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THE EFFECT OF WORKING CAPITAL ON PROFITABILITY OF FIRMS IN NIGERIA: EVIDENCE FROM GENERAL METHOD OF MOMENTS (GMM)

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ABSTRACT

The paper investigates the effect of working capital on profitability of firms in Nigeria for the period 1999 to 2007. The study adopts the dynamic panel general method of moments in analysing the data. Results of the estimation show that sales growth, cash conversion cycle, account receivables and inventory period affect firm positively, while leverage and account payable affect firm profitability negatively.

JEL Classification: *G30, G32*

Key Words: *Working capital management, inventory, profitability, Nigeria, GMM.*

INTRODUCTION

Working capital management is an important component of corporate finance because it directly affects the liquidity and profitability of the company. Indeed, interaction between working capital management practices and profitability should a major area of research focus. According to Kargar and Bluementhal (1994), any firm that put inaccurate working capital management procedures into practice may likely face bankruptcy even though their profitability is constantly positive. Hence, it must be avoided to recede from optimal working capital level by bringing the aim of profit maximization in the foreground, or just in direct contradiction, to focus only on liquidity and consequently pass over profitability. In general, excessive levels of working capital will result in a substandard return on assets while inadequate amount of it will lead to shortages and difficulties in maintaining day-to-day operations.

Moreover, working capital constitutes an important source of capital for small and medium scale enterprises as well as high flying firms. In most developing countries, these categories of firms face limited access to long term capital markets. To overcome this constraint, these firms tend to rely more heavily on owner financing, trade credit and short term capital bank loans(Chittenden et al, 1998; Saccurato, 1994). Hence, working capital position of such firms is not only an internal firm-specific matter, but also an important indicator of risk for creditors (Moyer et al., 1992). Firms with high amount of working capital are able to meet their short term obligations easily thereby decreasing their default risk and enhancing their borrowing capability. And, as increase in borrowing capability is often perceived as indication of decrease in cost of debt (and also in cost of capital), it is possible to state that the efficiency in working capital management affects not just the short term financial performance (profitability) but also long-term financial performance. Though efficient

management of the working capital is crucial for both profitability and prosperity of any firm, not many studies have been conducted on the issue in Nigeria. Indeed, to the best our knowledge, no known has been conducted on the issue in Nigeria. Hence, the main objective of this paper is to fill this gap in the literature. Specifically, the study examines the effects of working capital on the profitability of firms in Nigeria. In order to examine this issue for 66 firms for the 1999-2007 period, we employed the dynamic panel general Method of Moments (GMM) in this study.

The rest of the paper is organized as follows: the next section presents the model and the data description. The third section discusses the methodology and the fourth section reports the empirical findings of the study. The last section concludes the paper.

2. MODEL SPECIFICATION AND DATA

Following the empirical literature, the functional specification of the relationship between profitability and the working capital may be specified as[1]:

$$\pi_{it} = \beta_o + \sum_{it}^{n} \beta_i X_{it} + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where π_{it} = profitability of firm I at time t,......... i = 1,2,3.......... 66 firms

β_o = intercept

β_i = coefficients of X_{it} = independent variables for working capital of firm i at time t

ε = error term

The annual time series data are obtained from 66 firms listed in the Nigerian Stock Exchange Market for the period 1999-2007. The listed firms chosen for the study were selected on the basis of data availability.

3. METHODOLOGY

This paper employs dynamic panel general method of moments. In panel estimation, neither the Generalised Least Squares (GLS) estimator nor Fixed Effect (FE) estimator produces consistent estimates in the presence of dynamics and endogeneous regressors. The profitability equation we estimate has lagged endogeneous regressors as well as unobserved firm fixed effects which are correlated with the regressor, hence the orthogonality condition is not likely to be met for a GLS or FE estimator to produce consistent estimates. This explains the use of GMM approach.

The basic GMM panel estimators are based on moments of the form,

$$g(\beta) = \sum_{i=1}^{M} g_i(\beta) = \sum_{i=1}^{M} Z_i' \, \varepsilon_i(\beta) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (21)$$

Where Z_i is a $T_i \times$ p matrix of instruments for cross-section i, and,

$$\varepsilon_i(\beta) = (Y_i - \int (X_{it}, \beta)) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (22)$$

In some cases we will work symmetrically with moments where the summation is taken over periods *t* instead of *i*.
GMM estimation minimizes the quadratic form:

[1] However, as working capital is not the only factor affecting profitability, other factors such as sales growth, size, leverage and economic growth rate were accounted for in the estimated model.

$$S(\beta) = [\sum_{i=1}^{M} Z_i' \varepsilon_i(\beta)]' H [\sum_{i=1}^{M} Z_i' \varepsilon_i(\beta)] = g(\beta)' Hg(\beta) \quad \text{..... (23)}$$

With respect to β for a suitably chosen $p \times p$ weighting matrix H.
Given estimates of the coefficient vector, $\hat{\beta}$, an estimate of the coefficient covariance matrix is computed as,

$$V(\hat{\beta}) = (G'HG)^{-1} (G'H\Lambda HG)(G'HG)^{-1} \quad \text{.....(24)}$$

Where Λ is an estimator of $E(g_i(\beta) g_i(\beta)') = E(Z_i' \varepsilon_i(\beta) \varepsilon_i(\beta)' Z_i)$, and G is a $T_i \times k$ derivative matrix given by:

$$G(\beta) = \left(-\sum_{i-1}^{M} Z_i' \nabla \int_i (\beta) \right) \text{.....(25)}$$

In the simple linear case where $\int(X_{it}, \beta) = X_{it}', \beta$, we may write the coefficient estimator in closed form as,

$$\hat{\beta} = \left(\left(\sum_{i=1}^{M} Z_i' X_i \right)' H \left(\sum_{i=1}^{M} Z_i' X_i \right) \right)^{-1} \left(\left(\sum_{i=1}^{M} Z_i' X_i \right)' H \left(\sum_{i=1}^{M} Z_i' Y_i \right) \right)$$

$$= (M_{ZX'} H M_{ZX})^{-1} (M_{ZX'} H M_{ZY}) \text{.....(26)}$$

With variance estimator,

$$V(\hat{\beta}) = (M_{ZX}' H M_{ZX})^{-1} (M_{Zx'} H \Lambda H M_{ZY}) (M_{ZX'} H M_{ZX})^{-1} \quad \text{.....(27)}$$

For M_{AB} of the general form:

$$M_{AB} = M^{-1} \left(\sum_{i=1}^{M} A_i' B_i \right) \quad \text{..... (28)}$$

The basics of GMM estimation involve: (1) specifying the instruments Z, (2) choosing the weighting matrix H, and (3) determining an estimator for Λ.

It is worth pointing out that the summations here are taken over individuals; we may equivalently write the expressions in terms of summations taken over periods. This symmetry will prove useful in describing some of GMM specifications that EViews supports. A wide range of specifications may be viewed as specific cases in the GMM framework. For example, the simple 2SLS estimator, using ordinary estimates of the coefficient covariance, specifies:

$$H = (\hat{\sigma}^2 M_{ZZ})^{-1}$$
$$\Lambda = \hat{\sigma}^2 M_{ZZ} \quad \text{..... (29)}$$

Substituting, we have the familiar expressions,

$$\hat{\beta} = (M_{Zx}' (\hat{\sigma}^2 M_{ZZ})^{-1} M_{ZX})^{-1} (M_{Zx}' (\hat{\sigma}^2 M_{ZZ})^{-1} M_{ZY})$$

$$= (M'_{Zx}\, M_{ZZ}^{-1}\, M_{ZX})^{-1}(M'_{Zx}\, M_{ZZ}^{-1}\, M_{ZY}) \quad \text{..... (30)}$$

and, $V(\hat{\beta}) = \hat{\sigma}^2\left(M_{ZX'} M_{ZZ}^{-1} M_{ZX}\right)^{-1}$

Standard errors that are robust to conditional or unconditional heteroskedasticity and contemporaneous correlation may be computed by substituting a new expression for Λ,

$$\Lambda = T^{-1}\left(\sum_{t=1}^{T} Z_t\, \hat{\varepsilon}_t \hat{\varepsilon}_t\, Z_t\right)$$

So that we have a white cross-section robust coefficient covariance estimator.

Essentially in this work, we use the Arellano and Bond (1991) dynamic panel General Method of Moments (GMM) estimator proposed by Arellano and Bond (1991). We have used this method partly because we do not have reasonable instruments for the endogeneous regressors that can be excluded from the equations and partly because it produces consistent estimates in the presence of endogeneous regressors. Arellano and Bond provide a family of dynamic panel GMM estimators in the DPD 98 program that allows for one to estimate coefficients from levels, first difference or orthogonal deviation of the variables. In this study, we estimate the equations in the first difference form.

The DPD estimator is given as:

$$\hat{\theta} = (\overline{X}^1 Z A_N Z^1 \overline{X})^{-1}\, \overline{X}^1 A_N Z^1 \overline{y} \quad \text{..... 32}$$

Where $\hat{\theta}$ is a vector of coefficient estimates on both exogeneous and endogeneous regressors, $\overline{X}$ and $\overline{y}$ are the vectors of first differenced regressors and dependent variables respectively, Z is a vector of instruments and A_N is a vector used to weight the instruments. The estimator uses all lagged values of endogeneous and predetermined variables as well as current and lagged values of exogeneous regressors as instruments in the differenced equation. As an illustration, for the equation:

$\Delta y_{i3} = \alpha \Delta y_{i2} + \beta \Delta x_{i3} + \Delta \Gamma_{i3}$ this study used $y_{i1}, x_{i1},$ and x_{i2} as instruments. For the Δy_{i4} equation, $y_{i1,}, y_{i2}, x_{i1}, x_{i2}$ and x_{i3} serve as valid instruments. Instruments for other cross-sectional equations are constructed in the same way. The dynamic panel estimator is a GMM W equivalent of an efficient three stage least squares (3SLS) estimator.

Two estimators are proposed by Arellano and Bond (1991). These are one-and two-step estimators. The two-step is the optimal estimator. Thus in this work, we use the two-step estimator to estimate the coefficients of the profitability equation because it is more efficient than the one-step estimator.

4. EMPIRICAL RESULTS

We used the DPD estimator to estimate equation 1. Table 1 presents the results of the estimation. Columns 1 and 2 report results using lagged dependent variable and number of days' account receivable as independent variables. Columns 3 and 4 uses inventory turnover as independent variable. Columns 5 and 6 adopt account payable as measure of working capital while columns 7 and 8 uses cash conversion cycle as measure of working capital.

Table 1(GMM)
Empirical Effects of Working Capital Management on Profitability

Dependent variable Regression Model	Profitability Dynamic GMM							
	1	2	3	4	5	6	7	8
Prof.-1	0.137*** (4.457)	0.1544*** (4.129)	0.177*** (7.449)	0.196*** (6.859)	0.170*** (7.362)	0.189*** (4.215)	0.162*** (5.175)	0.209*** (4.375)
Prof(-2)	-	0.002 (0.108)	-	-0.011 (-0.814)	-	0.0027 (0.170)	-	-0.006 (-0.033)
Siz	-1.585 (-0.284)	-5.965 (-0.984)	9.732* (1.695)	-1.321 (-0.194)	0.103 (0.025)	-14.575** (-2.047)	4.097 (0.752)	-6.782 (-0.976)
Sgr	0.000004** (2.529)	0.000003** (2.067)	0.000003* (1.715)	0.000003* (1.757)	0.000004** (2.795)	0.000004** (2.570)	0.000004** (2.523)	0.000003* (1.656)
Lev	-0.164 (-1.361)	-0.243* (-1.838)	-0.246* (-1.573)	-0.299** (-2.159)	-0.193* (-1.631)	-0.237* (-1.813)	-0.118 (-0.842)	-0.238* (-1.658)
Gdp	0.0001 (1.385)	0.00009 (1.388)	0.00004* (1.742)	0.00001 (0.387)	0.00004 (1.336)	0.00002 (0.658)	0.00002 (0.714)	0.00003 (1.199)
Are	0.122** (1.983)	0.131** (2.389)	-	-	-	-	-	-
Invt	-	-	0.037 (1.742)	0.0195 (0.886)	-	-	-	-
Pay	-	-	-	-	0.0038 (-0.324)	-0.028 (-1.567)	-	-
Ccc	-	-	-	-	-	-	0.035 (2.242)	0.043 (2.572)
j-statistic	20.072	18.608	21.149	19.391	22.792	18.456	19.969	17.411
Instrument Rave	35.000	33.000	35.000	33.000	35.000	33.000	35.000	33.0000
p-value	0.5786	0.5474	0.5115	0.4966	0.4137	0.5573	0.585	0.6261
N No of vation	66	66	66	66	66	66	66	66

Note: The figure in parenthesis indicate t-statistics
* Denotes significance at 10%
** Denotes significance at 5%
*** Denotes significance at 1%

The results show that the coefficients of lagged dependent variable are positive and significant at 1%. This suggests that current profit levels are positively influenced by profit level in the previous year. Sales growth is positively and significantly related to profitability. Sales growth is an indicator of a firm's business opportunities as such it is an important factor that allows firms to enjoy improved profitability. Leverage is negatively and significantly related to profitability. The negative relationship between leverage and profitability might be an indication that firms maintain high debt ratio to increase their liquidity holdings so as to decrease the likelihood of financial distress. Increase liquidity holding possibly adversely affected the profitability of the firms. Several previous studies have found negative relationship between profitability and leverage (see Myers 1984 and Rajan and Zingales 1995). Also, the finding of negative relation between leverage and firm profitability may be explained by the suggestions that highly leveraged firms are "boster" competitors that will curtail investment (Myers 2003), so their insufficient power of competition may lead to decrease in profitability. Size variable is positively related to

profitability where only first lags of dependent variable are incorporated but the coefficient is not significant at 5%. The coefficient of GDP is positive in all the regressions but the coefficient is not significant in all the regressions. The non significance of the economic growth rate might not be unconnected with relatively low economic growth rate experienced during the study period. Indeed, as a result of low economic growth and poor infrastructural facilities, many firms were either closed down or operated far below capacity during the study period.

The negative relation between profitability and number of days account payable shows that less profitable firms take longer time to settle payment to creditors. Hence, when there is a drop in profitability, less cash is generated from operations and firms are able to survive by postponing payment to suppliers. Also, the positive relation between inventory period and profitability may be the result of increasing sales leading to higher profits and thus fewer inventories. The positive relation found between profitability and number of days inventories possibly shows that reducing the number of days inventory by firms may not increase their profitability. The results show positive relationship between account receivable period and profitability. This might be due to the fact that customers do not require more time to assess quality of products they buy from firms with increasing profitability.

The cash conversion cycle (CCC) has significant positive effect on profitability. The positive relation for CCC is consistent with the view that resources are blocked at the different stages of the supply chain, thus prolonging the operating cycle. This possibly increase profits as a result of increase sales, especially where the costs of tied up capital is lower than the benefits of holding more inventories and generating more trade credits to customers.

5. CONCLUSION

The paper uses a dynamic panel estimator to examine the impact of working capital on profitability of firms in Nigeria over the period 1999 – 2007. These are the major findings. First, sales growth is positively related to firms' profitability. Firms may gain some advantages like monopoly or bargaining power due to growth as a reflection of economies of scale (Kulter and Dermirgunes 2007). Second, leverage is negatively related to profitability. Third, accounts receivable period and firms' profitability are positively related. Fourth, cash conversion cycle is positively related to profitability.

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