SPECIFICATION AND ESTIMATION OF DEMAND AND SUPPLY FUNCTIONS OF COMMERCIAL BANKS' LOANS AND ADVANCES IN NIGERIA: 1961 – 1983

Comments

The main objective of the paper, according to the author, is to specify and estimate the demand and supply functions of commercial banks loans and advances "with a view to identifying those factors that influence both variables in Nigeria." If this could be interpreted to mean that the author wants to pinpoint the variables that explain the demand and supply of commercial bank loans and advances, then the study is necessarily both theoretical and empirical in nature. The procedure should be first to appeal to theory to seek the explanatory variables. Such theoretical consideration should be clear and convincing in order to forestall the chance of either including unnecessary variables or excluding any important variable from the equation specified.

It is also clear, as recognised in the literature, that the demand for commercial banks loans and advances is a demand for credit. In the Nigerian context, since the clampdown on credit for consumption purposes, demand for commercial bank loans is largely to finance industrial and business projects. It could be safely assumed that credit will be demanded by an individual investor in the event of a shortage of investible funds available to the investor. Thus, loans and advances are needed to bridge the gap existing between an investor's own resources and the desired level of investment. The amount demanded will depend on the borrowing-lending opportunities available to the individual investor. From this reasoning, it is clear that the area of the economics discipline that should be consulted for this study is the theory of capital. The demand for credit or loans and advances of commercial banks therefore seems to find reasonable explanations from capital theory.

The theory considers optimal utilization of opportunities available to an investor in the capital market to prosecute investment projects. Although the treatment is on micro-economic level, appropriate generalisation or aggregation may be adopted through use of suitable proxies. The choice open to an individual investor, over time, depends upon the individual's productive investment opportunities, borrowing-lending opportunities and his time preference [Layard & Walters, Hirshleifer, 1965]. In our own situation, it appears that, because of the dependence of almost every activity on the foreign sector, the macro-economic variable that will reflect the productive investment opportunities open to an investor may depend on such variables like the level of available external reserves, total foreign exchange available to the country, and aggregate value of trade (imports plus exports). Also, in order to reflect the dominance of government activities in the domestic level of activities, productive investment opportunities seem to be measurable by total government expenditure or the entire GDP. These variables may also, in our own context, be regarded as suitable measures of the level of economic activities. The appropriateness of these variables, especially those which relate to the foreign sector, is reinforced by the process whereby the savings-investment gap is bridged in our economy. The fact that an investor has investible resources in local currency does not automatically mean that the resources can be invested. Foreign exchange must be available to finance the off-shore

cost of investment. Even if access to the domestic capital market is open, i.e. borrowing-lending opportunities exist, without the foreign capital to supplement local resources investment efforts may be frustrated. The problem with using GDP as a proxy for productive investment opportunities is discussed below.

Such factors like the real rate of interest to reflect time preference may also enter the demand function. Aggregate capital stock or its breakdown into fixed capital stock, current investment and inventory may also be relevant determinants of the demand for commercial bank loans and advances. The rate of interest enters as the rate of discount employed for investment decisions while its nominal value also represents the cost of credit.

From the above suggestions the demand for commercial banks loans and advances in Nigeria could be specified as:

$$Ld = f(R, r, K, D)$$

where:

Ld = amount of loan demanded

r = real rate of interest

K = capital stock in its aggregate form but preferably broken down into three components viz previous stock, $Kt-1$' current fixed investment (FI) and inventory (V).

R = total available foreign exchange including external loan drawings, or total value of trade as may be found appropriate.

D = relevant dummy variables.

The capital-theoretic approach underlying the works of Melitz and Pardue [1978] and, subsequently that of Oladeji Ojo may probably derive from the above reasoning. While the latter work appreciated and acknowledged the merit in the capital – theoretic approach followed by the former joint authors, Ojo lent emphasis to the fact that appeal to capital theory is unavoidable when he stated that "Though the specification reflects the influence of Melitz and Pardue's work, it also reflects our own thinking on the subject as set out in a term paper written as a graduate student before the work of these two people came to hand."

In their specification and estimation of the demand equation, Melitz and Pardue discovered that both permanent and transitory incomes are strong explanatory variables in the demand for loans and advances. This was after they had subtracted estimated figures of fixed investment and inventory from GNP figures which were disaggregated into permanent and transitory incomes. At no part of their work is GDP used or even mentioned as claimed by the author of this paper in his review. The discovery by Melitz and Pardue that the permanent and transitory incomes act in conflicting ways through theoretical and empirical study of the demand function confirms that the inclusion of absolute level of income (or GDP) as a single variable (without disaggregation into permanent and transitory components) in any specification of the demand function is expected to produce unsatisfactory result as is obtained in the paper by Mr. Mordi. In other words, the failure of the author to use actual theoretical arguments to

locate explanatory variables of the demand function could have been responsible for the poor and discouraging results obtained in his paper. The wrong signs and the statistically insignificant coeffients computed for many variables which are theoretically established to be important explanatory variables could have derived from this source. This does not mean that the author should necessarily use the same explanatory variables as used in previous works. The lack of systematic approach to the subject by the author might have resulted in the choice of inappropriate variables.

In fact, it is difficult to understand why GDP or GNP should explain the demand for commercial bank's loans and advances more than it will explain supply. An increase in GDP has the prospect of increasing the demand for deposits, thus enhancing the liquidity of banks and the prospect of supply of loans. A decrease will have the opposite effect. Why should investors be willing to borrow when they are well-off? It does appear that if GDP or income is to be used as an explanatory factor of demand for loans and advances its disaggregation into permanent and transitory components (which has been shown to generate opposite impacts on demand for loans) is unavoidable in order to produce a satisfactory study. Data on those aggregates are however, still unavailable.

The author's assumption that the banks behave according to the capital-stock adjustment model in their loan supply behaviour is not based on any theoretical consideration. It amounts to an unjustified imposition of econometric method to describe economic behaviours without actually establishing the reasons for applying the method. The appropriateness of a particular model to a situation has to be demonstrated vividly on theoretical grounds. It is necessary for the author to explain the appropriateness of such an ad hoc partial adjustment model in the explanation of commercial bank behaviours in their supply of loans. The same also goes for the relevance of the adaptive expectation hypothesis to loan demand.

Stock adjustment is applicable in a situation where there is a discrepancy between actual physical stock of a durable asset and a desired level of stock. It may be difficult for many people to see how this fits into the theory of commercial bank behaviour towards supply of loans and advances. In theory, what are likely to pre-occupy commercial banks in deciding the supply of loans is the excess of their liquid assets over the reserve requirement, the cost of savings and time deposits, the liquidity ratio, the rate of interest on loans and advances relative to other interest rates, and their portfolio holdings of assets. The asset variable should even be further adjusted for the amount of loans and advances in order to prevent a regression of a variable on itself. Given the control over bank liquidity and an assumed cost minimizing behaviour, it could be expected that banks do have a desired level of liquidity they want to maintain. Whatever the desired level of loans banks want to extend to customers (if such a desired level exists) may not be relevant and theory seems to be silent about this.

The author's inclusion of liquid assets and required reserves as separate variables in the supply function is improper. What is likely to be important to commercial banks is the excess of liquid assets (LS), over required reserves (QR). In fact, the excess must be further adjusted by the whole amount of loans and advances so as to avoid regressing the same variable on itself.

In his specification of the demand function, the author suggests, without explanation, that the expected productivity and level of economic activity may be explanatory variables of the demand for loans and advances. He assumed that those who demand the loans and advances form their expectation according to the "adaptive expectation" hypothesis. This assumption is very crucial to the objective of the study. To say the least, like his assumption of capital-stock adjustment model for the supply function, the assumption of adaptive expectation hypothesis should be regarded as merely academic until it is empirically verified and its validity established. It is an empirical issue which, given the objective of this paper, is expected to be established (not assumed) by the author.

I wish to sound a note of warning concerning the use of expectations in modelling. Expectations are very difficult to handle in econometric works and several models of expectations exist in econometric studies. Each of the models depends on the feelings and ingenuity of those who construct them. The suitability of a particular one to a situation that is being handled has to be first established before it is used. Expectation models are more likely to mislead a writer especially at the stage of interpreting calculated coefficients because after using them they create other problems for the technique of estimation to the extent that if devices to eliminate the effect of the problems are not built into the technique of estimation, computed parameters will be biased.

The author's report of the results of estimating the demand and supply equations he specified in the paper is clear and could be understood by all and sundry. This report and the paper's conclusion are enough to show whether the objective of the study has been accomplished or not. Probably the problems in the author's approach highlighted above contributed to the author's inability to achieve his objective. In spite of high values of coefficients of correlation he reported that the results are discouraging for both supply and demand functions. It should be emphasized – and the computed equations in this study confirm it – that goodness of fit alone is not sufficient to determine the admissibility of an estimated equation.

The author claims that the high coefficient obtained for rediscount rates (RD) shows that that variable is important to the supply function. He should however, realise that the simultaneous inclusion of rediscount rates (RD) and the rate of interest on competing assets (RC) (which is probably computed as an average or a function of the relevant rates) in the supply function is questionable as the two variables are not likely to be truly independent. The implication of this for econometric work of this type is obvious. This seems to have been the reason why the author obtained a very high coefficient for the discount rate (RD).

In view of the discouraging results obtained by the author he should have realised that all estimated parameters must be biased and unworthy of credence. His statement that "the supply of loans does appear to be explained by a partial adjustment mechanism with a fairly fast speed . . ." which is based on the estimated coefficient of adjustment depends on the bias introduced by an unsuitable computational technique.

The study's conclusion is also very crucial. All economic variables theoretically justified as explanatory variables of the demand and supply functions are not supported by the study as appropriate explanatory variables. The study thus negates all theoretical claims without any suggestion of what variables should explain these important dependent variables.

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REFERENCES

1. See, P. R. G. Layard and A. A. Walters. *Micro-economic Theory*. Chapter 12, pp. 326–347. McGraw-Hill Book Company, New York. Also, see J. Hirshleifer, "On the theory of Optimal Investment Decisions" *Journal of Political Economy*, Vol. 66, pp. 326–351, and another article by the same author titled "Investment Decision under Uncertainty: Choice – Theoretic Approaches" in *Quarterly Journal of Economics*, Vol. LXXIX, November, 1965.

2. See J. Melitz and M. Pardue. The Demand and Supply of Commercial Bank loans "*Journal of Money, Credit and Banking*, Vol. 5, 1978.

3. See Oladeji Ojo, The Demand and Supply of Commercial Bank loans in Nigeria, 1962 – 1972 Published in "*Money, Finance and Nigerian Economic Development*" Edited by O. Teriba and V. P. Diejomaoh.

A REPLY

It must be pointed out that, although it is true that economic research generally must be guided by theory and practices in other countries, but in applying such theories and experiences to any given country, due cognisance must be given to the economic setting of that particular country. Researchers in developing countries like ours are often faced with the problems associated with our level of development/nature of the economy, nature and inadequacy of available statistics, unavailability of relevant data in some cases, institutional constraints, unquantifiable controls often imposed by the authorities, etc. Thus, the application of sophisticated models of advanced countries to developing countries must consider these factors and appropriate modifications made where necessary. This has been the approach adopted in my study.

Mr. Oresotu feels that the procedure adopted by Melitz and Pardue in the choice of explanatory variables was so standard that it is difficult to set their work aside entirely. However, a cursory examination of the explanatory variables used for my study shows that they are the same except for some slight modifications. As it is clearly discernible from the paper the choice of variables in the study has been influenced mainly by the considerations of theoretical and practical relevance to the Nigerian situation, as well as the additional factor of data availability and its nature.

It is rather surprising that Mr. Oresotu questions the use of GDP as a proxy to measure the level of economic activity and hence productivity, when in fact elementary economic theory recognises this. Its usage in my study was in line with the approach adopted by Melitz and Pardue and Ojo in their study. The only difference with the former being their disaggregation of the GNP into permanent and transitory components.

Furthermore, within the Fisherine Capital-theoretic approach which formed the basis of my analysis, it was stated that the demand for credit depends on the productivity of the credit acquired; where a good proxy for such productivity is the level of economic activity often measured by GDP (or GNP) or its other components like investment, inventories or exports. The claim that Melitz and Pardue never used GNP (or GDP for that matter) is not true as confirmed by the following statement:

"our procedure, hence, was first, to divide aggregate income, measured by GNP, between permanent and transitory income, ..." (Melitz and Pardue, p.683).

It needs to be pointed out, however, that the concept of permanent and transitory incomes is rooted in the analysis of consumption behaviour of households. Even though Melitz and Pardue found the two variables as strong explanatory variables in the demand for loans in their study, one finds it difficult to rationalize its practical relevance to the Nigerian situation, moreso, that no attempt has been made up to date to analyse consumption behaviour in Nigeria. Do we really believe that households in Nigeria have a perceived permanent income that determines their decision to consume now relative to the future? While recognizing that the division of aggregate income into permanent and transitory components could be a worthwhile exercise, can we really adopt this for Nigeria in view of the nature of available statistics? This fact was acknowledged by Mr. Oresotu when he stated "data on these aggregates are, however, still unavailable". In addition, it should be recognised that the consumers' decision to borrow is not a choice about the source of his future consumption services and the method of payment for those services.

Furthermore, Mr. Oresotu questioned why borrowers (or investors) will be willing to borrow when they are well-off that is, why increasing productivity will lead to increased demand for loans. In reacting to this, I wish to state that in an economy characterised by low incomes, low level of savings, high investment opportunities, high bank liquidity and where shortage of investible funds has been identified as a constraint on the level of economic development, higher level of economic activity (and hence productivity) has the potency of increasing credit demand. This is because any increase in economic activity or productivity measured by GDP will, *ceteris paribus* open up more investment opportunities (expansion of existing investments or new investments) and hence lure investors to request for additional loans to finance these investments. Thus, as long as incomes are low and there exists shortage of investible funds, increasing productivity has the tendency to open up opportunities and hence increase loan demand.

In adopting the partial stock-adjustment procedure, I have been guided by the available literature on the portfolio behaviour of commercial banks. It was not a question of imposing an econometric method to describe economic behaviour.

I wish to refer to the work of Goldfeld (1966), which has become an indispensible tool in the analysis of commercial banks' portfolio behaviour since its publication. In adopting the approach used in my study, I took into consideration the rational profit-maximising behaviour of banks. The banks were viewed as a business unit out to maximise profits, and that among the set of assets available to them to invest in, the most attractive in terms of yield (or rate of return) are loans and advances. Since loan supply is merely a reflection of commercial banks' desire to earn income (or rate of return) on their asset portfolio, and given the high interest rate on loans and advances relative to other assets, banks tend to have a desired level of loans they would wish to offer. However, this

desire is not often achieved because of certain scale constraints like their assets in excess of their required reserves, banks liquidity, risks and uncertainty involved in the loan and deposit markets, in addition to the set of controls imposed by the authorities on the activities of commercial banks. This last point was recognized by me in the study and adequately taken account of through the inclusion of various policy instruments and a policy dummy variable in the supply equation.

Similarly, the use of 'expectation' and consequently the partial-adjustment mechanism in the demand equation was also predicated on the rational behaviour of borrowers. The role of expectations in modern economic analysis – particularly in the demand for financial assets – is so clear that I need not go into details here. However, borrowers will not necessarily go for loans if they do not expect a high return from such loans. That is, if the expected productivity of such loans is not sufficient to make them attractive. It was this reasoning that guided me in adopting the approach used in my study.

Mr. Oresotu regards the simultaneous inclusion of liquid assets and required reserves as well as discount rate and interest rate on competing assets as separate variables in the supply function as improper. Both required reserves and discount rates were introduced into the equation as policy instruments. It was aimed at capturing the effect of a change in either or both of them on loan supply. This was adequately taken care of in the study when I stated ". . . we consider excess liquid assets/excess liquidity ratio as the more relevant supply variables. This is so because we believe that it is the excess rather than the total that acts as a constraint on the expansion of loan given an adequate loan demand, . . ."

Regarding interest rate on competing assets, we know that loans and advances are just one single asset open to commercial banks to invest in, how do we account for the possible influence of their decision to invest in other assets instead of in loans and advances? The discount rate and interest rate on competing assets were included to capture two different situations – one to serve as a policy instrument and the other the rate of return on alternative assets that competes for commercial banks' portfolio activities. There is no doubt, however, that there might be a problem of multicollinearity, but this was not tested for in the study.

On the issue of real rates, how do we measure the real rate particularly in a situation of generally low and institutionally-determined nominal rates? What realistic results do we hope to obtain from such an exercise? Theoretically, nominal rate is composed of two elements – the real rate of interest and the inflation rate. In a situation where inflation rate is higher than the nominal interest rate, how do you derive the real rate given that in most cases this will generally be negative? What economic interpretation do you give such a negative variable and what kind of *apriori* relationship will be expected between this and loan demand? These are additional issues that have to be taken up in any empirical analysis that purport to use the real interest rate in Nigeria.

As rightly pointed out, 'expectations' have been and have continued to be very difficult to model in empirical studies, and efforts have continued to be made to improve on its usage. However, the problem associated with modelling them is not enough justification for not recognizing their role in modern economic analysis, particularly in portfolio analysis and speculative market situations to which the loan market belongs. (See for example Chernoff and Moses (1959), Friedman and Savage (1948)).

Furthermore, Mr. Oresotu seems to be mixing up issues about the assumption of adaptive expectations hypothesis in the study and its empirical validation. When assumptions are made, it is left for empirical analysis to justify or reject such assumptions. It does not necessarily boil down to establishing such an assumption before carrying out your empirical analysis. The role of expectations in portfolio decisions is quite clear in the literature, all that was required in my study was to establish its applicability to credit borrowers.

On the appropriateness of the estimation techniques adopted, it was clearly stated in the paper that this was dictated more by the available computational facilities, rather than by my conviction that the procedure was more approporate. These are issues which further research efforts should be geared towards eliminating.

On the poor estimated parameters, it is rather surprising that Mr. Oresotu generalized his conclusions by stating that "the fact that all estimated parameters turned out insignificant must be due to the unsuitable computational techniques." While the computational technique could have contributed to the poor results obtained, it is necessary to recognize also that the Nigerian economy has been characterized by a lot of control, so that it is not impossible for the policy variables included in the study to produce unexpected results; moreso, as most of these variables are fixed or determined by the monetary authority. Some of these variables have remained fixed over the years or have changed very little to the extent that their effects are negligible, if any. Thus, even though theoretical considerations recognize their role, the institutional constraints are enough to cause some distortions in the results.

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REFERENCES

1. Chernoff, Herman, and Lincoln E. Moses, *Elementary Decision Theory* (New York: John Wiley and Sons, 1959)

2. Friedman, Milton, and L. J. Savage, "Utility Analysis of Choices Involving risk," *Journal of Political Economy*, LVI. (August 1948), pp.279–304

3. Goldfeld, Stephen M. *Commercial Bank Behaviour and Economic Activity* (Amsterdam: North Holland Publishing Co. 1966)

4. Melitz, J. and Pardue, M. "The Demand and Supply of Commercial Bank Loans" in *Journal of Money, Credit and Banking*, Vol. 5, 1973

5. Mordi, C. N. O. "Specification and Estimation of Demand and Supply Functions of Commercial Banks' Loans and Advances in Nigeria: 1961–1983", Research Paper, Central Bank of Nigeria, June 1985.

6. Ojo, O. "The Demand and Supply of Commercial Bank Loans in Nigeria 1960–1972", in O. Teriba and V. P. Diejomaoh eds; *Money, Finance and Nigerian Economic Development, Essays in Honour of Obasanmi Olakanpo* (Nigerian Economc Society 1978).