

## **Cost and Earning Dynamism: The Cointegration Approach**

Kehinde, James Sunday Phd

Dept Of Accounting And Finance, Faculty Of Management Science, Lagos State University

Email: pastorkehindebox@yahoo.com

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### **Abstract**

The study examine the existence of a long run equilibrium between various cost variables and earning and the existence of cost variables stability of the in the firm. Secondary data from the financial reports of Cadbury Nigeria plc covering 2001 to 2010 was adopted for the study. The Augmented Dickey Fuller (ADF) unit root technique was used for the stationary test while the Engle-Granger approach was adopted for the cointegration test. The study reveals that long run relationships exist between the variables and the long run stability relationships exist between the variables, however, at weak significant point. It was recommended that cost management and review strategies should be adopted by the firm to strengthen the position of the firm in the industries and to put the firm in long run control of it cost and performance horizon

**Keywords :** Cointegration, Unit root, Administration cost, Operation cost.

### **Introduction**

Cost stability remains a strong factor in the process of long run stability, survival and performance of the firm. Most firms who made lost do so for poor cost management and ineffective resources management. In manufacturing, operational cost are divided into administrative and distributive cost, directly related to production is the cost of goods sold or cost of sale, Which must be deducted from turnover to give gross profit, all these costs produce the business risk of the firm other none production related cost result in financial risk namely interest paid on debt (loans and advances). Thus, for effective management of the firm financial risk related cost and business risk related cost there must be a long run stability of the variables and a long run equilibrium relationship must be established. Thus, the existence of a long run stability and equilibrium will enable the firm to achieve effective cost management and performance stability. The growth and survival problem in most firms are cost management related and the inability to assess the efficient of cost on earning at equilibrium and stability level result in difficult cost management in many firms which exposes the firm to several operational risk and survival costs. Thus, this study examines the relationship process of establishing long run stability and equilibrium for the firm in relations

to the firms cost variables and the earning factor using the cointegration and the unit root approach

### **Cost defines**

The term 'cost' means the amount of expenses [actual or notional] incurred on or attributable to specified thing or activity.(yusuf,2009 ) In accounting, costs are the monetary value of expenditures for supplies, services, labor, products, equipment and other items purchased for use by a business or other accounting entity

The term cost is used in reference to production or manufacturing of goods and services cost refers to sum total of the value of resources used like raw material and labour and expenses incurred in producing or Manufacturing of given quantity.( )

The Institute of cost and work accountants (ICWA) defined Cost as 'measurement in monetary terms of the amount of resources used for the purpose of production of goods or rendering services In relation to production Cost include the value of raw material, amount paid to labour and and cost of overhead of production

### **Cost concept**

Cost concept allows the cost of producing the good to be stated in term of the absolute cost of producing the good called the total cost. The total cost is the sum of all costs in generating a good it can be stated in term of a unit produced or in term of all product or unit term of a batch or contract done. Yusuf (2009) said cost can be classified according to function, element, responsibility, definition and behaviour. In relation to function total cost include production cost, marketing cost, selling cost, distribution cost, research cost and development cost , according to element, cost is classified as material cost, labour cost and overhead cost in relation to responsibility can be controllable cost and uncontrollable cost, by definition cost can be stated as total cost standard cost , opportunity cost, direct and indirect cost incremental cost , fixed cost, variable cost and semi- variable cost. (Baker,2000)

Kelly (2002) stated that Direct Cost is the cost assigned specifically to a given or particular service. And A cost necessary for the functioning of the organization as a whole is known as indirect Cost. Total cost is the sum of all costs, direct and indirect, associated with the provision of a given or particular service or in production of a certain good. A fixed cost is a cost that does not change with increases or decreases in the amount of service provided (e.g., rent) over time while the cost that increases or decreases with increases or decreases in the amount of service provided or good is called Variable Cost

### **Concept of avoided cost**

Avoided cost is the cost a producer would incur to generate a product it did not purchase product from another source it is therefore the opportunity cost of not purchasing a product but produce it directly conversely it would be the cost at which a producer would rather have purchase a product rather than produce the item

Avoided cost provides the basis of the rate required to be paid for a product or a unit of a product. it deal mostly with direct cost of a product( Beecher,2011)

The concept of avoided cost relate to the selection of the least cost in recourse planning, it is a centre characteristic of integrated recourse planning (IRP). It has the benefit of avoiding unnecessary cost . Avoided costs can be used to evaluate the benefits of resource alternatives on the supply side. it also relate to the incremental cost approach

In the context of IRP for units of a product, avoided costs are the incremental savings associated with *not* having to produce additional units of the product or service while demand requirements is still being met (Beecher, 1995).

Opportunity cost, also referred to as economic cost is the value of the best alternative that was not chosen in order to pursue the current endeavor—i.e., what could have been accomplished with the resources expended in the undertaking. It represents opportunities forgone.

Total cost is the sum of all costs, it is the total amount expended on production of goods and services. In addition, total cost can be a useful concept in comparison of the organization's service delivery efficiency with either the private sector or other governments. The firms ability to determine the total cost of a service, however, is of limited value; *understanding* total cost should always be the goal.

Understanding total cost by examining its components can provide the information necessary for informed decision making. It allows an organization to focus its actions where it will be most effective.

Yusuf (2009) classified cost according to functions, elements, responsibility, definition, and behavior. Every one of these concept is applicable to situations in which cost is a central focus. Cost according to definition can be stated as total cost, standard cost, opportunity cost, direct cost, indirect cost, and incremental cost. Direct and indirect are useful concept whenever a service charge is being evaluated because it is concerned with the measurement of the total organization effort required to deliver a service.

The concepts of direct and indirect costs provide one of the basic approaches to cost analysis, an approach that stresses the organizational structure of the jurisdiction. Cost according to function can be stated as administrative cost, production cost, selling cost, distribution cost and development cost (Yusuf, 2009).

It is useful to distinguish between two types of indirect costs: indirect service costs and indirect administrative costs. Indirect service costs are those that might be performed by a service unit by and for itself, but which are centrally controlled — usually for reasons of efficiency, control, or economies of scale, a centralized data processing operation or a purchasing function fall into this category.

Indirect administrative costs are associated with activities that must be incurred by the organization, but which do not directly benefit any service delivery function. (Richard 1991)

### **Total cost concept**

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### **Cointegration and cost- value variables**

Shih et al (2010) using cointegration approach empirically demonstrated that market value and book value are nonstationary for selected sample of small firms and more importantly book value and residual income cointegrate with market value for 64.29 percent of the sample firms at the 0.05 level proving right the ohlson finding that the price of share in the stock market are better determine by the book value of the firm rather than exogenous variables like dividend and the income of the firm

George Rapsomanikis and David Hallam(2006 ) in an empirical study of cost and price relationship using the error correction model (ECM) and the cointegration approach for sugar-ethanol-oil relationship to establish the *possibility of nonlinear dynamic adjustment in the sugar-ethanol-oil* price and value find out *that sugar and oil and ethanol and oil prices are characterized by discrete threshold behaviour, whereas, sugar and ethanol can be thought of as being linearly cointegrated. Threshold estimates suggest that sugar prices adjust rapidly to long run equilibrium, determined by oil prices, in an asymmetric manner, when disequilibria are negative. It need to be stated that Threshold behaviour and discrete adjustment characterise many economic relationships that determine commodity and asset prices, inventories, interest and exchange rates and employment. Geoge rapsomanikis (2006) stated that thresholds are normally thought of as functions of transaction and adjustment costs, or economic risk that prevent agents from adjusting continuously to changes in markets, as reflected by the empirical notion of cointegration and the related linear VCM.*

Campiche Jody L., et al (2006) study the differences in prices paid and prices received by farmers are using cointegration analysis. The study find out that the Johansen cointegration

test between prices paid and prices received revealed that the series were cointegrated. After accounting for technological change, the study does not reject a long-run one-for-one relationship between prices paid and prices received.

### **Research problem**

Cost variables counts in stating the earning-cost models and measuring the relationship between cost and revenue or earning of firms, thus, a spurious regression and wrong estimate of values will occur when the cost variables are not stable and not at equilibrium, it also means that long run relationship may not exist within the variables this is a basic issue in regression estimate

### **Research method**

#### **Research Design and Strategy**

Research design is the structure and strategy for investigating the relationship between the variables of the study. The research design adopted for this study is the experimental research design. The reason is that experimental research design combines the theoretical consideration with empirical observation. It enables the researcher to observe the effects of the explanatory variables on the dependent variable.

#### **Type and Sources of Data**

Secondary data were used for this study. The data were obtained from the annual financial reports of the firm, website, Journals and Newspapers. The data collected are: cost of sales (Csales), distribution expenses (Dexp) Administrative expenses (Aexp) and interest paid on loan.

#### **Model Specification**

The study adopts model on the causal relationship between distribution expenses (Dexp) Administrative expenses (Aexp), interest paid on loan (Int) and cost of sales (Csales) of the firm. When distribution expenses (Dexp) Administrative expenses (Aexp), interest paid on loan (Int) are independent variables ( $X_1, X_2, X_3$  respectively) and cost of sales (Csales) is a dependent variable ( $Y_t$ ), the model is as shown in Eq. (1):

$$Csales_t = \alpha_0 + \beta_1 Dexp_t + \beta_2 Aexp_t + \beta_3 Int_t + \hat{\epsilon}_t \dots \dots \dots (1)$$

When  $Csales_t$  (cost of Sales) is the dependent variable and distribution expenses (Dexp) Administrative expenses (Aexp), interest paid on loan (Int) are independent variables. Where;  $t$  is the  $t$ -th year (time series annual data),  $Csales_t$  is the Dexp, Aexp, and Int of  $t$ -th year. And  $\hat{\epsilon}_t$  is the error term.

#### **Data Processing Technique**

In this study, the empirical investigation consists of three main steps. First, the Augmented Dickey Fuller test (ADF) tests of stationarity (1981). Second, the Johansen test of coin-

integration (1991) and third, the error correction mechanism (ECM) analysis. Most empirical works based on time series assume that the underlying time series is non-stationary. However, if the time series data are not stationary and regression is done it leads to a spurious result. Hence, the adoption of Augmented Dickey Fuller (ADF) test to avoid the problem. The Augmented Dickey Fuller (ADF) is expressed as follows

$$\Delta X_t = \alpha_0 \delta X_{t-1} + \sum \beta \Delta x_{t-1} + \ell_t \dots \dots \dots (1)$$

Where  $\Delta X_t$  is the first difference,  $\Delta x_{t-1}$  is the lagged difference of  $X_t$  in year t,  $\delta$  and  $\beta$  are parameters and  $\ell_t$  is the error term.

The Johansen test of coin-integration (1991) was used to analyse the long-run relationships and dynamic interactions existing between variables. Rufai and Omonona (2012) declare that where data is non stationary, cointegration test may be applied to determine which of the variables will co-move in the long run. The unrestricted cointegration rank test (trace) is expressed as:

$$Y_t = \beta_1 + X_1 + X_2 + X_3 \dots \dots \dots (2)$$

The ECM is always used where there is cointegration in the variables to correct for the disequilibrium and to reconcile the variables to the long run behaviour. The ECM assumption reveals that the change in a variable, at times, is not only dependent on the changes in independent variables, but also on its own lagged changes. This enables researchers to induce flexibility by explaining the short run and long run dynamics in a unified manner. The ECM is expressed as:

$$\Delta Y_t = \alpha_0 + \alpha_1 \Delta X_1 + \alpha_2 \Delta X_2 + \alpha_3 \Delta X_3 + \alpha_t ECM(-1) + \ell_t \dots \dots \dots (3)$$

Where  $Y_t, X_1, X_2, X_3$  are previously defined,  $\Delta$  is the difference operator,  $ECM(-1)$  is the error correction factor and  $\ell_t$  is the stochastic error term assumed to be normally distributed with zero mean and constant variance.

The data on the variables were all processed using E-view for windows econometric package. The Eview was always preferred to SSPS because it enables researchers to correct the serial correlation in the data.

**Data Analysis, Results and Discussions**

**Stationary and co integration test**

The study was carried out using the secondary data sourced from the annual financial reports of the firm. The study firm is Cadbury Nigeria plc. The ordinary least square regression model was adopted for the study. The study covered a period of 2000 to 2010. The variables were tested for presence of unit root using the Augmented Dickey Fuller (ADF) unit root test, and cointegration using the Engel and Granger approach.  $dy_{t-1} = y_{t-1} + u$ , is the model for unit root using the Augmented Dickey Fuller (ADF) and in this case the cost-earning model is  $Nprofit = a_0 a_1 Dex + a_2 Aexp + a_3 Int + u$

Table1

	t-statistics	Decision rule	Asypm.prob
Csales	2.747676	I(1)	0.0629**
Dexp	2.416274	I(1)	0.0521**
Aexp	-2.700907	I(1)	0.0355*
Interest	2.793676	I(1)	0.0234*

(\*)(\*\*) two asterisks denote rejection of the hypotheses at 0.01 and one asterisk at 0.05

The study test for the relationship between net profit and various costs in the organization, to ensure the stationary of the variables, the unit root test using the Augmented Dickey Fuller (ADGF) was carried out on the variables the result is presented in table 1.

Table1 shows the result of the ADF unit root test for the variables .cost of sales (Csales) , distribution expenses(Dexp) Administrative expenses(Aexp) and interest (paid on loan) were all stationary at first difference using the Mackinnon(1996) one sided P-value at 10% for cost of sales and distribution expenses and 5% for administrative and interest paid.

## COINTEGRATION TEST

Table2

	t-cal	t-tab	P-value	
ADF(t-statistic)	2.8189			
1%		4.4205		
5%		3.259		
10%		2.77	0.0954	

\*MacKinnon (1996) one-sided p-values.

Source: author's analysis

The co-integration test was carried out using the residual value of the least square regression test model in the study. The result revealed that the variables in the study cointegrate and 90% confidence level and hence is significant at 10 significant levels. Thus there is no long run relationship between the variables at 1%, and 5% significant level but at 10% thus the variables reflect a long run relationships but a weak one for a firm of this status it also means that the variables though can be used for prediction of the cost and earning relationship of the firm but at a weak level for the firm

## Conclusion and recommendation

The study revealed that distribution and distribution expenses are stationary and can be of value in estimation of the earning-cost model, also in the long run all the variables can be used to predict activities of the firm and for effective cost management in the firm, the

variables co-integrate , It was recommended that cost management and review strategies should be adopted by the firm to strengthen the position of the firm in the industries and to put the firm in long run control of it cost and performance horizon

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