities. The statistics in parentheses are t-ratios.

The models represented by equations (2) to (5) were fitted to annual data for the period 1973 - 1979 and the results are as follows:

$$D = 1{,}946.33 - \underset{(-0.29)}{1.80GDP} + \underset{(1.88)}{1.68\dot{P}} \quad (14)$$

$R^2 = 0.0087$ SEE = 202.11 F = 0.00

$$DD = 604.30 + \underset{(0.93)}{1.94GDP} + \underset{(1.12)}{0.34\dot{P}} \quad (15)$$

$R^2 = 0.0195$ SEE = 70.91 F = 0.12

$$SD = 435.47 + \underset{(0.72)}{1.24GDP} + \underset{(1.16)}{0.29\dot{P}} \quad (16)$$

$R^2 = 0.0156$ SEE = 57.92 F = 0.08

$$FD = 905.88 - \underset{(-1.34)}{4.98GDP} + \underset{(1.93)}{1.05\dot{P}} \quad (17)$$

$R^2 = 0.0447$ SEE = 125.89 F = 0.09

An attempt will be made in section four to discuss some of the possible reasons for these generally poor results. A few observations may be made at this point. Firstly, contrary to a priori



reasoning, the income coefficient estimate is insignificant in all cases. The sign of the income coefficient is negative for total deposits and fixed deposits but positive for savings and demand deposits.

Secondly, the estimate of the inflation variable is also insignificant in all cases and surprisingly enough all the signs of the inflation coefficient are positive. Thirdly, the equations had little explanatory power as evidenced by the extremely low $R^2$.

The results of the models specified in equations (6) to (13) are presented below:

$$D = 1{,}934.25 + \underset{(0.36)}{0.19GDP} + \underset{(1.87)}{3.17RSD} \quad (18)$$

$R^2 = 0.0010$ SEE = 202.76 F = 0.01

$$DD = 616.73 - \underset{(-0.18)}{0.03GDP} + \underset{(1.16)}{0.67RSD} \quad (19)$$

$R^2 = 0.0003$ SEE = 68.75 F = 0.004

$$SD = 443.80 - \underset{(-0.58)}{0.08GDP} + \underset{(1.20)}{0.57RSD} \quad (20)$$

$R^2 = 0.0010$ SEE = 56.72 F = 0.003

$$FD = 872.90 + \underset{(1.02)}{0.32GDP} + \underset{(1.88)}{1.94RSD} \quad (21)$$

$R^2 = 0.0028$ SEE = 123.42 F = 0.02

$$D = 1{,}963.46 - \underset{(-1.86)}{4.53GDP} + \underset{(1.89)}{2.18RFD} \quad (22)$$

$R^2$ = 0.0218 SEE = 202.82 F = 0.02

$$DD = 623.10 - \underset{(-1.28)}{1.06GDP} + \underset{(1.18)}{0.46RFD} \quad (23)$$

$R^2$ = 0.0106 SEE = 68.84 F = 0.01

$$SD = 449.69 - \underset{(-1.51)}{1.03GDP} + \underset{(1.21)}{0.39RFD} \quad (24)$$

$R^2$ = 0.0129 SEE = 56.90 F = 0.01

$$FD = 890.02 - \underset{(-1.65)}{2.45GDP} + \underset{(1.91)}{1.34RFD} \quad (25)$$

$R^2$ = 0.0222 SEE = 123.17 F = 0.01

As a general note, the substitution of an interest rate variable for the inflation variable caused no improvement in the results. More specifically, the income coefficient in all instances are insignifica The sign of the income coefficient is positive in equations (18) and (21) but negative in all the other equations.

The estimates for the interest rate variable are all insignific However, the signs of the interest rate coefficients in equations (1 (20), (22) and (25) are correct. The models represented by equation (18) to (25) have gained nothing in terms of explanatory power as both $R^2$ and F statistics are smaller.

In an attempt to determine the influence of interest rates only some demand equations were estimated using interest rates as the exp tory variables. The results are as follows:



$$D = 1,974.38 - \underset{(-1.83)}{687RSD} + \underset{(0.36)}{0.20RFD} \quad (26)$$

$R^2$ = 0.0022 SEE = 204.48 F = 0.05

$$DD = 625.98 - \underset{(-1.29)}{1.64RSD} - \underset{(-0.21)}{0.04RFD} \quad (27)$$

$R^2$ = 0.0009 SEE = 69.15 F = 0.03

$$SD = 452.52 - \underset{(-1.52)}{1.60RSD} - \underset{(-0.62)}{0.09RFD} \quad (28)$$

$R^2$ = 0.0031 SEE = 57.28 F = 0.04

$$FD = 895.12 - \underset{(-1.58)}{3.61RSD} + \underset{(1.01)}{0.33RFD} \quad (29)$$

$R^2$ = 0.0054 SEE = 123.74 F = 0.03

None of the interest rate coefficient estimates in equations (26) to (29) were statistically significant. However, the signs of the coefficients were correct in most instances. It is interesting to note that the sign of the savings deposits rate in equations (26) and (28) has changed to a negative. Indeed, when savings deposits were regressed against the savings deposit rate only as shown in the following equation, no significant relationship was discerned and the sign remained negative.

$$SD = 837.61 - \underset{(-0.66)}{98.05SDR} \quad (30)$$

$R^2$ = 0.0989 SEE = 467.35 F = 1.97

A similar equation was estimated for fixed deposits with the rate of interest on fixed deposits as the sole explanatory variable. The results are shown below:

$$FR = 1,362.53 - \underset{(-2.77)}{79.31RFD} \quad (31)$$

$R^2$ = 0.6579 SEE = 580.91 F = 1.91

The interest rate coefficient was statistically significant at the 5 per cent level and the value of $R^2$ is reasonably high. However, the sign of the coefficient estimate is wrong.

The results presented so far have been generally poor and clearly suggest the need for a further change in the specification of the model. The results of an alternative specification are shown below.

$$D = -55.61 + \underset{(5.22)}{317.98GDP} \quad (32)$$

$R^2$ = 0.8718 SEE = 2,379.42 F = 1.99

$$DD = 197.43 + \underset{(1.42)}{66.93GDP} \quad (33)$$

$R^2$ = 0.3344 SEE = 503.75 F = 1.96

$$SD = 87.35 + \underset{(1.48)}{56.84GDP} \quad (34)$$

$R^2$ = 0.3541 SEE = 427.59 F = 1.96

$$FD = -347.14 + \underset{(5.65)}{195.17GDP} \quad (35)$$

$R^2$ = 0.8886 SEE = 1,460.35 F = 1.99

The results are generally better. The income coefficent estimates in equations (32) and (35) are significant at the 5 per cent and 1 per cent levels and the signs of the income coefficients are all correct.

Secondly, with the inflation variable and the interest rate variable dropped, the explanatory power of all the equations have increased considerably particularly in the case of equations (32) and (35). This indicates that inflation and interest rates are not important variables in the demand for commercial bank deposit liabilities.

Table I below gives the income elasticity estimates for commercial bank deposit liabilities.

Table I: Income Elasticity Estimates*: Commercial Bank Deposit Liabilities

| Dependant Variable | GDP |
|---|---|
| D | 1.0254 |
| DD | 0.6812 |
| SD | 0.8040 |
| FD | 1.3933 |

*Elasticities were computed at the point of means.

The income elasticity for total and fixed deposits exceeds unity, while that for demand and savings deposits is large but less than one. The implications of these elasticities will be discussed in the next section.



## Section III

An attempt will now be made to assess the findings. The fact that the results were unsatisfactory in all but two cases does not imply that the theory underlying the model is inadequate but is due rather to certain perculiarities of our domestic monetary, economic and financial situation. The limitations of the study, some of which will be discussed in the concluding section, should also be borne in mind when assessing the results.

Equation (32) shows that income is the only important determinan in the demand for total deposits in the Bahamas. A priori we would expect interest rates to also be an important variable, however, equations (18) and (22) indicate no significant relationship between interest rates and total deposits.

None of the specifications for demand deposits show income or interest rates as important variables. The same holds true for savings deposits. This suggest that there may be other factors, probably non-economic, which may influence the demand for savings deposits, such as, the quest for security.

From equation (28), we see no significant relationship between savings deposits and the rate of interest on savings or fixed deposit: This may be due in part to the fact that the savings deposits rate in the Bahamas has shown little or no change over the seven year period under review. Normally, individuals may hold a small amount of savings deposits which for precautionary reasons, they may require to be very liquid. This suggests, therefore, that liquidity rather than interest rates may be a more dominant factor. Some caution shou

be exercised, however, when interpreting the findings on the fixed deposits rate since we are using only the rate on deposits with three months maturity.

Equation (35) reveals that income is the major determinant of the demand for fixed deposits. The rate of interest on fixed deposits is insignificant in all instances. However, equation (31) shows that fixed deposits bear some statistical relationship to the three months fixed deposit rate. Consequently, we may infer that this rate is a reasonable proxy.

The results obtained for the effect of interest rates on deposits overall suggest no significant relationship between deposits and interest rates. At the policy level, this implies that changes in interest rates will not lead to any growth in the level of deposits. A caveat may be noted here. This is not due to any shortcomings in the conventional model itself but rather to peculiarities of the Bahamian economy.

The income elasticity of demand for total deposits exceeds unity (1.0254) which a priori we would expect. In the absence of any information on the presence or otherwise of serial correlation, we may conclude tentatively that deposit holders in the Bahamas increase their holdings of bank deposits more than proportionately to the rise in incomes.

The income elasticity of demand for demand deposits is positive and large but less than unity. The fact that the income elasticity of demand for savings deposits is greater than that for demand deposits supports the widely held view that as income increases, composition of deposits shifts in favour of savings deposits.[9]

While this may be the case in developed economies, it may de facto apply to a developing country like the Bahamas. It depends on the income group involved, because in economies such as ours one tends to associate rising incomes with a preference for demand deposits, as savings deposits are usually held by low-income earners. As income increases, therefore, the structure of deposits may not shift from demand to savings. Indeed Table I shows that the shift in the composition of deposits in The Bahamas was primarily from demand deposits to fixed deposits.

The high estimate of the income elasticity of demand for time deposits suggests that time deposits should be classified as a luxury good. This large, positive value supports our hypothesis that as income increases, the shift in the composition of deposits is primarily to fixed deposits.

Before concluding this section, it should be noted that the elasticity estimates depend on the efficiency of the regression coefficients, hence they should be interpreted with care.

## Section IV

### Conclusion and Suggestions for Future Research

The results of this study suggest that interest rates and the rate of inflation are not important variables in the demand for commercial bank deposit liabilities in the Bahamas. The results show income as the major determinant in the demand for total deposits and fixed deposits.

The fact that the relationship between deposits and interest rates do not satisfy our theoretical expectations is no reflection on the adequacy of the theory on which the demand functions are based but is due rather to internal considerations.

The results are tentative and should be assessed against the limitations that the study faced. Firstly, because of the unavailability of income data prior to 1973 and post - 1979, the series was restricted to seven years. Furthermore, the income data used are only provisional and are themselves open to much debate. Efforts to revise and update the series are presently underway.

Secondly, owing to limited computer capacity, the models were restricted no more than two (2) independent variables at a time. However, this particular shortcoming should be overcome rather quickly as we are now in the process of converting to a more sophisticated system.

If our database can be refined and expanded and given the anticipated additional computer capacity, we may be able to obtain more substantive results in future research. It is also hoped that the inclusion of other variables, such as, the rate of interest on deposits with more than three (3) months maturity may lead to more satisfactory results in future research.

## Data Appendix

This appendix gives a brief description of the data used in the empirical section of the study.

All financial data were obtained from various issues of the Central Bank of the Bahamas Quarterly Review.

All variables were expressed in real terms using the Retail Price Index (Nov./Dec.1971)= 100) as the deflator. Data on GDP were obtained from the Department of Statistics Report on the National Accounts of the Bahamas, 1973 - 1979.



## FOOTNOTES

1. Hagen, E. E.: "The Classical Theory of the Level of Output and Employment," Readings in Macroeconomics, Holt, Rinehart and Winston, Inc., U.S.A. 1966, p.11.

2. For a discussion of Keynes' Absolute Income Hypothesis, see D. Ott, A. Ott and J. Yoo (23).

3. For an elaboration of Duesenberry's Relative Income Hypothesis see W. Branson (4), p.188-190 and D. Ott, A. Ott and J. Yoo (23) p.64-66.

4. This section draws heavily from R. F. Mikesell and J. E. Zinser's article, "The Nature of the Savings Function in Developing Countries: A survey of the Theoretical and Empirical Literature, "Journal of Economic Literature, March 1973 p.8-9.

5. See R. F. Mikesell and J. E. Zinser, Ibid, p.10-11.

6. In his study of eight Asian countries, J. G. Williamson derived significant estimates of $MPS_p$ of from .20 to .29; the range for $MPS_T$ was .37 to 1.12.

7. For evidence of this, see B. Strumpel, "Saving Behaviour in West Germany and the United States, American Economic Review, May 1975, p. 210-216.

8. For example, C. Bourne (2), M. Hall and D. Tanna (12) and T. Wai (26).

9. For evidence of this, see J. Gurley (10).

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