

FIRM SIZE, PROFITABILITY AND CASH HOLDINGS: A CAUSAL ANALYSIS OF SELECTED QUOTED MANUFACTURING FIRMS IN NIGERIA

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ABSTRACT

The study examined the causal relationship between firm size, profitability and level of cash and cash equivalents of selected quoted manufacturing firms in the Nigerian Stock Exchange. Ex-post-facto research approach via panel least squares was employed to assess the nature and extent of association between these variables. Data were collated from the audited annual reports of thirty-seven (37) manufacturing firms for the fourteen year period: 2005-2018. Diagnostic tests were carried out on the collated data using Levin-Lin-Chu panel unit-root test which confirmed their stationarity and Westerlund Panel Cointegration Tests that depicted the variables were not cointegrated in the long run. Hypothetical statements tested using Granger Causality Wald Tests portrayed that CASH and LnTA cause ROA (proxies for cash and cash equivalents, logarithm of total assets and return on assets respectively). These results imply that optimizing firms' profits necessitate striking the best liquidity-profitability trade-offs, otherwise firms keeping insufficient liquid assets may be forced to borrow from external sources at exorbitant costs or become illiquid. The study asserted that Nigerian manufacturing firms' profitability is proportionately and significantly influenced by size of the firm and adequacy of cash holdings.

Keywords: Cash Holding, Firm Size, Profitability.

1. INTRODUCTION

1.1 Background of the Study

Studying the relationship between profitability and cash holdings of various manufacturing companies in Nigeria became imperative given the continual demise of the surviving firms (Kwode, 2015). Recent studies suggest that besides minimizing transactive, precautionary and agency costs, financial crises had altered firm characteristics and business environment as regards cash position. In fact, firms' cash balance in the financial statements has steadily increased over the years and it is a major concern for shareholders given that it worsened the agency problem (Xiao and Zhao, 2012). For instance, there has been growing concern on the part of the United States (US) government on the economic and other implications of stashing away at least \$2.1 Trillion in cash by non financial firms (Rubin, 2015). The origin of cash levels and influence of cash holdings on value (size) and performance of firms is still ambiguous as evidenced by divergent empirical results.

Global financial crisis (GFC) of 2008-2009 that had worldwide effect (Asia, Australia, Europe, Americas and Africa) necessitated a critical reassessment of the illiquidity problem. This became necessary given that the GFC was caused by firms' inability to maintain adequate liquidity. In other words, most firms that became bankrupt had just declared significant profits in their financial statements. An optimal capital structure includes not only

a sound balancing of debt and equity but an optimal cash balance as capital and other relevant costs are ever increasing (Pettit, 2007). An optimal liquidity position (i.e. adequacy of available cash and other liquid substitutes) for the firm has become imperative in that the recurring and persistent economic recession cum credit crunch (2007-2009) forced most manufacturing companies to optimize profit. The manufacturing industry in Nigeria has suffered greatly given that most firms in the industry use imported inputs that are at the mercy of extremely volatile foreign exchange in lieu of our local soft currency for the hard stable currencies: the US dollar, the Euro and the British pound sterling. As a result, the costs of these inputs continued to increase at a geometric pace resulting in cash flow and other related problems (Kwode, 2015).

1.2 Statement of the Problem

The manufacturing firms operate in very harsh environments (poor storage facility, inadequate physical infrastructures, political and economic instability, market biased towards cheap imported goods, underdeveloped capital and money markets that forced these firms to stockpile cash to avoid costlier transaction and other costs of sourcing funds). These environmental constraints led to the untimely exit of 820 manufacturing firms within a span of nine years: 2000-2008 (Akinbuli, 2009; Sangosanya, 2011; Aminu, 2012, Uwuigbe, Uwalomwa and Egbide, 2012). For the survival of the remaining firms in the industry (designated the bedrock of development for any economy), the development of an effective, optimal cash balance aligned to other working capital management drivers for the firm is essential. Even the number of firms in the so called financial sector has significantly dwindled highlighting the need for proper management of liquid resources by all firms (Agbada and Osuji, 2013). It takes considerable amount of time for post credit crunch effect to be reflected in the operational activities of the firms. This study is necessitated by the fact that relevant studies are comparative studies on several countries carried out by foreign authors. There were no direct studies at least to the best of my knowledge. Further, it extended the study period to 2018, employ multiple panel regression approaches and emphasize manufacturing companies quoted on the Nigerian Stock Exchange.

The objective of the study is to evaluate the relationship (causal and otherwise) between firm size, profitability and cash positions of the sampled manufacturing firms.

2. LITERATURE REVIEW

2.1 Conceptual Review

Profit is a measure of managerial efficiency in controlling resources at their disposal. It is mostly viewed as return on investment made by the shareholders / owners. It is the main reason for establishing a business enterprise. For profit to exist, cash inflows into the firm must exceed the cash outflows (Brealey, Myers and Allen, 2013; Pandey, 2015). For the accountants, profit is the excess of total revenue over total expenses. Conversely, profitability denotes the capacity to earn profits by the firm or a given investment. That is, profitability refers to the relationship between the profits generated by the company and the investments that gave rise to these profits (Alshatti, 2015). It is also measured using profitability and efficiency ratios. In the first instance, it is computed as the quotient of operating income (profit for the year) and operating assets (capital employed). In relation to sales, there exist such profitability ratios as gross profit ratio, net profit (profit for the year ratio), operating profit ratio, operating ratio and expenses ratio. In relation to investment, there are return on capital employed (ROCE), return on equity / proprietors fund (ROE) and return on asset (ROA) (Nweze, 2016).

There are contradictory theoretical predictions on the effects of profitability on the cash position of firms. Trade-off theory suggests that more profitable firms are less exposed to bankruptcy, possessing a greater incentive to take on debt in order to benefit from company debt tax savings (Jensen, 1986; Frank and Goyal, 2003). Extant literature proposes that profitability can have either a positive or negative effect on cash holdings. It is probably because profitable companies retain their profits within the firm, thereby accumulating cash over time. That is, a positive relationship exists between profitability and cash holdings. On the other hand, firms may use profits as a substitute for raising new funds by reinvesting them immediately or use same profits to repay debt or pay out dividends. In this instance, there exists a negative relationship between profitability and cash holdings (Steijvers & Niskanen, 2013).

Firm size is described as either natural log of turnover or natural log of total asset. While trade-off theory of cash holding proposed negative relation between cash holding and firm size, the other two theories (pecking order theory and free cash flow theory) suggest a positive relationship between cash holding and firm size. Jamil, Anwar, Afzaal, Tariq and Asif (2016) finding aligned to the later two theories i.e. there exists a positive association between firm size and cash holdings. Conversely, Muhammad (2014) observed a negative relationship between cash holdings and firm size for firms listed on the Karachi Stock Exchange in alignment with trade-off theory.

Extant literature including Guizani (2017), Le, Tran, Ta and Vu (2018) and Mohd-Ashhari and Faizal (2018) portrayed one of the key variables that affects cash holdings as firm size given that small firms exhibit higher information asymmetries than large firms, which makes external financing much more costly. This increases the already bulging financial constraints of small firms. In other words, small firms have higher incentives to accumulate excessive cash than large firms. In addition, financial distress costs are also inversely related to firm size as small firms are less likely to be diversified, rendering them more exposed to financial distress costs. To decrease those costs, small firms do hold more cash on their statement of financial position in order to reduce the likelihood of financial distress (Faulkender, 2002). The life cycle of most businesses commence with cash in hand and/or at bank and ends with the same cash during bankruptcy / liquidation. Cash, therefore, is the most important component of all current assets as substantial amount is held by cash finance officers at a given point in time for reinvestment in noncurrent assets and short term investments, payment of dividends, maturing debt obligations and taxation, precautionary purposes (Almeida, Campello and Weisbach, 2004). Cash holding is synonymous with cash and cash equivalents and is optimized when marginal costs of holding cash equal marginal benefits derivable from such hoarding (Hilgen, 2015).

2.2 Empirical Reviews

Gancherka and Westerman (2018) examined the factors (institutional and financial) exerting significant influence on cash holdings of 800 non-financial firms in Europe for the study period of five years (2010-2014). Using panel least squares, the study posited a negative association between the explanatory variables (leverage, net working capital, firm size and collateral) and cash holding whereas capital expenditures and operational cash flows exerted statistically significant effect on cash positions of the sampled firms.

In his study of the relationship between managerial ownership and corporate cash holdings, Abdioglu (2016) adopted 100 Turkish firms quoted on the Borsa Istanbul Stock Exchange for the nine year period (2005-2013). Proxy for managerial ownership was managerial alignment

or entrenchment. Using panel regressions, the study indicated a goal congruence i.e. both the interests of shareholders and managers are aligned. The study posited that firm size and tangibility, albeit control variables, exerted significant positive effects on the levels of cash and cash equivalents of these firms.

Aftab, Javid, and Akhter (2018) critically examined the determinants of cash holdings of multinational companies and other regional firms on a global scale. The study touched all the continents by using a sample of 5,957 firms drawn strategically from 47 countries for the ten year study period (2007-2016). Employing panel generalized method of moments (PGMM), the study posited that market to book ratio, leverage, dividend, intangibles, profitability and net working capital exerted strong negative influence on cash holdings while actual investments, cash flows, firm size and financial strength affected cash holdings of these firms positively and significantly.

Koshio (2003) examined the factors determining the level of cash balances held by Brazilian firms using quantitative panel methodology. The effects of inventories, accounts payables, debentures, accounts receivables, profits from normal activities, standard error of profits from operations, current liabilities and long – term liabilities on cash holdings of firms were deduced using information obtained from the annual reports of 396 non-financial firms for a period of 8 years (1995 – 2002). The effects of the predictor variables on the cash holdings of firms were statistically significant. Bansal and Vipin (2012) investigated the determinants of corporate liquidity using a sample of 100 firms in India. The study covered a 10 year period (1999 – 2008). It adopted backward step wise regression in analyzing collated data from the firms. The study concurred that the independent variables including leverage ratio, cash flow adequacy, and surplus cash excluding size impact significantly on corporate liquidity.

Ogundipe, Salawu and Ogundipe (2012) opined that the determinants of corporate cash holdings in Nigeria should include inventories, accounts receivables, growth opportunities, leverage and financial distress. The study used a sample of 54 non – financial firms listed in Nigeria Stock Exchange (NSE) for 15 year period (1995-2009). These firms were selected using purposive sampling method. Data collated from the audited annual financial statements of these firms were analyzed using generalized methods of moments (GMM) of dynamic panel methodology. The cash positions of financial institutions were, however, excluded as they are predetermined and controlled by the Central Bank of Nigeria (CBN). However, dynamic panel estimation has inherent limitations when analyzing snapshot data extracted from audited annual financial statements. Wasiuzzaman and Arumugam (2013) examined the determinants of working capital investment studying 192 Malaysian quoted firms. The study spanned for a period of 6 years (2002- 2007). Collated data were analyzed using ordinary least squares regression. The study revealed that during economic boom, small and medium firms invest enormously in operating working capital as the firms possess low leverage, rapid sales growth, increasing operating cash flows, less non – current assets, less volatile revenues and information asymmetry is virtually absence.

Muhammad (2014) assessed the effect of some firm specific factors on cash holdings of a sample of fifty (50) non-financial firms quoted on the Karachi Stock Exchange. The study made use of the Generalized Method of Moments (GMM) on a set of panel data. The period of the study spanned eleven (11) years (2003-2013). The independent variables entered in the dynamic model consist of leverage, return on assets, inventory asset ratio, market-to-book ratio, firm size, networking capital, investment, accounts payable, accounts receivable, bank relationships and foreign direct investment (FDI). The study acquiesced to the existence of

significant positive impact of accounts receivable, investment expenditure and leverage on cash positions of the sampled fifty firms. On the other hand, significant negative associations exist between the dependent variable and the predictor variables (firm size, return on assets, net working capital and bank relationship).

Jamil, Anwar, Afzaal, Tariq and Asif (2016) carried out a study on the key firm specific factors exerting significant influence on the cash holdings of fifty (50) firms quoted at the Karachi Stock Exchange for the three year period (2012-2014). Analyses of data were carried out using the ordinary least squares regressions on the processed data. These results are in alignment with some previous empirical results: Afza and Adnan (2007), Gill and Shah (2012) and Ogundipe, Salawu and Ogundipe (2012). The study showcased a positive relationship between cash holdings and the predictor variables (investment, net working capital, firm size and board size). The dependent variable is, of course, negatively influenced by such predictor variables as leverage, return on assets and debt structure. Kruja and Borici (2016) considered the determining factors responsible for varied levels of cash balance of firm in the Shkodra region. The study population is made up of all firms in the region excluding banks and other financial institutions. Thirty firms were purposely drawn and their annual reports for a two year period (2013-2014) collated and analyzed using ordinary least square regression and ANOVA. The findings showed that cash holdings of firms are significantly and positively affected by net working capital, total debt including bank borrowings, profitability and firm size.

Niresh (2012) examined the cause and effect relationship between liquidity and profitability of thirty – one (31) quoted manufacturing companies in Sri Lanka for a period of five years (2007 – 2011). The study also looked into the existence or otherwise of other factors having significant influence on profitability. Data on the relevant variables were collected for the relevant period from the database of the Colombo Stock Exchange. Complementary data were gleaned from relevant academic journals and text books. These companies were randomly selected from a population of thirty – nine quoted non – financial firms. Multiple correlations and regressions including measures of central tendencies and dispersion were used for analyzing the collated data. The findings depict current and quick ratios as being within industrial average by means of descriptive statistics. Nevertheless, correlational analyses on the association between the independent and dependent variables proved to be irrelevant. That is, there is weak negative correlation between return on capital employed (ROCE) and the causative (liquidity) variables: quick ratio, current ratio and liquid ratio in that their P-values are greater than 5% ($P > 0.05$).

Velnamby and Kajanathan (2013) examined the influence of cash position on profitability of telecommunication firms quoted on the Colombo Stock Exchange for a period of seven years (2005 – 2011). The study investigated the determinants of cash holdings and financial performance in both Sri Lanka Telecom Plc. and Dialog Telecom Plc. The telecommunication sector of the stock exchange is made up of only these two firms. Financial performance for the two firms was proxied by both return on assets and return on equity. The predictor variables for measuring cash position are made up of cash and cash equivalents to turnover (CCETR), cash and cash equivalents to total assets (CCETAR) and cash and cash equivalents to current liabilities (CCECLR). Data analyses were carried out using multiple correlations and regressions and tests of hypotheses (otherwise, inference) necessitated the use of analyses of variance (ANOVA). The results are inconclusive given the non existence of any significant associations between the predictors and the dependent variables with respect to Dialog Telecom Plc. Further, measures of central tendencies and dispersion

showed no significant deviations in the levels of cash and liquid substitutes of these firms. Employing same multiple correlations and regressions with respect to Sri Lanka Telecom Plc depicted significant relationships between these variables.

Powell and Baker (2010) empirically examined varied views of middle and top management as regards determinants of corporate cash holdings. The study made use of survey approach to balance existing empirical studies that relied heavily on secondary data. Further, most extant literature reviewed stated that determinants of corporate cash holding are limited to leverage, firm size, investment opportunities, risk agency costs, reduction in dividends, sale and purchase of assets. The study also suggests that effective corporate governance mechanisms (frequency of board meetings, adequate number of non – executive directors, curbing chief executive officer / managing director duality) limit the excesses of managers (by curtailing their unwise acquisitions of low or non – value adding assets, keeping excess cash that can be easily diverted to private use, empire building at the expense of ageing shareholders). Structured questionnaires made up of forty – two (42) close ended statements were sent to chief financial officers (CFOs) of 1000 largest US non – financial firms for the year ended 31 December 2008. Only 93 out of 1000 questionnaires distributed are good for collation of data. The survey indicated that most cash finance officers (CFOs) acknowledged the relatively better performance indices for companies that stock pile cash for various reasonable endeavors. These managers also agreed to an optimal trade – off approach to firms’ cash holdings. Specifically, growing young firms should amass most cash to facilitate expansion activities given that ageing firms with unlimited access to the capital and money markets reasonably hold less cash.

Gill and Mathur (2011) studied empirically the factors that determine level of corporate liquidity holdings in Canada. The population of the study includes all manufacturing and service firms quoted on the Toronto Stock Exchange out of which a sample of 164 firms was selected using simple random sampling. The study period was for only three years (2008 – 2010). Quantitative panel methodology and analysis of variance were used to analyze collated secondary data and test the stated hypotheses respectively. The findings include: corporate liquidity holdings (otherwise, cash and cash equivalent balances of firms) have positive correlation with liquidity ratios, firm size and internationalization of the firm. Further, corporate liquidity holding is determined by liquidity ratio, firm size, net working capital, near liquidity, short – term debt, investment, industrial peculiarities and internationalization of the firm. However, corporate liquidity holding has an inverse relationship with profitability via panel regression analyses.

Ivanova and Raei (2014) examined German nonfinancial firm cash positions with respect to collated panel data of 24,000 firms from eight (8) highly developed economies (specifically, G7 countries including the Netherlands) for the twenty – one year period (1991 – 2011). The study affirmed that Japanese nonfinancial firms have the highest average cash-to-asset ratios in 1998 (16%) and 2011 (20%) respectively with respect to the firms studied notwithstanding that median cash-to-asset ratios in most economies have been at a continuous ascent since the 1990s.

2.3 Theoretical Framework

2.3.1 Financial Approach to Theory

The study is anchored on the Financial Hierarchy (Pecking Order) Theory (Myers, 1984). According to Pecking Order Theory, firms have a preferred hierarchy for financing decisions. The finance manager in a bid to exercise more control of the company and reduce

agency cost of equity most prefer to use internal financing (retained earnings including depreciation in reality exist first in cash form only if cash basis is employed; otherwise, in cash and accounts receivables form if accrual basis is used) before resorting to any form of external financing as internal funds incur no flotation costs and require no additional disclosure of proprietary financial information. The manager, thus, avoids severe market discipline and a possible loss of competitive advantage resulting from issue of either new debt or new equity. The key assumption of the theory is asymmetric information, or the likelihood that a firm's managers know more about the company's current earnings and future growth opportunities than do outside investors. That is, financial managers possess insider information unavailable to outsiders and they desire to keep such information proprietary. The second key assumption is that managers will act in the best interests of the company's existing shareholders (Myers & Majluf, 1984). Further, adequate liquid resources ensure that managers pursue viable projects (positive NPV projects) relieved of being forced to issue junk debts and / or undervalued securities (Wasiuzaman and Arumugam, 2013).

2.3.2 Operational Approach to Theory using Cash Models

The Stone Model unlike other models emphasized management of cash balance. Attention is diverted at all times from ascertaining the optimal transaction size. In the same vein, it employs control limits relying on forecasted cash flows as checks for upper and lower limits. The theory postulates the likelihood of the surplus or deficit of cash naturally correcting itself. If the summit or upper limit is reached, but is to be followed by cash out flow days supposed to bring down the cash balance to an acceptable level, no action is required. However, if the surplus cash would substantially remain to the upper limit, cash is withdrawn to reduce the cash balance to a predetermined optimal level. The reverse applies if cash were in short supply and the lower control limit was reached accentuating the usefulness of the cash flow forecast.

Putting the theories of liquidity and models discussed above to practice should lead to an optimal mix for the local economy that is characterized as an imperfect young market. In other words, the economic climate is hazardously influenced by selfish policies and activities of corrupt government officials (MAN, 2010) and players of the private sector. An experienced manager will find an optimal if not perfect blend / hybrid of financial theories to obtain a practical solution for the profitability liquidity problems.

2.3.3 Theories of Profitability

These theories are briefly discussed given that profits of firms correlate significantly with their level of cash and cash equivalents. In other words, profits and reserves are in reality part of the cash holding if these funds are not invested in noncurrent assets and other long term investments.

Clark Theory of Profitability

The theory analyzed a profitless economy and compared it to a profit-making economy putting emphasis on the significant differences that becomes the profit. The profitless economy exists in a perfect market where all relevant factors are stable. Entrepreneurs are rewarded with respect to salary level in management. Hence, monopolistic competition does not exist. In other words, economic units compete in a perfect market with no frictions. Any significant change necessitates a movement towards new equilibrium. For instance, improvement in production techniques increases output at reduced cost leading to new equilibrium price (lower than the initial price). Clark's static state model demonstrated that change causes profit implying an efficient entrepreneur finds permanence in a constant flux

in so far as being ahead of competitors at all times (Siddiqi, 1971 in Owolabi and Obida, 2012). *Managers of manufacturing companies in Nigeria found themselves in an imperfect market signaling the non-existence of stability in prices and other factors.*

Schumpeter's Theory of Profitability

Schumpeter propounded the circular flow of income model. Here, a profitless economy exists as the monopolists' abnormal profits and other market imperfections have been competed away. The difference between an ideal competitive economy and actual economy is the profit. The theory identified innovation as the single determinant of profit. That is, the market anticipates the gradual variations caused by changes in population and capital and adjust accordingly. The theory posits that these variations manifest in the form of significant changes in industrial organization, finding new and fertile markets, improvements in production techniques, identifying new and cheaper resources / raw materials, improving old products and introducing new ones. Management of manufacturing firms should understand the workings of these profitability theories and align it to liquidity theories given the existence of liquidity – profitability – trade-off.

3. METHODOLOGY

The study employed ex-post facto research design. Asika (2006) and Creswell (2009) contended that ex-post facto research guarantees that research problems influenced by the environment (manufacturing firms exist in a business environment) are methodically and empirically solved. The causal relationships between the variables studied in lieu of the manufacturing firms were tested using adjusted *Fixed Effects Panel Least Squares Regression and Panel Granger Causality i.e. Panel Vector Autoregression*. Panel Pairwise granger causality tests were carried out to fathom the direction of the relationship between the variables using *pvargranger stata command* (Abrigo and Love, 2015). Panel data (use of both time series and cross sectional data) is employed in most researches as it can diminish the influence of a single variable, lesser colinearity, multiple observations that ensures better management of unobservable firm characteristics and eliminates heterogeneity (Baltagi, 2005; Saunders, Lewis & Thornhill, 2009, Gujarati and Porter, 2009).

Further, panel multiple correlations and regressions used are modifications of the variants adopted by Padachi (2006), Hilgen (2015) and Borici and Krujer (2016). Data and information on the variables of the study are extracted from the audited annual reports and accounts of thirty-seven (37) sampled firms for the fourteen (14) year period (2005 to 2018). *The dependent variable in this study is proxied by cash and cash equivalents (CASH), while the independent variables are made up of return on assets (ROA) and natural logarithm of total assets (LnTA). The control variables include net working capital (NWC), cash flow (CF) and sales growth (SG). The regression equation becomes*

$$CASH_{it} = \beta_0 + \beta_1 ROA_{it} + \beta_2 LnTA + \beta_3 NWC_{it} + \beta_4 CF_{it} + \beta_5 SG_{it} + c_{it} + \varepsilon_{it}$$

Where CASH = Cash and Cash Equivalents / (Total Assets – Cash and Cash Equivalents)

$$CF = \text{Cash Flow} = \text{Net Cash Flows from Operations} / \text{Current Liabilities}$$

ROA = (Profit for the Year) / (Net Assets)

NWC = Net Working Capital = (Working Capital – Cash and Cash Equivalent) / Total Assets

LnTA = Natural Logarithm of Total Assets used as proxy for size

Sales Growth = SG = (Sales_t – Sales_{t-1}) / Sales_{t-1}

β_0 is the constant term or intercept for firm *i* in the year *t*. $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 are linear regression coefficients to be estimated. c_{it} is the non-observable individual effect while ε_{it} is the disturbance or error term for firm *i* in the year *t*. Note that lagged dependent variable is

used as explanatory variable to estimate a Generalized Method of Moments (GMM) framework that facilitates consistent estimates of the Panel Vector Autoregression (PVAR).

4. RESULTS

Major diagnostic tests include Levin-Lin-Chu unit root tests depicting absence of a unit root (see table 1 below) and Westerlund error correction model (ECM) Panel Cointegration tests showed that the p-values of G^* for all the entered variables exceeded $\alpha = 0.05$ (see table 2). In other words, for the entered variables, it is not necessary to run an error correction model also known as the random effects model. Error correction model is only employed when there is existence of Cointegration (Omoke, 2010). The results are aligned to the stationarity results as shown in table 1. That is, the fixed effects model (or any of its derivatives such as the Prais–Winsten Regression Correlated Panels Corrected Standard Errors) is optimal and therefore, adopted in the study.

Table 1: Panel Data Stationarity Tests

Levin-Lin-Chu unit-root test for all the Variables based on Augmented Dickey-Fuller tests

H₀: All panels contain unit roots

Number of panels (N) = 41

H_a: Panels are stationary

Avg. number of periods (T) = 12.29

Asymptotics: T / N → 0

Var	Panel-adjusted ADF	1%	5%	P-values	Lags (Order of Integration)
ROA	-4.54	-2.58	-1.95	0.000	1
CASH	-6.55	-2.58	-1.95	0.000	1
CF	-8.53	-2.58	-1.95	0.000	1
NWC	-7.40	-2.58	-1.95	0.000	1
LnTA	-3.23	-2.58	-1.95	0.046	1
SG	-9.83	-2.58	-1.95	0.000	1

Source: Authors' STATA 13 Outputs

Table 2: Westerlund (Error Correction Model) Panel Cointegration Tests

H₀: There is no Cointegration (H₀: $\alpha_i = 0$ for all i)

H_a: The whole panel is cointegrated (H_a: $\alpha_i < 0$ for at least one i)

With 41 series and 1 covariate

CASH is the dependent variable

Var	Group-Mean	*G _a Statistics	Panel Statistics	P _a Statistics	Z-values for *G _a	P-values for *G _a	Average AIC Lag
	Test (GT)		(PT)				Length
ROA	-2.272	-2.153	-11.518	-1.917	9.053	0.965	1
CF	-2.522	-2.044	-13.023	-1.368	9.154	0.984	1
NWC	-2.440	-2.217	-4.224	-1.183	8.995	0.765	1
LnTA	-1.733	-1.507	-8.508	-1.439	9.647	0.939	1
SG	-1.936	-2.419	-10.311	-2.227	8.809	0.964	1

Source: Authors' STATA 13 Outputs

Table 3: Descriptive Statistics

Var.	Obs.	Mean	Standard Deviation	Standard Deviation	Prob. Error	Prob. Skewness	Min	Max
CASH	518	0.1525	0.3321	0.0146	0.0000	0.0000	-0.1615	6.9244
LnTA	518	15.715	2.3909	0.1062	0.0000	0.0000	0.0000	0.0008
								20.6937
ROA	518	0.2523	0.6384	0.0284	0.0000	0.0000	-1.0963	7.8495
CF	518	0.1961	0.5923	0.0263	0.0000	0.0000	-3.2774	2.0146
NWC	518	1.2199	0.6317	0.0281	0.0000	0.0000	-0.9541	3.8113
SG	507	0.3246	3.0851	0.1370	0.0000	0.0000	0.0000	-7.0825
								67.8623

Source: Source: Authors' STATA 13 Outputs

The compiled figures for both the dependent and explanatory variables are pooled and averaged to arrive at the values portrayed on table 3 above. The standard deviation, a measure of dispersion, is quite large in comparison to the respective means which is expected as the sampled firms come from the diverse ninety – five subsectors. This is characteristic of heterogeneous (panel) data. Opportunely, the standard errors of the means of variables, most valuable estimator, are quite small and aligned to the theoretical postulate of becoming smaller as the sample size approaches the population.

Table 4: Prais-Winsten Regression Correlated Panels Corrected Standard Errors

	Panel-corrected					
CASH	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
ROA	-.0025905	.0084807	-3.32	0.001	-.0140719	.0092529
LnTA	.0074404	.0021996	0.31	0.760	.0031188	.0117622
CF	.0261984	.0082981	3.16	0.002	.0098947	.0425021
NWC	.0427452	.0176841	4.57	0.000	.0484435	.0064605
SG	.0064435	.0015362	0.22	0.825	-.0174252	.0094618
_CONS	-.0490129	.0378664	0.39	0.696	-.1234109	.0235385
rho	.7936818					number of obs = 518
Durbin-Watson (original)		1.900483	F(5, 512) = 6.44			Prob > F = 0.0000
Durbin-Watson (transformed)		2.001791	R-squared = 0.2054			Root MSE = 0.3263

Source: Authors' STATA 13 Outputs

As depicted above, P-value = 0.0000 gives the inference that the cumulative influence of the determining variables is statistically significant. In table 4, the transformed Durbin-Watson d-statistic is perfect 2 (from 1.90 to 2.00) indicating that any serial correlation has been corrected. F – Statistic (a powerful statistic for testing hypothesis) depicts that the combined influence of all the explanatory variables including the control variables on cash and cash equivalents is statistically significant. Further, return on assets, cash flow and net working capital showcased perfect relationships with cash and cash equivalents when values are rounded to two decimal places.

Granger Causality Test (Null Hypotheses)

- First equation (1): Lagged values of ROA and LnTA do not cause CASH.
- Second equation (2): Lagged values of CASH and LnTA do not cause ROA.
- Third equation (3): Lagged values of CASH and ROA do not cause LnTA

Table 5: Granger Causality Wald Tests

Equation	Excluded	chi2	df	Prob > chi2	
CASH	ROA	5.2844	2	0.071	
CASH	LnTA		7.2332	2	0.027 (1)
CASH	ALL	7.5729	4	0.109	
ROA	CASH	15.635	2	0.000	
ROA	LnTA	24.622	2	0.000 (2)	
ROA	ALL	26.762	4	0.000	
LnTA	CASH	.61739	2	0.734	
LnTA	ROA	1.0194	2	0.601 (3)	
LnTA	ALL	1.1606	4	0.885	

Source: Authors' STATA 13 Outputs

Eqn (1): The first row of table 5 demonstrates that lagged values of ROA do not cause CASH as the p-value is greater than $\alpha = 0.05$. However, because of the p-value ($0.027 < 0.05$), lagged values of LnTA cause CASH. Therefore the null cannot be rejected. The direction of causality is therefore from LnTA to CASH.

Eqn (2): Here, p-value for CASH is less than 5% level of significant ($0.0000 < 0.05$). Therefore, the null hypothesis that lagged values of CASH do not cause ROA is rejected at $\alpha = 0.05$. Further, the null hypothesis that lagged values of LnTA do not cause ROA is also rejected as the equivalent p-value (0.000) is less than 0.05. *This implies that both CASH and LnTA cause ROA.*

Eqn (3): Here, results show that lagged values of both CASH and ROA do not cause LnTA. Since the p-values for both the variables are greater than 0.05, accept the null hypothesis that lagged values of CASH and ROA do not cause LnTA at 5% level of significance.

Implication: Return on assets exhibit a negatively and significant association with the level of cash holdings of quoted manufacturing firms in Nigeria. As a consequence, Nigerian manufacturing firms should opt for optimal liquidity profitability trade-off rather than stockpiling cash given that the information asymmetry between the operators of the Nigerian Stock Exchange including the management of these sampled firms and the shareholders / investing public. In other words, operational cash management theories support an optimal profitability – liquidity trade-off as decisions involving corporate cash holding are essential aspects of capital structure in the short run.

5. CONCLUSION

The causal relationship between return on assets and cash holdings of manufacturing firms in Nigeria was investigated for the fourteen year period (2005 – 2018) taking cognizance of the size of these sampled firms. The study employed panel least squares estimation technique and surmised that manufacturing firms with adequate liquid resources at least sustain optimal profits. That is, the magnitude of cash and cash equivalents is pertinent to the sampled firms if optimal liquidity – profitability trade-off is desired.

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