

# **EVALUATION OF THE NEXUS BETWEEN REVENUE VOLATILITY FROM COMMODITY SALES AND FINANCIAL PERFORMANCE OF MANUFACTURING COMPANIES IN KENYA**

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## **ABSTRACT**

The researchers sought to evaluate the impact of revenue volatility on the financial performance of the manufacturing companies in Kenya given the anecdotal arguments that point to both positive and negative relationships. Revenue volatility was measured using the coefficient of variation of sales while financial performance was measured using earnings before interest and tax (EBIT) and return on assets (ROA). The

data was analysed using long run and dynamic panel data models and appropriate specification tests used. The researchers came to the conclusion that revenue volatility has a negative and significant impact on the financial performance and should be of particular concern for manufacturing entities in Kenya.

**Key Words:** *revenue volatility, manufacturing entities, financial performance*

## **INTRODUCTION**

Chiang, Sun and Walkup (2018) in a study on business volatility and employee performance delineate business volatility as the variability that characterizes environmental actions related to a business entity operations and results from the entity inability to predict the probability of future events. When operating in a volatile business environment, the management should strive to gather adequate and useful information that will assist in making financial decisions, failure to which will result in decisions that adversely affect financial performance. The researchers identified three types of business volatility namely; technological volatility, earnings volatility and sales volatility. Of the three measures, sales volatility was identified as a better and more objective measure of business volatility as it is able to capture the firm operating environment and its exposure to various risks.

Different researchers have established a connection between commodity risk and revenue volatility especially for large commodities consumers such as manufacturing companies. Bodnar, Graham and Harvey (2011) classified risk exposure in businesses entities around the world into six major areas which included interest rate, foreign exchange, commodity, energy, credit and geopolitical risks. Of the 119 firms that they identified as facing commodity risk, fifty one per cent of these business entities indicated that they appraised two or more sources of commodity risks. Most of the firms surveyed indicated that risk management was a function of the purchasing department. Risk management should largely be a finance function as a vital insight from the theoretical literature available on risk management is that business entities employ risk management because of financing constraints (Cifarelli, & Paladino 2010).

Baffes (2011) argues that business entities are often affected by volatility in commodity markets resulting in disrupted operations, high operating costs and poor financial performance as commodities such as electricity, oil, agricultural products, metals and minerals often experience significant and often unexpected price changes. This price risk has a direct financial effect on

pricing of products, sales made, business entity cash flows, working capital and ultimately the financial performance of the organization.

This work is organized as follows: in the second section, the statement of the problem is presented. In section three, empirical literature review is outlined. Section four presents the research methodology and the variables of study. Section five presents the results and the discussion of the findings.

## **STATEMENT OF THE PROBLEM**

Different researchers have established the critical relationship between revenue generated from sales and an entity's financial performance and therefore any volatility in the market will have a significant impact on the performance of an entity especially when this is tied to volatility in the commodities markets (Ondiek, 2010; Ateka & Ochieng, 2012; Sobhani, Malarvizhi, Al-Mamun & Jeyashree, 2014). Commodities such as electricity, oil, agricultural products, metals and minerals have been experiencing significant and often unexpected price changes (KIPPRA, 2014). This volatility is eventually translated to the financial performance of manufacturing entities and should therefore be adequately managed. Poor financial performance has been observed in companies listed in the Nairobi Securities Exchange (NSE) where a significant number of companies have issued profit warnings implying that their profits will decline by over 25% compared to the previous period. Ehrhart and Guérineau (2013) argue that volatility in commodity prices may have micro and macroeconomic effects. The microeconomic effects such as use of substitutes and reallocation of funds will vary depending on the options that business entities and consumers have. The macroeconomic effects especially for a net importer country will result in a reduction in revenue and hence less expenditure and these effects will eventually be transferred to the various sectors of the economy. This paper thus sought to evaluate nexus between revenue volatility from commodities sales and financial performance of manufacturing companies in Kenya.

## **LITERATURE REVIEW**

Cariolle (2012) used export revenue data for the period 1970 – 2005 to analyse different measures macroeconomic volatility based on the argument that macroeconomic volatility affects negatively the gross domestic product (GDP) especially in less developed countries. The researcher evaluated different approaches that can be used to measure volatility focusing on macroeconomic volatility. Generally, the approaches used are dependent on the choice of reference values and how the subsequent deviations are calculated. The typical measure of volatility is standard deviation of a given distribution measured around its average/mean or the trend. The researcher argues that standard deviation is appropriate when the variable to be measured is stationary at first difference and therefore the hypotheses formulated should be restrictive. An alternative measure involves calculating the standard deviation of the residuals under an economic regression with the key measures being the coefficient of determination and the variations in the growth rates. A more

robust measure of volatility involves calculating the standard deviation but incorporating a statistical filter in order to disaggregate the trend into both the long and short term trends.

Solomon and Muntean (2012) highlight the central place of financial risk when assessing business entity profitability as risk has a direct impact on profitability. In a study on assessment of financial risk and an entity's profitability, the researcher used data from two companies over a five period duration. They identified market, credit, liquidity and interest rate risks as the major risks that affect the performance of entities. The key indicators during financial risk assessment include financial leverage or debt burden, financial breakeven and the leverage factor as these help to indicate fluctuations in the entity profitability occasioned by the financial structure. The level of debt affects the return on equity and in turn influences the level of risk exposure. Fang (2016) postulates that financial risk will manifest itself in manufacturing companies through low profitability and poor efficiency resulting from depressed gross profit margins, high product costs and low return on investment (ROI).

Vätavu, Lobonț, Para and Pelin (2018) contends that when profitable business entities face decline in revenue, they take measures such as making drastic cuts in expenditure and deferring investing in capital expenditure and therefore such volatility may not affect their immediate financial performance but this may be reflected on low return on assets. Menguc and Barker (2005) argues that volatility in sales affects predictability and planning of activities related to sales which eventually results in higher variability in a business entity financial performance. Ramesh, Al-Habsi and Al-Sharji (2017) argues that due to the fact that manufacturing companies hold significant levels of current assets which are not necessarily productive, this tends to have a negative effect on ROA.

Deleersnyder, Dekimpe, Sarvary and Parker (2004) evaluated business cycle fluctuations and their effect on durable goods sales patterns. They observed that sales tend to drop very fast when the economy is on a downward turn but the upward adjustment is not as fast when the economy recovers. To quantify the extent of cyclic fluctuations, the researchers calculated the percentage standard deviation within a series and the cyclical co-movements to determine the extent fluctuations in the economy are transferred to specific sales performance. Mohammed and Knapkova (2016) argue that effective and integrated risk management tends to influence financial performance as it enhances the company's understanding of exposures that will have an impact on the performance of the company and ensure that the company takes advantage of arising opportunities.

Mwelu, Rulangaranga, Watundu, Kaberuka and Tindiwensi (2014) researched on risk in manufacturing companies in Uganda using cross sectional analysis and a sample of eighty companies. Using correlation, regression and factor analyses they established risk management influences the profitability of manufacturing entities. The researchers established that there is strong correlation between risk management and profitability ( $r=0.598$ ;  $p<0.01$ ) and the factor

loadings were high (above 0.7). Olayinka, Emoarehi, Jonah and Ame (2017) studied firms in the emerging markets using value at risk (VaR) as a measure of enterprise risk and return on assets as a measure of financial performance. The researchers found that enterprise risk management has a significant positive impact on the financial performance of companies in the emerging markets.

Kinyua, Gakure, Gekara and Orwa (2015) advocated for a robust internal control system as an approach for managing risk in companies. Using a sample of thirty eight companies listed in the Nairobi securities exchange and cross sectional data, the researchers evaluated the effect of internal control systems on financial performance. They found that 30.8% of variation in financial performance can be attributed to risk management. Kariithi and Kihara (2017) analysed profitability, sales volume and market share in manufacturing firms in the pharmaceutical industry over a five year period using descriptive analysis and established that the three variables have a significant influence on an entity performance. Wanjohi, Wanjohi and Ndambiri (2017) established that there is a direct relationship between financial risk management and the return of an entity and they recommend active and robust risk management.

The research conducted within the Kenyan context largely uses descriptive and cross sectional analysis and therefore this paper adds to the existing literature by presenting the performance of manufacturing entities in a different perspective. The paper uses panel data and more robust analysis by use of long run and dynamic models and thus significantly contributes to the existing body of knowledge.

## **HYPOTHESES**

Financial performance literature point to the fact that sales/revenue volatility will have varied effects on different measures of financial performance. Carton and Hofer (2010) analysed the different measures that can be used to measure financial performance and indentified six key measures that can adequately differentiate between high and low performing organizations. The measures include return on assets, return on equity, return on sales, return on investments, EBITDA return on investment and operating margin. The researchers advocate for selecting financial performance measures that adequately discriminate among business entities with different levels of financial performance and recommend any of the above measures as being appropriate. Capkun, Hameri and Weiss (2009) contend that EBIT is a superior measure of financial performance as it indicates how well a business entity is able to efficiently control cost of sales, production and operating expenses. Ramesh, Al-Habsi and Al-Sharji (2017) argues that due to the fact that manufacturing companies hold significant levels of current assets which are not necessarily productive, this tends to have a negative effect on ROA. Manufacturing companies experience greater cyclic fluctuations in revenue compared to services providing companies which is attributed to volatility in the commodities markets and changes in consumer habits (Lacoviello, Schiantarelli & Schuh, 2011). Through review of related literature, we came up with the following hypotheses;

**Hypothesis 1:** Revenue volatility does not have a significant effect on the earnings before interest and tax (EBIT) of manufacturing companies in Kenya.

**Hypothesis 2:** Revenue volatility does not have a significant effect on the return on assets (ROA) of manufacturing companies in Kenya.

**METHODOLOGY**

The study uses the two models below to measure revenue/sales volatility:

Long run model;

$$EBITS_{i,t} = \beta_0 + \beta_1 \ln(\text{assets}_{i,t}) + \beta_2 \text{revvol}_{i,t} + \beta_3 \text{LEV}_{i,t} + \alpha_i + \epsilon_{i,t} \dots\dots\dots 1$$

Dynamic model;

$$EBITS_{i,t} = \beta_0 + \lambda EBITS_{i,t-1} + \beta_1 \ln(\text{assets}_{i,t}) + \text{revvol}_{i,t} + \beta_3 \text{LEV}_{i,t} + \alpha_i + \epsilon_{i,t} \dots\dots\dots 2$$

- i        1,.....,49 (individual manufacturing companies)
- t        1,2.....10 (time indicator)

Where  $EBITS_{i,t}$  is performance of entity  $i$  at time  $t$ ,  $EBITS_{i,t-1}$  performance of entity  $i$  at time  $t-1$ ,  $\ln(\text{assets}_{i,t})$  the natural log of total assets is included as a control variable to factor in the size of the company,  $\text{revvol}_{i,t}$  is the sales volatility measured by the coefficient of sales over an ten year period from 2007 to 2016.  $\text{LEV}_{i,t}$  is included as a control variable and measures the financial leverage. It is measured by ratio of total debt to total assets as long term debt commitment has a significant influence on an entity performance (Pagach & Warr 2011).

Long run model;

$$ROA_{i,t} = \beta_0 + \beta_1 \ln(\text{assets}_{i,t}) + \beta_2 \text{revvol}_{i,t} + \beta_3 \text{LEV}_{i,t} + \alpha_i + \epsilon_{i,t} \dots\dots\dots 3$$

Dynamic model;

$$ROA_{i,t} = \beta_0 + \lambda EBITS_{i,t-1} + \beta_1 \ln(\text{assets}_{i,t}) + \beta_2 \text{revvol}_{i,t} + \beta_3 \text{LEV}_{i,t} + \alpha_i + \epsilon_{i,t} \dots\dots\dots 4$$

- i        1,.....,49 (individual manufacturing companies)
- t        1,2.....10 (time indicator)

Where  $ROA_{j,t}$  is performance of entity  $i$  at time  $t$ ,  $ROA_{j,t-1}$  performance of entity  $i$  at time  $t-1$ . The expected coefficients for revenue volatility under both EBITs and ROA models were expected to be negative and significant.

## Measures

### Explanatory Variable

Chiang *et al.*, (2018) measures revenue/sales volatility by calculating the coefficient of variation of sales by taking an entity sale in year  $i$  less the mean of sales over a five year period divided by the sales mean. The coefficient of variation is taken to be a superior measure compared to other measure since it is able to mitigate time and industry/firm specific effects.

The study adopts the formula by Chiang *et al.*, (2018) when calculating revenue/sales volatility as illustrated below:

$$\text{COV}(\text{sales}_i) = \frac{\sqrt{\sum_{i=1}^3 ((\text{Sales}_i - \text{Sales}_{\text{mean}})^2/3)}}{\text{Sales}_{\text{mean}}} \dots\dots\dots 5$$

Where  $\text{Sales}_i$  depicts the entity sales in period  $i$  and  $\text{Sales}_{\text{mean}}$  is the mean of sales/revenue over a rolling duration of three periods. To normalize the raw entity specific data on volatility, the result is divided by the sales mean to alleviate time and industry effects (Ghosh & Olsen, 2009). A higher (lower) value of coefficient of sales indicates a higher (lower) level of sales/revenue volatility.

### Dependent Variables

The study adopted two key measures of financial performance; namely, EBITs and ROA in order to give a holistic picture of the different aspects of financial performance. EBITs is used as a measure of the operating efficiency as it depicts the ability of an entity to control the cost of sales and other related operating expenses. ROA is an important measure of financial performance in its own right as it ensures that you can objectively compare companies of different sizes as you are able to eliminate the bias that results from comparing small and large companies.

### Control Variables

**Natural Log of Assets:**  $\text{Ln}(\text{assets}_{i,t})$  the natural log of total assets is included as a control variable to factor in the size of the company. Capkun *et al.*, (2009) argue that while it's prudent to control for the size, the researcher should not be so much concerned about the sign or the significance of the coefficient as size will largely depend on business cycle, the industry a firm is operating in and the financial performance measures used in the analysis.

**Leverage:** Leverage (LEV) is included as a control variable and measures the financial leverage. It is measured by ratio of total debt to total assets as long term debt commitment has a significant influence on an entity performance (Pagach & Warr 2011). An inverse relationship between leverage and financial performance was expected.

## Descriptive Statistics

Table 1 shows the overall mean, standard deviation, minimum and maximum values, EBITs, ROA, Lnassets, sales growth ratio, corporate diversification and leverage respectively.

**Table 1: Summary Statistics for the Secondary Data Set**

Variable	Obs	Mean	Std. Dev.	Min	Max
EBITS	351	0.0045	0.6391	-7.2	0.9114
ROA	351	0.0881	0.1418	-0.4799	0.6351
Lnassets	351	7.8721	1.9968	1.6094	12.603
Revvol	351	0.2589	0.5894	0.001	6.2946
Lev	351	0.5525	0.4719	0.0081	4.0911

From Table 1 we observe that the panel data was balanced thereby enhancing the accuracy of the results. EBITs has a mean of 0.0045 with a relatively high standard deviation. Thus when you consider the standard deviation, minimum and the maximum values, they point to the conclusion that the EBITs captures significant volatility among the manufacturing companies. ROA shows less variability although the measures point to the same direction where the standard deviation is relatively less and the range between the minimum and the maximum value compare to the values under EBITs.

Revenue volatility has a relatively low standard deviation and its minimum and maximum values range from 0.001 to 6.2946 indicating significant volatility in the streams of cash flow (Hannagan & Morduch, 2015). The Lnassets has a high mean value signifying that the manufacturing entities hold significant levels of assets as can be discerned from the minimum and maximum values. Low but still significant variations can be observed under the leverage.

**Table 2: Correlation for Revenue Volatility and financial performance**

	EBITS	ROA	Lnassets	Revenue volatility	Leverage
EBITS	1.000				
ROA	0.5889 (0.0000)	1.0000			
Lnassets	0.1101 (0.0392)	0.1828 (0.0006)	1.000		
Revvol	-0.5088 (0.0000)	-0.2697 (0.0000)	-0.1717 (0.0012)	1.000	
Lev	-0.0244 (0.6493)	-0.1741 (0.0011)	-0.1089 (0.0414)	-0.1390 (0.0091)	1.000



**Table 3: Estimated Coefficients of Revenue Volatility and Financial Performance**

<b>Dependent variable</b>	<b>EBITS</b>	<b>ROA</b>
<b>Explanatory variable</b>	<b>Coefficient.</b>	<b>Coefficient.</b>
Lnassets	-0.003702 (-0.11)	-0.00471 (-0.69)
Revvol	-0.05461*** (-7.00)	-0.05999*** (-3.24)
lev	-0.114509 (-1.16)	-0.06855*** (2.91)
_cons	0.20895 (0.78)	0.168007*** (2.90)
<b>Post Estimation Diagnostics</b>		
Rho	0.76602	0.55037
Wald test chi2(3)	49.37***	16.73***
Lm test Chibar2	01.37***	324.54***
Hausman Test	0.05 (0.9969)	2.96 (0.1001)

**KEY**

Statistical significance: P-Value<0.01      \*\*\*; P-Value<0.05      \*\*; P-Value<0.1      \*

**Table 4: One Step System GMM Estimates for Revenue Volatility**

<b>Dependent variable</b>	<b>EBITS</b>	<b>ROA</b>
<b>Explanatory variable</b>	<b>Coefficient.</b>	<b>Coefficient.</b>
EBITS <sub>t-1</sub>	-0.0660792 (-1.06)	-
ROA <sub>t-1</sub>	-	0.315452*** (2.77)
Lnassets	0.0057245 (0.07)	-0.0508648** (-2.07)
Revvol	-0.8749704*** (-7.27)	-0.063285* (-1.75)
lev	-0.112804 (-0.65)	-0.1605943*** (-3.21)
_cons	0.2500752 (0.37)	0.5680683*** (2.87)
<b>Post Estimation Diagnostics</b>		
Hansen J test	5.34933**	29.2235***
Wald test	55.21***	27.53***

**KEY**

Statistical significance: P-Value<0.01      \*\*\*; P-Value<0.05      \*\*; P-Value<0.1      \*

## **FINDINGS**

The results in Table 2 found that revenue volatility and financial performance of manufacturing companies measured using EBITs and ROA are negative and significantly associated. The results also indicated that Leverage and financial performance of manufacturing companies measured using EBITs is negative but insignificantly associated while Lnassets and financial performance of manufacturing companies measured using EBITs and ROA are positively and significantly associated. These results are in agreement with those of Chiang *et al.*, (2018) who found that there is a negative but significant relationship between revenue volatility and performance. The researchers therefore conclude that financial performance has a negative and significant relationship with revenue volatility.

The results in Table 3 show that Lnassets, revenue volatility and leverage are jointly significant in elucidating the disparity in EBITs and ROA since the Wald statistic is statistically significant at one, five and ten per cent level of significance. LM test statistic and the Hausman test are significantly higher than the expected critical value at one, five and ten per cent level of significance. Consequently, we reject the null hypothesis on the non heterogeneity of the cross sections at one, five and ten per cent level of significance. As a result, we adopt the random effect model instead of the pooled OLS model.

Revenue volatility is observed to have a negative and significant effect on the financial performance of the entities both under the EBITs and ROA models. For EBITs and ROA models, the long run coefficients of revenue volatility are significant at one, five and ten per cent level of significance. Therefore, we observe that the coefficient differs significantly from zero at five and ten per cent level of significance. . Even after relaxing the assumption of past performance influencing current performance under the GMM model, the coefficients do not significantly change showing consistency in the measures. Therefore, the supposition that the revenue volatility does not have a significant relation with the financial performance of manufacturing companies measured using EBITs is rejected. As Fang (2016) postulates, financial risk will manifest itself in manufacturing companies through low profitability and poor efficiency resulting from depressed gross profit margins, high product costs and low return on investment. Vätavu *et al.*, (2018) contends that when profitable business entities face decline in revenue, they take measures such as making drastic cuts in expenditure and deferring investing in capital expenditure and therefore such volatility may not affect their immediate financial performance but this may be reflected on low return on assets.

## **SUMMARY AND CONCLUSION**

In this study we sought to evaluate the impact of revenue volatility on the financial performance of the manufacturing companies in Kenya. We used panel data for a ten year period that was analysed using long run/static and dynamic models. As a check for the

robustness of the model used, the researcher applied the dynamic Generalized Method of Moments to re-estimate the revenue volatility - financial performance nexus.

The study findings as presented in Tables 1 to 4 indicate that the natural log of assets, revenue volatility, and leverage affect the financial performance of manufacturing entities in Kenya. The coefficients for revenue volatility are negative and significant as expected implying that revenue volatility has a significant and negative effect on the financial performance of manufacturing companies in Kenya. Thus the null hypothesis that revenue volatility does not have a significant relation with the financial performance of manufacturing companies in Kenya is rejected in favour of the alternative hypothesis.

From the findings of the study, the researchers recommend that manufacturing entities should carefully monitor their sales/revenue volatility due to the observed negative and significant effect on the financial performance. Revenue volatility has a negative effect on the financial performance of manufacturing entities when measured using EBITs and ROA and thus should be closely monitored to ensure volatility in revenue does not have an adverse effect on the financial performance. Equally, the level of debt incorporated into the capital structure of a business entity should be of concern as the findings of the study pointed to the fact that leverage has a significant effect on the financial performance of manufacturing entities when measured using ROA.

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