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## OPTIMAL BORROWING MODELS: A LIQUIDITY AND SOLVENCY ANALYSIS

NNAUKWU UKOHA\*

*This paper discusses liquidity and solvency parameters with borrowing models appropriately developed for analysing conditions where corporations are able or unable to borrow to meet maturing financial obligations. It demonstrates that, with functioning financial markets, it is possible to design and implement corporate strategies that can turnaround Africa corporations in spite of observed liquidity constraints.*

### **Introduction**

Corporate borrowing is undertaken to maximise the profit object. This objective itself is constrained by the corporation's budget. These are the principal features of all borrowing models. The borrowing problem is formally resolved by maximising the profit objective subject to the dynamic budget constraints. In the solution of a

borrowing model, we are merely seeking a path of investment, output and debt that maximise the profit function. The resulting path however does not, in itself, specify the policies needed to achieve it. They need to be worked out separately. A general borrowing model specifies that the magnitude of funding as well as the terms under which a corporation can borrow from a lending institution are constrained by liquidity and solvency evaluation as well as the probability of repudiation by the debtor corporation. In acute dependency however, the solvency criteria is not readily considered by lending institutions, especially in Africa. The result becomes the unfortunate impairment of long-run liquidity by not considering the solvency parameters.

\* Author was a Research Fellow of the Michael Ibru Postgraduate School, University of Nigeria, Nsukka and Senior Lecturer in the College of Business Administration, Abia State University, Uturu.

### *Main Proposition*

In view of the foregoing, it is contended here that emphasis on short-run liquidity to the exclusion of solvency considerations might lead to the closure of major business organisations with prospects of long-term liquidity and tremendous growth opportunities.

### *Objectives of the Paper*

This paper is intended to demonstrate with appropriate mathematical models that liquidity problems can co-exist with solvency properties by long-term criteria. It is also directed towards energising the search for identifiable solvency signals as a springboard for corporate turn-around strategies.

### *Organisation of the Paper*

An introductory analysis, as the first section, precedes two other sections. The second discusses the models and their applicability to corporate operation and the funding problem. The third section concludes the overall analysis and makes some policy recommendations for improving the efficiency of highly dependent distressed institutions.

## **Corporate Operations and the Funding Models**

Solvency refers to the corporation's long-run capacity to service its debts. This should not be construed to mean the probability of becoming a creditor corporation in the long-run. It only refers to the availability of resources for debt

servicing without recourse to additional borrowing to meet maturing interest obligations. For example, ₦20m loan has a zero market value if there must be continuous borrowing to service this loan and a market value of ₦20m, if this loan can be serviced from the corporation's own earnings.

Debt servicing is only possible if there is a surplus in the form of profit  $p$ . The corporation is recording a loss if  $P_t < 0$  where  $P_t$  is profit at time  $t$ .

The corporation can only service its debt if the maximum discounted sum of its current and future profits is greater than its outstanding debt.

$$* \text{Max} \sum_{t=1}^n (1+r)^{-(t-0)} P_t > D_t \dots\dots\dots (5.1)$$

where:  $r$  = the real rate of interest and  
 $D_t$  = the outstanding loan stock  
 at time  $t$ .

If however,

$$\text{Max} \sum_{t=1}^n (1+r)^{-(t-0)} P_t \geq D_t \dots\dots\dots (5.2)$$

the corporation will have to borrow indefinitely up to the size of the real interest rate if debt servicing is to be continued. If the outstanding debt at period  $t$  is  $(1+r) D_t$ , the solvency constraint can be stated as the requirement that:

$$(1+r)D_t \leq \text{Max} \sum_{t=1}^n (1+r)^{-(t-0)} P_t \dots\dots\dots (5.3)$$

### *Profit, Cost and Revenue*

The corporation's current and future profits  $P_t$  are functions of total cost (TC)

and total revenue ( $TR_t$ ), which are themselves, functions of output  $Q_t$  and price  $P_t$ . We can simply state that  $P_t = TR_t - TC_t$ . The solvency constraint can be restated as:

$$(1+r) D_t < \text{Max} \sum_{t=1}^n (1+r)^{-(1-t)} (TR_t - TC_t) \dots (5.4)$$

The expression on the right side of (5.4) above is the maximum discounted sum of  $P_t$  or  $(TR_t - TC_t)$ . This is the accrued wealth of the corporation in dynamic terms.

The solvency constraint requires that the corporation's outstanding debt stock,  $(1+r) D_t$  be less than its accrued wealth  $P_t$  or  $(TR_t - TC_t)$  at period  $t$ . As long as the corporation is willing to pay its debts and if it can always borrow freely, subject to the condition that it remains solvent then:

$$(1+r) D_t \leq \text{Max} \sum_{t=1}^n (1+r)^{-(1-t)} P_t$$

OR

$$(1+r) D_t \leq \text{Max} \sum_{t=1}^n (1+r)^{-(1-t)} (TR_t - TC_t)$$

defines the loan supply schedule to the corporation.

However, this is not without an important and binding qualification.

If  $TR_t - TC_t$  or, in other words,  $P_t$  grows in the steady state at a rate  $P$  greater than  $r$ , then the corporation will face no solvency constraint. Its wealth stream:

$\sum (1+r)^{-(1-t)} (TR_t - TC_t)$ ; will be infinite. The implication therefore is that

starting from any level  $D_t$ , the corporation has future income stream to repay its debts.

#### Liquidity and Borrowing Capacity

The corporation's liquidity constraint may set a limit to its ability to borrow even when the solvency limit has not been attained. With cash flow problems, the corporation begins to find it difficult to service its loans in the absence of new facilities. If a fraction of an outstanding exposure becomes due within a period of illiquidity, the corporation will fail to meet amortisation and interest payment  $XD_t$  and  $rD_t$  respectively.

Total debt servicing requirement will be  $(X + r)D_t$  which is greater than  $P_t$  i.e.  $(X + r)D_t > P_t$  even though  $(1+r) D_t < \text{Max} \sum (1+r)^{-(1-t)} (TR_t - TC_t)$ . There is indication here that when,  $(X + r) D_t > P_t$  the corporation will be unable to meet its debt serving obligations because of liquidity constraints in spite of the fact that it is solvent by long-term criteria.

#### The Role of the Capital Market

In some circumstances the capital market may be functioning properly and the debtor corporation can borrow  $(X + r) D_t - P_t$  in order to be able to honour its current obligations. Otherwise, the corporation may be able to obtain further loans.

If the corporation's facilities are syndicated, the lending decisions of any one member of the financing institutions will be affected significantly by the

properties can be put together in spite of current illiquidity. Since profitability is a function of output and price, a corporation can borrow now to improve its future liquidity position if its production function and the market structure that it faces can attract institutional assistance and modification especially in the context of dependency.

Instruments of policy would need to identify and emphasise collaborative assistance to public and private sector institutions that are currently facing serious cash flow problems. This is particularly necessary for these corporations where solvency by long-term criteria are not in doubt. Their operations as going concerns can be jeopardised if liquidity constraint becomes the primary basis of evaluation instead of a search for solvency properties and the methods that can be adopted to assist them in meeting their maturing obligations.

What is required especially in the underdeveloped economies of Africa, Asia, and Latin America is a financial engineering system developed out of their fragile but emerging financial markets that would directly address the problems of improving production capacity and the strengthening of internal markets first. This would, undoubtedly, improve the wealth stream of these corporations, resolve current liquidity problems and subsequently improve their borrowing and repayment capabilities.

From there on, these corporations, through improved products, can penetrate the international commodity and capital markets. They would require the assistance of their various governments in spite of the global tendency towards market economies.

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