

Sensitivity of Cash Positions to Leverage and Firm Size of Selected Listed Manufacturing Firms in Nigeria

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Abstract

The study examined the empirical relationship between firm size, financial leverage 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 thirteen year period: 2006-2018. 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 panel least squares revealed that while financial leverage (Lev) exerted insignificant negative influence on the firm's level of cash and cash equivalents, natural logarithm of total assets exerted insignificant but positive influence on cash holdings. These imply that firms keeping insufficient liquid assets may be forced to borrow from external sources at exorbitant costs or become illiquid. The effects of the control variables are, however, statistically relevant.

Keywords: financial leverage, cash holding, firm size

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1. Introduction

1.1 Background of the Study

Trade and other payables including debenture holders rely chiefly on the credit worthiness of manufacturing firms that depend on them being liquid enough to honor debt covenants and other maturing liabilities as they fall due. This is facilitated with effective and efficient management of the firms' cash and liquid substitutes. 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). Further, the persistent liquidity squeeze globally that emanated from the global financial crises (GFC) made finance managers to increase their precautionary stash of cash and other liquid resources. As a result of the GFC and credit crunch, liquidity constraints influenced the cash holding policies and practices of firms such that these firms either stockpile excessive cash and near liquid resources, minimize cash outflows and / or contract exorbitant debt covenants (Chen, 2016; Borici and Kruja, 2016). Recent studies suggest that cash holdings of firms are influenced by investment opportunities, cash flow variability, dividend payments, net working capital, leverage ratio, return on assets, return on equity, profit for the year, liquidity, free float, firm size, short term debt, investment in capital expenditures, tax expenses, age of firm, cash conversion cycle, corporate governance, internationalization of firm and industry (Hofmann, 2006 in Sulaman, Amna, Naila, Adnan & Mohsin, 2016; Harford, Mansi and Maxwell, 2008; Isshaq and Bokpin, 2009; Anjum and Malik, 2013; Hemmati, Rezaei and Anaraki, 2013; Magerakis, 2015; Kariuki, Namusonge and Orwa, 2015; Le, Tran, Ta and Vu, 2018). An optimal cash position ensures that managers pursue viable projects (positive net present value projects) relieved of being forced to issue junk debts and / or undervalued securities (Wasiuzaman and Arumugam, 2013). For instance, profitability has to be balanced / synced with the firm's liquidity position (Aminu, 2012) in line with trade-off theory. This position involves having enough liquid and near-liquid resources to offset maturing debt obligations and current liabilities. Most recent studies incorporating quantitative panel methodology focused on firm specific factors rather than macroeconomic / external factors exerting significant influence on cash positions of firms. These studies exhibited divergent views. That is, it is unclear as to which specific factors affect cash holdings of firms. Nonetheless, determining an optimal cash position for the firm entails management of the aforementioned factors adequately and at minimal cost. Use of cash flow analysis, cash budgets and financial / liquidity ratios ensures necessary adjustments are made by the firm in this post GFC era to avoid illiquidity (Mizen, 2008; Abushammala and Sulaiman, 2014).

The manufacturing sector (industry) evolved in a bid by the federal government to structurally transform and revamp the economy through industrialization. The manufacturing sector is weak and heavily import dependent as it consumes, at least, 63% of our hard earned foreign exchange (Omotola, 2016). The manufacturing sector has failed the economy as it is bedeviled by little or no foreign investment / capital flight, high production cost, low capacity utilization, low economic value added, borrowed technological base that is capital intensive and so on (Simon-Oke and Aribisala, 2010; Ozigbo, 2018).

1.2 Statement of the Problem

Unwholesome techniques adopted by Nigerian manufacturing firms may result in unnecessary increased costs of holding and sourcing funds as optimal levels of cash requires cash finance officers / managers employing but not limited to cash budgeting and forecasting and cash flow adequacy tools to obtain cheaper sources of funding for the anticipated periods of negative cash flows. The number of listed manufacturing companies on the NSE before and during the GFC plummeted from 1926 firms in 2000 to 820 firms in 2009 (MAN, 2009) and to a mere 98 firms in 2016 (NGSE, 2017). Further, the rapid demise of these manufacturing firms signaled both the foreign and local investors to divest from the sector and even from the economy to economies possessing lesser infrastructural and administrative bottlenecks (Odior, 2013, Onakoya, Fasana and Babalola, 2012; Onakoya, 2014; Omolara and Asaleye, 2016; Onakoya, Ogundajo and Johnson, 2017; Onakoya, 2018).

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 threat to the survival of listed manufacturing firms in the form of incessant cash stockout has culminated in the drastic reduction from one thousand in 2000 to a mere ninety-eight as at third quarter of 2016 (NGSE, 2016). Manufacturers Association of Nigeria (MAN) and various chambers of commerce including the Lagos Chamber of Commerce and Industry (LCCI) have lamented the tough operating environment faced by their surviving members. Non-financial firms in Nigeria are characterized by recurring decline in profitability. It has been shown that developing economics are characterized by poor developed markets and financial sectors with practically no alternative sources of finance (Ge and Qui, 2007).

The objective of the study is to evaluate the relationship (causal) between firm size, financial leverage and cash holdings of the sampled quoted manufacturing firms.

2. Literature Review

2.1 Conceptual Review

Financial Leverage: Leverage may be used to measure a firm's mix of operating costs, showcasing how changes in output affect profits. Fixed and variable costs are the two types of operating costs; depending on the company and the industry, the mix is divergent. In computing leverage ratio, the main factors to be considered are debt, equity, assets and interest expenses (Brealey, Myers, & Allen, 2013). Leverage, simply, is the ratio of total liabilities to total asset. It is also expressed as a percentage of share capital (i.e. gearing level). While financial leverage is concerned with the measurement of both fixed capital and interest expenses of the firm, operating leverage emphasized the influence of earnings volatility before corporate taxes and interests given significant movement on total revenue / turnover (Khedkar, 2015). Further, pecking order theory posits positive relationship between leverage and cash holding, both trade-off and cash flow theories predict negative association between cash holding and leverage.

While Ozkan & Ozkan (2004) depicted a negative association between leverage and cash holdings, Kariuki, Namusonge and Orwa (2015) and Weideman (2016) opined a strong positive association between cash holding and leverage. Firms with high leverage are perceived to hold more cash given their increased precautionary and transactive risks. Moreover, Ferreira & Vilela (2004) asserted that debt is directly related / proportional to retained earnings, the later and depreciation being part of cash held in the firm. Opler, Pinkowitz, Stulz & Williamson (1999) also found an inverse relation between internal funds and leverage because firms most of the times prefer to have excessive cash to meet financing need than issuing equity which is expensive due to transaction, information asymmetry and other costs. However, most literature depict the existence of a negative relationship between financial leverage and profitability and by extension, firm size (Akinlo and Asaolu, 2012; Raza, 2013; Javed, Rao, Akram and Nazir, 2015). Yet, a few studies depict a positive relationship between financial leverage and profitability (Kartikasari and Merianti, 2016).

Cash and Cash Holding: It consists of cash on hand, cash at bank (demand and time deposit) and cash equivalents (money market holdings including marketable securities, treasury bills, and commercial papers). Cash

equivalents mature within three months. It is computed by adding up cash and cash equivalents and dividing the sum by total assets excluding cash and cash equivalents (Ferreira and Vilela, 2004; Opler et al, 1999). But pecking order theory asserted the existence of a positive relationship between cash flows and cash holdings as high cash flow signaled smooth running of operations given increased capacity to invest in positive NPV projects. In addition, Kim et al (1998) joined together the opposing theories of both Myers and Majluf (1984) and Jensen (1986) by developing a new model for ascertaining the optimal level of cash holdings. They tested their theory cum model using quantitative data and found out that high cash flow volatility i.e. uncertainty of future cash flows demands larger cash holdings by firms. In other words, firms maintain a buffer of liquid assets to prevent sudden cash shortfall. The study also depicted that the standard deviations of both free and operating cash flows have significant positive influence on cash holdings.

That is, the firm keeps more cash for precautionary and transactive motives (Opler et al. 1999; Pinkowitz & Williamson, 2001; García-Teruel and Martínez-Solano, 2008). Further, Bates, Kahle, and Stulz (2009) observed a doubling of the cash ratio of US based firms between 1980 and 2006 i.e. in 27 years. This increase is mostly characterized by non-cash dividend paying firms, in addition to firms that had more recent initial purchase offers (IPOs). There is also a significant increase in the cash to assets ratio among these firms as cash flow risk has increased. An overall decrease in inventory including substantial increase in R&D expenditures ensured the geometric increase in cash reserves by the studied firms. That is, precautionary motive is the key determinant of demand for cash, as firms with high cash ratios are characteristically faced with many risks they cannot hedge against, thus, adequate cash reserves serves as a buffer.

Firm Size: It 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.

2.2 Empirical Reviews

Siddiqua, Rehman and Hussain (2019) investigated the asymmetric adjustment of Pakistani firms' levels of cash and cash equivalents employing the generalized method of moments (GMM) on 200 quoted non-financial firms for the study period (2006-2016). The findings indicate the existence of high speed of adjustment for firms with levels of cash above the optimal level. Arfan, Basri, Handayani, Majid, Fahlevi and Dianah (2017) looked at the determining financial factors affecting cash holdings of quoted 77 manufacturing firms on the Indonesian Stock Exchange for the five year period (2009-2013). Adopting panel generalized least squares (PGLS), the study asserted the existence of a significant positive association between growth opportunities and cash holdings of firms; and significant negative relations between capital expenditure, financial leverage and levels of cash and cash equivalents held by these firms. 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) excluding the fourth quarter of 1994. The effects of the predictor variables on the cash holdings of firms were statistically significant.

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 absent. Abbadi and Rasha (2013) evaluated the determinants of working capital requirements (WCR) in eleven (11) industrial firms of Palestine. The study covered a period of eight (8) years (2004 – 2011). The data used were culled from the audited annual reports of these firms quoted on the Palestine Securities Exchange. Employing measures of central tendencies and dispersion, Pearson Correlations and Ordinary Least Squares, the study declared that return on assets, cash conversion cycle, and operating cash flow are very significant determinants of working capital requirements (WCR) of companies. However, firm size and leverage exhibited strong negative associations with working capital requirements.

In their study, Manyo and Ogakwu (2013) explored the influence of liquidity on return on assets of forty – six (46) quoted firms listed on the Nigerian Stock Exchange for the ten year period (2000 – 2009). Utilizing ex post facto approach, they used multiple regressions to assess the relationship between liquidity, the independent variable against return on assets. The results affirmed the existence of a significant positive relationship between the regressors and the regressand. Return on assets is influenced positively by liquidity at a marginal rate of 2.8%. In addition, there is a significant positive influence of leverage on growth and return on assets. Bhunia and Khan (2011) scrutinized the association between cash management and profitability of Indian steel companies for a period of nine (9) years (2002 – 2010). Using secondary data extracted from CMIE data base of a sample of 230 steel companies in the India private sector, the relationship between eight liquidity indices (Absolute Liquid Ratio,

Debt – Equity Ratio, Current Ratio, Liquid Ratio, Inventory Turnover Ratio, Interest Cover Ratio, Debtors' Turnover Ratio and Creditors' Turnover Ratio) acting as predictor variables and Return on Capital Employed as proxy for profitability are analyzed using descriptive statistics (measures of central tendencies and dispersion), multiple correlation and regressions. Notwithstanding the relationship between dependent and predictor variables are weak adopting multiple regressions, descriptive analyses depicted satisfactory solvency position and increasing profitability.

Uremadu and Efobi (2012) examined the associations between liquidity, capital structure and the regressand: corporate profitability in Nigeria. The study adopted pooled ordinary least square regression framework on a sample of ten firms for a period of five years (2002 – 2006). Log – linear least squares method was adopted for analyses of data and information of these quoted firms. The study demonstrated the presence of negative but statistically significant associations between ratios of short – term debt to total liability, long term debt to total liability, equity capital to total liability and profitability. Further, a positive and statistically significant association between the liquidity rate and profitability, total value of short term debt and profitability were established. Afza and Aduan (2007) used a sample of 205 firms quoted on the Karachi Stock Exchange for the relevant range of eight years (1998-2005) to investigate the factors determining the level of cash and cash equivalents. Multiple regression and correlations were used to analyze the extent of the relationship between the dependent variable: corporate liquidity holding and the determinants: cash flow uncertainty, firm size, net working capital and leverage. The study stated that leverage, firm size, net working capital and cash flow uncertainty wield strong influence on cash positions of firms. These results agree with the findings by Isshag and Bokpin (2009). The later declared that firm size, target liquidity level, return on assets and net working capital exert strong influence on the firm's liquidity position. Extant literature has revealed that the desired level of liquidity by firm's management influences significantly its cash holdings within the relevant range.

Akhavan, Abasaltian, Shekarchizadeh and Mahdi (2015) empirically discovered the factors wielding significant influence on cash positions of firms in the Iranian Stock Exchange. The results were obtained using content analysis and descriptive statistics. The relevance of these factors was fathomed through employing the following theories: agency theory, information asymmetry theory, and equilibrium theory. According to equilibrium theory, factors exerting significant impact on cash holdings of firms should comprise of current assets liquidity, financial leverage, size, cash flow, cash flow distrust, paying dividends, debt overdue and financial crises. On the other hand, proponents of financial hierarchical theory asserted that determinants of cash holdings are made up of investment opportunities and financial leverage. With respect to free cash flow theory, these determinants include financial leverage, investment opportunities, size and banking relations. Bansal and Vipani (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 sampled firms. The study concurred that the independent variables including leverage ratio, cash flow adequacy, and surplus cash excluding size impact significantly on corporate liquidity positions.

Kariuki, Namusonge and Orwa (2015) investigated the firm specific factors influencing cash holdings of private manufacturing firms in Kenya. The study argued that sub-optimal cash balance is the genesis of such problems as cash abuse / free rider syndrome by managers of cash cow firms, increased agency costs and higher opportunity costs. Using stratified random sampling for evenly representation of each stratum, a sample of 156 private companies was chosen and 123 processed. These firms are registered members of Kenyan association of manufacturers. Data collection involved issuing questionnaires to chief finance officers of these firms. Pearson correlations and multiple regression techniques were employed in data analysis. The study deduced strong positive relationships between cash holdings and the predictors (leverage, firm size and cash flow volatility). The positive relation between cash holding and leverage agrees with precautionary motive for hoarding cash. There also exists a strong negative association between cash holdings and possibility of financial distress.

Shabbir, Hashmi, and Chaudhary (2016) empirically identified the firm specific factors affecting the level of cash holdings of 150 firms quoted on the Karachi Stock Exchange of Pakistani. Banks and other financial institutions were excluded given that these firms possess a different capital structure in comparison to non-financial firms. The study period was nine years (2004 – 2012). Collated data were analyzed using Pearson correlations and multiple regression and eight hypotheses tested using the analysis of variance (ANOVA). The results showed that cash holdings (CH) of Pakistani non-financial firms is positively and significantly influenced by cash flow volatility, market-to-book ratio, profitability and firm size. However, CH is negatively and significantly influenced by leverage, liquidity and debt maturity (at $\alpha = 0.10$). The findings imply that both Pecking order and trade off theories explained completely the nature of the relationship between the variables studied.

Thu and Khuong (2018) investigated the determinants of corporate cash positions of quoted twenty-eight (28) energy companies in the Vietnam's stock market. The study period spanned a period of seven (7) years (2010-2016) totaling 196 firm year observations (i.e. 28 x 7). Employing multiple regressions, specifically, general methods of moments (GMM), the results depicted a significant negative relationship between these variables (return on assets, operating cash flow, leverage and cash positions of the sampled firms. 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, 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. Further, size of the firm and tangibility exerted significant positive effect on the level of cash and cash equivalents. Umrya and Diantimala (2018) explored the factors responsible for the level of cash and cash equivalents held by 106 quoted Indonesian firms for the relevant period of six years (2012-2017). Adopting multiple regressions, the study showcased that debt maturity is negatively related to cash holdings of these sampled firms while financial distress relationship with the dependent variable is positive and significant.

2.3 Theoretical Framework

The study is anchored on the Financial Hierarchy Theory (Myera, 1984) and Free Cash Flow Hypothesis (Jensen, 1986). Pecking Order Theory postulated that firms have a preferred hierarchy for financing decisions. The finance manager / cash officer 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. That is, debt finance should be preferred given the tax merits to the exorbitant cost of equity.

According to Jensen's Free Cash Flow Hypothesis, managers tend to accrue cash and cash equivalents so as to widen their control network with respect to investments in assets (Ferreira and Vilela, 2004). That is, finance managers are most likely to accumulate cash and cash equivalents targeted towards minimizing the firm's investment risk (precautionary motive). Consequently, the more than adequate net working capital facilitates the manager's pursuit of goals that may be at variance with goals of the shareholders (e.g. pursuit of empire building when the ageing shareholders would prefer increased dividend payout). This aligns with the fact that managers would retain cash and cash equivalents at all cost (wasting the liquid resources on inefficient investments) and pay stipends to the shareholders (Drobotz, Gruninger and Hirschvogel, 2010). Further, the managers may be accumulating cash and cash equivalents to wade off hostile takeovers by business vultures that purchase a firm for its breakup value which, in this instant, is higher than the market value of the firm (Opler, Pinkowitz, Stulz and Williamson, 1999).

William Baumol's Optimal Cash Balance Model: He is the pioneer management scientist to assert in 1952 that the simple inventory model used in ascertaining the economic order quantity for inventory can be customized to calculate the optimal cash balance for the firm (Brealey and Myers, 1996; Van Horne and Wachowicz, 1998). The annual demand for inventories was replaced by annual cash disbursements, ordering cost per order by cost per sale of treasury bills and carrying cost per unit by the prevailing interest rate. The simple calculation results in an optimal cash balance for the firm. This model has practical limitations as firms do not always use up the cash inventory. There are weeks of cash shortages (involving huge payments to suppliers) and weeks of net cash inflows.

3. Methodology

The study was carried out using ex-post facto research design. Secondary data were collated from the sampled 37 manufacturing firms' audited annual reports for the 13 year period (2006-2018). Data, of course, were sourced from each firm's Official Portal Online, African Financials Online, NGSE Database and so on. The causal relationships between the variables studied in lieu of the manufacturing firms were tested using adjusted Fixed Effects Panel Least Squares Regression after carrying out diagnostics for stationarity and cointegration. The regressand is proxied by cash and cash equivalents (CASH), while the independent variables are made up of financial leverage (LEV) and natural logarithm of total assets (LnTA). The control variables include net working capital (NWC), cash flow (CF) and sales growth (SG). The equation becomes

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

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

LEV measures the Financial Leverage as ratio of Total Debt to Total Asset for firm i in the year t

Total Debt = TA – BVE or TD = STD + LTD

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

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

CF = Cash Flow = Net Cash Flows from Operations / Current Liabilities

$$\text{Sales Growth} = \text{SG} = (\text{Sales}_t - \text{Sales}_{t-1}) / \text{Sales}_{t-1}$$

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 .

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 –Winston 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) = 37

H_a: Panels are stationary

Avg. number of periods (T) = 13.21

Asymptotics: T / N → 0

Var	Panel-adjusted	1% ADF	5% ADF	P-values	Lags (Order of Integration)
LEV	-3.02	-2.58	-1.95	0.037	1
LnTA	-3.23	-2.58	-1.95	0.046	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
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 Test (GT)	*Ga Statistics	Panel Statistics (PT)	Pa Statistics	Z-values for *Ga	P-values for *Ga Length	Average AIC Lag
LnTA	-1.733	-1.507	-8.508	-1.439	9.647	0.939	1
LEV	-2.400	-2.402	-13.825	-3.139	8.825	0.973	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
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 Error	Prob. Skewness	Prob. Kurtosis	Min	Max
CASH	507	0.1525	0.3321	0.0146	0.0000	0.0000	-0.1615	6.9244
LEV	507	0.5021	2.8405	0.1262	0.0000	0.0000	-6.7285	55.9322
LnTA	507	15.715	2.3909	0.1062	0.0000	0.0000	0.0008	20.6937
CF	507	0.1961	0.5923	0.0263	0.0000	0.0000	-3.2774	2.0146
NWC	507	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	-7.0825	67.8623

Source: Authors' STATA 13 Outputs

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

CASH	Coef.	Semirobust Std. Err.	t	P> t	[95% Conf. Interval]
cf	.0583818	.0173884	3.36	0.001	.0242186 .092545
lev	-.0007308	.00191	-0.38	0.702	-.0044833 .0030217
lna	.0068285	.0044978	1.52	0.130	-.0020084 .0156654
nwc	.0393874	.0107698	3.66	0.000	.0182278 .060547
sg	.0058882	.0024164	2.44	0.015	.0011407 .0106357
cons	-.016204	.0793221	-0.20	0.838	-.1720489 .1396408
rho	.7936818				number of obs = 507
Durbin-Watson (original)		1.867660	F(5, 501) = 6.51		Prob > F = 0.0000
Durbin-Watson (transformed)		2.002999	R-squared = 0.2945		Root MSE = 0.3286

Source: Authors' STATA 13 Outputs

Discussions

In table 1, Levin-Lin-Chu unit-root test, a diagnostic tool, was employed which assumed that the number of panels is fixed while the number of time periods tends to infinity such that the ratio N_p to N_T approaches zero. At 95% confidence level which, hitherto, is the default for most statistical analysis, both the p-values and adjusted t-statistic (All Variables < 1.95) strongly suggest absence of a unit root. That is, all the entered nine variables are stationary. Table 2 portrayed the values of the group mean test (G_T), panel statistics (P_T), the critical values for both (G_T and P_T) and the P-values for *Ga. Since the p-values for the *Ga for all the entered variables exceed $P < 0.05$, it implies that both the dependent variable (CASH) and predictor variables are not cointegrated signaling no long-run relationship existing between them. 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 empirical existence of Cointegration (Omoke, 2010). The results are aligned to the stationarity results as shown in table 1.

Table 3 depicted the means of the six variables, a powerful median measure even though vulnerable to extreme values, of the quoted 37 manufacturing firms in 507 observations. These sample means were expected to approximate the true population means of manufacturing firms in Nigeria. On the other hand, 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 subsectors. Fortunately, 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.

As depicted in table 4 above, P-value = 0.0000 gives the inference that the cumulative influence of the determining variables is statistically significant.

Regression Equation for the Comprehensive Model

$$\text{CASH} = -.0162 - .0007\text{LEV} + .0584\text{CF} + .0068\text{LnTA} + .0059\text{SG} - .0394\text{NWC}$$

Here, the transformed Durbin-Watson d-statistic is perfect 2 (from 1.87 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 holdings of firms is statistically significant. The multiple coefficient of determination, R-squared, is approximately 30% indicating that 30% movement on cash holdings of firms is caused by these determinants. According to Gujarati and Porter (2009), the decision rule involves accepting the alternate hypothesis (H_1) if the sign of the coefficient for both financial leverage (LEV) and natural logarithm of total assets (LnTA) is either positive or negative, the modulus of the t-Statistic > 2.0 and the P-value of the t-Statistic < 0.05. Otherwise, accept H_0 and reject H_1 . The control variables (cash flow, sales growth and net working capital), in this instance, depicted strong positive results (very significant probabilities) of the t-statistic. Specifically, these variables exhibited very strong influence on cash and cash equivalents with P-values: cash flow = 0.001, net working capital = 0.000, and sales growth = 0.015. The P-values (0.702 > 0.05 and 0.130 > 0.05) show statistically insignificant influences of both LEV and LnTA on CASH. Since the P-value > 0.05, t-Statistic < 2 in both instances, we reject the alternate hypothesis and surmise that both financial leverage (LEV) and natural logarithm of total assets (LnTA) do not significantly affect the level of cash positions of quoted manufacturing firms in Nigeria.

5. Conclusion

The study embarked on ascertaining the sensitivity of firm's cash position to financial leverage and firm size employing panel least squares. The major findings posited an insignificant negative relationship between leverage ratio and corporate cash holdings and insignificant positive association between natural logarithm of total assets and cash positions of the sampled firms. Albeit insignificant, negative influence of leverage on the regressand connotes that manufacturing firms keep up adequate liquid resources and liquid assets substitutes to cover maturing

loan obligations as they fall due. This became necessary as it is very costly to borrow externally in an undeveloped stock market. However, size of the firm moves in the same direction as level of cash kept by these sampled firms.

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