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THE SUPPLY OF MONEY AND BANK CREDIT IN ARGENTINA

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I. INTRODUCTION

This paper analyzes the process determining the supply of money and bank credits in Argentina since the banking reform of November 1957. Two definitions of money are used: the traditional one including banks' demand deposits and currency held by the nonbanking private sector, and a broader definition which includes, in addition, banks' savings and time deposits. The quantity outstanding of ordinary loans granted by banks to the public is used as the empirical counterpart of bank credit.1/

With the reform of 1957, the Argentinian monetary system took on the characteristics of Anglo-American systems. In these systems, the Central Bank can not control the stock of money directly but rather controls it indirectly through the manipulation of policy instruments. Thus the emphasis of the analysis is on the portfolio allocation decisions of banks and the public.

The Argentine Central Banks is a government agency which operates under direct control of the executive branch of the Federal government. It supplies high-powered money to the economy by means of the following operations: (a) purchase and sale of foreign moneys and gold;

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1/ I distinguish between ordinary loans and selective loans. The latter are financed by banks with "conditionally free" reserves imposed by the Central Bank to pursue selective credit policies.

(b) acceptance of Federal government debt;[1/] and (c) advances and rediscounts to commercial banks.[2/] Even though it can actually control the last two types of operations,[3/] the Central Bank does not control the first source in a fixed-exchange rate system.[4/] It is assumed throughout the paper that any undesirable effect which the foreign sector might have on the supply of high-powered money can be offset by the Central Bank within a given quarter, the time unit of the analysis.

The Central Bank, by manipulating monetary policy instruments, can affect the terms under which banks sell their liabilities, the expansion of banks' earning assets and the composition of assets held by banks. In the context of Argentina, the specific monetary policy instruments are:

(a) Reserve requirements on banks' liabilities. These requirements differ in accordance with the type of bank deposits and other liabilities, and with the region of the country where the bank is located. Until May 1968 there were also differences between average and marginal reserve requirements.

(b) "Conditionally free" reserve requirements on banks' liabilities. Banks can utilize such reserves to purchase assets established by the Central Bank (selective loans).

1/ The Central Bank Act of 1957 established some restrictions upon the maximum amount of government assets which the Central Bank could hold to finance the budget deficit.

2/ In Argentina the discount rate is not a policy instrument because the Central Bank sets the amount and all the terms of bank borrowings.

3/ The Central Bank may not be able to pursue a monetary policy independent of fiscal policies because of its tight dependence on the executive branch of the Federal government.

4/ See Wilms (1971) for a discussion on the control of money in an open economy with a fixed-exchange rate system.

(c) Ceiling rates on interest rates paid on different classes of deposit liabilities. Although the ceiling for time deposits was removed in March 1960, there have been ceiling rates for savings deposits since 1957. For demand deposits, the prohibition against interest payments was established in 1946, and has continued to the present.

(d) Ceiling rates on interest charged by banks on loans to the nonbanking private sector.

(e) Control over banks' purchases of government assets.

(f) Full control over banks' borrowing from the Central Bank.

In the next section I present the analytic framework used to explain the process determining the supply of money and bank credit.[1/] In Section III, I present estimations of the structural equations and analyze the portfolio allocation decisions of both the public and banks. The explanation of the supply of money and bank credit that follows from the theoretical framework and the empirical evidence is analyzed in Section IV.

II. ANALYTIC FRAMEWORK

It is proposed that the process determining the nominal stocks of money and bank credit in Anglo-American monetary systems revolves around the portfolio allocation decisions of banks and the public and their response to the changing policies of the monetary authority. It is this approach which is used to develop a model of the Argentine monetary sector.[2/]

1/ For a complete exposition of this framework see Barandiaran (1973).

2/ The main advantages of the approach I follow with respect to the Brunner-Meltzer hypothesis are: (a) portfolio behavior of each sector is not necessarily independent of the sector's total liability; (b) portfolio disequilibriums can be explicitly introduced; and (c) the interrelationships among asset markets are explicitly considered. See A. Burger (1971) for an exposition of the Brunner-Meltzer hypothesis.

The ceteris paribus conditions utilized in the analysis relate to the exact nature of each sector's adjustments with respect to its portfolio balance.[1/] The length of the time period used is a main determinant of the types of adjustments made by banks and the public to changing market conditions and monetary policies. Since the effects of changing one variable cannot be discerned immediately, the longer the length of the time period employed, the greater the likelihood that the entire sequence of effects will be completed. In the quarterly model presented in this paper, it is assumed that banks and the public adjust their holdings of high-powered money (currency and reserves), deposits and loans, but not their holdings of other assets. Furthermore, feedback effects of the "real" sector of the economy upon the "monetary" sector are not taken into account. In David Fand's terminology, the money supply concept I use is a short-run one.

For the model to be consistent and complete,[2/] it should include a total-demand equation, a total-supply equation and the equilibrium condition, i.e., total-demand equal to total-supply, for each asset treated endogenously. However, the relative importance of demand and supply conditions in explaining the quantity outstanding and the rate of return of each asset depends upon the institutional constraints which affect asset markets. I maintain that the structure of each of the six asset markets in the model is as follows:

(a) High-powered money. The quantity supplied is assumed to be fully controlled by the Central Bank and its nominal interest rate set equal to

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1/ Cf. D. Fand (1971).

2/ Cf. C. Christ (1971).

zero. Total demand consists of the public's demand for currency, banks' demand for excess reserves and legal reserves. The role of total demand is to determine whether there is equilibrium or disequilibrium in this market.

(b) Demand deposits. The effective nominal rate is assumed to be equal to the ceiling set by the Central Bank (zero in this case). Although banks have certainly attempted to avoid this ceiling to increase deposits, I assume that the quantity outstanding is determined by demand conditions given that ceiling.

(c) Savings deposits. As demand deposits, the effective nominal rate is assumed to be equal to the ceiling set by the monetary authority and the quantity determined by demand conditions given the ceiling rate.

(d) Time deposits. Banks' supply is assumed to be perfectly elastic; they set the rate at which they are willing to accept any amount of deposits.[1/] The quantity outstanding is then determined by demand conditions given the rate set by banks.

(e) Ordinary loans. I assume a type of market structure in which both the quantity outstanding and the loan rate are determined by banks' behavior. The basic ideas underlying such an assumption are that loans are heterogeneous and that banks cannot fully exploit their market power in order to behave as discriminant monopolists.[2/] Banks set the rate at which they are willing to lend, but since this rate is below the

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1/ From the banks' viewpoint there has been a limit to the rate they can pay given by the regulated loan rate adjusted for the marginal reserve requirement on time deposits. They consider this limit "too low" for successful competition with other financial intermediaries.

2/ See D. Jaffee (1971) for a discussion of this idea in relation to the U.S. loan market.

would-be-equilibrium rate, the quantity outstanding is determined by banks' supply conditions.

(f) Selective loans. I assume that the quantity outstanding of this type of loans is determined by the quantities of deposits. An identity expresses this relationship. There is no explicit reference to the interest rate on which the Central Bank sets a ceiling.

Interrelationships among asset markets in the model result from two types of constraints: the balance-sheet constraint for each of the two sectors and the interdependence of the two balance-sheet identities. The former is introduced into the analysis by imposing restrictions on the parameters of the portfolio behavior equations. The latter, which amounts to an application of Walras' law to asset markets, allows us to omit from the model the equilibrium condition for high-powered money (H = C + ER + LR).

The two balance-sheet identities are:

(1) $C + DD + SD + TD = OPL + SPL + Z_p$ for the public,

(2) $OPL + ER = DD + SD + TD + Z_b - LR - SPL$ for banks,

where:

C: actual quantity of currency held by the public;

DD, SD, TD: actual quantities of demand, savings and time deposits respectively;

LR: required quantity of legal reserves;

ER: actual quantity of excess reserves;

Z_b, Z_p: residual (exogenous) components of banks' and the public's balance sheets respectively.1/

The total liabilities of each sector are defined as:

1/ The stock of high-powered money H is equal to the sum of Z_b and Z_p.

(3) $M2 = OPL + SPL + Z_p$ for the public,

(4) $LC = DD + SD + TD + Z_b - LR - SPL$ for banks

The assumptions about the asset markets allow us to consider the total liabilities M2 and LC as given from the viewpoint of the corresponding sector. The public's portfolio behavior then refers to how the total liability M2 is allocated among currency and the three types of deposits and banks' portfolio behavior to how their loanable capacity LC is allocated between excess reserves (ER) and ordinary loans (OPL).

The specification of the demand equations for currency and deposits are based on desired or long-run demand relationships and a complete partial adjustment mechanism. The long-run demands are functions of the total liability M2, the expected net nominal rates of return of deposits, and other variables that cause changes in the public's preferences among the four assets.

The expected net nominal rate of return of deposits R_i is defined as:

(5) $R_i = I_i + N_i - (b_i \cdot m_i)$ for $i = D, S, T$,

where:

I_i: the contractual interest rate;

N_i: any other expected return per peso of deposits;

b_i: average cost per market transaction; and

m_i: number of market transactions per period.

Returns of bank deposits depend upon the controls on interest rates (the I's) payable by banks and upon the attempts by banks to avoid these controls (the N's). Banks are prohibited from paying any interest on demand deposits ($I_D = 0$) and there is a maximum rate on savings deposits. Even though the controls on interest rates on time deposits were removed in 1960, there still exist a limit to the rate that banks would be willing to pay. In order to circumvent these ceilings, banks offer additional returns such as rendering services to depositors without charge and in proportion to the size of the account, giving pecuniary benefits in the form of gifts, and granting loans (in a rationed market) if they are accompanied by compensating balances. In addition, the R's depend upon the transaction costs associated with deposits. These costs include any service charge per transaction, but more importantly, they include the time involved in each transaction and further depend upon the number of transactions in the period. To increase depositors' net returns banks have also reduced the transaction costs by offering free checking and by establishing a pletora of conveniently located branches.

Since only a very small number of assets is explicitly considered, the public's preferences among them for given values of the total liability M2 and the R's may change as a result of changes in other economic magnitudes not explained by the model. Three additional variables that may produce these allocative effects on the asset composition of M2 are the public's wealth (W_p), the expected rate of inflation (ERI) as a proxy for nominal rates of return of other assets, and the volume of transactions in the economy (GDP).

For the balance-sheet identity to be satisfied at all point in time, the partial adjustment mechanism must be complete.[1/] Thus, the

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1/ See W. Brainard and J. Tobin (1968) and C. Swan (1970).

instantaneous response to a discrepancy between desired and actual holdings of every asset is only partial and depends on the current discrepancy in the holdings of all the four assets.

Therefore, the portfolio behavior of the public is described by this system of four equations:1/

$$(6) \quad \begin{bmatrix} C \\ DD \\ SD \\ TD \end{bmatrix}_t = B \cdot \{M2,\ R_D,\ R_S,\ R_T,\ W_P,\ ERI,\ GDP\}_t + (I-\lambda) \cdot \begin{bmatrix} C \\ DD \\ SD \\ TD \end{bmatrix}_{t-1}$$

where B is a 4x7 matrix of short-run coefficients, λ is the 4x4 matrix of adjustment coefficients and I is a 4x4 unit diagonal matrix. The balance-sheet identity implies the following restrictions on the matrices B and λ:

$$\sum_{i=1}^{4} b_{i,1} = 1 \quad \text{and} \quad \sum_{i=1}^{4} b_{i,j} = 0 \qquad \text{for j } 2,3,\ldots,7;$$

$$\sum_{i=1}^{4} \ {}_{i,j} = 1 \quad \text{for all j } 1,2,3,\ldots,7$$

In relation to banks' portfolio behavior I maintain that the anticipated or expected value, rather than the current value, of their loanable capacity is the relevant magnitude. This assumption is based upon the fact that in Argentina the main source of bank liquidity is anticipated cash inflows from deposits. Given banks' concern for their

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1/ It is assumed that the long-run demands are linear functions of the explanatory variables.

liquidity position, the choice between excess reserves and ordinary loans is meaningful only in relation to anticipated loanable capacity (ALC). The unexpected component of loanable capacity (ULC) is entirely allocated to excess reserves.

Banks' allocation of anticipated loanable capacity ALC depends upon the marginal return and marginal cost of holding loans instead of reserves. The marginal return of loans are assumed to be determined by the effective loan rate (r_L), the risk associated with the loan portfolio (L_{dr}) and the degree of loan demand pressure on banks' loanable capacity (L_{dp}). The latter two determinants are a consequence of non-price rationing in the loan market.[1/] In turn, the marginal cost of holding loans is determined by the cost of liquidity sources alternative to excess reserves (C_{liq}), the anticipated participation of demand deposits in loanable capacity (ADD) and the cost of failing to meet the reserve requirement test (pR).

Thus, banks' behavior is summarized in the following equations:

(7) $$LC = ALC + ULC$$

(8) $$\begin{bmatrix} OPL \\ ER \end{bmatrix}_t = C\cdot\{ALC,\ C_{liq},\ ADD,\ pR,\ rL,\ L_{dr},\ L_{dP}\}_t + \begin{bmatrix} 0 \\ 1 \end{bmatrix}\cdot ULC_t$$

1/ In the absence of price rationing, some other aspects of the loan or the loan customer has to be used by banks as their rationing criterion. Two aspects of loans are generally considered for this purpose; the risk of partial or complete default on the loan and the length and value of the customer relationship; see D. Jaffee (1971) and D. Hodgman (1963). The two variables mentioned in the text are related to these two aspects.

The first term on the right-hand side of the system of two equations (8) explains the allocation of anticipated loanable capacity. Because of the balance-sheet identity, the coefficients of the 2x6 matrix C must satisfy these restrictions:

$$\sum_{i=1}^{2} c_{i,1}=1 \quad \text{and} \quad \sum_{i=1}^{2} c_{i,j}=0 \text{ for } j \;\; 2,3,\ldots,6$$

Since series of the effective loan rate and of the interest rate on time deposits are not available, I must omit the two equations explaining banks' behavior with respect to these rates from our estimated model. I proceed as if these two rates did not respond to changes in the conditions underlying banks' behavior.

In addition to the six behavioral equations (6) and (8) and to the three definitions (3), (4) and (7), the model includes the following two identities explaining the quantities of legal reserves (LR) and selective loans (SPL):

(9) $LR = \;\; k_1 + (1-f)h_1 \;\; DD + k_2 + (1-f)h_2 \; SD + k_3 + (1-f)h_3 \; TD + XLR$

(10) $SPL = (f \cdot h_1)DD + (f \cdot h_2)SD + (f \cdot h_3)TD + XSPL$

where:

k_1, k_2, k_3: average "frozen" reserve requirement on DD, SD, and TD respectively;

h_1, h_2, h_3: average "conditionally free" reserve requirement on DD, SD, and TD respectively;

f: average proportion of "conditionally free" funds available to lend to the private sector that is actually used.

XLR: exogenous (residual) component of legal reserves; and

XSPL: exogenous (residual) component of selective private loans.

The model also includes the definitions of ALC, ADD and M1. The definitions of the anticipated values of loanable capacity and demand deposits are derived from the adaptive expectations hypothesis[1/] and can be written as:

(11) $ALC_t = b \cdot LC_t + (1-b)\ (1\ g_{L,t-1})ALC_{t-1}$

(12) $ADD_t = b \cdot DD_t + (1-b)\ (1\ g_{D,t-1})ADD_{t-1}$

where:

b: the expectation parameter;

$g_{L,t-1}$: the expected nominal rate of growth of LC in t at t-1;

$g_{D,t-1}$: the expected nominal rate of growth of DD in t at t-1.

Finally, the definition of M1 is

(13) $M1 = M2 - SD - TD$

Thus, the model consists of the fourteen equation (3), (4), (6), (7), (8), (9), (10), (11), (12) and (13). They jointly determine the values of currency (C), demand, savings and time deposits (DD, SD and TD), legal and excess reserves (LR and ER), ordinary and selective loans (OPL and SPL), the two monetary aggregates (M1 and M2), current, anticipated and unexpected loanable capacity (LC, ALC and ULC) and anticipated demand deposits (ADD).

III. ESTIMATION OF THE PORTFOLIO BEHAVIOR EQUATIONS

In this section I present estimations of the portfolio behavior equations of the public and banks. To estimate the two sets of structural

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1/ The trend of the series are taken into account by incorporating the rates of growth (the g's).

equations (6) and (8), which are overidentified, I use the method of two-stage-least-squares (2SLS).[1/] The constraints on the parameters of these equations that result from the balance-sheet identities are exactly satisfied by 2SLS estimates.[2/]

In the estimation I assume that the portfolio behavior equations, in addition to being linear functions, are homogeneous of degree one in all nominal values. Consequently, interest rates and other explanatory variables expressed in terms of ratios are multiplied by a nominal magnitude (permanent income PY in the case of the public's behavior equations and anticipated loanable capacity ALC in the case of banks' equations). Furthermore, I deflate nominal magnitudes by a wholesale price index to avoid possible heteroskedasticity problems due to the inflationary conditions in Argentina.

2SLS estimates of the public's and banks' portfolio behavior equations are shown in Tables 1 and 2. The specifications used in these two tables are the result of experimenting with several alternatives. In relation to the theoretical specifications discussed in Section 2, the main omissions in Tables 1 and 2 refer to some components of the rates of return on deposits, to the effective loan rate and to banks' cost of failing to meet the reserve requirement test. All these omissions are due to the lack of appropriate series.

1/ The problem posed by the two nonlinear elements ERIxALC/P and A/Dx ALC/P is solved by approximating these variables using a Taylor expansion series evaluated at mean values. The exogenous variables XLR/P and XSPL/P were not included in the first stage because of the lack of appropriate series.

2/ See Barandiaran (1973, p. 63).

Table 1

Demand for Currency and Deposits: Two-Stage Least-Squares Estimates, 1960 I - 1970 IV

	DEPENDENT VARIABLES			
	C/P	DD/P	SD/P	TD/P
M2/P (endogenous)	0.374** (11.585)	0.359** (12.830)	0.247** (17.268)	0.020* (1.383)
GDP	0.006 (0.845)	0.011** (1.789)	-0.014** (-4.455)	-0.003 (-0.948)
ERIxPY	0.023* (1.344)	-0.026** (-1.772)	0.015** (1.954)	-0.012* (-1.499)
I_SxPY	-0.185** (-2.125)	0.097 (1.292)	0.088** (2.282)	-0.000 (-0.020)
I_TxPY	0.066 (0.983)	-0.079* (-1.348)	-0.036 (-1.219)	0.049* (1.625)
DDVxPY	0.020** (1.976)	-0.021** (-2.390)	0.005 (1.099)	-0.004 (-0.865)
$(C/P)_{-1}$	0.286** (4.984)	-0.067* (-1.341)	-0.197** (-7.747)	-0.022 (-0.861)
$(DD/P)_{-1}$	0.026 (0.314)	0.048 (0.682)	-0.112** (-3.116)	0.038 (1.059)
$(SD/P)_{-1}$	-0.571** (-7.080)	-0.004 (-0.056)	0.629** (17.597)	-0.054* (-1.500)
$(TD/P)_{-1}$	-0.458** (-2.654)	-0.264** (-1.762)	-0.033 (-0.431)	0.755** (9.774)
S4: FOURTH QUARTER DUMMY VARIABLE	4.943** (5.661)	-4.060** (-5.354)	-0.709** (-1.831)	-0.174 (-0.446)
SY·X	1.398	1.214	0.620	0.626

I report parameter estimates and their t-values and the standard error of estimate (SY·X). An asterisk (*) on a parameter estimate indicate that it is significant in a one tail-test at the 10 per cent level, two asterisks (**) at the 5 per cent level. The standard errors of estimate are adjusted for degrees of freedom.

The Public's Portfolio Behavior. The theoretical explanation of this behavior was based on three types of variables: (a) the total liability or balance-sheet constraint M2; (b) the expected nominal net rates of return of deposits; and (c) other variables affecting the public's preferences among the four assets. The estimates in Table 1 for the total liability M2 indicate that in the short-run, that is, within a quarter, an increase in M2 is allocated mainly to currency and demand deposits. However, the estimates of the long-run coefficients that can be derived from Table 1[1/] show the following allocation of this increase for the long-run:

Currency	0.17
Demand deposits	0.36
Savings deposits	0.45
Time deposits	0.02

Thus, currency is playing the role of a buffer stock in the short-run with respect to savings deposits. The very low proportion of time deposits, both in the short- and in the long-run, can be explained by

1/ The long-run coefficients for the structural equations are calculated by multiplying the inverse of the matrix by matrix B in equation (6).

bank's inability to compete with other financial intermediaries offering a similar type of asset but with higher return for depositors. This situation has been typical for the last twenty-five years.

In specification (5) of the rate of return of deposits R_i, only the interest rates are readily associated with observable magnitudes. The additional monetary returns given by banks to depositors (the N's) require that all devices used by banks be identified. In gernal, it is difficult to summarize these returns in an appropriate aggregate measure. Our inability to construct these measures implies a serious omission, at least in the case of demand deposits, for the empirical evidence on our explanation of the public's portfolio behavior. Furthermore, the available series on the rate on time deposits (I_T) is that paid by a government bank, which hardly responds to market forces.1/

The estimates for the interest rate on savings deposits (I_S) show a substitution effect between savings deposits and currency. This effect persists and gets substantially larger in the long-run. The estimates for I_T show a substitution effect between demand and savings deposits on one hand and time deposits on the other, even though the level of significance of these estimates is lower than in the case of I_S. This relationship also persists in the long-run and the size of the effects increases. The complementarity effect of I_T on currency, which is nonsignificant, implies a decrease in the sum of the three types of deposits when I_T increases.

1/ Because of the poor quality of this series on I_T, I did not estimate the supply function of time deposits.

Some costs of transaction, the remaining component of the R's, can be functionally related to other observable magnitudes. However, I only use a proxy variable for the number of transactions per period for demand deposits (m_D).1/ This proxy variable is the turnover rate of demand deposits (DDV) which measures the degree of utilization of the inventories of demand deposits and can be assumed to be positively related to the number of transactions m_D. The estimates of DDVxPY for currency and demand deposits are significant and of the expected sign in both cases; since DDVxPY represents a cost of holding inventories of demand deposits, increases in DDVxPY decreases the quantity demanded of DD and increases that of C.

The last set of explanatory variables includes those affecting the public's preferences among the four assets. Three variables are considered. Permanent income PY, used as a proxy for the public's wealth W_p, is not included in Table 1 since it has been nonsignificant in all the regressions performed. The volume of transactions in the economy is approximated by gross domestic product GDP. The estimate in Table 1 show that the relative demand for money in a narrow sense (currency plus demand deposits) increases with the volume of transactions. In the short-run, the effect is primarily on demand deposits; in the long-run, it is on currency. Finally, the allocative effect of the expected rate of inflation ERI implies a shift from demand and time deposits to

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1/ I used the variable "number of banks per inhabitant", which I assumed was a determinant of the cost per transaction, in preliminary regressions but it appeared with signs different from those expected.

currency and savings deposits when ERI increases. The long-run effect is similar, except that the shift is almost entirely from time deposits to currency. Under conditions of high and varying rates of inflation the expected rate of inflation is a main determinant of the allocation of wealth between monetary assets and other types of assets. However, there is no a-priori reason to argue that changes in ERI affect the relative demands for currency and deposits in one way or another. The specific direction implied by the estimates in Table 1 indicates that banks lose their relative position in financial markets when ERI increases. This may be due to the lack of adjustment in the returns on deposits offered by banks.

Bank's Portfolio Behavior. Our theoretical explanation of this behavior was based on a distinction between an anticipated and unexpected component in banks' lonable capacity. Our hypothesis about the formation of expectations about loanable capacity and demand deposits was summarized in expressions (11) and (12). The value of the expectation parameter b in these expressions was chosen from ordinary least squares regressions of the supply of loans and the demand for excess reserves and the criterion I used was to pick that value of b for which the unexpected component of LC was entirely allocated to excess reserves and the value of the R^2 statistic was largest. This value turns out to be 0.60.[1/]

1/ Since I considered only one decimal values of b, there was just one value that satisfied the criterion.

Table 2

Supply of Loans and Demand for Excess Reserves: Two-Stage Least-Squares Estimates, 1960 I - 1970 IV

	DEPENDENT VARIABLES	
	OPL/P	ER/P
ALC/P (endogenous)	1.457** (18.260)	-0.457** (-5.825)
ULC/P (endogenous)	0.174 (0.655)	0.826** (3.086)
ADD/P (endogenous)	-0.980** (-5.944)	0.980** (5.944)
A/DxALC/P (endogenous)	-0.431** (-4.229)	0.431** (4.229)
ERIxALC/P (endogenous)	-0.299* (-1.457)	0.299* (1.457)
GDP	0.017** (4.658)	-0.017** (-4.658)
SY·X	2.125	2.125

Substituting identities (9) and (10) into definition (4), loanable capacity can be written as:

(14) $LC = (1-k_1-h_1)DD + (1-k_2-h_2)SD + (1-k_3-h_3)TD + Z_b - XLR - XSPL.$

The effect on LC of each source differs according to the reserve requirements imposed on them. From the estimates in Table 2, a one-peso increase in each source of LC is allocated between excess reserves and loans in this way.1/

Changes in:	ER	OPL
DD	0.372	0.171
SD, TD	0.073	0.675
Z_b	0.097	0.903

Thus, the source of the increase in their total liability LC is important for banks. The large allocation of the increase in demand deposits to excess reserves is due to the characteristic of this type of bank liability of being payable on demand and which I assume increases the marginal cost of holding loans instead of reserves.

The allocation of anticipated loanable capacity depends upon the marginal return and cost of holding loans instead of reserves. The main determinant of this marginal return is the effective loan rate, but no series is available of it. The ceiling loan rate was used in some regressions but the signs of the estimates were not as expected.2/

1/ These values were calculated using the estimates of Table 2 and the mean values in the sample period of the variables A/D and ERI. A one peso increase in the case of DD means an increase of 0.543 in LC and in the case of SD and TD an increase of 0.748 in LC as result of reserve requirements (for the specific values used here see p. 22 fn 1).

2/ For the period 1967 I - 1970 IV, I used a rate charged by other financial intermediaries as a proxy for the effective loan rate; the estimates had the expected signs and were significiant.

The other two determinants of the marginal return of loans mentioned in the theoretical specification, L_{dr} and L_{dp}, are approximated by the ratio of advances to discounts (A/D) and gross domestic product than its (GDP) respectively. The variable A/D is a measure of the ex-post risk associated with the loan portfolio;[1/] if it appears to banks that the risk of lending increases during the period, they will adjust the size of their loan portfolio to have a larger ratio of advances to discounts at the end of the quarter. The estimates in Table 2 have the correct signs: increases in A/D implies increases in the porportion of excess reserves and decreases in loans. Gross domestic product GDP is used as a measure of loan demand pressure under the assumption that the level of economic activity is a main determinant of the demand for short-term debt by businesses. Increases in GDP are supposed to make banks increase their holdings of loans as a result of their interest in preserving "customer relationships." The estimates in Table 2 are in accordance with this notion.

The main determinant of the marginal cost of holding loans is the cost of alternative sources of liquidity to excess reserves. The alternative I consider is the cost of obtaining additional deposits by offering either higher interest rates on time deposits or additional benefits on demand and savings deposits. A proxy for the cost of securing additional deposits is the expected rate of inflation ERI, assuming that it dominates the behavior of nominal interest rates. The estimates in Table 2 indicate, as expected, that increases in ERI by increasing the

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1/ CF. L.I.M. Vendrell Alda (1967).

cost of securing additional deposits affect banks' allocation in favor of a larger participation of excess reserves. The other two determinants of the marginal cost of holding loans are the anticipated value of demand deposits ADD and the cost of failing to meet the reserve requirement test pR. The former is included in the specification shown in Table 2 and the estimates indicate that the larger the anticipated participation of demand deposits in loanable capacity, the larger the demand for excess reserves. The remaining variable pR could not be accurately measured; in some regressions the penalty rate charged by the Central Bank was used but the estimates did not have the expected signs.

IV. DETERMINANTS OF THE SUPPLY OF MONEY AND BANK CREDIT

Our hypothesis of the process determining the supply of money and bank credit is summarized in the system of equations presented in Section 2. Allocation decisions of the public and banks refer to the six assets traded between them. The monetary authority is assumed to control, among other variables and parameters, the interest rates on high-powered money, demand and savings deposits and selective loans. Interest rates on time deposits and ordinary loans are assumed to be set by banks, but the two equations explaining banks' behavior with respect to them cannot be estimated. Thus, the estimations of Section 3 are based on a fourteen equation model in which all interest rates are either controlled by the monetary authority or inflexible.

To take into account all the forces which participate in that process, I use the reduced form and the final form of the model estimated in

Section 3. To compute the reduced form coefficients from the 2SLS estimates, the average reserve requirements coefficients that appear in the identities for legal reserves and selective loans must take specific values. Since appropriate series of these average reserve requirements between 1960 I - 1968 I are hardly available because of the difference between marginal and average requirements before May 1968, the computations shown in this section are based upon the values for the subperiod 1968 II - 1970 III.[1/] In Table 3 I present estimates of the quarterly impact, total interim and equilibrium multipliers of the exogenous variables on the supply of money and bank credit derived from the reduced and final forms of the model.[2/]

From an initial equilibrium position, a change in any one of the exogenous variables affecting the allocation of M2 between currency and deposits will initiate a process in which all of the endogenous variables will move to a new equilibrium position. In the short-run such a change

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1/ The values of the reserve requirement parameters used to compute the reduced and final forms are the following:

$$k_1 + (1-f)h_1 = 0.157 + (0.25x0.30) = 0.232$$

$$f \cdot h_1 = 0.225$$

$$k_2 + (1-f)h_2 = k_3 + (1-f)h_3 = 0.074 + (0.25x0.178) = 0.118$$

$$f \cdot h_2 = f \cdot h_3 = 0.75x0.178 = 0.134$$

All these values correspond to the period 1968 II - 1970 III.

2/ The multipliers corresponding to the variables DDV, I_T, ERI, A/D and I_S were computed using the average values of PY and ALC/P in 1968 II - 1970 III.

Table 3

Supply of Money and Bank Credit: Quarterly Impact, One Year Total, Two Year Total, and Equilibrium Mulipliers of Changes in the Exogenous Variables

Exogenous	Impact			One Year			Two Years			Equilibrium		
Variable	M1/P	M2/P	OPL/P	M1/P	M2/P	OPL/P	M1/P	M2/P	OPL/P	M1/P	M2/P	OPL/P
Nonpolicy:												
DDV	-4.1	-3.8	2.9	-0.5	-16.6	-6.9	-5.8	-44.8	-30.4	-20.9	-110.1	-83.4
I_T	-18.0	-0.1	21.9	1.0	70.1	90.6	21.3	173.2	179.8	86.9	461.0	416.5
ERI	-63.5	-81.0	-64.1	-62.4	-115.3	-87.1	-73.2	-176.4	-138.4	-107.7	-321.7	-262.9
A/D	-83.4	-113.8	-100.5	-91.1	-144.0	-125.8	-97.6	-171.1	-147.8	-198.5	-261.8	-184.9
GDP	0.022	0.006	0.005	0.012	-0.051	-0.041	-0.002	-0.109	-0.088	-0.025	-0.206	-0.167
Policy:												
I_S	-3.2	160.7	95.8	61.3	698.7	520.1	192.3	1278.4	989.6	426.8	2256.0	1781.2
Z_p/P	1.002	1.367	0.207	1.095	1.730	0.511	1.172	2.055	0.775	1.304	2.604	1.220
Z_b/P	0.921	1.257	1.110	1.540	2.383	2.085	1.703	2.945	2.548	1.914	3.824	3.260
XLR/P	-0.921	-1.257	-1.110	-1.540	-2.383	-2.085	-1.703	-2.945	-2.548	-1.914	-3.824	-3.260
XSPL/P	0.081	0.110	-0.903	-0.445	-0.653	-1.574	-0.531	-0.653	-1.772	-0.611	-1.220	-2.040

will affect banks' loanable capacity and its allocation between loans and reserves. The change in loans will in turn affect the quantity outstanding of M2 and its allocation between currency and deposits. The short-run position will depend upon the adjustment mechanism of actual to desired quantities of currency and deposits by the public, and upon the effect of current loanable capacity on its anticipated component. These two factors introduce nonstationary features into the model, because they imply movements toward a long-run equilibrium position. A similar process will occur if there is a change in any of the exogenous variables affecting the allocation of loanable capacity between reserves and loans.

Depending upon their effect on the supply of money and ordinary loans, the exogenous variables can be divided into two groups: those that initially affect the balance-sheet constraint of a sector and those that initially affect the allocation of these aggregates among alternative assets. In general, the former have a greater effect on the supply of money and ordinary loans than does the latter. The reason is that those variables which initially affect only the allocation of assets in the system lead to partially offsetting effects. The five nonpolicy exogenous variables (DDV, L_T, ERI, GDP and A/D) and the first policy variable (I_S) initially have only an allocative effect while the remaining policy variables (Z_b, Z_p, XLR and XSPL)[1/] result initially in changes in the balance-sheet constraints.

1/ I consider the variables Z_b, Z_p, and XLR as controlled by the government. However, these variables include, among other assets and debts, other assets traded between the public and banks that are not explicitly treated in the model.

A more appropriate measure of the size of the effects of the exogenous variables is the eleasticity of money and loans with respect to each of them. As shown in Table 4, the elasticities of the first six exogenous variables are close to zero. Only the elasticity of the supply of money M1/P with respect to GDP (equal to 0.14) has a relatively large value. This is due to the role which GDP plays in the allocation of M2 -- an increase in GDP increases currency and demand deposits and decreases savings and time deposits -- and to its role in the allocation of loanable capacity -- an increase in GDP similarly increases the supply of loans and decreases the demand for excess reserves. The lower values of the elasticities of M2/P and OPL/P with respect to GDP are due to the inverse effect on savings and time deposits, which partially offsets the effects on currency, demand deposits and loans. There is no other variable affecting the allocation of M2 and LC (see Tables 1 and 2) for which the effects on the components of M1 and M2 and on OPL do not tend to offset each other. For example, in the case of I_S, its impact effects on M1, M2 and OPL are the result of the offsetting effects on currency and deposits. However, in the long-run, when the substitution effect between savings deposits and currency is large, the effects of I_S are rather important; even after one year, the effects on the stock of money M2 and bank credit are important (see Table 3).

The multipliers of Table 3 reveal a significant difference between the two policies variables Z_p and Z_b. Changes in the supply of high-powered money will affect the supply of money and bank credit through

Table 4

Supply of Money and Bank Credit: Short- and Long-Run Elasticities with Respect to Exogenous Variables

Exogenous Variable	Short-run			Long-run		
	M1	M2	OPL	M1	M2	OPL
Nonpolicy:						
DDV	-0.01	-0.01	0.01	-0.04	0.14	0.17
I_T	-0.01	0.00	0.01	0.04	0.13	0.20
ERI	-0.01	-0.01	-0.01	-0.01	-0.02	-0.03
A/D	-0.03	-0.03	-.004	-0.04	-0.06	-0.08
GDP	0.14	0.03	0.04	-0.16	-0.93	-1.24
Policy:						
I_S	0.00	0.04	0.04	0.15	0.57	0.75
Z_p	0.36	0.34	0.09	0.46	0.65	0.51
Z_b	0.38	0.36	0.53	0.78	1.10	1.56
XLR	-0.06	-0.06	-0.09	-0.12	-0.17	-0.25
XSPL	0.00	0.00	-0.05	-0.03	-0.04	-0.12

changes in Z_p and/or Z_b. These variables express the effect of high-powered money in the liability side of each sector's balance-sheet, whereas currency and reserves express the effect on the asset side. Although initial effects on the money supply are virtually the same for both Z_p and Z_b, a change in Z_p result in a much smaller effect on bank credit than a change in Z_b. In the equilibrium multipliers there are also important differences: a change in Z_b has a greater effect than a change in Z_p. These differences reflect different behavior on the part of the two sectors. For the public it makes no difference if the initial change in the total liability M2 is due to Z_p, to OPL, or to SPL, whereas banks' response to this change will differ according to the source of the change. If, for example, the change in banks' loanable capacity comes from Z_b, there will be a larger effect on OPL than if the change came from deposits, since the latter are subject to reserve requirements.1/ Alternatively, if the change comes from demand deposits, the effect on OPL will be even lower because of the larger liquidity needs of this type of deposits. The elasticities with respect to Z_p and Z_b have large values in all the three cases, except for the contribution of Z_p in the explanation of loans. Elasticities of the supply of money and bank credit with respect to high-powered money can be obtained from Table 4 by adding the corresponding elasticities with respect to Z_p and Z_b; they are below one in the short-run and well above one in the long-run.2/

1/ See p. 19.

2/ In the traditional multiplier approach to the study of the money supply, the elasticities of the money supply with respect to high-powered money are maintained to be equal to one. Our results contradict this hypothesis.

The policy variable XLR is a component of loanable capacity (see equation (14)) like Z_b; therefore, the estimates of the multiplier in Table 3 are of equal absolute value but of different signs. The low elasticity of this variable is due to its small participation in banks' loanable capacity. The policy variable XSPL initially affects the two balance-sheet constraints and in opposite directions; therefore, the estimates of the multipliers in Table 3 differ from those of XLR in absolute values. There is also a different sign for money than for loans in the impact multipliers. The positive effect on money is due to its effect on the public's balance-sheet constraint, whereas the negative effect on loans is due to its effect on banks' loanable capacity. Again the low elasticity of XSPL is due to its small participation in both balance-sheet constraints.

The role of both the "complete" partial adjustment mechanism of the public's portfolio behavior and of the hypothesis on banks' expectations about loanable capacity and demand deposits can be analyzed by comparing the size of the impact and equilibrium multipliers. In general, as shown in Table 3, the equilibrium multipliers are substantially larger in absolute value than impact multipliers. However, the large equilibrium multipliers of nonpolicy variables do not imply important increases in the absolute values of the elasticities (see Table 4); they continue being close to zero except for gross domestic product (GDP). Furthermore, the proportion of the total effects of nonpolicy variables that takes place within a year is less than 50 per cent (see Table 3), except for our loan risk measure A/D. In the case of policy variables, the absolute values of the long-run elasticities are generally quite different from zero and most of the total effects takes place within a year.

Having analyzed each explanatory variable separately, I consider the question of how well the model does at tracking the behavior of the stocks of money and bank credit. To assess this tracking ability I compute the predicted values of M1/P, M2/P and OPL/P from the estimated reduced form equations and perform a dynamic simulation for the period 1968 II - 1970 III.1/ In Table 5 I present the series of actual, predicted and simulated values of M1/P, M2/P and OPL/P.

The predicted values approximate reasonably well the behavior of the actual values. In particular, all the turning points of the series of actual values are accurately forecasted, except for the turning point of M2/P in the second quarter of 1970 that is missed by a quarter. The series of simulated values show no error accumulation, which is important for multiperiod forecasting, and the turning points coincide with those of the series of predicted values.

In summary, empirical evidence indicates that in the short-run the supply of money and bank credit do not respond significantly to variables related to the returns of assets traded between banks and the public. The short-run behavior of the money stock and bank credit is determined largely by the behavior of high-powered money and its composition in terms

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1/ The predicted values are computed by using the actual observed values of all exogenous and lagged endogenous variables for each quarter. The simulated values are computed from actual observed values of all exogenous and lagged endogenous variables for 1968 II and proceeding then forward in time, quarter after quarter, using as inputs for each successive quarter's calculations the actual observed values for exogenous variables and the previously computed values for the lagged endogenous variables.

Table 5

Supply of Money and Bank Credit: Actual, Predicted and Simulated Values, 1968 II - 1970 III, in billions of 1960 pesos

Quarter	M1/P			M2/P			OPL/P		
	Actual	Predicted	Simulated	Actual	Predicted	Simulated	Actual	Predicted	Simulated
1968 II	200.3	198.0	198.0	277.7	276.6	276.6	152.8	151.8	151.8
III	207.7	202.9	204.1	289.1	282.9	285.1	168.4	163.4	166.9
IV	223.6	218.5	220.6	313.6	304.6	310.5	186.5	178.9	184.0
1969 I	234.8	230.5	232.6	334.4	326.6	330.8	195.9	189.5	193.2
II	228.5	224.5	226.7	328.2	323.0	326.0	198.7	194.3	196.9
III	224.6	218.7	222.1	324.5	316.5	322.0	205.2	197.9	202.6
IV	233.5	223.3	226.3	337.1	321.8	327.8	223.0	209.5	214.6
1970 I	236.6	231.8	233.3	344.2	335.8	339.4	216.0	209.1	212.1
II	231.2	230.4	232.9	337.6	336.3	340.3	209.9	208.8	212.2
III	221.7	223.1	227.9	327.6	327.1	333.7	200.9	200.8	206.5

of the variables Z_p and Z_b,[1/] by the public's portfolio disequilibriums, and by banks' expectations about the behavior of loanable capacity and demand deposits. A model based on this explanation of the supply of money and bank credit appears to do well at tracking the quarterly behavior of these variables.

1/ Even for given values of the supply of high-powered money, the monetary authority can produce important effects on the supply of money and bank credit by manipulating the two components Z_b and Z_p.

APPENDIX: THE DATA

Definition of Variables:

C/P:	Currency held by the public, in billions of pesos at 1960 prices, measured as average of stocks for the last day of the second and third months of the quarter;
DD/P:	Demand deposits held by the public, measured as C/P;
SD/P:	Savings deposits held by the public, measured as C/P;
TD/P:	Time deposits held by the public, measured as C/P;
M2/P:	Sum of currency and demand, savings and time deposits;
OPL/P:	Ordinary loans held by banks, in billions of pesos at 1960 prices, measured as an average for the last month of each quarter;
ER/P:	Excess reserves held by banks, measured as OPL/P;
LC/P:	Ordinary loans plus excess reserves;
ALC/P:	Anticipated loanable capacity, measured as OPL/P;
ULC/P:	Unexpected loanable capacity, derived as the difference between current and anticipated loanable capacity;
ADD/P:	Anticipated demand deposits, measured as DD/P;
PY:	Permanent income, in billions of pesos at 1960 prices;
GDP:	Gross domestic product, in billions of pesos at 1960 prices;
ERI:	Quarterly expected rate of inflation;
I_S:	Annual rate paid by banks on savings deposits (equal to the Central Bank's ceiling rate), measured as average of rates for the last day of the second and third months of the quarter;
I_T:	Annual rate paid by banks on 3-months time deposits (equal to the Banco de la Nacion's rate), measured as I_S;
DDV:	Demand deposits' turnover rate, as measured in the last month of the quarter;
A/D:	Banks' ratio of advances to discounts, measured at the end of the quarter.

Sources:

Data on high-powered money, deposits and loans: From Banco Central de de la Republica Argentina, Boletin Estadistico, several issues and unpublished data.

Data on demand deposits' turnover rate and banks' ratio of advances to discounts: From Banco Central de la Republica Argentina, Boletin Estadistico, several issues.

Data on interest rate on savings deposits: From Banco Central de la Republica Argentina, letters to commercial banks.

Data on interest rate on time deposits: From Banco de la Nacion, unpublished data.

Data on quarterly gross domestic product: From Pou, Pedro, The Demand for Money and the Balance of Payments: Argentina, Brazil, and Chile, unpublished Ph.D. dissertation, University of Chicago, 1972.

Data on prices: From Instituto Nacional de Estadisticas y Censos, Boletin Estadistico, several issues.

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