

# AN ANALYSIS OF RANDOM EFFECTS RESULTS OF THE NET PROFIT MARGIN (NPM) MODEL IN EXPLAINING THE RELATIONSHIP BETWEEN PROFITABILITY AND CORE COMPONENTS OF WORKING CAPITAL MANAGEMENT (A STUDY OF SELECTED MANUFACTURING COMPANIES IN NIGERIA)

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## ABSTRACT

*The random effect model is also called random intercepts or partial pooling model. The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. This paper analyzed a total no. of 55 manufacturing companies in Nigeria. Findings from the random effects model of the Net Profit Margin (NPM) model revealed that the average collection period (ACP) and inventory conversion period (ICP) were negatively and significantly related to the net profit margin (NPM) with coefficient values of -0.6466 and -0.7807 respectively. The negative relationship connotes that, as either of these variables is low, then the NPM increases. The result also signifies that the average payment period (APP) was positively and significantly related to the net profit margin (NPM) with coefficient values of 0.6204. The result depicts that when the variable is low, then the NPM will also be low, and vice-versa. On that note, it is recommended that manufacturing companies should hasten up their accounts receivables and delay accounts payables.*

**Keywords:** Random effects model, Average collection period, Inventory conversion period

## INTRODUCTION

There is no doubt that working capital management is a very sensitive area in the field of Finance and Accounting. It is concerned with decisions on the ideal composition and amount of current assets and the manner in which these assets are financed. A clear

distinguishing feature of current assets is that, they include all these assets that in the normal course of business can be easily converted to the form of cash within a short period of time, mostly within a year, and such temporary investment as may be readily converted into cash when needed (Raheman & Nasr, 2007). Decisions that are likely to maximize profitability tend to minimize the chances of

sufficient liquidity. On the other hand focusing almost totally on liquidity will likely reduce the potential profitability of the firm (Deloof, 2003).

It therefore, follows that working capital is known as the life giving force for any economic unit hence its management is considered among the most important functions of corporate management (Raheman, Afza, Qayyum & Bodla, 2010). All organizations, either with profit motive or not, no matter the size and nature of the business, require necessary amount of working capital. It is therefore the most crucial factor for ensuring survival, profitability, liquidity and solvency of business (Raheman, *et al.*, 2010).

Studies on working capital management always face the conflicting objective of profitability and liquidity. In the light of this statement therefore, Eljelly (2004) opined that working capital management is one of the most important areas while making the liquidity and profitability comparisons among firms. Smith, Beaumont & Begemann (1997) emphasized that profitability and liquidity are the salient goals of working capital management. Similarly, Deloof (2003) opined that profit can be potentially maximized depending on the way working capital is managed. He equally maintained that while maximizing profit, keeping an acceptable level of liquidity is equally a very important objective that a company must fulfill, there must be a trade-off between profit and liquidity (Mathuva, 2010). The greatest dilemma in working capital management therefore, is to achieve the desired balance between liquidity and profitability. It must be ensured that one objective should not be achieved at the expense of the other, simply because both are important. Hence, working capital management should be given proper consideration and will ultimately influence the company's profitability (Raheman & Nasr, 2007; Dong & Su, 2010).

Researchers have approached working capital management in different ways, some investigated on the accounts receivable while others on the inventory management trying to postulate an optimal way policy that leads to profit maximization (Lazaridis & Tryfonidis, 2006;). According to Deloof (2003), the way that working capital is managed has a significant impact on profitability of firms. Such results indicate that, there is a particular level of working capital management, which potentially maximizes return. Other researchers tend to study working capital management in relation to sectorial or industrial

performances, for example, manufacturing, pharmaceutical, non-financial firms and so on. Gill *et al* (2010), Ananiadis and Varsakelis (2008), and Hussain, Farooq and Khan (2012) studied the relationship between working capital management and profitability in relation to the manufacturing sectors.

## LITERATURE REVIEW

This study finds it very important to review some important literatures.

### Random Effects

The random effect model is also called random intercepts or partial pooling model. The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the predictor or independent variables included in the model. The crucial distinction between fixed and random effects is whether or not the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not (Greene, 2008).

Furthermore, where you have reason to believe that differences across entities have some influence on your dependent variable, then random effects can include time invariant variables (like gender), whereas, in the fixed effect model these variables are absorbed by the intercepts.

Random effect assumes that the entity's error term is not correlated with the predictors which allows for time-invariant variables to play a role as explanatory variables. Additionally, in random effect there is the need to specify those individual characteristics that may or may not influence the predictor variables. The problem with this is that, some variables may not be available, therefore leading to omitted variable bias in the model. Random effects also allow generalizing the inferences beyond the sample used in the model (Greene, 2008).

Again, in order to use random effects, care must be taken to check whether there is any meaning to using them in a model compared to the fixed effect model. Comparing the two methods, one might think that the use of the random effects estimators as superior compared to the fixed effect estimator, simply because the former is the GLS estimator while the latter represents a limited case of

the random effects model as it is in line with cases where the variation in individual effects is relatively large. However, on the other hand, the random effects model is built under the assumption that the fixed effects are uncorrelated with the explanatory variables, an assumption that in reality creates strict limitations in panel data treatment. In conclusion, the difference between these two possible ways of testing models on panel data is that fixed effect model assumes that each firm differs in its intercepts term, while the RE model assumes that each firm differs in its error term. Usually when panel data is balanced, there is tendency that fixed effects will work best. While in cases where sample contains limited observation of the existing cross sectional units, the random effect model might be more suitable.

## COMPONENTS OF WORKING CAPITAL

The main components of working capital are the average collection period (ACP), inventory conversion period (ICP) and average payment period (APP).

### Average Collection Period and Profitability

Average collection period is the time frame within which account receivables are expected to be collected back from the respective debtors. The accounts receivable at a firm represents the total unpaid credit that the firm has extended to its customers. Accounts receivable can include trade credit (i.e. credit extended to another business) or consumer credit (credit extended to a consumer) or both. Businesses provide trade and consumer credit because doing so increases sales and because it is often a competitive necessity to match the credit terms offered by competitors. The downside to granting such credit is that, it is expensive to evaluate customers` credit applications to ensure that they are creditworthy and then to monitor their on-going credit performance. Firms that are not diligent in managing their credit operations can suffer large losses from bad debts, especially during a recession, when customers may have trouble paying their bills (Moles *et al.*, 2011).

### Inventory Conversion Period and Profitability

Inventory conversion period (ICP) is used as a proxy for inventory management. The ICP is considered as one of the explanatory or independent variable of this study. The

inventory conversion period is a partial component of the cash conversion cycle, which is used in this study to measure the efficiency of working capital management in relation to the profitability of manufacturing firms listed on the Nigerian Stock Exchange. We shall begin, the discussion on inventory itself, need for inventories especially in a manufacturing firms, Economic ordering quantity (EOQ) model, monitoring and inventories control and the empirical studies relevant for discussion. Inventories could naturally include supplies, raw materials, work-in-process, and the finished goods. These categories of inventory constitute an essential part of virtually all business operations (Brigham & Houston, 2007).

Raw materials are materials and components that are inputs in making the final product. Work-in-process also called stock-in-process refers to goods in the intermediate stages of production. While finished goods consist of final products that are ready for sale (Moles *et al.*, 2011). Manufacturing firms generally hold all the three types of inventories, while distribution firms hold mostly finished goods (Prasana, 2000). Inventories represent the second largest asset category for manufacturing companies next only to plant and equipment. Given this substantial investment in inventories, the importance of inventory management cannot be overemphasized (Prasana, 2000).

### Average Payment Period and Profitability

The average payment period is used as a proxy for accounts payable which is a partial component of the cash conversion cycle, and this cycle is used to measure the efficiency of working capital management in relation to profitability. Accounts payable arises from the fact that firms generally make purchases from other firms on credit and record the debt as an account payable. It is the largest single category of short term debt. Hence it is a spontaneous source of financing, in the sense that, it arises spontaneously from ordinary business transaction (Brigham & Houston, 2007). Trade credit can either be free or costly. If the seller does not offer discounts, then it is free in the sense that there is no cost for using this credit. While the costly trade credit is any trade credit over and above the free trade credit (Brigham & Houston, 2007). It represent about 25percent to 50 percent of short-term

financing (Prasana, 2000). Accordingly, the confidence of the suppliers is the key to securing trade credit.

## METHODOLOGY

STATA version 11 was employed as the software of running and analysing the data. The choice of the version 11 was as a result of its robustness and sophistication. By far, the version 11 was an improvement upon version 10 and simpler to operate or execute. The section that follows attempt to describe the methodology or procedure of operation as much as possible, it shall begin with data management.

Once the data is transferred from Excel and read in, there was considerable work in its cleaning up, then transforming of the variables was undertaken and selecting the final sample. All the data management tasks were recorded, dated and saved. It was thought that the existence of such a record makes it easier to track changes and eases the task of replication. The greatest challenge faced at the stage, as far as this study was concerned, was the issue of transforming the data to econometric form that the software recognizes. Most importantly converting the

alpha-numeric data to real numeric and in conformity with econometric form was an uphill task.

The next step was the naming and labelling of variables. The first step was to give more meaningful names to variables by using the rename command. That was done for the variables used in the subsequent analysis. The named or renamed variables retain the descriptions that they were originally given. Some of these descriptions were unnecessarily long, so label variable was used to shorten output from commands. Data with respect to Fifty five (55) no. manufacturing companies were analysed. The model specification is as follows:

$$\text{NPM} = b_0 + b_1(\text{ICP}) + b_2(\text{ACP}) + b_3(\text{APP}) + b_4(\text{OCATAR}) + b_5(\text{OCLTAR}) + b_6(\text{DR}) + b_7(\text{NLS}) + e$$

## RESULTS AND DISCUSSION

### Net Profit Margin (NPM) Model

For the net profit margin (NPM) model, the first test conducted was the variance inflation factor (VIF) test. The purpose of this test was to check for multicollinearity among the variables in the model. The results for the test are as follows:

Table 4.6

*Results of Variance Inflation Factor test for NPM Model.*

Variable	VIF	1/VIF
ACP	1.78	0.5629
APP	1.71	0.5861
ICP	1.67	0.5978
OCATAR	1.20	0.8355
OCLTAR	1.23	0.8134
NLS	1.22	0.8189
DR	1.20	0.8349
Mean VIF	1.43	

From the above result, the VIF mean was found to be 1.43 which is less than 5. This indicates that, there is no multicollinearity in the model. The next test conducted then was the Wooldridge test for autocorrelation in the panel data, the result indicated that there was no first order correlation and prob > f was equal to 0.2038 (not significant). Based on this, the result indicates no auto correlation. There would have been the presence of autocorrelation had the value of prob. >f found to be significant.

The next test conducted was the serial correlation test for heterosekedacity which was

performed using the (xt-test 3) command for re. The prob. > chi 2 = 0.0000, based on the chi 2 value which was significant, this implies that there exists heterosekedacity problem. However, according to Asterious and Hall (2007), when heterosekedacity problem is observed, all the variables are logged, and the model be made robust by using the (VCE robust) command. Henceforth, by doing that, the problem of heterosekedacity is treated. The fixed effects and random effects were both run, and the influences of the independent variables on the NPM were similar. Based on that Hausman test was used to select the more superior of the two models and the random effects was chosen and the robust model is reported accordingly.

Table 4.7

*Summary Table of model 2 (NPM, random effect result)*

NPM	Coefficient	Z value	P value	Decision
ACP	-0.6466	-6.12	0.000***	-sig
ICP	-0.7807	-6.70	0.000***	-sig
APP	0.6204	4.29	0.000***	+sig
OCATAR	-0.2286	-1.91	0.056	-sig
OCLTAR	0.0261	0.54	0.591	not sig
NLS	0.6605	1.78	0.074	+sig
DR	0.0030	-0.15	0.883	not sig

\*\*\* (1% sig. level) \*\* (5% sig. level)

The results of the regression from the NPM model signified an overall good model fit with F statistic of 0.0000. That testify how good the overall model is. The R-square was found as 0.4632 which explains the level to which the independent variables associate with the dependent variable.

From the above, the results indicate that the average collection period (ACP) and inventory conversion period (ICP) were negatively and significantly related to the net profit margin (NPM) with coefficient values of -0.6466 and -0.7807 respectively. The negative relationship connotes that, as either of these variables is low, then the NPM increases. The result also signifies that

the average payment period (APP) was positively and significantly related to the net profit margin (NPM) with coefficient values of 0.6204. The result depicts that when the variable is low, then the NPM will also be low, and vice-versa. Consequently the result of the remaining two variables in the model, that is the OCLTAR and DR were not significant with net profit margin (NPM). Also a weak significance for OCATAR and NLS has not also been considered as significant. According to Chin (1998), significance at 10% significant level is accepted, although as a weak significance.



**CONCLUSION AND RECOMMENDATION**

In summary, it was found that the relationship between profitability and major components of working capital management varies. This study reveals that the average collection period (ACP) and inventory conversion period (ICP) were negatively and significantly related to the net profit margin (NPM) with coefficient values of -0.6466 and -0.7807 respectively. The negative relationship connotes that, as either of these variables is low, then the NPM increases. The result also signifies that the average payment period (APP) was positively and significantly related to the net profit margin (NPM) with coefficient values of 0.6204. The result depicts that when the variable is low, then the NPM will also be low, and vice-versa. On that note, it is recommended that manufacturing companies should hasten up their accounts receivables and delay accounts payables.

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