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A Short-Run Variable Adjustment Model for Bank Loans*

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The intent of this paper is to address an empirical evidence which is consistent with the post-Keynesian proposition of the endogeneity of the money supply. The purpose of such an exercise is two-fold. First, on the theoretical level, an endogeneity of the money supply depends, in part, on a better understanding of the causal link between the money wage rates and bank loans. Second, on a more practical level, changes in bank lending practices have been jointly investigated by developing a variable speed of adjustment model within the context of the short-run disequilibrium frameworks.

I. Introduction

Although it is viewed, by both monetarists and non-monetarists alike, that commercial bank lending behavior plays the central role in the deposit-creating process in monetary and macroeconomics, voluminous studies have focused on the interest rate sensitivity of the money supply and thus the stability of the money multiplier to identify determinants of the stock of money in conjunction with the endogeneity-exogeneity issue of the money supply. In contrast, one of the key features that post-Keynesian have regarded the stock of money as being essentially endogenous is the short-run disequilibrium adjustment of commercial bank loans in responding and

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change their portfolio compositions by reducing government securities holdings and the level of excess reserves and by increasing borrowings from nondeposit sources of funds. In the portfolio adjustment process, short-term interest rates will be increased. The central bank thus passively permits the expansion of the money supply by supplying additional reserves through its open market operations to validate contract-binding money wage increases and to keep interest rates at their desired level which are consistent with the central bank's goal of achieving its projected levels of prices, output, and employment.[5] If not accommodated, an increase in the money wage might result in financial chaos and rising unemployment rates.[6] Bank reserves and the monetary base thus become more the consequence, than the determinant, of the demand-determined money supply in the short run.

Although this post-Keynesian proposition has long been argued in the literatures and many empirical evidences have been available on the commercial bank lending behavior, most of empirical evidences have been conducted within the traditional equilibrium approach of the nominal interest rates charged at commercial banks as being a dominant explanatory variable. Thus, the purpose of this paper is to address an empirical evidence which is consistent with the post-Keynesian proposition of the endogeneity of the money supply by establishing the relationship between money wages and bank loans. To meet this end, the changing pattern of commercial bank lending practices has been jointly investigated by developing a variable speed of adjustment model within the short-run disequilibrium frameworks.

The next section of this paper derives a simple stock adjustment model for commercial bank loan outstandings based on the conceptual framework provided by the existing literatures and extended to include a variable speed of adjustment in the model to reflect bank credit rationing behavior. Section III contains the results of estimating the model developed in the preceeding section, and followed by conclusions in Section IV.

[5] When the central bank finds that the money stock is expanding more rapidly than desired and it is impossible to moderate the large changes in the interest rates necessary to offset past excessive growth of the money stock, the central bank might amend its target values of reserves as well as interest rates. See Lombra and Torto.

[6] Moore (1979b), p. 65.

other studies on bank lending practices (D. Harris 1973; Campbell 1978; and Boltz and Campbell 1979) stems from the fact that the demand equation for business loan is formulated to include loans made available under the lines of credit so that only the working capital needs are entered as an element of determination of the business loan demand, leaving the effects of other variables on the short-term commercial and industrial loan demand.

On the contrary, an equation for business loan demand has been estimated by M. Harris. Her measure of the business loans made by commercial banks is more close to the loans made available to finance short-term expenditures other than the working capital needs, because the change in business loans was expressed as a function of such explanatory demand variables as the change in business inventories, the change in business fixed investment, the change in corporate cash flows, and the change in the differential between the prime rate and the commercial paper rate.[10]

A. The Stock Adjustment Model for Bank Loans

According to the study of the Survey of Terms of Bank Lending Data (Boltz and Campbell), it is common in bank lending pratices that commitments are very widely used by commercial banks to secure compensating balances and to establish long-term customer relationships in the profit-maximizing process. The short-run choice problem of commercial banks is then to select the optimal combination of commercial and industrial loan outstanding and security holdings to maximize their expected profit, subject to the bank balance sheet constraint. Thus, it is assumed that the profit-maximizing optimal level of commercial and industrial loan outstandings (CBL_t) at the end of a given period of time is positively related to the expected level of business loans demanded by business firms (BL_t) during a given period of time, i.e.,

$$(1)\ CBL_t^* = a_0 + a_1 BL_t^d \ ; \ a_1 > 0.$$

10 Each variable can be entered separately as explanatory variables. But, in order to avoid the possible multicollinearity problem, a new variable, financial gap (FGAP), is generated as FGAP = INVT + BFI-CF, where INVT is inventories, BFI is business fixed investments, and CF is corporate cash flows.

bank loan demand. Finally, the interest rate differential (RDIF) will help firms determine whether they borrow from banks or issue new short-term securities to finance the needs for funds (M. Harris 1976).

Thus, in a linear equation form, the expected demand for short-term business loans can be written as:

$$(4)\ BL_t^d = b_0 + b_1\ WBILL_t + b_2\ FGAP_t + b_3\ RDIF_t;$$
$$b_1, b_2, b_3 > 0.$$

Substitution for BL_t^d from equation (4) into equation (3) leads to express the reduced form equation for fixed coefficient business loans as:

$$(5)\ BL_t = \theta\ (c_0 + c_1\ WBILL_t + c_2\ FGAP_t + c_3\ RDIF_t - CBL_{t-1}),$$

where $c_0 = (a_0 + a_1 b_0)$, $c_1 = a_1 b_1 > 0$, $c_2 = a_1 b_2 > 0$, and $c_3 = a_1 b_3 > 0$.

In order to reflect the changing pattern of bank lending practices, the model will be extended to include the determinants of the speed of adjustment.

B. A Variable Speed of Adjustment Model

Within the traditional equilibrium context of the business loan market model, Hicks attempted to reflect the bank lending practices in the model. Hicks included the past level of bank loans in the demand equation to represent the partial adjustment of bank loans as well as the bank-customer relationship, whereas the reserve adjustment magnitude and portfolio constraint variables were included in the supply equation to reflect the banks' allocation of total earning assets between business loans and other investments. Within the dynamic stock adjustment frameworks, Grieves extended the stock adjustment model to include a variable speed of adjustment and a variable replacement rate, based on the postulates that timing decisions and liquidity availability affect the household demand for consumer durables.

tions in this study is constructed by utilizing the information available from the Quarterly Survey of Changes in Bank Lending Practices conducted by the Federal Reserves Board of Governors. The measure of the money market credit conditions has been constructed as a weighted average of questions asked to the bank senior loan officers about their willingness and policies to extend business loans:

$$\begin{aligned}\text{CREDIT}_t = &\sum_j w_{1j}\ (\%\ \text{of considerably more willing}) \\ &+ \sum_j w_{2j}\ (\%\ \text{of moderately more willing}) \\ &+ \sum_j w_{3j}\ (\%\ \text{of essentially unchanged}) \\ &+ \sum_j w_{4j}\ (\%\ \text{of moderately less willing}) \\ &+ \sum_j w_{5j}\ (\%\ \text{of considerably less willing})\end{aligned}$$

where weights are given as follows:

$$w_{ij} = w_{ik} \qquad \text{for all } j \text{ and } k,$$

$$w_{1j} = -w_{5j} = 2 \qquad \text{for all } j,$$

$$w_{2j} = -w_{4j} = 1 \qquad \text{for all } j,$$

$$w_{3j} = 0 \qquad \text{for all } j.$$

Substituting equation (6) into equation (5) and adding an error term yields the variable adjustment model for short-term business loans as:

$$\begin{aligned}(7)\ \text{BL}_t^s = &(d_0 + d_1\ \text{CREDIT}_t + d_2\ \text{MBASE}_{t-1})\ (c_0 + c_1 \\ &\text{WBILL}_t + c_2\ \text{FGAP}_t + c_3\ \text{RDIF}_t - \text{CBL}_{t-1}) + e_t,\end{aligned}$$

where e_t is an error term. Equation (7) will be estimated to jointly test the validity of variable speed of adjustment as well as the relationship between the money wage and business loans.

(CREDIT) as described in the preceeding section is computed as a weighted average of 10 items related to short-term business loans from the Quarterly Survey of Changes in Bank Lending Practices published in the Federal Reserve Bulletin.[12] The range of index value of CREDIT is $-2 \leqslant \text{CREDIT} \leqslant 2$. The closer to the value of 2 indicated an easy credit conditions, whereas the closer to the value of -2 implies a tight credit conditions.

Equation (7) was estimated using a nonlinear least squres routine available in the Time Series Processor, LSQ from TSP (Hall). In the estimating procedures, all variables were entered as first difference in order to obtain unbiased estimates by eliminating possible autocorrelation problem.[13] Thus, the first-order difference form of equation (7) estimated in this study is[14]

$$(7a)\quad \Delta BL_t = (g_0 + g_1 \Delta CREDIT_t + g_2 \Delta MBASE_{t-1})\ (h_0 + h_1 \Delta WBILL_t + h_2 \Delta FGAP_t + h_3 \Delta RDIF_t - BL_{t-1}) + u_t$$

where $u_t = e_t - \rho e_{t-1}$ is an error term which is assumed to be serially uncorrelated.

B. Estimation Results

The above nonlinear first-order difference equation (7a) was estimated under the different assumptions. Estimation results are presented in Table 1. Estimation 1 is the result of the assumption of a fixed speed of adjustment, i.e., $g_1 = g_2 = 0$, whereas Esti-

[12] Those 10 items in each subsample period are:

(1) From February 1967 through November 1977, all 10 items questioning willingness to make loans to nonfinancial businesses.

(2) From February 1978 through November 1979, to qualify for prime rate or spread above prime as standards of creditworthiness, willingness to make fixed-rate short-term loans, 5 items for reviewing credit lines or loan applications except loans to finance companies, and 2 items for willingness to make other types of commercial and industrial loans.

[13] An initial estimation of equation (7) was conducted to eliminate the autocorrelation problem using Cochrane-Orcutt Iterative routine. But Durbin-Watson statistic of 1.25 with the value -0.4793 for Rho indicates that the autocorrelation problem is not completely eliminated, so the a simple first difference of each variable is entered in the equation.

[14] Since $BL_{t-1} = CBL_t - CBL_{t-1}$, the past business loan was entered in the equation.

ultimately in an expansion of the money stock through an accommodating commercial bank lending behavior.

The statistically significant coefficient of financial gap with expected positive sign implies that business firms utilize the prearranged loan commitments to finance their capital expenditure needs, at least temporarily until further arrangements for sources of financing are completed. In addition, the statistically insignificant coefficient of rate differential indicates that commercial and industrial loans are not homogeneous products.[15] Since many large banks in financial center compete with each other and with alternative sources such as the commercial paper market, commercial and industrial loans made as the prime rate generally of the type of floating-rates and no fixed maturity (Boltz and Campbell). Thus, the borrowers could liquidate the loan at any time if more attractive rates were available elsewhere, so that the rate differential has no significant influence determining the source of financing short-term needs for funds.

Turning to the speed of adjustment, Estimation 1 and Estimation 2 present the similar results. An inclusion of current money market credit condition alone as a determinant of the speed of adjustment does not support the postulated assumption of a variable speed of adjustment. The magnitude of constant term in both Estimation 1 and Estimation 2 is about the same, but the large value of t-statistics computed under the hypothesis, $H_0: g_0 = 0$ against $H_a: g_0 \neq 0$, implies that the constant term might be overestimated possibly due to the existence of misspecification and/or the simultaneous-equation bias problem. Thus, in order to avoid the possible misspecification and/or simultaneous-equation bias problem, the past credit condition affected by the monetary policy is included in Estimation 3 and Estimation 4.

When a comparison between the results of Estimation 1 and Estimation 2 and the results of Estimation 3 and Estimation 4 is made, it is clearly shown that the speed of adjustment depends on the current and the past credit conditions affected by the monetary policy. The comparison also indicates that large part of

15 The traditional view of the prime rate assumed that loans carrying at the prime rate are basically a homogeneous product when made to the preferred customers. See Boltz and Campbell, p. 20.

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